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The Biology of Mangroves . *By Peter J Hogarth*

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Review by: Reviewed by Norman C Duke

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## HISTORY, PHILOSOPHY &amp; ETHICS

## CAN A DARWINIAN BE A CHRISTIAN?: THE RELATIONSHIP BETWEEN SCIENCE AND RELIGION.

By Michael Ruse. Cambridge and New York: Cambridge University Press. \$24.95. xi + 242 p; ill.; index. ISBN: 0-521-63144-0. 2001.

I had not expected to enjoy this book nearly as much as I did, nor did I expect to warm to the conclusion that “when one is dealing with a system like Christianity, which is grappling with some of the really deep issues which face humankind . . . precisely because one is a Darwinian, one ought to be sympathetic when the system runs into doubt and mystery. Being a Darwinian does not compel one to be a Christian; but, because one is a Darwinian one is opening the way for someone to be a Christian” (p 142).

In the course of his exploration of the question in the title of his book, Ruse considers both Darwinian accounts of evolution and Christianity in depth and with guarded sympathy for both points of view. Of course, the conclusion that they are compatible does not imply that either is true. But Ruse has done the scientific and Christian communities a great intellectual service by setting out the issues with such clarity and without technical jargon. If one stands back and considers the potential conflict from the viewpoint of a court of law, one is left without doubt (not least through the intellectual contortions that have to be adopted in order to ascribe any sense to Christian claims) that Christianity is guilty of error, and that Darwinians are on the side of the angels; nevertheless, Ruse shows that the battle is not totally clear cut, and readers on both side of the divide (and those who contrive to straddle it) will take great pleasure from

this excellent, thoughtful, and accessible introduction to an eternal debate.

PETER ATKINS, *Chemistry, Lincoln College, University of Oxford, Oxford, United Kingdom*

## SPARKS OF LIFE: DARWINISM AND THE VICTORIAN DEBATES OVER SPONTANEOUS GENERATION.

By James E Strick. Cambridge (Massachusetts): Harvard University Press. \$45.00. xiii + 283 p; ill.; index. ISBN: 0-674-00292-X. 2000.

Could living things emerge spontaneously from nonliving raw materials? This is a question that obsessed many Victorian naturalists, from famous names like Charles Darwin and Thomas Henry Huxley, to less well-known men like Henry Charlton Bastian. The issue had been debated for centuries, but it became a hot topic that began in the 1860s and continued through the 1880s because of two new contexts: Darwinism and the germ theory of disease. The former seemed to require—at some stage in life’s history—a leap from nonlife to life, while the latter claimed to explain the presence of bacteria in diseased patients without the traditional recourse to spontaneous generation (which had been used to explain such things as bacteria and parasites). Strick discusses the spontaneous generation debates in relation to both these contexts, whereas previous scholars have tended to focus primarily on the medical context.

In Strick’s assessment, the career of Bastian, one of spontaneous generation’s most respected advocates, epitomizes many of the reasons for the theory’s brief popularity and subsequent decline. Bastian’s work was initially promoted and defended by Huxley and the members of the X-Club, which exercised an informal but extensive influence over

London's scientific societies. Concerns about the respectability of their science and a desire to distance Darwinism from earlier evolutionary theories eventually led the X-Club to drop spontaneous generation. Huxley's colleague, the physicist John Tyndall, enthusiastically promoted Pasteur's germ theory (often in the face of opposition from within the medical community) and used it to attack Bastian's reputation as a careful experimenter. The combination of the germ theory and the X-Club's maneuverings made it almost impossible for Bastian to publish, and spontaneous generation gradually slipped from scientific attention.

Strick's book suffers slightly from being too short and thus being too compressed: dates, people, ideas, terms, and theories are all introduced in such rapid procession that readers without some prior familiarity with the period and the issues may become a little dizzy. And Strick's decision to organize his material thematically, rather than chronologically, leads to repetition that adds to the confusion. Nevertheless, it is an original and immensely well-researched contribution to the literature on this debate, and one that should be in every university library.

JIM ENDERSBY, *History & Philosophy of Science, University of Cambridge, Cambridge, United Kingdom*

THE MAN WHO FOUND THE MISSING LINK: EUGÈNE DUBOIS AND HIS LIFELONG QUEST TO PROVE DARWIN RIGHT.

By Pat Shipman. New York: Simon & Schuster. \$28.00. xii + 514 p; ill.; index. ISBN: 0-684-85581-X. 2001.

Pat Shipman's biography of the Dutch scientist Eugène Dubois is a missed opportunity. Dubois certainly deserves attention. Chaffing in the late 1880s under the restrictions and responsibilities of his university lectureship, the young Dubois set out for the Dutch East Indies on an audacious gamble to uncover the elusive "missing link" between humans and apes. Through luck, determination, skill, and the full weight of an exploitive colonial economy, he discovered fossilized bone fragments that allowed him to identify an intermediate species proudly christened *Pithecanthropus erectus* (now *Homo erectus*). Scientists spent decades arguing, often caustically, about the exact value and meaning of these bones. Although Dubois's irascibility and selfishness needlessly exacerbated the acerbity of these exchanges, their heat was generated primarily by fundamental questions about the underlying nature of the evolutionary process, the basis of intellectual authority, and the contested "ownership" of specimens and excavation sites.

Inexplicably, Shipman lacks faith in this fantastic material. She fills this putative work of nonfiction with countless invented scenes. This far exceeds dramatic license; not content with fabricating dialogue

and peppering it with stutters, pregnant pauses, hand gestures, and colorful ethnic colloquialisms, she also records what people were thinking and feeling at specific moments. Her endnotes clearly indicate that these set pieces invariably possess only a dubious grounding in the documentary record. No doubt all this is meant to "humanize" Dubois's story, but good biographers can bring their subjects to life without recourse to omniscient narration.

An inadequate understanding of the historical development of evolutionary theory in the 19th and early 20th centuries mars the biography more seriously. Misunderstanding and invention sometimes mingle with disastrous effect, no more so than in the claim raised by the subtitle. She leaves no doubt that Dubois saw his "quest" for the "missing link" as a crusade to prove evolution definitively true. An odd position to take: by the time he embarked for Java, the overwhelming majority of biologists already accepted evolution matter-of-factly, notwithstanding the literally dying opposition from recalcitrant old men like Rudolf Virchow. Besides, did Dubois really hold the perversely anthropocentric notion that the fate of evolution as a scientific theory somehow pivoted on the discovery of the physical remains of a transitional form between humans and apes? It is impossible to distinguish what Dubois believed from what Shipman believes for him.

Shipman concludes that "[i]t is time now for the truth [about Dubois], and I have told it" (p 454). This sits rather oddly in a book dominated by deliberate invention and a persistent misunderstanding of the historical context.

RICHARD BELLON, *Program in the History of Science & Technology, University of Minnesota, Minneapolis, Minnesota*

CLONING: RESPONSIBLE SCIENCE OR TECHNOMADNESS? *Contemporary Issues*.

Edited by Michael Ruse and Aryne Sheppard. Amherst (New York): Prometheus Books. \$19.00 (paper). 332 p; ill.; no index. ISBN: 1-57392-836-4. 2001.

Anyone who has followed the federal, professional, and popular debates surrounding embryonic stem cell research, gene therapy trials, or the Human Genome Project in recent years knows that the development of biomedical ethics as a vital discipline continues to grow in direct proportion to the medical research that inspires it. Michael Ruse and Aryne Sheppard's edited anthology of essays uses the late 1990s phenomenon of Dolly the sheep as a case study for raising a host of bioethical concerns surrounding the issue of cloning. The editors, who are philosophers of science, have selected essays from a broad range of authors whose work, taken collectively, forms a kind of temporal "snapshot" of Dolly's 1997 reception.

Twenty-nine essays drawn from sources as varied as public policy journals to *Time* magazine are grouped into ten different sections focused on such germane topics as cloning and identity, cloning and medicine, genetically modified plant and animal life, and religious perspectives on cloning. A final section includes statements on cloning issued by governmental and parliamentary commissions in Europe and the U.S. Readers familiar with contributors such as Walter Glannon, Leon Kass, and Philip Kitcher will discover many less familiar voices whose scholarship on the social and political implications of cloning is equally important. Perhaps the only significant disappointment in the volume is Ruse and Sheppard's weak introductions to the volume and each of the ten sections. Like their book's sensationalistic title, their introductory material fails to provide the proper historical and political contexts into which the Dolly debates must be situated. Lacking this perspective some four post-Dolly years later, the volume seems somewhat dated, especially now that embryonic stem cell research has replaced Dolly as the *bête noire* of bioethics in the public mind. Still, the volume's wise choice of essays, as well as its internal structure, makes the book enormously useful for teaching, even if it also permits repetition of themes and arguments. This may be one of the sticking points of organizing an entire volume around such a narrowly defined theme.

DAVID H SERLIN, *History, Albright College, Reading, Pennsylvania*

WHAT FUNCTIONS EXPLAIN: FUNCTIONAL EXPLANATION AND SELF-REPRODUCING SYSTEMS. *Cambridge Studies in Philosophy and Biology.*

By Peter McLaughlin. Cambridge and New York: Cambridge University Press. \$54.95. xi + 259 p; index. ISBN: 0-521-78233-3. 2001.

This book makes an important contribution to the question of the extent to which it is proper to ascribe functions to natural systems. It is an examination of the metaphysical assumptions that underlie functional ascriptions and explanations. In particular, what kinds of systems are capable of being functionally explained? What does a commitment to a functional account entail? The natural systems discussed are, for the most part, biological systems, although there are passing references to functional explanations of social systems. The author rightly assumes that the problematic cases of functional explanation are those that are causal as well. Then the issue becomes: what does ascribing a function to some system or part do in addition to a mere causal account of its working? The bottom line is that only self-reproducing systems qualify as candidates for functional explanation. In recent

years, biologists and philosophers of biology have sought to explain the emergence of functionality in biological systems as due to the working of Darwinian natural selection. The author concludes that Darwin is not enough.

The book is separated into three parts. The first part, Functions and Intentions, lays out the relationships among teleology in nature, the role of intentionality in generating functions, functions in artifactual systems, and functions in natural systems. Part 2, The Analysis of Functional Explanation, is a very useful summary and critique of recent work in the philosophy of science on the nature and role of functions. Two related but distinct concepts of "function" have been recognized. One, the "etiological view," traces back to the work of Carl Hempel and Larry Wright. In this view, functions are explained in terms of the causal factors that contribute to their production. The other, "dispositional view," which has its roots in the work of Ernst Nagel and Robert Cummins, treats functions in terms of their effects on the systems of which they are a part. In Part 3, Self-Reproducing Systems, the author uses the analyses from Parts 1 and 2 to develop his own position.

McLaughlin rejects the common view that natural selection provides a mechanism that produces "design without a designer." He then goes on to argue that although natural selection can account for the presence of a function bearer—some trait of an organism or system—it cannot explain why that bearer has a function. An analysis of feedback mechanisms and the concept of the "good" for a natural system leads to the conclusion that only self-reproducing systems are capable of being functionally explained. What functions explain are the existence and properties of those parts of a self-reproducing system that contribute to the self-reproduction of that system.

This work is a detailed and careful investigation of the metaphysical commitments that appeals to what functions entail. It is an empirical question, to be decided by working biologists, whether the author's preferred concept of function will prove fruitful. Anyone interested in the role of functions in biological explanations will benefit from reading this book.

MICHAEL BRADIE, *Philosophy, Bowling Green State University, Bowling Green, Ohio*

THE SPLENDID FEAST OF REASON.

By S Jonathan Singer. Berkeley (California): University of California Press. \$24.95. xxiii + 242 p; ill.; index. ISBN: 0-520-22425-6. 2001.

This book, by a retired molecular biologist, is intended for general readers. It is a celebration of the life of reason as a tonic for survival in what

appears to be an irrational world. The author condemns a number of "irrationalities" from traditional religion to postmodernist social constructionist critiques of science. He has, however, no illusions about the power of rationality to completely dispel the irrational elements of human nature, but he argues that rational pursuits can hold them in check. A brief sketch of the history of science, focusing on the development of cosmology and biology, provide the evidence for belief in an objective external reality to which human beings must accommodate themselves.

A primary theme is to encourage the application of the results of biological sciences to the understanding of human affairs. The main objective of the book is to suggest a way of reconciling the internal, egocentric subjectivity of human thought (the province of humanists) with the external reality of the physical world (as revealed by scientists). Too few individuals can successfully span both cultures, but given that the pursuit of knowledge has an economic, political, social, and moral price, it is the duty of rationalists to try to bridge the gap. In the final chapter, the author, writing from a left of center perspective, addresses three questions: the wisdom of imposing constraints on the conduct of scientific research (a bad idea); the need for constraints on free wheeling capitalism (a good idea); and the benefits of political democracy (a sometimes chaotic system, but the best among all the alternatives). There are seven short appendixes on biological topics, the last being a parable on the potential dangers of unrestricted biotechnology. The book is an easy read and may well inspire more careful thought about the issues it raises.

MICHAEL BRADIE, *Philosophy, Bowling Green State University, Bowling Green, Ohio*

GRIT-TEMPERED: EARLY WOMEN ARCHAEOLOGISTS IN THE SOUTHEASTERN UNITED STATES. *The Ripley P. Bullen Series.*

*Edited by Nancy Marie White, Lynne P Sullivan, and Rochelle A Marrinan; Foreword by Jerald T Milanich. Gainesville (Florida): University Press of Florida. \$49.95 (hardcover); \$24.95 (paper). xix + 392 p; ill.; index. ISBN: 0-8130-1686-X (hc); 0-8130-2101-4 (pb). 1999.*

This book is a delight; it is an important contribution to the history of anthropology and gender studies. Nine anthropologists document the web of social relations that allowed and impeded the contributions of women to southeastern U.S. archeology in the early and mid-20th century. This volume demonstrates that southeastern archaeology was an integral part of the discipline, and that women were involved in every aspect from site identifica-

tion to paleoethnobotany. The book serves as a history of archeology itself—not in the usual terms of great men (although they are necessarily mentioned, most often as providers of training and support for women archeologists), but as a way of understanding the theoretical interests, practical concerns, and contingencies that affected all 20th-century archeologists.

It is a theoretically sophisticated, secondary source, but will also be a primary reference for future work by historians as it nicely documents the interests, concerns, and attitudes of archeologists in the 1990s. Its style and conclusions will also prove useful to investigations of other geographically situated sciences (particularly those involving field work), and will interest readers pursuing the interface between elite academics and amateurs (ranging from illiterate local field hands to major philanthropists).

The most exciting essay for cultural historians is likely Claassen's Black and White Women at Irene Mound. This famously important Works Progress Administration (WPA) site was excavated by a crew of 117—including 87 black women. Some 32 white women were involved in other aspects of the project. Other digs may have averaged as many as three women for each man.

Besides the engagingly written biography and disciplinary history, *Grit-Tempered* raises deep philosophical issues, particularly the beginning and concluding chapters by Nancy Marie White. How could our vision of human evolution fail to be colored by the world-view of the scientists who work in the field? Ever since Darwin, the prehistory of humanity has been used to tell stories that either reinforce or challenge the status quo regarding race, class, and gender. *Grit-Tempered* asks about the specific activities of women in prehistory and of those who discover what these women left behind.

PATRICIA PRINCEHOUSE, *History of Science, Harvard University, Cambridge, Massachusetts*

GEORGE GAYLORD SIMPSON: PALEONTOLOGIST AND EVOLUTIONIST.

*By Léo F Laporte. New York: Columbia University Press. \$50.00 (hardcover); \$16.00 (paper). xviii + 332 p; ill.; index. ISBN: 0-231-12064-8 (hc); 0-231-12065-6 (pb). 2000.*

George Gaylord Simpson (1902–1984) was a vertebrate paleontologist with broad interests in quantitative methods, mammalian systematics, historical biogeography, and the pattern and process of evolution. He was a principal architect of the modern evolutionary synthesis integrating genetics, systematics, and paleontology in the 1940s and 1950s, and one of the most influential biologists of the 20th

century. His works include the classics *Quantitative Zoology: Numerical Concepts and Methods in the Study of Recent and Fossil Animals* (with A Roe. 1939. New York: McGraw-Hill); The principles of classification and a classification of mammals (1945. *Bulletin of the American Museum of Natural History* 85:1–350); *Tempo and Mode in Evolution* (1944. New York: Columbia University Press) and its revision, *Major Features of Evolution* (1953. New York: Columbia University Press); *Principles of Animal Taxonomy* (1961. New York: Columbia University Press); and the college textbook, *Life: An Introduction to Biology* (with C S Pittendrigh and L H Tiffany. 1957. New York: Harcourt Brace). Simpson's technical papers and monographs published over more than a half-century are almost uncountable in number, but written with clarity and originality by a field and museum person with many discoveries and novel insights to report.

The present book is not strictly biographical: Simpson published a straightforward autobiography titled *Concession to the Improbable: An Unconventional Autobiography* (1978. New Haven (CT): Yale University Press), and Laporte published a complementary collection of Simpson's letters titled *Simple Curiosity: Letters from George Gaylord Simpson to His Family, 1921–1970* (1987. Berkeley (CA): University of California Press). The current book is the result of a 20-year effort to identify and explore Simpson's major research themes, his approach to scientific problems and, to some extent, his impact. It is presented as a collection of essays, all available previously in diverse books and journals, but now receiving the accessibility they deserve. The longest chapter is on Simpson's most influential book, *Tempo and Mode in Evolution*; and the last is on his intriguingly introspective and posthumously published science fiction novella, *The Dechronization of Sam Magruder: A Novel* (1996. New York: St. Martin's Press). We are all interested in our intellectual ancestors, especially the giants, and *George Gaylord Simpson* is a welcome addition to the historical literature on paleontologists and evolutionists.

PHILIP D GINGERICH, *Museum of Paleontology, University of Michigan, Ann Arbor, Michigan*

**LIFE STORIES: WORLD-RENOWNED SCIENTISTS REFLECT ON THEIR LIVES AND THE FUTURE OF LIFE ON EARTH.**

*Edited by Heather Newbold. Berkeley (California): University of California Press. \$45.00. xii + 234 p; ill.; index. ISBN: 0-520-21114-6 (hc); 0-520-21896-5 (pb). 2000.*

In this book, the editor describes the life and work of 16 world-renowned environmental scientists, incorporating additional information, writing the

narrative, and gaining approval of their chapters. Each scientist briefly explains how they became involved with their specialty and outlines the essence of the world's greatest environmental problems. The book is easy to read and informative, and includes chapters such as Gaia, Our Living Earth (James Lovelock), Life-Support Systems (Paul Ehrlich), Biological Diversity (Thomas Lovejoy), The Nature of Things (David Suzuki), Water Pollution (Ruth Patrick), Nature Conservancy (Max Nicholson), Climate Change (John Firor), and Global Security (Norman Myers). The final chapter (by Henry Kendall) contains warnings from the Union of Concerned Scientists regarding the threats posed by environmental degradation.

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

**LIFE: THE COMMUNICATIVE STRUCTURE: A NEW PHILOSOPHY OF BIOLOGY.**

*By Günther Witzany. Norderstadt (Germany): Libri Books on Demand. DM 58 (paper). 231 p; ill.; no index. ISBN: 3-8311-0349-6. [Translation by Michael Stachowitsch.] 2000.*

According to the author, we are in an ecological crisis that requires an ecological ethic. He argues that we can master this crisis if we understand nature as "a global community of communication." The idea is that if we are part of a community of nature, we can formulate the normative principles—an ethic—for our participation in the community. The basis of Witzany's approach is his account of the three kinds of communication: intraorganismic, that operates within and among the cells of individual organisms; interorganismic communication, that operates between members of the same species; and metaorganismic, that operates between organisms belonging to different species.

This book is presented as a general summary of evolution to replace the "reductionist" account based on mutation and selection processes. It is bold and original, but its flaws are substantial. First, there seems to be systematic equivocation in the use of terms like "community," "sign," and "communication." This is significant because different kinds of community have different properties, and one cannot necessarily make inferences from one type of community and its grounding of normative principles to another. Second, the author's style seems intended to obscure rather than clarify. Cryptic references to thinkers like Schelling, Habermas, and Kuhn are tossed off without adequate explanation. And terms like "distorted communication," "norm subject," "nature as productiv-



ity,” and “transcendental reflexivity” are used without sufficient clarification. Third, the author repeatedly makes problematic assertions without argument. At one point, he cites Thomas Kuhn and proclaims that research has proven beyond a doubt that the important steps in cultural evolution are discontinuous. But anyone familiar with the literature on this subject must surely be aware of the many doubts still held about Kuhn’s thesis. Elsewhere he asserts that what is ecologically natural is a “balance of mutually stabilizing” relationships. This is also problematic and requires argument. Ironically, a failure of communication makes it difficult to see what is worthwhile in this communicative account of nature. The ideas in this book need to be presented with much greater clarity, precision, and care before we can determine their value.

RICHARD RICHARDS, *Philosophy, University of Alabama, Tuscaloosa, Alabama*

**BIOETHICS: ANCIENT THEMES IN CONTEMPORARY ISSUES.** *Basic Bioethics.*

*Edited by Mark G Kuczewski and Ronald Polansky. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$36.95. xiii + 304 p; index. ISBN: 0-262-11254-X. 2000.*

Since its emergence four decades ago, bioethics has developed into a significant academic field with implications for clinical practice and public policy. Much of this growth is due to technological and scientific advances. Several signs now point to its intellectual maturity. Among them is the nascent conversation of contemporary bioethicists with scholars of ancient Greek medical and philosophical thought, a conversation to which this volume makes a significant contribution. The book contains 12 essays separated into two parts that address a wide range of issues.

The first part examines the nature of medical knowledge. Bartz explores the development of the Hippocratic tradition in medicine and particularly how the ethical statements contained in that tradition emerged from the clinical setting. Montgomery argues that contemporary medicine is incorrectly described as science, art, or both, and suggests that medicine is a kind of practice the ancients knew as the virtue of practical wisdom. Chambers embraces the oft-rejected approach of the sophists and shows that it is an effective means to achieve consensus in a social world marked by moral pluralism.

The second part looks for classical approaches that may suggest fruitful ways to address contemporary problems. Cosans examines our reactions to suffering due to illness and the morality of sui-

cide from the perspective of the stoic Epictetus, who is concerned to show that suicide has an adverse effect upon the virtue of the person and so is to be avoided. London looks to Plato’s *Republic* to understand patient-centered medicine in an economic environment requiring bedside rationing. Kuczewski elaborates on several themes of a contemporary brand of Aristotelian politics known as communitarianism and suggests some novel ways to address the issue of abortion.

Unlike other areas of philosophical inquiry, issues in ethics are largely inconclusive. But as Aristotle noted, we should expect only as much precision as our subject matter allows. The study of ethics is more about the questions we ask than about the conclusions we reach. This volume asks some of the right questions and by employing ancient knowledge delivers important insights into several problems in contemporary bioethics.

GABRIEL PALMER-FERNANDEZ, *Dr. James Dale Ethics Center and Philosophy & Religious Studies, Youngstown State University, Youngstown, Ohio*

**BIOLOGY OF PLAGUES: EVIDENCE FROM HISTORICAL POPULATIONS.**

*By Susan Scott and Christopher J Duncan. Cambridge and New York: Cambridge University Press. \$100.00. xiv + 420 p; ill.; index. ISBN: 0-521-80150-8. 2001.*

This book considers in great detail the spread and persistence of the Black Death throughout Europe from 1347 into the 17th century. The main focus of the authors is to refute the commonly held belief that this disease was Bubonic Plague. They postulate that it was some unknown viral pathogen—referred to throughout the book as haemorrhagic plague. To this end, the authors produce an array of historical evidence to support their proposition. The most compelling evidence comes from the role played by rodents and fleas in the spread of Bubonic Plague. None of the historical documents from the time of the Black Death report the large death rate in rats that is associated with Bubonic Plague. Also, the authors claim that during the Middle Ages conditions were too harsh for suitable rodents and fleas to survive the British winters.

In contrast, the evidence from “modeling” is weak. The Reed-Frost model is used throughout, and yet its behavior is a vast simplification of the true dynamics of a disease that would be far from deterministic in many of the small communities documented. The authors also seem to believe that cases displaying the classic bell-shaped distribution of the Reed-Frost model are a good indication of person-to-person transmission, yet the 1905 outbreak of Bubonic Plague in Bombay showed very

similar dynamics. This book certainly does not provide a good introduction to modeling.

*Biology of Plagues* has brought together a vast array of data (both quantitative and qualitative) on deaths from this disease mostly from parish records in England. As such it may prove an invaluable reference to anyone interested in the detailed spread and outbreaks of haemorrhagic plague, the amount of anecdotal details provided may be overwhelming for many biologists and epidemiologists.

Even after reading *Biology of Plagues* I am still undecided over whether this devastating disease was the Bubonic Plague. Genetic techniques may provide the only certain answer, but widescale testing of skeletons from this era may be difficult to perform. Until then, this book provides an interesting perspective on this historical disease.

MATT KEELING, *Zoology, University of Cambridge, Cambridge, United Kingdom*



#### GENERAL BIOLOGY

ARTIFICIAL LIFE VII: PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE. *Complex Adaptive Systems*.

*Edited by Mark A Bedau, John S McCaskill, Norman H Packard, and Steen Rasmussen. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$75.00 (paper). xii + 564 p; ill.; author index. ISBN: 0-262-52290-X. 2000.*

CREATION: LIFE AND HOW TO MAKE IT.

*By Steve Grand. London: Weidenfeld & Nicolson. £18.99. x + 230 p; ill.; index. ISBN: 0-297-64391-6. 2000.*

Should biologists get ALife? In this day and age, when many of us walk around with pacemakers, artificial hip joints, and false teeth, and contemplate the use of visual prostheses for the blind and the prospects of nanobots crawling through our blood vessels, the concept of artificial life does not seem an overreach. There are two basic approaches to ALife. The first, more mundane, is to imitate real life. The second, esoteric approach is to transcend real life: ALife subsumes real life, and then some.

*Artificial Life VII* contains 67 papers that span both approaches. It is an excellent snapshot of the current state, and some of the chutzpah, of ALife investigations. Of the 117 authors, I can identify only four as being employed in "classical" biology departments. There is nothing wrong with "outsiders" entering biology. They provide fresh air, some naivety, and sometimes an uncanny ability to get to

the heart of a problem. Witness the fact that many of the instigators of molecular biology were physicists, and Pasteur was a physical chemist. Although the redefinition of sacred biological words (such as chemical, DNA, gene, cell, genotype, phenotype, and even organism) may grate as you, a presumed biologist, flip through these pages tearing your hair out, be patient. Some good may come of it.

*Artificial Life VII* has seven sections: Origin of Life, Self-Organization, and Self-Replication (11 chapters); Development and Differentiation (six chapters); Evolutionary and Adaptive Dynamics (14 chapters); Robots and Autonomous Agents (seven chapters); Communication, Cooperation, and Collective Behavior (ten chapters); Methodological and Technological Applications (eight chapters); and The Broader Context (11 chapters). As is unfortunately typical in a proceedings volume, there is no subject index. Furthermore, although the book is nominally in English, even the papers from the U.K. would have benefited from proof-reading. One expects a higher standard from MIT Press.

I can only mention a few chapters that most interested me. Di Paolo's Searching for Rhythms in Asynchronous Random Boolean Networks has the best discussion I have seen on these much-touted models for genetic regulation. Downing's Exploring Gaia Theory: Artificial Life on a Planetary Scale brings Gaia down to Earth. Furusawa and Kaneko's Complex Organization in Multicellularity as a Necessity in Evolution presents a curious nonlinear model for the unsolved problem of the origin of multicellularity, whose spirit is applied to sympatric speciation and origin of the genetic code in subsequent papers. A brave new world, using real lampreys, is entered by Reger et al. in their paper, Connecting Brains to Robots: The Development of a Hybrid System for the Study of Learning in Neural Tissues.

Steve Grand, a computer game programmer, is a complete outsider to academic biology. But in *Creation* he has more of "a feeling for the organism" than anything in *Artificial Life VII*. What he has done is put together computer organisms that have physiological drives approximating middling vertebrates. In fact, this is an excellent way to introduce students to physiology, by making the subject quite exciting. Although well written, the book is unfortunately poorly illustrated, and one must purchase a commercial version of Grand's software, *Creatures* (<http://www.creatures.co.uk/>), to see the result in action. I saw him demonstrate it at the Digital Burgess conference (<http://www.biota.org/conf97/>). It surpasses in sophistication the fads of the pet rock, the Tamagochi, and perhaps even the robot dog, with one million "living," interacting



creatures inhabiting home computers. In fact, Grand puts life on as firm a foundation as one can muster, with what amounts to a careful and incisive discussion of reductionism and materialism. "I want to try to show that life is more than *just* clockwork, even though it is *nothing but* clockwork" (p 6). He puts life in the context of the whole universe as a set of "persistent patterns," which are not themselves "hard" matter, although they pass through it. Grand builds his creatures in a bottom up fashion, and they are convincing and endearing as they take off ("emerge") on their own: "Our creature will be fully alive and intelligent only if its future lies in its own hands, and to give it this autonomy we must relinquish direct control of its design" (p 147). This is, then, a book of philosophy of biology, tested by computer simulation. What is missing from *Creatures* is real embryogenesis, but then we will have to solve that for real life before we can do much about it in a nontrivial way in ALife. Artificial life is not ready to subsume real life.

What is common between these two books is an abandonment of the program of artificial intelligence. ALife is a backtracking to a more fundamental understanding of life, with the hope that by going forward we can produce machines closer adapted to us. Grand notes, "[w]e are more ruled by machines now than we ever will be in the future, not because [present] machines are smart but because they are stupid. . . . But imagine putting [simulated] squirrel brains into, let us say, a set of traffic lights" (pp 196, 201). Nothing here is conscious, but today's ALife may be a step toward achieving it.

RICHARD GORDON, *Radiology, University of Manitoba, Winnipeg, Manitoba, Canada*

THE UNIFIED NEUTRAL THEORY OF BIODIVERSITY AND BIOGEOGRAPHY. *Monographs in Population Biology, Volume 32.*

By Stephen P Hubbell. Princeton (New Jersey): Princeton University Press. \$75.00 (hardcover); \$29.95 (paper). xiv + 375 p; ill.; index. ISBN: 0-691-02129-5 (hc); 0-691-02128-7 (pb). 2001.

Like other icons of the 1960s and 1970s—bell-bottoms, peace signs, and VW beetles—the search for a general theory of species diversity resurfaced during the 1990s. But unlike recycled fashions, a general theory of biodiversity is desperately needed. An ideal theory would be based first on principles, tested against data, and usable for managers. Hubbell's long-awaited book lays out a theory neatly satisfying the first two criteria. Unfortunately, it falls short as an ecology for economists.

I found the current book nearly as exciting to read as the two famous monographs, *The Theory of*

*Island Biogeography* (R H MacArthur and E O Wilson. 1967. Princeton (NJ): Princeton University Press) and *Stability and Complexity in Model Ecosystems* (R M May. 1973. Princeton (NJ): Princeton University Press). It, too, seems destined to be a provocative classic, but more likely because of what it fails to deliver than what it does.

Hubbell's model is based on the Markov mathematics used in neutral allele theory. Neutral in the author's case means that all individuals of all species exist as equals on a zero-sum, competitive landscape. The essence of the argument is that an empty patch is colonized by a species with a probability equal to that species' relative abundance in the metacommunity. He calls this ecologic drift. By incorporating speciation into a patch model of colonization and extinction, Hubbell predicts relative species abundances, generating R A Fisher and F Preston-type patterns using MacArthur-Wilson type processes.

Besides amazingly accurate rank abundance curves, the model provides a very contemporary view of species area relations, sampling results, distribution and abundance patterns, as well as metapopulation, metacommunity, and phylogenetic insights. Conspicuously missing are derivations of other well-known patterns of macroecology: e.g., latitudinal, productivity, disturbance, elevational, and body size relations. In their place is a somewhat ad hoc treatment on the unification of niche-assembly and dispersal assembly views.

So why is this book destined to be a classic? Because many readers will find the author's writing compelling and his approach promising much that we want delivered. But in the end, something is missing. What it is I cannot say for certain, but when it is found we will know that a truly unified theory has been constructed.

ROMAN DIAL, *Environmental Science, Alaska Pacific University, Anchorage, Alaska*

INTRODUCTION TO THE EXPLORATION OF MULTIVARIATE BIOLOGICAL DATA.

By János Podani. Leiden (The Netherlands): Backhuys Publishing. \$52.50 (paper). vi + 407 p; ill.; subject index. ISBN: 90-5782-067-6. [Originally published as *Bevezetés a többváltozós biológiai adatfeldolgozás rejtelmeibe* by Scientia Publishing, Budapest, Hungary, 1997.] 2000.

This volume discusses multivariate statistical methods and provides examples from many areas of biology. Special emphasis is given to applications in ecology and evolutionary biology. The chapters include discussions of cluster and ordination methods, and a separate chapter on evolutionary inference. Methods associated with the new field of geo-

metric morphometrics are also mentioned, but they are oddly placed (as the author admits) within the chapter on ordination methods.

Podani's approach is applied rather than theoretical. Helpful advice is given on topics such as sampling methods, choice of similarity coefficient (an extensive account), appropriate methods of analysis, and the availability of methods in different software. An interesting feature of the book is the use of "imaginary dialogs." Questions are asked and then answered using an informal style. These should be helpful for both self-study and to stimulate classroom discussions. The bibliography is extensive. The usefulness of the book is also enhanced by the availability of example datasets from the author's website.

There is, however, no discussion of the comparative approach to allow readers to take into account the expected lack of independence when samples are taken across a phylogeny. There is also no mention of the statistical problems caused by the presence of spatial autocorrelation in many datasets in biology. Another difficulty is that many of the plots indicate the results of ordination analyses. It is essential that the axes be shown to the same scale—to do otherwise distorts the apparent relationships among the points. Although small differences in scale (e.g., as in Figure 7.16) are not very important, large differences (as in Figure 7.26) can be very misleading because the apparent distances are distorted. Overall, the book is a valuable contribution and I think many biologists will find it useful.

F JAMES ROHLF, *Ecology & Evolution, State University of New York, Stony Brook, New York*

**ANATOMY & PHYSIOLOGY: THE UNITY OF FORM AND FUNCTION. *Second Edition.***

*By Kenneth S Saladin. Boston (Massachusetts): McGraw-Hill. \$107.81. xxxiii + 1181 p; ill.; index. ISBN: 0-07-250475-7. 2001.*

Knowledge about human anatomy has not changed much in the last century or two, but the same is not true in regard to physiology. A work that brings physiology up to date and also covers anatomy is a welcome contribution. This book does that and more almost to the point of overkill. The chatty and condescending narrative starts with a brief treatment of the scientific method and evolution, and includes the Periodic Table of the Elements after the final chapter.

This volume is designed as a two-semester textbook for junior college-level students who are aiming toward careers in "nursing, therapy, sports medicine, health education, and other health professions" (p xiv), and who have never had a college-

level course in chemistry or biology. There are chapters on basic chemistry, cellular biology, genetics, and histology that cover their topics adequately. All of the basic terms are defined, and a home-grown phonetic transcription is provided to aid the beginning student in pronouncing scientific names. Occasionally this misfires as when, for example, pleiotropy is rendered as "ply-OT-roep" (p 163). Useful glossaries and an excellent index are provided.

Scattered throughout the text are highlighted paragraphs labeled "Clinical Insight" that point out practical applications of the basics being discussed, and this is a useful addition to the volume. The anatomy is illustrated by renditions that appear as air-brushed, slick, magazine popular art. This is not an improvement on Vessalius. For anyone who really wants to know what things look like, it would be best to go back to Gray's *Anatomy of the Human Body* and Grant's *Atlas of Anatomy* of fifty years ago. The claim for a sex difference in the greater sciatic notch is backwards (p 295), and the use of a grossly distorted rendition of a male gorilla skull labeled "Chimp" (p 302) to contrast with the human condition are annoying, although not harmful, but the mistakes in the discussion of sickle cell anemia really need to be corrected (p 695).

The first 30 or so pages are devoted to a Preface and to a publisher's insert describing the CD-ROM that accompanies the book. This all sounds rather like the type of television commercial that gets one to push the mute button. A bit of that chatty and hucksterish tone runs all through this otherwise useful and well-produced volume.

C LORING BRACE, *Museum of Anthropology, University of Michigan, Ann Arbor, Michigan*

**METHODS AND MORALS IN THE LIFE SCIENCES: A GUIDE FOR ANALYZING AND WRITING TEXTS.**

*By Wim J van der Steen and Vincent K Y Ho; with contributions by Harry Cook, Dorine Bax, and Arjen Groen. Westport (Connecticut): Praeger. \$55.00. viii + 212 p; index. ISBN: 0-275-97119-8. 2001.*

The subtitle proclaims the aim of this volume—to serve as a guide for writing and critically analyzing textbooks in the life sciences. A summary of ideas from elementary logic and philosophy of science provide a basis for critiques. The authors offer advice for improving writing in the life sciences, both in content and form. A virtue of the book is the illustration of its guidelines by commenting on many passages taken from contemporary sources. Forty-five passages from discussions of altruism, genetics, psychopathology, and medicine are analyzed. The comments are often perceptive, although they are sometimes controversial or mundane. Writ-

ers are cautioned against an overly broad construal of the concepts of "egoism" and "altruism," and are warned not to overemphasize the roles of genes in determining behavior.

This is an unusual book that is difficult to classify. The authors note: "In other books devoted to the writing of texts or to the analysis of literature, you will not come across a collection of guidelines as brought together in our survey. You will therefore need some time to get the idea of our approach" (p 55). The style is sometimes awkward, as if the book were an imperfect translation. Although generally clear enough, the text does not always read smoothly. For example, the authors state: "Science is affected by a great variety of factors that are jointly covered many different disciplines. However, nowhere has the coverage matured into an exhaustive coherence that satisfies some significant purpose" (p 3). Despite its flaws, this is a rather useful source of ideas for critical thinking in a science. The authors show a good understanding of issues in the methodology of science and of value questions that arise in scientific practice. Since the critical philosophical issues raised are commonly not discussed in scientific training, the book could make writers in the life sciences aware of problems they might not otherwise consider.

HENRY BYERLY, *Philosophy, University of Arizona, Tucson, Arizona*



#### FOR TYROS & LAICS

THE GHOSTS OF EVOLUTION: NONSENSICAL FRUIT, MISSING PARTNERS, AND OTHER ECOLOGICAL ANACHRONISMS.

By *Connie Barlow; Foreword by Paul Martin. New York: Basic Books. \$26.00. xii + 291 p; ill.; index. ISBN: 0-465-00551-9. 2000.*

The author is a popular science writer who picks a topic originally espoused by Dan Janzen in the late 1970s—the notion that many of today's large tropical fruits evolved their current form for dispersal by animals that no longer exist, such as the gomphotheres (extinct elephant-related beasts) that roamed South America in the Pleistocene. The "ghosts" of the title are the missing large herbivores that Barlow claims lurk even in New York City, where no dispersal agents exist for the ginkgo (although in this instance the "ghosts" here are not mammals, but small scavenging dinosaurs). The anachronisms are the plants left bereft of their original dispersal agents.

I initially found this book rather repetitive, and Barlow's knowledge of evolutionary theory a little naive. For example, she thinks that the discipline of "evolutionary ecology" is akin to paleoecology. I was also disappointed that most of the illustrations were of the fruits, with few depictions of the mammalian ghosts aside from their molars. Then, about halfway through the book I realized that I was reading it from the wrong perspective. This is not so much a scientific treatise as a journal of the author's attempts to really understand Janzen's perspective, to figure out how one could test hypotheses of certain fruits being ecological anachronisms, and to discover her own examples of anachronistic dispersal devices or protective agents such as Devil's Claw. We are treated to her trips to the supermarket to buy exotic fruit, experiments on the palatability of unusual fruits such as pawpaw with the native wildlife (including the delightful Mrs. Foxie) and zoo elephants, and musings about what type of digestive physiology would promote seed passage and dispersal. There is plenty of interesting information and comprehensive references, but a prominent feature of this book seems to be a narrative on how to think about science, rather than on the hard science itself.

CHRISTINE JANIS, *Ecology & Evolutionary Biology, Brown University, Providence, Rhode Island*

#### THE WISDOM OF THE EYE.

By *David Miller. San Diego (California): Academic Press. \$49.95. xi + 169 p + 36 pl; ill.; index. ISBN: 0-12-496860-0. 2000.*

This is a charmingly eclectic book on "the elements of the eye and visual brain that have significantly helped early human societies survive" (p ix). Problematic as this selective (and selectionist) principle may be, it ranges far beyond utility for the survival of societies, and in so doing is often maddening.

In Chapter 1, the author gives his own programmed growth explanation for emmetropization (the adjustment of the optics of the eye so that the image falls on the retina), ignoring all of the recent work demonstrating the feedback control of the length of the eyes of birds and primates to accomplish this. In the same chapter, he repeats the old saw about astigmatism greatly distorting the relative dimensions of images (as in an El Greco painting) even though the actual optical distortion of even a severely astigmatic eye is negligible.

Despite such omissions and errors, this is an interesting book, enlivened by amusing anecdotes from the author's rich experience as an ophthalmologist, as well as uninhibited speculations. About one-half of the book is on the eye and the other half on visual processing in the Central Ner-

vous System (CNS). It is well referenced. It must be noted that the author was ill served by his editors. The ostrich is not a mammal (p 51) and Figure 8.12 has been printed on its side. Probably due to the small format, the colored circles in Figure 9.6, which are supposed to have illusory dark lines around them, actually have dark lines.

In summary, this is an interesting book, but is best suited for readers who can provide their own salt.

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

WINNING THE GAMES SCIENTISTS PLAY: STRATEGIES FOR ENHANCING YOUR CAREER IN SCIENCE.

By Carl J Sindermann. Cambridge (Massachusetts): Perseus Publishing. \$18.00 (paper). xiv + 290 p; ill.; index. ISBN: 0-7382-0425-0. 2001.

There are a well-devised set of procedures and rules by which scientists function as individuals and as a community. The rules for doing quality research (e.g., methods and analyses) are explicit. The interpersonal strategies and tactics that encompass the performance of science are often implicit. Sindermann's book attempts to make explicit those interpersonal strategies and tactics, or as he labels it, *scientific game playing*. This book helps to fill a void in our understanding of the practice of science: game playing rules and implications are fleshed out.

The book contains three main parts: Basics discusses writing and presenting scientific papers; Higher Orders deals with issues of promotion, power acquisition, and ethics; and Special Topics covers women in science, and issues in dealing with industry, government, media, and the public. The style of writing is informal and humor is nicely interjected. To present his thesis the author draws upon primarily eyewitness accounts and anecdotal data. Given the dearth of research on scientific game playing, there is not much empirical data to draw upon. Although one may have disagreements with some of Sindermann's interpretations and implications of the data, I found much of what was presented "rang true."

It would be helpful to have a chapter on how scientists get their first job. Newly trained graduate students often lack the necessary knowledge and understanding of the application and interviewing process. The interview itself can be quite a stumbling block for the first-time job seeker. Perhaps the author will consider such a chapter in a future edition. Also, the book would profit from a chapter on the ethical use of the game playing tactics and strategies. Although ideas are sprinkled throughout the book, it would be better if they were assembled into a single chapter. This could serve as a useful admonition for the individual who would

use game playing in a manipulative and opportunistic fashion.

This book is recommended for scientists who are at any phase in their career. To some extent, it is a training manual. It also allows readers to obtain some perspective and clarification on how one has functioned and should function as a scientific *person* in a community.

CHARLES A DILL, *Psychology*, Hofstra University,  
Hempstead, New York



PALEONTOLOGY

THE DRAGON SEEKERS: HOW AN EXTRAORDINARY CIRCLE OF FOSSILISTS DISCOVERED THE DINOSAURS AND PAVED THE WAY FOR DARWIN.

By Christopher McGowan. Cambridge (Massachusetts): Perseus Publishing. \$26.00. xvi + 254 p; ill.; index. ISBN: 0-7382-0282-7. 2001.

In this book, the author argues that before Charles Darwin's ideas on evolution could be accepted in 1859, an intellectual groundwork had to be laid. This was done by a circle of British naturalists and fossilists in the first part of the 19th century. Although Darwin, Richard Owen, and Thomas Henry Huxley may be better known to history than Gideon Mantell, Mary Anning, William Conybeare, or George Hawkins, they are no less important to the history of evolution and biology. Their discoveries and intellectual leaps made it possible for the *Origin of Species* to explode onto the scene, be of immediate interest, and make so much sense. Although this is not a particularly novel argument, McGowan does an excellent job of telling the story of this burst of activity that helped topple accepted Western notions of how the natural world worked, and ushered in a new paradigm to explain the course of life on Earth.

What is most interesting here is how so many of these early naturalists seemed at odds with one another over questions of the meaning of fossils, how strata were laid down, the age of the Earth, and whether living things did transmute. It was not one big happy family all working toward one goal. Not all these researchers would be pleased about having inadvertently helped the cause of evolution theory. It is just this bickering and disagreement, often done through the medium of books, articles, and popular lectures, that fired the public's imagination and made the idea of evolution so much more palatable when it did appear.

Written for nonspecialists, McGowan eschews tightly focused scholarly citations and references for a series of loose and general endnotes, and stresses

a narrative element to build the story. The book meanders slyly and in a deceptively simple fashion as the naturalist's awareness of the past grows from a vague perception to a deeper understanding and sophisticated interpretation of the fossil and geological record. McGowan does, however, take time to explain the ideas and thought processes of his protagonists so that readers have a fuller understanding of the concepts and science involved.

This is a well-written work that can be used as a textbook for survey courses on the history of science and even British intellectual history in general.

BRIAN REGAL, *History, TCI College of Technology, New York, New York*

EVOLUTION OF HERBIVORY IN TERRESTRIAL VERTEBRATES: PERSPECTIVES FROM THE FOSSIL RECORD.

*Edited by Hans-Dieter Sues. Cambridge and New York: Cambridge University Press. \$80.00. x + 256 p; ill.; taxonomic and subject indexes. ISBN: 0-521-59449-9. 2000.*

This compact volume provides an outstanding review of ancient land vertebrates that fed on plant fibers, including a nice balance between phylogenetic and biomechanical perspectives. By selecting a few established authorities, the editor assured excellent treatments of lower vertebrates (one chapter), dinosaurs (three chapters), and land mammals (three chapters). Although much of this work has appeared previously in the more technical literature, this is the first such offering to a broader audience seeking a comprehensive sweep through all of the rises and falls of ancient terrestrial vertebrates.

The special reasons for following 300 million years of such history is that through the exigencies of four mass extinctions various groups of vertebrates attained dominance on the land by "learning" to efficiently process the vast resources of high-fiber plants. Each wave of these primary consumers generally got very large, very numerous, and very diverse.

Two fundamental problems shadow these paleontological studies from the Pennsylvanian through the Pleistocene. One is the difficulty of linking particular herbivore groups to particular plant groups. For example, after recalculating the generic richness of ornithischian dinosaurs, Weishampel and Jianu warn against the presumption that this group neatly tracked the bloom of Cretaceous angiosperms. A second pervasive problem concerns the mechanical design issue. Can paleontologists make a priori links among certain feeding structures and certain plant types? Barrett questions whether prosauropod dinosaurs always used their leaf-like teeth to eat leaves. MacFadden teases apart some of diversity of hypsodont horses using stable carbon isotopes extracted from their tooth enamel as a

proxy indicator for tropical grasses. Early in the book the editor notes that most paleontologists still assume the mechanistic approach of Cuvier. And he adds, both as a *caveat* and as a challenge, that this method is "admittedly somewhat circular" (p 11).

S DAVID WEBB, *Florida Museum of Natural History, University of Florida, Gainesville, Florida*

AUSTRALIA'S LOST WORLD: PREHISTORIC ANIMALS OF RIVERSLEIGH. *Life of the Past.*

*By Michael Archer, Suzanne J Hand, and Henk Godthelp. Bloomington (Indiana): Indiana University Press. \$39.95. 264 p + 1 foldout; ill.; index. ISBN: 0-253-33914-6. [First U.S. Edition 2000.] 1991.*

The most remarkable breakthrough in the history of Australian marsupials came with the research by Michael Archer and colleagues on the then newly discovered Riversleigh deposits in Queensland. These researches comprehensively cover mainly the Miocene, with some from the late Oligocene and early Pliocene. The forms were laid down in well-watered terrain and the monsoon forests. They show that the continent had already enjoyed an incredible radiation of marsupials well ahead of the modern faunas. Many of the Pleistocene and later terminal forms (including "giant" ones) had their origins in the Miocene. Some morphological types challenge the imagination. The book traces early radiations, evolutionary changes, and improvements. The way ecomorphological types were grouped in habitats is different than the way it is done today. Nevertheless, the fauna has a modern facies; it is largely postdrift Australia (we still do not know what the Eocene stem marsupial faunas were like).

This book has been obviously a labor of love for the authors and it shows in the writing style. Artists have created the forms in large, colorful plates. The result is a beautifully illustrated and inspiring volume.

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

RIVERS IN TIME: THE SEARCH FOR CLUES TO EARTH'S MASS EXTINCTIONS.

*By Peter D Ward. New York: Columbia University Press. \$29.95. ix + 315 p; ill.; index. ISBN: 0-231-11862-7. [Updated and revised edition of *The End of Evolution: On Mass Extinction and the Preservation of Biodiversity*, published in 1994 by Bantam Books, New York.] 2000.*

One of the strongest motivating factors for environmentalists is the modern precipitous drop in biodiversity due to the numerous activities of our own species. The magnitude of biodiversity loss suggests that we are in the midst of a mass extinction. This volume provides a paleobiological per-



spective on the current biodiversity crisis through the examination of the three great mass extinctions of the past that framed and characterized the Mesozoic, from 65 to 250 million years ago.

The ancient mass extinctions highlighted by Ward occurred during an interval in Earth's history when global temperatures were warmer than today. They also occurred during the breakup of the great supercontinent, Pangea. Vast outpourings of continental flood basalts, which are thought to have contributed to climatic warming, accompanied the breakup. These intervals of flood basalt volcanism and associated warming may have set the stage for uniquely stressful events that tipped the Earth's biosphere into crisis. Such triggering events could have included unusually deadly episodes of volcanism and its associated effects, or impacts by large extraterrestrial objects (such as is well documented for the end-Cretaceous mass extinction that occurred 65 million years ago and caused the demise of the dinosaurs). The author has extensive experience studying these three mass extinctions. Thus, one of the real strengths of this volume is that readers will obtain the perspective of a researcher who is actually working on ancient mass extinctions, something that is lacking from many books on this subject. Ward's writing style is very accessible to both scientists and nonscientists, and he has woven his story in the context of a travelogue, as he visits important sites where evidence for these mass extinctions is best obtained.

The history of life on Earth has been a long one. This book is highly recommended for anyone concerned about our current biodiversity crisis and how life has survived the specter of mass extinction in the past.

DAVID J. BOTTJER, *Earth Sciences, University of Southern California, Los Angeles, California*



## MOLECULAR BIOLOGY

BIOLOGICAL COMPLEXITY AND THE DYNAMICS OF LIFE PROCESSES. *New Comprehensive Biochemistry, Volume 34.*

By Jacques Ricard. Amsterdam (The Netherlands) and New York: Elsevier Science. \$148.00. xii + 356 p; ill.; subject index. ISBN: 0-444-50081-2. 1999.

The position of cells during development plays a crucial role in their fate. Spatial and temporal patterns of the organization of individuals also play important roles in the dynamical properties and behaviors of groups and populations. The social context of an animal can determine what it learns and allows for alternative modes of information

transfer between individuals and over generations. These are all paradigms of complex systems. Ricard takes a giant step toward showing us that, at the molecular and physical levels of the cell, the same basic principles of complex systems are omnipresent. One example discussed in this book is ATP synthesis from ADP. On a reductionist paradigm, this synthesis should have been explained by the properties of a single enzyme. But no such molecule was ever discovered. Instead, it was determined that an enzyme catalyzed the reverse process of ATP into ADP in vitro. But, in vivo, this enzyme is part of a complex system that catalyzes ADP into ATP. The ATP synthase aids this process by anchoring to the mitochondrial membrane and facilitating proton transfer across the membrane (a nonequilibrium thermodynamic process). The complex system in which ATP synthase functions in vivo requires cell compartmentalization and nonrandom spatial and temporal distributions of enzymes and nonenzymatic proteins in cellular compartments and membranes.

Over and over again we are led to the conclusion that cell processes and structures cannot be explained by properties of individual molecules. Information transfer is not restricted to a one-way exchange from DNA to proteins. Within the complex system of a cell, proteins can exchange information through protein imprinting. Plant cell walls are dynamical systems capable of exhibiting oscillations and chaos at the molecular level during growth. The oscillatory and chaotic dynamics of molecular processes in cells also have the benefit of reduced energy dissipation relative to steady state processes. The interaction of multiple enzymes, spatially organized on cell membranes, can act as biosensors with "memory" for the direction of prior rate changes in chemical concentrations. In the final two chapters, Ricard sketches some of the implications of this approach for the development and evolution of single and multicellular organisms. The main difficulty with the book is the level of mathematical detail. The specifics of the mathematical derivations of key equations should have been relegated to appendixes so as not to obscure the important ideas of this book.

JEFFREY SCHANK, *Psychology, University of California, Davis, California*

THE CYTOKINE NETWORK. *Frontiers in Molecular Biology, Volume 25.*

Edited by Fran Balkwill. Oxford and New York: Oxford University Press. \$110.00 (hardcover); \$50.00 (paper). xvi + 199 p; ill.; index. ISBN: 0-19-963703-2 (hc); 0-19-963702-4 (pb). 2000.

The author has assembled a comprehensive and concise review of the cytokine world to date. For expert cytokine biologists, or those interested in

numerous research and clinical aspects of cytokines, this book offers detailed and salient reviews of various aspects of cytokine biology. The panel of experts offers extensive chapters on how to utilize genomics for cytokine discovery to the various aspects of cytokine signaling pathways. The signaling chapter (Nelms) is an essential guide for the ever-expanding network of signaling molecules involved in cellular responses to cytokines and signaling cytokine expression. All of the chapters include numerous informative mechanistic figures that delineate complicated pathways and interactions among the various cell types from which they are produced and the corresponding effector cells. Concise tables also summarize various chemokines, viral cytokines, and their receptors. More importantly, the chapters relate the numerous cytokines to the various pathologies for which they are associated.

With some exceptions, *The Cytokine Network* is able to avoid providing tedious and unconnected descriptions of a lengthy string of cytokines that are commonly associated with extensive reviews of broad topics. The authors also provide their insight into the potential benefits and drawbacks of the use of cytokines for therapeutic purposes. The cytokine world is expanding exponentially and Balkwill has put together an informative and clear reference guide to the field.

J ANDRES MELENDEZ, *Center for Immunology & Microbial Disease, Albany Medical College, Albany, New York*

CALCIUM HOMEOSTASIS. *Topics in Biological Inorganic Chemistry, Volume 3.*

*Edited by E Carafoli and J Krebs. Berlin and New York: Springer. \$110.00. ix + 188 p; ill.; no index. ISBN: 3-540-67175-7. 2000.*

Ionized calcium ( $\text{Ca}^{2+}$ ) is arguably one of the most important cations in biology. As such, it is appropriate to devote an entire volume of the series *Topics in Biological Inorganic Chemistry* to this essential metal ion. The book begins with an excellent overview by Robert J P Williams of the increasing importance of calcium homeostasis in all organisms ranging from prokaryotes through simple unicellular eukaryotes to complex multicellular plants and animals. Williams stresses the interdependence of energy fluxes with the creation and maintenance of chemical (ion) gradients, and points out the increasingly varied role of free  $\text{Ca}^{2+}$  in cellular processes which necessitated the establishment of sophisticated and highly regulated mechanisms for the precise spatial and temporal control of  $\text{Ca}^{2+}$ . The importance of  $\text{Ca}^{2+}$  "sensing," buffer-

ing, and transport proteins is also nicely introduced. These proteins are the main "currency" of calcium homeostasis as they are responsible for the transmission of the  $\text{Ca}^{2+}$  signal and for the control of  $\text{Ca}^{2+}$  concentrations in different intracellular compartments (and in some cases, the extracellular milieu).

EF-Hand proteins are a major class of  $\text{Ca}^{2+}$ -binding proteins, and their overall characteristics and evolutionary relationships are discussed and tabulated in a useful chapter by Nakayama et al. There are now well over 500 protein sequences known that contain over 2000 EF-Hand domains; their classification into subfamilies may help discern functional and structural commonalities. It is sobering that little if anything is known about the function of most of these proteins. Detailed structural aspects of one of the most ubiquitous and versatile EF-Hand proteins, calmodulin, are described by Yuan et al. who summarize data on  $\text{Ca}^{2+}$ -free and  $\text{Ca}^{2+}$ -bound calmodulin and present an overview of currently known calmodulin-target peptide and calmodulin-drug complexes. This chapter also briefly reflects on the structural basis of the versatility of calmodulin in recognizing many different targets. The EF-Hand motif is not the only  $\text{Ca}^{2+}$ -binding structure found in proteins; the chapter by Downing et al. on the structure and biological function of the EGF-like  $\text{Ca}^{2+}$ -binding motif is therefore a welcome addition. This motif is found in a considerable number of extracellular proteins and serves as a useful reminder of the often overlooked importance of tight  $\text{Ca}^{2+}$  control in the extracellular space.

The following two chapters (Krebs; Klee) provide an overview of two important classes of calmodulin-regulated enzymes—the calmodulin-dependent kinases and the phosphatase calcineurin. These are appropriate choices, considering that second messenger ( $\text{Ca}^{2+}$ ) signaling commonly involves phosphorylation and dephosphorylation switches. The final three chapters deal with membrane-intrinsic  $\text{Ca}^{2+}$  transport proteins involved in the regulated flux of  $\text{Ca}^{2+}$  across the plasma and intracellular membranes. Inesi and Toyoshima provide a brief discussion of the mechanistic features and structural characteristics of the sarco/endoplasmic reticulum  $\text{Ca}^{2+}$  ATPases, while the plasma membrane  $\text{Ca}^{2+}$  ATPases and  $\text{Na}^+/\text{Ca}^{2+}$  exchangers are treated in brief reviews by Guerini and Gabellini et al., respectively. Although more comprehensive reviews have recently been published on each of the calmodulin-dependent enzymes and  $\text{Ca}^{2+}$  transporters mentioned above, the chapters in this book provide a useful overview of the diversity and complexity of  $\text{Ca}^{2+}$ -regulated and  $\text{Ca}^{2+}$  binding proteins.

Clearly, many other  $\text{Ca}^{2+}$  regulated systems and  $\text{Ca}^{2+}$  binding proteins deserve to be included in a book on  $\text{Ca}^{2+}$  homeostasis: the  $\text{Ca}^{2+}$  channels are but one example of additional proteins contributing crucially to cellular  $\text{Ca}^{2+}$  homeostasis. Although the title *Calcium Homeostasis* promises more than can be covered in a book of only 188 pages, this small volume will serve as an excellent primer for biomedical scientists interested in getting a glimpse of the universal importance and beautiful complexity of calcium homeostasis in living organisms.

EMANUEL E STREHLER, *Biochemistry & Molecular Biology, Mayo Clinic, Rochester, Minnesota*

TRANSLATIONAL CONTROL OF GENE EXPRESSION. *Cold Spring Harbor Monograph Series, Volume 39.*

*Edited by Nahum Sonenberg, John W B Hershey, and Michael B Mathews. Cold Spring Harbor (New York): Cold Spring Harbor Laboratory Press. \$115.00. x + 1020 p; ill.; index. ISBN: 0-87969-568-4. 2000.*

One emerging theme from studies utilizing cDNA microarray analysis to identify those changes in gene expression that translate into changes in a specific cellular response is the limited correlation between changes in the expression level of a particular mRNA species and changes in the expression level of the corresponding protein. These observations have prompted an increased interest in the study of post-transcriptional regulatory mechanisms as determinants of cellular protein expression and function. For those new to or reacquainting themselves with the area of protein synthesis, this book is an excellent collection of 36 review articles that provide a thorough overview of current research in the field of translational regulation.

The volume begins with a general review of the history and scope of the field of translational regulation and outlines the key findings that shaped the hypothesis that translational mechanisms play a key role in regulating cellular function. The collection then progresses from reviews of basic mechanisms fundamental to translation, such as initiation and elongation, to aspects of "global" translation control mechanisms, which the editors define as "impact[ing] the entire complement of mRNAs within a cell" (p 6), and finally to reviews on more "specific" translational control mechanisms that affect select mRNAs, such as in iron-mediated translational regulation. The individual authors not only review the scientific observations key to understanding their respective areas of study, but comment on the potential impact of these phenomena on more general aspects of development, cellular responses to metabolic changes, viral infection or disease, signal transduction, or the development of cancer. With the extensive background

material provided, the wide range of topics covered, and the consistency of scope within the individual reviews, the editors of *Translational Control of Gene Expression* have compiled a valuable resource for both students and established scientists who want to familiarize themselves with the field of translational regulation.

LESLIE A PARSELS, *Pharmacology, University of Michigan Medical School, Ann Arbor, Michigan*

FUNDAMENTALS OF MOLECULAR EVOLUTION. *Second Edition.*

*By Dan Graur and Wen-Hsiung Li. Sunderland (Massachusetts): Sinauer Associates. \$48.95 (paper). xiv + 481 p; ill.; subject and taxonomic indexes. ISBN: 0-87893-266-6. 2000.*

DNA TECHNOLOGY: THE AWESOME SKILL. *Second Edition.*

*By I Edward Alcamo. San Diego (California): Academic Press. \$60.00. xii + 348 p; ill.; index. ISBN: 0-12-048920-1. 2001.*

I reviewed the first edition of this slim textbook in early 1998. Although it looks the same, the second edition contains much new material and is impressively up to date. Alcamo discusses the history of DNA research, its present status and future possibilities in agriculture, forensic science, and medicine. Discussions of gene therapy and the Human Genome Project are also included. None of the sense of urgency to communicate the excitement of the subject has been lost in this new edition. It remains an interesting and easy book for students who like breadth without too much depth. The diagrams, rubrics, questionlines, and glossary seem designed to save precious time. Many a good test answer is to be found in these pages.

It was a disappointment that some errors noted in the first edition have not been corrected. One exception, and a great improvement, is the treatment given to the DNA polymerase chain reaction (PCR). The same cannot be said for another important concept, Restriction Fragment Length Polymorphism (RFLP) analysis, which remains unclear. And some implausible concepts (for example, the possibility of genetic manipulation to make crop plants fix their own nitrogen requirements from the air) are still given unwarranted space and credence. Whatever its flaws, this book is nonetheless vivid and informative. It rockets readers into the orbit of DNA science.

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

ANNUAL REVIEW OF BIOPHYSICS AND BIOMOLECULAR STRUCTURE. *Volume 30: 2001.*

*Edited by Robert M Stroud, Wilma K Olson, and Michael P Sheetz. Palo Alto (California): Annual Reviews. \$75.00. xiii + 505 p + 29 pl; ill.; subject index, cumulative indexes (contributing authors and chapter titles, Volumes 26-30). ISBN: 0-8243-1830-7. 2001.*

ANNUAL REVIEW OF BIOCHEMISTRY. *Volume 70: 2001.*

*Edited by Charles C Richardson, John N Abelson, Christian R H Raetz, and Jeremy W Thorne. Palo Alto (California): Annual Reviews. \$75.00. xii + 924 p; ill.; author and subject indexes, and cumulative indexes (contributing authors and chapter titles, Volumes 66-70). ISBN: 0-8243-0870-0. 2001.*

COMPUTATIONAL MODELING OF GENETIC AND BIOCHEMICAL NETWORKS. *Computational Molecular Biology.*

*Edited by James M Bower and Hamid Bolouri. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$59.95. xx + 336 p + 29 pl; ill.; index. ISBN: 0-262-02481-0. 2001.*

This book is the result of a 1998 graduate course at the California Institute of Technology that was intended to provide biology graduate students and postdoctoral fellows with an introduction to modeling techniques. These pedagogical roots are evident in the logical organization of the material and the level of the presentations. Initially, the problems of modeling genetic regulation of single genes are addressed with particular attention to the strengths and weaknesses of various modeling approaches. Complications introduced by the stochastic character of many regulatory chemical mechanisms are well covered. Then, the volume progresses through increasingly complex modeling challenges presented by eukaryotic genetics, networks of genes, and the regulatory subsystem controlling the cell cycle. The choice of topics is eclectic and somewhat idiosyncratic, but suited to the purpose. The 11 chapters are written by authors with varying styles and with different levels of emphasis on the biological versus mathematical aspects of the models. Nevertheless, there is throughout a consciousness of the need to root modeling assumptions in experimental observations and of the practical difficulties in doing so. The book serves well as an introductory road map to the topic of biological modeling suitable for advanced undergraduates, graduate students, or simply interested readers curious about this frontier of modern biology.

An inescapable conclusion after reading this volume is that the next generation of biological scientists will have to be far more strongly grounded in mathematics, statistics, and quantitative analysis methods than has been necessary up to now. Equally evident is the requirement for a new level of in-depth training in biological phenomenology for engineers, physicists, and statisticians who now hope to apply their skills to biological analysis. Bower and Bolouri provide a valuable tool for developing these cross-cultural skills.

HARLEY MCADAMS, *Developmental Biology, School of Medicine, Stanford University, Stanford, California*



## CELLULAR BIOLOGY

PRINCIPLES OF MOLECULAR REGULATION.

*Edited by P Michael Conn and Anthony R Means; Foreword by Bert W O'Malley. Totowa (New Jersey): Humana Press. \$130.00. xiv + 474 p; ill.; index. ISBN: 0-89603-630-8. 2000.*

The field of signal transduction has exploded in recent years and is currently the focus of much research on hormone action, neuroscience, immunology, and development. In the current book, the editors have assembled a group of experts who have contributed 27 chapters on key signaling pathways. The book is separated into six parts: signaling mechanisms initiated by cell surface receptors; those mediated by ion channels, calcium, and lipids; cyclic AMP, protein kinases, and protein phosphatases; signaling initiated by nuclear receptors; molecular regulation of cell proliferation and death; and rational drug discovery. The authors emphasize fundamental principles common to regulation by diverse signals, and readers will gain an appreciation of how receptors transmit information, how specificity is attained, and how signaling pathways are regulated. Figures are generally clear and informative, and chapters are usually followed by a list of five to 20 seminal papers and relevant reviews.

Most chapters include an excellent overview that explains the biochemical and structural basis for regulation and a discussion of exciting areas of current research. Protein kinases and phosphatases, calcium signaling, and apoptosis are covered in particularly well-written sections, and the four chapters on nuclear receptors (totaling just over 50 pages) provide a fine introduction. *Principles of Molecular Regulation* is a comprehensive volume,

including pathways initiated at the membrane and in the nucleus. The book stresses mammalian models and has an endocrine flavor, yet it includes chapters on *Drosophila* visual transduction and *Dicystelium* chemotaxis, and provides examples from immunological and neuronal systems. Nonetheless, it would have benefited from broader discussion of receptor and nonreceptor tyrosine kinases and a chapter on major pathways in development. Rapid publication has resulted in a very up-to-date volume, but has come at the price of a distracting number of minor errors and a few more serious ones, such as figures that do not match the text.

*Principles of Molecular Regulation* explores signal transduction in much greater depth than advanced textbooks of biochemistry or cell and molecular biology, and the volume provides background and breadth absent from typical reviews. It could serve as an excellent textbook for a graduate-level course and will be a valuable resource for investigators interested in cell signaling.

PATRICIA M HINKLE, *Pharmacology & Physiology, School of Medicine & Dentistry, University of Rochester, Rochester, New York*

THE DEVELOPMENT OF SARCOPLASMIC RETICULUM.  
By Anthony N Martonosi. Amsterdam (The Netherlands): Harwood Academic Publishers. \$118.00. xiii + 618 p + 5 pl; ill.; subject index. ISBN: 90-5702-602-3. 2000.

This scholarly book is likely to become a highly prized possession among advanced and beginning students of muscle, and will also attract the interest of cell biologists in other fields. The subject is the sarcoplasmic reticulum (SR) of muscle cells, a complex membrane system dedicated to the handling of calcium. The SR gradually differentiates from its parent system, the endoplasmic reticulum, but also retains some of its fundamental roles. Although the focus is on SR development, the book effectively covers in detail all aspects of this and related membrane systems. Basic principles of regulation in the myogenic lineage are followed by a detailed presentation of the structure, function, disposition, targeting, and insertion of all the known major and minor proteins in the SR. Well-presented forays into other cell types illustrate the general relevance of lessons learned from this specialized organelle. The membrane lipids are not forgotten: they are extensively covered in the chapter on the regulation of phospholipid composition of SR during development. Chapters 10 through 18 cover regulation of a number of proteins, bringing into focus the regulatory effects of calcium movements.

The general organization of the chapters will greatly help readers acquire information. Each

new protein is first introduced from the molecular point of view, then explored in its structure and function, later related to other components with which it interacts, and finally followed during muscle development, with emphasis on the mechanism of its localization.

Illustrations are abundant, including several from the author's extensive work on the Ca<sup>2+</sup> ATPase. The only regret is that the printing detracts somewhat from the quality of the images. The most impressive aspect of the book is the thoroughness and fairness with which each detail is explored, referenced, and discussed. In perusing it, one finds endless sources of information. The volume will be an essential reference. It uniquely brings together an extensive amount of material, with a most thorough and up-to-date reference list. I will keep it on hand in my bookshelf for many years to come.

CLARA FRANZINI-ARMSTRONG, *Cell & Developmental Biology, School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania*

CYTOKINE CELL BIOLOGY: A PRACTICAL APPROACH.  
*The Practical Approach Series.*

Edited by Fran Balkwill. Oxford and New York: Oxford University Press. \$110.00 (hardcover); \$50.00 (paper). xxix + 254 p + 3 pl; ill.; index. ISBN: 0-19-963860-8 (hc); 0-19-963859-4 (pb). 2000.

I would highly recommend that thesis advisors of cytokine cell biology students hand out this book to students on their first day in the laboratory. The book provides the "why and how" of cytokine cell biology. The text for each chapter explains the advantages and limitations of the discussed methods. The mention of common pitfalls in the methodology is even more helpful for the uninitiated. One such example is the use of paraformaldehyde to fix cells for FAC analysis—the authors actually state that it should not be substituted with glutaraldehyde because it will result in an autofluorescent background (p 141). The book adopts a realistic approach to science in that it discusses not only in vitro, but in vivo work such as in vivo leukocyte migration or how to obtain T cells from diseased tissue. The chapters are well referenced both in terms of background and methodological papers, as well as the location of protocols in different chapters within the book.

Another advantage is that the book has a clear and concise layout. The beginning chapters explain methods involved in the isolation of several cell types, whereas the second half discusses the different assays involved in cytokine analysis. The most useful aspect of the layout of the textbook is the gray protocol boxes that describe the basic reagents necessary as well as a clear, concise, num-



bered procedure for their use. The possible source of some reagents is very helpful for one new to the technique (Chapter 2).

I found the practical approach to *Cytokine Cell Biology* an easy-to-read and valuable reference of cell biology techniques. I would highly recommend it to anyone, but especially to individuals new to the field who would benefit from learning the reasons for the technique.

CATHLEEN J CIESIELSKI, *Kennedy Institute of Rheumatology, Imperial College School of Medicine, London, United Kingdom*



## GENETICS & EVOLUTION

**YOUR GENETIC DESTINY: KNOW YOUR GENES, SECURE YOUR HEALTH, AND SAVE YOUR LIFE.**

By *Aubrey Milunsky*. Cambridge (Massachusetts): *Perseus Publishing*. \$27.50. xvii + 410 p; ill.; index. ISBN: 0-7382-0377-7. 2001.

The goals of this book, written for the general public, are to encourage readers to use their knowledge of family history to identify potential disease susceptibility and thereby to reduce risks. These are laudable goals, and the author, a clinical geneticist at Boston University School of Medicine, does a fair job of presenting a great deal of information that will be beneficial to the public. Unfortunately, the presentation tends to be one-sided and misleading.

In educating the general public about genetics, scientists and clinicians must walk a fine line between stressing the importance of genes to health and well-being, and promoting the notion of genetic destiny that leads individuals to believe that they are no more than the sum of their genes. Milunsky has strayed a bit too far toward the latter in this book, which reads like an advertisement for clinical geneticists in some sections. The author overstates the ability of modern genetics to prevent illness and writes in a manner that implies that every reader has a pressing need for a genetics consultation. I am concerned that naive readers will come away from this book believing that an understanding of their family history (and a trip to the clinical geneticist) will prevent illness and secure health. There is no discussion about our serious limitations in testing for the majority of genetic conditions, or our constraints in altering genetic risks through environmental modifications. Although the author states several times

that genes are not destiny, a conflicting message arises because the term genetic destiny is used repeatedly and themes of genetic destiny recur. For example, height and stature are described as purely a function of genes (p 55), and the section on reproductive cloning suggests that parents will be able to "follow a personal copy through early growth and development," while a resulting child will be able to "witness his or her future in the life of the parent" (p 364).

The text is interspersed with clinical examples from Milunsky's considerable experience. Some of these are interesting and will help readers understand the science. Others strongly reflect his moral position, and it appears that they are used to further his own agenda. Although the author discusses the importance of nondirective counseling and notes the personal nature of decisions, his views come through in a heavy-handed, directive manner. For example, Milunsky believes that parents have an obligation to seek genetic services before conception, have any and all available genetic testing during pregnancy, and abort an affected fetus. He states: "Not bothering to determine all of the risks and options prior to conceiving a child who may be doomed to a lifetime of pain and suffering could be construed as a form of child abuse" (p 300). In addition, he highly touts the benefits of genetic testing, but does not discuss the potential negative implications until the penultimate chapter of the book.

This volume presents a bleak picture of many genetic disorders, which are described as tragedies. For example, tables representing the most common features associated with Klinefelter syndrome include mental retardation and multiple psychiatric manifestations; the table on Turner syndrome includes juvenile rheumatoid arthritis and schizophrenia. Although these features can occur, they are absent in a large majority of affected individuals. Milunsky also suggests that sickle cell carriers are impaired by their status and recommends that they undergo only gradual physical training and avoid overtaxing their bodies (p 93). This harkens back to the discrimination experienced by African Americans in the 1970s with the advent of genetic screening for sickle cell disease. Equally misrepresentative are the figures for empiric risks that appear throughout the book. The figures are provided with little or no discussion of population prevalence, relative versus absolute risks, or modifying factors, even though the author states that empiric risks are misleading without such information (p 329).

Perhaps Milunsky's view of genetics will become reality, but I cannot help but be concerned about the nature of that reality. In the interim, the con-

tents of this book could mislead the public about the current abilities of genetics professionals to predict and protect against illness. I do expect, however, that Boston University's Center for Human Genetics will find an increase in their patient volume in response to this publication.

HOLLY L. PEAY, *National Coalition for Health Professional Education in Genetics, Lutherville, Maryland*

#### REDESIGNING LIFE?: THE WORLDWIDE CHALLENGE TO GENETIC ENGINEERING.

*Edited by Brian Tokar. London and New York: Zed Books. \$69.95 (hardcover); \$19.95 (paper). v + 440 p; index. ISBN: 1-85649-834-4 (hc); 1-85649-835-2 (pb). 2001.*

The rise in gene-based technologies has inevitably been accompanied by increasing social concerns about the applications of this science. Much of the debate has been highly polarized and it is difficult to find balanced examinations of the issues surrounding these technologies. With chapters on topics as diverse as cloning, the genetic basis of violence, and xenotransplantation, I was looking forward to reading this book in the hope that it would provide a detailed overview of the emerging technologies, controversies, and issues. Unfortunately, I was to be disappointed.

Many of the chapters are extremely thought provoking, but the book merely adopts a fervent anti-biotechnology stance. Although the downsides and hazards of genetic technologies are extensively described, the authors consistently fail to discuss the potential benefits of the different technologies and thus address the most difficult issues facing society. Despite the possible disadvantages, complex ethical dilemmas, and concerns over safety that clearly need to be addressed, is it prudent to simply ignore the potential benefits of this technology, and how do both scientists and society balance the future benefits and disadvantages?

The quality of the individual chapters varies greatly; some contributions are analytical, comprehensive, and well written with extensive reference lists, while others appear superficial and simply reiterate now well-rehearsed criticisms of the technology, often referring only to anecdotal evidence. Despite these criticisms, for anyone interested in the public furor surrounding gene technologies, the book provides an interesting insight into the thinking and operation of campaigns against gene-based technologies. The chapter *Princes, Aliens, Superheroes and Snowballs: The Playful World of the UK Genetic Resistance* (by Jim Thomas of Greenpeace) is particularly enlightening.

It is difficult to imagine the target audience for this book. For laics, it lacks even a basic introduction to genetics. For those more involved in the field, many elements in the book are predictable and repetitive. If you want a comprehensive overview of the arguments against genetic technologies, read this book. If you seek a balanced examination of the debates surrounding gene technology, look elsewhere.

ROBERT MARCHANT, *School of Biosciences, University of Nottingham, Nottingham, United Kingdom*

#### THE MISUNDERSTOOD GENE.

*By Michel Morange; translated by Matthew Cobb. Cambridge (Massachusetts): Harvard University Press. \$24.95. xii + 222 p; index. ISBN: 0-674-00336-5. [Originally published as *La Part des Gènes*, by Editions Odile Jacob, 1998.] 2001.*

This is the best of the many current books that discuss human genetics and its social implications. It is a welcome antidote to the recent focus on the genome as a "blueprint for life." For Morange, although genes come first in the sequence of steps leading to a biological function, the major players are the proteins whose sequences are encoded within genes. Individual genes do not, by themselves, provide the information required for the development of a living organism. For example, although genes specify the sequence of amino acids in a protein, they often do not specify the biologically active three-dimensional conformation of that protein.

In the first half of his book, the author elaborates on these ideas by discussing what genes actually do. Relying heavily on the results of "knockout" experiments in which the effects of disabling single genes in an organism are studied, he illustrates the complex roles that genes play in both the structure and behavior of organisms. These illustrations convincingly demonstrate that the concept of a "gene for a trait" is intellectually bankrupt. A single gene can serve several purposes in the same organism and, conversely, a single biological process is usually the result of the action of many genes acting in cohorts. Of even greater importance is the prevalence of emergent properties of organisms, which will not be explained by characterizing only the individual constituents of a system. Morange notes that the renaissance in cell biology in the 1970s coincided with the realization that complex biological processes cannot be understood at the level of the protein, let alone that of the gene.

In the second half of his book, the author turns to some of the controversial applications of human genetics: the study of intelligence and human

social behavior, genetic determinism, and eugenics. Using the detailed biology presented in the first half of the book, he makes the case that, for example, the efforts of behavioral geneticists to find "intelligence" genes are misguided. In a discussion of eugenics, he notes that we need not worry that germ-line therapy, presumably the tool of the new eugenicists, will result in any significant loss of genetic diversity in the human gene pool, especially when compared to those losses that have been incurred throughout human history by war and genocide.

Although *The Misunderstood Gene* sounds like the title of a book for a general audience, it is not for the genetic neophyte. This volume should be read by biology students and their professors because of its clear-sighted overview of human genetics and its social implications. But perhaps its most important potential audiences are the science journalists who write on human genetics issues and the genetic researchers whose results the journalists discuss. Scientists complain that journalists do not understand the science; journalists complain that scientists cannot explain their science and overinterpret their results. *The Misunderstood Gene* serves as an excellent primer for both scientists and journalists who, for the sake of our entire society, must learn to present clearly and accurately the latest findings of human genetics and their social implications.

JOSEPH S ALPER, *Chemistry, University of Massachusetts, Boston, Massachusetts* and JON BECKWITH, *Microbiology & Molecular Genetics, Harvard Medical School, Boston, Massachusetts*

#### THE EVOLUTION EXPLOSION: HOW HUMANS CAUSE RAPID EVOLUTIONARY CHANGE.

By Stephen R Palumbi. *New York: W. W. Norton & Company.* \$24.95. x + 277 p; ill.; index. ISBN: 0-393-02011-8. 2001.

The last few years have seen increased efforts to pass legislation that would either prohibit the teaching of evolution in the public schools or require "equal time" for alternative explanations of the origin and perpetuation of living things. Biologists and anthropologists are often called upon to comment on these efforts or to add expertise to the fight against such legislation. Palumbi's book provides all the ammunition needed in these conflicts and, if opponents to the teaching of evolution would read it, much of the resistance would be silenced.

In an engaging (although often a bit overdone with metaphors) and easy-to-read style, Palumbi offers dozens of examples of rapid evolutionary changes that have occurred in less than one human generation of time: antibiotic-resistant

bacteria, insecticide-resistant insects, herbicide-resistant weeds, HIV, and declining fisheries. The chapter, *Temporary Miracles: The Evolution of Antibiotic Resistance*, describes how natural selection has dashed all hopes that permanent magic bullets in the form of antibiotics can be found for diseases such as tuberculosis and infections caused by streptococcal and staphylococcal bacteria. The familiar battle to defeat or slow HIV is reviewed with enough detail to provide readers with a more sophisticated understanding of the evolution of this disease than is usually available in books written for a popular audience.

If your antievolution interlocutors are not convinced that human-targeted viruses and bacteria are evolving, then offer them the evidence that crop pests and noxious weeds have evolved in response to the broad use of insecticides and herbicides. Palumbi's evidence should even convince the antievolutionists in Kansas that their proposed legislation is not only ill-founded scientifically, but potentially disastrous for their agriculturally based economy.

If one can get through the all-too-frequent metaphors (it will be a long time before I forget the image of an anchovy daquiri that Palumbi uses to illustrate a concept), this book has a lot of information that will be useful for those who teach evolution and for students and the scientifically literate public who are trying to understand what evolutionary theory has to offer today in the real world. The evidence of evolution is all around us, and this book helps to open our eyes.

WENDA TREVATHAN, *Sociology & Anthropology, New Mexico State University, Las Cruces, New Mexico*

#### BIOINFORMATICS: A PRACTICAL GUIDE TO THE ANALYSIS OF GENES AND PROTEINS. *Second Edition. Methods of Biochemical Analysis, Volume 43.*

By Andreas D Baxevanis and B F Francis Ouellette. *New York: Wiley.* \$164.95 (hardcover); \$69.95 (paper). xviii + 470 p + 16 pl; ill.; index. ISBN: 0-471-38390-2 (hc); 0-471-38391-0 (pb). 2001.

The personal computer is celebrating its birthday these days. Since its introduction to the public 20 years ago, it revolutionized our lives by entering almost every niche of our activities. The major contribution of computers and computer science to modern biology was in the development of computational tools that are essential for organizing and analyzing the numerous data obtained from the recent large sequencing projects. These new tools, a crossroads between biology and computer science, are represented in a new discipline of modern science, known as bioinformatics. The second edition of this book provides biologists with a

practical description of all modern tools needed for a successful sequence analysis.

The volume contains 17 chapters that can be separated into several content groups covering all aspects of bioinformatic research: database model and structure, genome mapping, information search and retrieval, sequence alignment, predictive methods, Expressed Sequences Tags (ESTs), sequence assembly, phylogenetic analysis, as well as comparative and large scale genome analysis. In addition, the book contains an introductory chapter on internet basics and its major tools (i.e., email, file transfer, and Web browsing), as well as a concluding chapter on using Perl script to facilitate biological analysis. Most of the chapters begin with a short description of the discussed problems from the biologist's point of view and then lead readers to the computational methods and computer programs needed to solve the specific problems. For example, sequence alignment and database searching are probably the most common tasks biologists perform in their routine analysis of genes and proteins. Chapter 8 describes the biological basis for sequence alignment followed by the optimal alignment methods used in different computer algorithms. Then, the chapter clearly describes the substitution scores and gap penalties, mathematical techniques used to increase the sensitivity to weak alignments (mostly used for protein-protein alignment), and discusses the statistical significance of alignments. Finally, the chapter introduces readers to the most commonly used programs for database similarity searching: FASTA and BLAST. This chapter also provides readers with a special insight into database searching artifacts. Such hierarchy organization within the chapters is most beneficial for both beginners and experienced readers, as it provides every step in the bioinformatical analysis of a given problem. Thus, this book, written by the top scientists in the field of bioinformatics, is the perfect choice for every molecular biology laboratory.

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



## PLANT SCIENCES

### INSECTS AND PLANT DEFENCE DYNAMICS.

*Edited by T N Ananthkrishnan. Enfield (New Hampshire): Science Publishers. \$68.00. xii + 253 p; ill.; index. ISBN: 1-57808-155-6. 2001.*

Research on the interactions among plants, herbivorous insects, and their natural enemies is blossoming exponentially. These tri-trophic interactions, once viewed as separate, are now receiving

more comprehensive and integrated scrutiny. At their core, they involve the dynamics of allelochemicals, nutrients, and abiotic factors that affect the behavior and physiology of the interacting elements. The present volume attempts to review the latest findings in chemical ecology from an applied, agricultural viewpoint, with an emphasis on how new discoveries in transgenics and induced plant defenses can be used to improve methods of integrated pest management.

Rather than providing new data, the book's 11 chapters present useful overviews and bibliographies about plant and herbivore defenses. Several chapters stand out as highly informative, contemporary, and readable summaries. Chapter 2, which deals with plant nutrients and trace elements, is perhaps the most interesting and important. As Fageria and Scriber argue, the role of nutrients in resistance—the plant's ability to withstand or reduce attack—has been underappreciated in studies of the chemical ecology of plant-herbivore interactions. Although trace minerals and essential nutrients may well have important effects on the degree to which plants tolerate (recover from) and resist herbivory, we lack even basic understanding about them from the plant's viewpoint. For example, increasing a nutrient's level (such as N) by fertilization appears to have mixed effects on resistance to herbivores, even when they feed on plants with nitrogen-based defenses. Nitrogen fertilization, however, generally improves a plant's ability to recover from attack. Aside from the better known effects of water and nitrogen, there is very little information about the roles of numerous other, scarcer elements like iron, zinc, potassium, and sodium, among others. One of at least ten hypotheses that attempts to explain plant resource allocation, the carbon/nutrient balance hypothesis—wherein plants growing in good nutrient and light conditions will shunt resources to growth and reproduction over carbon-based defensive pathways (terpenes and phenolics, among others), and will reverse this allocation ratio under poor growing conditions—has received some support, but remains controversial. Insects themselves need to eat enough plant to obtain scarcer but critical nutrients. How particular nutrient and trace element levels can be manipulated to reduce herbivore performance is generally unknown, so their role in integrated pest management strategies aimed to maximize crop yields remains limited.

One of the most intriguing ideas, the chemical defense syndrome (CDS), is presented in Chapters 8 and 9. CDS attempts to explain the evolved co-occurrence of diurnal feeding, aposomatism, large size, chemical defense, gregariousness, and "slug-gish" behavior. Herbivore sluggish behavior, a slow-

motion rate of movement, is suggested to be an adaptation that serves to avoid eliciting the attack behavior of sit-and-wait predators usually released by jerky or rapid fleeing movements. New data are given in support of sluggish behavior as part of the CDS syndrome.

On the negative side, I had several problems with some of the terminology and evolutionary interpretations used in the book. The subsequent misinterpretation of Ehrlich and Raven's (1964. *Evolution* 18:586–608) seminal, plant-herbivore coevolutionary hypothesis as an "arms race" appears yet twice again in this book. The arms race idea rests on the assumption that there is a pairwise—1:1—or reciprocal interaction between a plant and an herbivore. The outcome of this kind of tight, coevolution would be escalation, or the increase in the efficacy of a plant defense, followed by the countering improvement in the insect's ability to circumvent or detoxify it—and so on. Although plausible, Ehrlich and Raven posited no such tight coevolutionary reciprocity, and few well-documented examples of arms race coevolution exist.

Although used often and interchangeably throughout the text by several authors, the closely related terms "defense" and "resistance" have different evolutionary meanings. The former is a resistance character that evolved as an adaptation because it reduced the effects of herbivory, while the latter refers to a character that evolved for another function, which it still may serve, but is maintained because it (also) reduces herbivore damage. Cuticular waxes, mentioned in Chapter 6, may well have evolved initially to reduce desiccation, UV, or heat damage, but incidentally now provide resistance to chewing insects.

In Chapter 10, despite Fageria and Scriber's concerns (Chapter 2), there is a tone of uncritical acceptance of transgenic technology without any environmental caveats. Transgenic Bt corn (event 176 for example) has had unanticipated and perhaps unacceptable deleterious effects on monarch butterflies. Although dependence on pesticides, which do hammer nontarget species, might be reduced, the long-term and sublethal effects of transgenic crops remain to be measured. Genetic seepage to common, native plants related to crop species (for example, mustards) may have serious impacts on nontarget, beneficial insects. Despite heavy agrobusiness investment, the jury is still out on how to safely use this technology.

I recommend this book to anyone interested in the present state of knowledge of plant and herbivorous insect defenses. The field is changing so rapidly, however, that a new edition will likely be needed soon.

FREDRIC V VENCL, *Ecology & Evolution, State University of New York, Stony Brook, New York*

PLANT INVASIONS: SPECIES ECOLOGY AND ECOSYSTEM MANAGEMENT. *Based on a conference held in Sardinia, Italy, 13-16 October 1999.*

*Edited by G Brundu, J Brock, I Camarda, L Child, and M Wade. Leiden (The Netherlands): Backhuys Publishers. \$89.00 (paper). xiii + 338 p; ill.; index. ISBN: 90-5782-080-3. 2001.*

THE CAMBRIDGE ILLUSTRATED GLOSSARY OF BOTANICAL TERMS.

*By Michael Hickey and Clive King. Cambridge and New York: Cambridge University Press. \$85.00 (hardcover); \$29.95 (paper). xii + 208 p; ill.; no index. ISBN: 0-521-79080-8 (hc); 0-521-79401-3 (pb). 2000.*

Effective communication requires precise, generally agreed upon terminology. In structural botany our terms began with Medieval Latin. Modified over time, and expanded with additional terms for newly discovered structures, we now have a rich and precise vocabulary with which to describe the plant world.

Central to a book of this kind, and complementary to the definitions in the glossary, is the clarity and arrangements of its illustrations. In this regard the volume succeeds very well; the pen-and-ink illustrations are easily understood and the levels of detail are chosen well. Common shapes and structures are represented in addition to many unusual and highly sophisticated morphologies. Orchids, grasses, composites, sedges, and milkweeds have their peculiar flowers well delineated and clearly labeled. Differences are sometimes quite subtle, as in the case of diplostemonous and obdiplostemonous flowers—but they are next to each other for ease of comparison.

Finding the right word for a particular kind of pubescence or surface texture has always been difficult; here they are presented from both above and the side, helping readers choose the most appropriate term. The illustrations cover larger structures and those visible with a hand lens; only a few cellular and microscopic features are included. Beginning with roots, seeds, and life-forms, the plates continue through flowers to fruits, conifers, and ferns, in an arrangement that is easy to remember and revisit. The alphabetical glossary provides definitions and also explains many terms that are not illustrated. There is no index and most illustrations are referenced in the glossary, but a few are not. Thus, although orchid illustrations are listed in the glossary, readers have to find the flowers of milkweeds, grasses, and others by browsing the floral plates. Also, it is carpels that may be conduplicate, not the styles. But these are minor quibbles. This is a book that will prove indispensable for anyone seek-



ing to improve their understanding of botanical terms—and using them properly.

WILLIAM C BURGER, *Botany, The Field Museum, Chicago, Illinois*

GUIDE TO STANDARD FLORAS OF THE WORLD: AN ANNOTATED, GEOGRAPHICALLY ARRANGED SYSTEMATIC BIBLIOGRAPHY OF THE PRINCIPAL FLORAS, ENUMERATIONS, CHECKLISTS AND CHOROLOGICAL ATLASES OF DIFFERENT AREAS. *Second Edition.*

By David G Frodin. Cambridge and New York: Cambridge University Press. \$240.00. xxiv + 1100 p; geographical and author indexes. ISBN: 0-521-79077-8. 2001.

HANDBOOK OF NORTH EUROPEAN GARDEN PLANTS: WITH KEYS TO FAMILIES AND GENERA.

Edited by James Cullen. Cambridge and New York: Cambridge University Press. \$130.00 (hardcover); \$49.95 (paper). vii + 640 p; ill.; index. ISBN: 0-521-65183-2 (hc); 0-521-00411-X (pb). 2001.

RECENT ADVANCES IN THE BIOCHEMISTRY OF PLANT LIPIDS: PROCEEDINGS OF THE 14TH INTERNATIONAL SYMPOSIUM ON PLANT LIPIDS HELD IN CARDIFF, U.K., IN JULY 2000.

Edited by J L Harwood and P J Quinn. London: Portland Press. £75.00. xxiii + 418 p; ill.; index of authors. ISBN: 1-85578-146-8. [These proceedings have also been published in *Biochemical Society Transactions* 28 (2000):567-981.] 2000.

CROP POLLINATION BY BEES.

By Keith S Delaplane and Daniel F Mayer. Wallingford (United Kingdom) and New York: CABI Publishing. \$100.00. xv + 344 p; ill.; index. ISBN: 0-85199-448-2. 2000.

This book aims to be a source of practical information for agriculturalists whose crops depend on pollination by bees. It succeeds well in that aim, but it also has much to offer ecologists interested in plant-animal interactions in natural communities.

Delaplane and Mayer immediately and properly acknowledge this book's debt to two predecessors, John Free's more intensive *Insect Pollination of Crops* (Second Edition. 1993. San Diego (CA): Academic Press; reviewed in *QRB* 69(2):277-278), and S E McGregor's more extensive *Insect Pollination of Cultivated Crop Plants* (1976. Washington (DC): Agricultural Research Service, U.S. Department of Agriculture Handbook 496). In many ways, the new volume is a distillation of those classics, concentrating on salient information with practical—as

opposed to academic—implications. Indeed, the second half of Delaplane and Mayer's book, which gives summaries of floral biology, pollination ecology, and management recommendations for 36 crops, is strongly reminiscent of McGregor's volume. There are other differences, however.

First, *Crop Pollination by Bees* is more up to date. This is not as obvious as it might seem, because McGregor's book has been recently made available on the internet in a format described as "The First and Only Virtual Beekeeping Book Updated Continuously" (<http://gears.tucson.ars.ag.gov/book/index.html>). The updates found in the Web-based McGregor are spotty, rather than comprehensive. Although there are interesting additions on exotica such as neem, durian, and rambutan, the treatments of classic crops (e.g., cherries) are not current. The "neoclassic" crop canola does not even appear under its newly sanitized name, and the treatment of "rape" definitely misses new scholarship that Delaplane and Mayer have summarized. The earlier chapters on insect biology also contain fresh material; I was especially intrigued by some new and controversial work on the usefulness of pheromonal sprays to attract pollinators.

Second, the new book has a unique focus on active management of bees other than honey bees. Catastrophic declines of honey bee populations in the 1990s kindled interest in other pollinators, and growers who wish to experiment with bumble bees, leaf-cutting bees, and mason bees, among others, will find practical guidance here. Third, Delaplane and Mayer provide some "business savvy," including sample contracts for beehive rentals and advice on how growers can foil the unscrupulous practices of some beekeepers.

Applied pollination biology is a relentlessly empirical science in which theory has yet to play a significant role. Therefore, good practice depends absolutely on the integration of new research findings as they become available. Delaplane and Mayer put this information in the reach of those who can benefit from it.

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

THE ILLUSTRATED RHODODENDRON: THEIR CLASSIFICATION PORTRAYED THROUGH THE ARTWORK OF CURTIS'S BOTANICAL MAGAZINE.

By Pat Halliday; illustrated by John Curtis, Sydenham Edwards, Walter Hood Fitch, Joseph Dalton Hooker, Christabel King, Mary Mendum, Valerie Price, Rodella Purves, Stella Ross-Craig, Matilda Smith, Lilian Snelling, Margaret Stones, Wendy Walsh, and Ann Webster. Portland (Oregon): Timber Press. \$69.95. v + 268 p; ill.; no index. ISBN: 0-88192-510-1. 2001.

COFFEE: RECENT DEVELOPMENTS. *World Agriculture Series*.

*Edited by R.J. Clarke and O.G. Vitzthum. Oxford: Blackwell Science. \$144.95. ix + 257 p; ill.; index. ISBN: 0-632-05553-7. 2001.*

This is a well-produced and timely publication, appearing as other monographs go out of print. Many who have an interest in coffee will know, or at least know of, the editors. For those who do not, it is appropriate to say that both spent most of their scientific careers working for major coffee processors and in retirement continue to make significant contributions to the Association Scientifique Internationale du Café.

Coffee is a major item of international trade and is said to be the commodity second in importance only to oil. It will come as no surprise, therefore, that every aspect of its production should have been subject to much investigation. It is the advances made in the last 15 years or so that are dealt with in this new monograph.

The book is well illustrated, with comprehensive referencing and indexing, and is commendably free from typographical errors. It is separated into 11 chapters, all of high quality, written by recognized specialists. Chapters 1 through 3 are concerned with chemical aspects of coffee, Chapters 4 through 7 describe technological aspects, Chapter 8 discusses health and safety of the consumer, and Chapters 9 through 11 deal with agronomy, including molecular biology and biotechnology. The book concludes with three appendixes that discuss pertinent International Standards Organization (ISO) publications, the International Coffee Organization and, finally, relevant units and numerals.

I have no hesitation in recommending the volume to anyone concerned with the production, processing, marketing, or regulatory aspects of coffee, whether in industry, government, or academe.

MIKE CLIFFORD, *Food Safety Group, Centre for Nutrition & Food Safety, University of Surrey, Guildford, Surrey, United Kingdom*

TOBACCO: PRODUCTION, CHEMISTRY AND TECHNOLOGY. *World Agriculture Series*.

*Edited by D Layten Davis and Mark T Nielsen. Oxford and Malden (Massachusetts): Blackwell Science; distributed by Iowa State University Press, Ames (Iowa). \$164.95. xi + 467 p; ill.; index. ISBN: 0-632-04791-7. 1999.*

Although the scientific literature regarding tobacco is voluminous, very few resources provide the well-balanced survey of tobacco crop production, marketing, storage, and product manufacture found in this monograph from the international Cooperation Centre for Scientific Research Relative to Tobacco (CORESTA). The scope of the book is extremely wide, ranging from aspects of tobacco

seed quality and germination, to the chemical and physical properties of cigarette smoke, to important considerations of cigarette design and quality assurance. Interrelationships among crop production practices, product manufacturing methods, and characteristics of tobacco products are emphasized.

The first chapter serves as a very nice introduction to the rest of the book. Over half of the volume focuses on aspects of tobacco crop production, detailing practices involved in the production of the major tobacco types. There is considerable repetition of information, but the authors do tend to emphasize differing aspects of the topics. A short chapter discusses the potential applications of specific biotechnological techniques toward improving resistance to diseases and pests, as well as tobacco yield and quality. Plant physiology and metabolism is primarily discussed in terms of the chemical and physical factors important in tobacco products. The chapter on tobacco insect pests includes a brief, but very informative, discussion of pesticide regulations around the world and the need for consistent international standards for pesticide residues. The chemistry of tobacco leaves and smoke are treated extensively. Marketing systems for tobacco vary significantly around the world, and the clear presentation of these systems in different countries should prove helpful to many readers. Likewise, the information presented on tobacco processing and storage, blending, as well as cigarette design, production, and quality assurance should be very valuable. The final two chapters of the book dealing with cigars, cigarillos, and smokeless tobacco will also help fill a void in the tobacco literature that has resulted from the frequent neglect of tobacco uses other than for cigarette manufacture.

The broad range of topics covered should make this book a unique and valuable resource for anyone interested in tobacco production and manufacture.

CHARLES S JOHNSON, *Southern Piedmont Agricultural Research & Extension Center and Plant Pathology, Physiology & Weed Science, Virginia Polytechnic Institute and State University, Blackstone, Virginia*

PRINCIPLES OF BOTANY.

*By Gordon Uno, Richard Storey, and Randy Moore. Boston (Massachusetts): McGraw-Hill. \$80.00. xxiv + 552 p; ill.; index. ISBN: 0-07-247289-8. 2001.*

GREEN PLANTS: THEIR ORIGIN AND DIVERSITY. *Second Edition*.

*By Peter R Bell and Alan R Hemsley. Cambridge and New York: Cambridge University Press. \$90.00 (hardcover); \$31.95 (paper). x + 349 p; ill.; index. ISBN: 0-521-64109-8 (hc); 0-521-64673-1 (pb). 2000.*

These two books span a wide range of levels, from introductory to advanced. The variety of writing styles represents different teaching styles geared

toward different learning styles. We offer the following comments from the points of view of a teacher (GB) and a student (VV).

*Principles of Botany* appears to be aimed at students with little or no background in basic biology, and is suitable for an introductory level. The text appears to be complete in the topics it covers, although not detailed in the information it presents. The strong points include excellent illustrations that are well labeled and accompanied by clear explanations, well-written summaries at the end of each chapter, and thought questions that emphasize the main points of that chapter. A nice feature of the book is a companion website with links to related topics. The website has useful information to supplement the book, and also provides windows to more detailed botanical knowledge (namely, links to the Tree of Life pages, botany organizations, a biology glossary, and more). It is an excellent introduction to the study of plant biology, but only briefly covers plant diversity and evolution.

This is where *Green Plants* steps in and provides excellent information on "plants," including a motley of "algae" and Embryophyta. The biological information presented is extraordinary in its completeness and detail. The text is accompanied by line drawings and photographs that are clear and helpful in understanding the huge range of structures and complexity found in this group of organisms. There is no question that this is an invaluable source of information for students, as well as researchers unfamiliar with the tremendous variety of form and function that lie beyond *Arabidopsis* and maize. That said, we note several deficiencies that we hope would be rectified in future editions. From the point of view of the student, navigation might be facilitated by a more complete glossary. For example, Chapter 7 discusses ferns, and begins by distinguishing leptosporangiate and eusporangiate groups. The terms are not defined there or in the glossary; readers are referred to specific pages where the terms are first introduced, but there the definitions are buried in the text. The lack of chapter summaries and list of key terms are other drawbacks. From the point of view of the teacher, the single, serious flaw is an outdated approach to questions about the origins and evolution of different groups, something exemplified by the title of the book itself. In the authors' view, "green plants" includes all plants and there is no attempt explicitly to incorporate modern ideas regarding the recognition and naming of groups. As a result, this remarkable book on plant structure fails as an account of the evolution of the ahistorical and nonmonophyletic group, "plants." Nevertheless, there is no ques-

tion that this book will be advantageously consulted for research and used in courses on plant diversity. Indeed, used judiciously, the previously noted lack of learning devices, absence of explicit evolutionary analyses, and presence of a marvelous body of information may enable teachers to guide students through a self-steered voyage of learning in the truest sense.

GEETA BHARATHAN and VERONICA VIDAL, *Ecology & Evolution, State University of New York, Stony Brook, New York*

ANNUAL REVIEW OF PLANT PHYSIOLOGY AND PLANT MOLECULAR BIOLOGY. *Volume 52: 2001.*

*Edited by Russell L Jones, Hans J Bohnert, and Deborah P Delmer. Palo Alto (California): Annual Reviews. \$65.00. xvi + 926 p + 53 pl; ill.; subject index, cumulative indexes (contributing authors and chapter titles, Volumes 42-52). ISBN: 0-8243-0652-X. 2001.*

ROOT METHODS: A HANDBOOK.

*Edited by A L Smit, A G Bengough, C Engels, M van Noordwijk, S Pellerin, and S C van de Geijn. Berlin and New York: Springer. \$109.00. xiv + 587 p; ill.; subject index. ISBN: 3-540-66728-8. 2000.*

Although there has been a growing recognition of the importance of studying root systems, ecologists, biogeochemists, and agronomists have been saddled with laborious and often crude research methods. Many of these limitations are inherent to sampling complex belowground systems, but recent technological advances have refined traditional root-sampling techniques and led to the development of sophisticated new methods. There is a great need, however, to evaluate which root parameters are relevant to particular research questions, and to compare and contrast specific root sampling techniques. The development and wide application of standard, repeatable methods is critical for accurate comparisons among root research projects, sites, and life-forms, and for detecting patterns and trends from intrinsically "noisy" data.

*Root Methods* is intended to present readers with a contemporary review of root-sampling methods, with particular emphasis on the state-of-the-art techniques. The editors of this thorough yet very readable book have provided the long-awaited successor to Böhm's classic, *Methods of Studying Root Systems* (1979. Berlin (Germany): Springer-Verlag). Although several of the recent improved techniques have been described and reported in numerous journal articles and book chapters, *Root Methods* provides detailed comparisons and comprehensive reviews of virtually all root-sampling

techniques. There are good reviews of much discussed topics such as minirhizotrons, ingrowth cores, and isotope techniques, and chapters on fine-root longevity, modeling, and measuring root functional characteristics are unique and particularly valuable contributions. Also of special note is Atkinson's thorough discussion of the significance of root research, including identification of particular characteristics that should be investigated to address specific ecological questions. The book contains numerous tables that summarize and compare techniques and parameters, as well as clearly rendered illustrations. Although a more extensive use of photographs would have made complex procedures easier to understand, *Root Methods* belongs on the bookshelf of anyone interested in studying roots.

ANDY HUBBARD, *Sonoran Desert Network, National Park Service, Tucson, Arizona*

LICHENS OF ANTARCTICA AND SOUTH GEORGIA: A GUIDE TO THEIR IDENTIFICATION AND ECOLOGY. *Studies in Polar Research.*

By D O Øvstedal and R I Lewis Smith. Cambridge and New York: Cambridge University Press. \$100.00. xii + 411 p + 104 pl; ill.; index of taxa. ISBN: 0-521-66241-9. 2001.

THE CACTUS FAMILY.

By Edward F Anderson; with a Foreword by Wilhelm Barthlott; and a chapter on cactus cultivation by Roger Brown. Portland (Oregon): Timber Press. \$99.95. 776 p; ill.; indexes of scientific and common names. ISBN: 0-88192-498-9. 2001.

The name Edward (Ted) Anderson is well-known among cactologists for his pioneering studies, begun in the late 1950s, on small North American cacti, especially peyote and its close relatives. Now the cactus community owes him another debt for publishing an invaluable book, *The Cactus Family*, in which all genera and species currently recognized by the International Cactaceae Systematics Group (ICSG) are carefully described. Approximately half of the species are illustrated with fine color photographs. This tome replaces the long-antiquated, four-volume family monograph of Cactaceae by Britton and Rose (1919–1923. *The Cactaceae: Descriptions and Illustrations of Plants of the Cactus Family*. Washington (DC): Carnegie Institute)—the default reference for this New World family—and supercedes the confusing and unreliable six-volume monograph by Backeberg, *Die Cactaceae* (1958–1962. Jena (Germany): Gustav Fischer), as well as his work, *Das Kakteenlexikon* (1966. Jena (Germany): Gustav Fischer). Now, sys-

tematists and ecologists can obtain a full and well-informed view of this taxonomically complex and important plant family.

The consensus classification used in the book was developed since the mid-1980s by a committee of prominent cactus systematists. During that time a very conservative philosophy prevailed, lumping was strongly promoted, and recognizing monospecific genera was discouraged. Phylogeneticists insisted, against considerable opposition, that genera and tribes must be strictly monophyletic. Gradually that underlying principle took hold; the number of genera increased to the current treatment of 122 genera (ca. 1820 species). So different are many of the currently defined genera that they are barely distinguishable from the 123 genera recognized by Britton and Rose, and similar but still significantly different from the 123 genera recognized in an early phylogenetic classification by Gibson and Nobel (1986. *The Cactus Primer*. Cambridge (MA): Harvard University Press). The ICSG now fully embraces phylogenetic thinking and relies heavily on interpretations obtained from DNA studies. Currently, four subfamilies are recognized, and the opuntoids are rearranged into 15 genera, while broad use of the catch-all *Opuntia* to classify species has been abandoned. What is nice about Anderson's treatment is that he recognizes that this consensus classification is still in transition. Nevertheless, from this point, no flora or ecological study should be using outdated taxonomy for cacti.

The book also includes five introductory chapters on cactus characters, ethnobotany, conservation, cultivation (contributed by Roger Brown), and classification. Although nicely illustrated and written in a conversational style, the material is often not organized in a logical sequence, and key references are omitted and not properly used. Sometimes readers are misinformed about what the original author actually stated, especially in regard to physiological adaptations (Gibson and Nobel 1986). These chapters show a strong personal bias for studies from the United States, Mexico, and western South America, so that readers cannot learn how cacti are used and being conserved in most countries. The chapter on cultivating cacti is written primarily for container growing, and there is no coverage about caring for cactus epiphytes or other unusual life-forms.

Textual problems notwithstanding, this book will be an essential reference in every research library, and should reside on the shelf of every serious cactus enthusiast.

ARTHUR C GIBSON, *Organismic Biology, Ecology & Evolution, University of California, Los Angeles, California*

HERBICIDES AND THEIR MECHANISMS OF ACTION.  
*Sheffield Biological Sciences.*

*Edited by Andrew H Cobb and Ralph C Kirkwood. Boca Raton (Florida): CRC Press; Sheffield (United Kingdom): Sheffield Academic Press. \$85.00. xv + 295 p; ill.; index. ISBN: 1-84127-109-8; 0-8493-0502-0 (USA and Canada only). 2000.*

This book is a technical, up-to-date discussion of the challenges facing herbicide development. The mechanistic concepts are clearly presented, but require readers to have significant background in plant physiology and biochemistry in order to understand the discussion. The level of information is geared for upper-level graduate students to professionals. The text is well supported with appropriate references and a number of very useful summary tables.

Topics covered include the search for novel target sites, methods to increase target site delivery, weed resistance, and the use of herbicide-resistant crops. The roles of two very important protein complexes in herbicide metabolism (P450s and GSTs) are well characterized. Issues such as substrate specificity, gene expression, and enzyme-based weed resistance are discussed. The book provides a clear understanding of what is known and what remains to be discovered about how P450s and GSTs contribute to plant function and herbicide selectivity.

Some of the data presented in Chapter 4 are not easily traced to the original source. Table 4.2 does not indicate which researchers generated the resistance factors. Resistance ratios in Table 4.4 are also not referenced. This makes it impossible to compare the methods used or to locate more specific information. With a few exceptions, the book does not include much information regarding human or environmental toxicology.

Chapter 6 provides very good introductory information concerning phytopathogens to control weeds. The effects of these pathogens toward nontarget plant species and crop species, however, are largely not discussed. The authors also describe several models of assessing the interaction and joint action of binary herbicide mixtures in addition to providing several excellent binary mixture case studies. The modes of action of two contemporary herbicides—quinclorac and isoxaflutole—are presented as case studies. The authors describe in detail the discovery, uptake, metabolism, selectivity, and mechanisms of action of these two herbicides in target weed species.

In conclusion, this highly specialized textbook will benefit upper-level graduate students and professionals working in the agrochemical industry. The volume has excellent new information for the

contemporary use of herbicides and is very well supported with extensive literature citations.

PAUL L PENNINGTON and MARIE E DELORENZO, *Center for Coastal Environmental Health & Biomolecular Research, National Ocean Service, National Oceanic & Atmospheric Administration, Charleston, South Carolina*

ANNUAL REVIEW OF PHYTOPATHOLOGY. *Volume 39: 2001.*

*Edited by Robert K Webster, Gregory Shaner, and Neal K Van Alfen. Palo Alto (California): Annual Reviews. \$65.00. xii + 540 p + 8 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 30-39). ISBN: 0-8243-1339-9. 2001.*

TOXIC PLANTS OF NORTH AMERICA.

*By George E Burrows and Ronald J Tyrl. Ames (Iowa): Iowa State University Press. \$174.95. vii + 1342 p + 8 pl; ill.; index. ISBN: 0-8138-2266-1. 2001.*

MOLECULAR FUNGAL BIOLOGY.

*Edited by Richard P Oliver and Michael Schweizer. Cambridge and New York: Cambridge University Press. \$80.00 (hardcover); \$34.95 (paper). x + 377 p; ill.; index. ISBN: 0-521-56116-7 (hc); 0-521-56784-X (pb). 1999.*

This is a modestly sized and priced (at least in the paperback version) collection of essays aimed at advanced undergraduates and beginning graduate students. The intent is to provide an introduction to the application of cellular and molecular biology to fungi, and to serve as a supplementary textbook in courses on mycology and biotechnology. It is neither a comprehensive volume nor a field guide.

I think that the editors have, in general, achieved their goal, and that the work is suitable as a supplementary textbook. Volumes such as this inevitably contain some overlap among chapters, but this has been minimized, and what overlap there was served more to reinforce concepts rather than to simply repeat. The references furnished for each chapter vary widely in their depth, breadth, and number. In general, they appear to go through 1998, but with the speed with which this field is progressing some additional attention on the part of instructors and students will be required to ensure that major advances have not gone unnoticed. For example, only the yeast (*Saccharomyces cerevisiae*) genome was generally available at the time of publication, and fungal genome analysis has progressed significantly since then.



The material covered is quite diverse, including analysis and construction of phylogenies, genome sequence analysis, developmental aspects of fungal growth (cell division, sexual and asexual sporulation, and differentiation), metabolism (both primary and secondary) and its genetic encoding, and disease processes (both plant and animal). The chapter on phylogenies probably succeeds best as an instructional tool, and readers who would like a clear explanation and discussion of this field will find this chapter both useful and satisfying. The chapter on the yeast genome serves as a good introduction to most of the relevant issues that must be considered in the analysis of any genome, and has the references needed to begin a more in-depth study. The three metabolism chapters provide an extensive analysis of a primary metabolic pathway, an introduction to lignocellulose degradation, and a broad overview of secondary metabolism that should serve to orient students. The chapters on disease processes indicate important general areas, as an introduction should, and with only relatively general references as well. The chapters on fungal growth and development contain both the best and the worst that the volume has to offer. The chapters on hyphal cell biology and cell division will be useful both for students and for practicing scientists who need some idea of the types of problems being addressed in these important, but not heavily studied, fields. The chapter on asexual sporulation provides a good introduction to the *Aspergillus* process and leaves the clear impression that our understanding of this process is still a work-in-progress. The chapter on sexual development is the worst in the book, and may confuse as much as it will enlighten. This chapter is too broad and the outlines of the life cycles for *S. cerevisiae*, *Ustilago*, and *Schizophyllum/Coprinus* are oversimplified and likely to be of relatively little use. It also contains significant errors (e.g., the lack of distinction of sexual and asexual heterokaryons and the claim that pulsed field gel electrophoretic techniques are suitable for determining ploidy) and has significant omissions (e.g., no mention of *Podospora anserina* as a secondary homothallic, no reference to studies of meiosis and ascus development in *Neurospora*).

In summary, this volume should serve the goals set by the editors as a supplementary textbook for teaching purposes. The lack of a chapter on signaling seems the most serious omission, and the chapter on sexual reproduction contains enough errors that it should be avoided. Much of the rest of the material probably will age too rapidly for this to serve as a standard reference textbook for more advanced students or those working in the field. The addition of a glossary to assist students manage

the technical jargon in the field would have been helpful. Nevertheless, this volume makes a useful contribution to the field and is priced in such a manner that it should end up not only in most libraries, but also on many personal bookshelves.

JOHN F LESLIE, *Plant Pathology, Kansas State University, Manhattan, Kansas*

#### ALGAE.

By Linda E Graham and Lee W Wilcox. *Upper Saddle River (New Jersey): Prentice Hall.* \$74.67. xvi + 700 p; ill.; taxonomic and subject indexes. ISBN: 0-13-660333-5. 2000.

Algae are a group of organisms that are highly diverse morphologically, genetically, physiologically, and ecologically. They include unicellular, multicellular, photosynthetic, and heterotrophic species that live freely, symbiotically, or parasitically in marine, freshwater, and terrestrial environments. Photosynthetic species contribute to one-half (45 gigatons C per year) of global total primary production, and are essential to the biota by providing organic material, energy, and oxygen, whereas heterotrophic species constitute an important step in the microbial loop. Biogeochemically, algae play significant roles in recycling of elements such as C, N, P, Si, S, and Ca. Reproduction ranges from simple asexual binary fission to various types of sexual reproduction, and life history can consist of as little as two or many life stages. Some have high commercial value as human or animal food or industrial materials, while others cause environmental or health problems (harmful algal blooms). The diversity, importance, and biology of these organisms are far less well appreciated than land plants because most of them are microscopic or live underwater. Relatively poorly understood as they are, dramatic progress has been made in the last two decades.

*Algae* is a comprehensive and timely textbook that synthesizes classical understanding and latest findings on various aspects of these organisms. This volume presents the wide range of algal characteristics in an elegant and easy-to-understand way, making it well suited to the target audience, from undergraduate and graduate students to researchers and professionals. Composed of 23 chapters, this book begins with five chapters that provide an introduction to algae, with concise accounts on its general characteristics, roles of algae in global biogeochemistry, complex biotic associations, technological application, as well as diversity, phylogenetic relationship, and modern approaches to algal systematics. This should be a "must read" section at the beginning, or after reading the more specialized chapters. What follow are detailed treatments of

individual groups of algae, covering cell biology, biochemistry, evolution, and other aspects. It begins with Cyanobacteria, followed by origin of eukaryotic algae, Euglenoids, Cryptomonads, Haptophytes, Dinoflagellates, Ochrophytes, red algae, and green algae. The book concludes with two chapters on ecology, one dedicated to phytoplankton and the other to macroalgal and periphyton species.

Several distinctive features make this book outstanding. First, the authors carefully assessed existing taxonomy systems with molecular and cytological data and explained why a particular system was selected for this book. For instance, the authors used the nine phyla system with several classes grouped into the Ochrophyte phylum based on the flagellar structure and molecular information. The relationship of this phylum with earlier taxonomic divisions such as Chromophyta and Heterokonts is explained. This is very helpful because it is often frustrating for readers to learn new naming systems without context to earlier systems. The second important feature is the use of molecular phylogenetic analyses to elucidate evolution of cytological or ecological characteristics. For example, 16S rRNA-based phylogenetic tree is used to indicate polyphyletic origin of filamentous taxa and chlorophyll b-containing lineages of cyanobacteria (Chapter 6). Similar analyses are made for the evolutionary relationship between pennate and centric diatoms (Chapter 12) and evolution of parenchyma in brown algae (Chapter 15), among others.

The authors included new findings and approaches, especially in the area of molecular systematics and phylogeny. The highlights on where the molecular data are not congruent with traditional classification are particularly instructional for identifying areas of further study. The selected classical and updated references throughout the volume and the list of recommended books at the end of each chapter are extremely useful. This should especially satisfy researchers looking for not just general understanding, but the most updated information. Another outstanding feature is the numerous clear illustrations, in particular the good quality photographs that provide convenient reference to the morphology or structure of algae. The effort to collect such a large number of photographs is not trivial, and will be greatly appreciated by readers. The two ecology chapters, although falling short in length apparently due to page limits, are also helpful in putting algae as a whole in environmental context.

It would be nice if the algal photographs could be recorded on a CD-ROM and included with the

book. In addition, there are scattered typographical errors, some of which could be confusing to students. In summary, *Algae* is both a great textbook for students and teachers and a valuable reference for researchers.

SENJIE LIN, *Marine Sciences, University of Connecticut, Groton, Connecticut*



## ANIMAL SCIENCES

### PARASITISM: THE DIVERSITY AND ECOLOGY OF ANIMAL PARASITES.

By Albert O Bush, Jacqueline C Fernández, Gerald W Esch, and J Richard Seed. Cambridge and New York: Cambridge University Press. \$130.00 (hardcover); \$49.95 (paper). ix + 566 p; ill.; index. ISBN: 0-521-66278-8 (hc); 0-521-66447-0 (pb). 2001.

This is a refreshing approach to basic parasitology textbooks and a major revision of the previous volume, *A Functional Biology of Parasitism: Ecological and Evolutionary Implications* (GW Esch and JC Fernández. 1993. London (UK): Chapman and Hall). As its title suggests, the current book presents not only the standard descriptions of animal parasite groups, their hosts, and the pathology with which they are associated, but also places the parasites in the ecological context in which they belong. After all, to the parasite the tissues of a living host are nothing more than the living room of an ecosystem.

The book begins with an introduction of parasitism and a brief description of the immune mechanisms and pathology of the host, with a discussion of some biochemical pathways that both parasite and host utilize. For the next almost 300 pages, the specific parasitic groups are described along with adequate illustrations of their structure and life cycles. The ecology of the relationships between hosts and parasites has a decidedly medical orientation, and underscores the relevance of the importance of these relationships to human suffering. Interspersed are numerous boxes that introduce some interesting related stories, told in the same easy-to-read, entertaining style as the rest of the book. Each chapter has its own brief list of relevant references.

I thoroughly enjoyed the last 200 pages in which the ecological concepts are discussed in considerably more detail, and where this volume stands out from the rest. Among the topics covered are population dynamics, transmission and dispersal, biogeography, and the evolutionary

relationships among parasites and hosts. These chapters begin with elementary concepts with numerous illustrative examples and bring readers up to a sophisticated level. A brief glossary is also provided.

MARC J KLOWDEN, *Plant, Soil & Entomological Sciences, University of Idaho, Moscow, Idaho*

PARASITOLOGY AND VECTOR BIOLOGY. *Second Edition.*

By William C Marquardt, Richard S Demaree, and Robert B Grieve. San Diego (California): Harcourt/Academic Press. \$84.95. xvi + 702 p + 2 pl; ill.; index. ISBN: 0-12-473275-5. 2000.

AN INTRODUCTION TO THE INVERTEBRATES. *Studies in Biology Series.*

By Janet Moore; illustrated by Raith Overhill. Cambridge and New York: Cambridge University Press. \$64.95 (hardcover); \$22.95 (paper). xv + 355 p; ill.; index. ISBN: 0-521-77076-9 (hc); 0-521-77914-6 (pb). 2001.

There is a close similarity between the acquisition of knowledge and evolution. Both rely on innovation and selection as well as a history that can only be recapitulated approximately in ontogeny. For example, there is just too much knowledge for all to be reiterated in personal educations and some topics have to be compressed, even suppressed, in modern courses. So it has been with classical zoology. Yet much of our understanding of the diversity of life, its ecology and the way organisms work (all central topics in modern biology) presupposes more than a little understanding of the invertebrates. This is the challenge taken up by this "little book"—to fill the gap in providing "a short guide to the invertebrate phyla." And it is brief—in just over 350 pages, the book moves from poriferans to protochordates between general chapters on evolution and development. It is well illustrated and there is a good glossary, but it will probably fail to engage. Not because of inaccuracies or poor style; quite the contrary. But because the recapitulation is too faithful to the past. There are discussions of why nematodes are good for developmental studies, and why we have learned much about the central nervous system from octopuses, but there is little on ecology and nothing on why knowing the invertebrates is key in conservation and biological control. For a book of this kind to be successful it needs not only to summarize the classical roots, but to excite by showing where they lead in modern biology.

PETER CALOW, *Animal & Plant Sciences, University of Sheffield, Sheffield, United Kingdom*

ENJOYING MOTHS. *Poyser Natural History Series.*

By Roy Leverton; with line illustrations by Michael Roberts. London: T & A D Poyser. \$39.95. xi + 276 p; ill.; subject index and species indexes (*Lepidoptera* and Other Groups). ISBN: 0-85661-124-7. 2001.

This book was written by an aficionado who so loves moths that even on holiday he can be found digging around the base of trees in search of moth pupae. When a cohort of caterpillars escaped in his study, he fashioned piles of cut heather about the floor that could serve as havens for his nocturnal quarry. This is a book by a moth lover and seasoned naturalist about his deep and unabashed passion for moths. The book is not (nor intended to be) well referenced, being more an introduction to moth biology and study. The book is delightfully written and meticulously edited; outstanding photographs (all by Leverton) are peppered throughout the book; many are exquisite. There are three useful appendixes in the back of the book: one addresses gains and losses from the British moth fauna that no doubt will be of interest to those studying the effects of global warming. A second appendix lists the British moths that are now established in the United States and a third enumerates the reverse situation. These latter two appendixes will find an audience among those tracking alien species.

The book is full of hints for both amateurs and professionals on how to go about finding and observing all life stages. The reflections of Leverton (who as a child grew up in an enormously industrialized and polluted part of Britain) on Kettlewell's studies of industrial melanism in the Peppered Moth (*Biston betularia*) are good reading. The central focus of the work is British moths, with only sparse mention of butterflies or moths found elsewhere. The adopted convention of using common names (the scientific name is given only at the first mention of a species, sometimes ten chapters removed) limits the book's usefulness to those living "off island." There are few matters that are handled in an annoying fashion, such as when the author likens the taking of specimens to amassing "rows of dead corpses" (p 189), or the way some phenomena are explained in a Kiplingesque fashion, but overall it is a fine volume—I have already employed several of the suggestions provided by this moth aficionado. In case you are wondering, his ploy of piling cut vegetation about his study was wholly successful—Leverton recovered every one of his wayward caterpillars.

DAVID L WAGNER, *Ecology & Evolutionary Biology, University of Connecticut, Storrs, Connecticut*

**FIRE ANTS.** *Texas A&M University Agriculture Series, Volume 3.*

By *Stephen Welton Taber. College Station (Texas): Texas A&M University Press. \$29.95. xvii + 308 p; ill.; index. ISBN: 0-89096-945-0. 2000.*

This volume will be a welcome addition to the library of both amateurs and professionals with an interest in this important group of insects. Biology, physiology, ecology, history, and economic impact are reviewed for invasive and endemic species. Well-chosen quotations at the beginning of each chapter give readers a genuine feel for the controversy that imported fire ants have generated since their arrival into the U.S., and subsequent attempts to control or eradicate them. The author leaves readers with a series of unanswered questions regarding fire ants, many of which are currently being addressed by researchers in the U.S. and abroad. This, in combination with the ever-increasing mass of literature generated on these species, should make the second edition nearly as much of an undertaking as the first. Taber is to be commended for combining a relatively exhaustive review of current scientific knowledge with considerable insight into the politics and policies surrounding fire ants; the end result is a book that general biologists, specialized myrmecologists, and the interested public will all find very useful. I found at least one minor error—*Myrmecaphodius excavaticollis* should be *Martinezia dutertrei* (p 118). This is easily overlooked considering the daunting task of incorporating literally hundreds of references into such a comprehensive and valuable review.

I especially recommend this book to anyone considering postgraduate work on native or imported fire ants—as a review, general reference, and an excellent guide to some aspects of fire ants that offer promising avenues for basic and applied research.

J T VOGT, *Biological Control & Mass Reading Research Unit, Agricultural Research Service, U.S. Department of Agriculture, Mississippi State, Mississippi*

**THE CICHLID FISHES: NATURE'S GRAND EXPERIMENT IN EVOLUTION.**

By *George W Barlow; Foreword by George C Williams. Cambridge (Massachusetts): Perseus Publishing. \$28.00. xvi + 335 p + 8 pl; ill.; index. ISBN: 0-7382-0376-9. 2000.*

The author is smitten; since boyhood he has had a love affair with cichlid fishes. Cichlids are enormously important to speciation theory and to basic ethological, ecological, and genomic research. Moreover, they dominate global warm water aquaculture and are ubiquitous in freshwater aquaria. Three decades after the publication of Fryer and Iles's *Cichlid Fishes of the Great Lakes of Africa: Their*

*Biology and Evolution* (1972. Edinburgh (UK): Oliver and Boyd), no single volume has attempted to assemble a compendium of information about the biology of this evolutionarily complex group of teleosts. Barlow has gone much of the distance. Written principally for active cichlid aquarists and advanced students, *The Cichlid Fishes* provides ready access to a complex area of research.

With a strong foreword by George Williams, it was improbable that the effort would be poor. Barlow's opus, a compilation of his personal, lifelong research on cichlid fishes is integrated with much of the contemporary work on the group (citations are up to 1999) and with the author's detailed perspectives on evolutionary biology. *The Cichlid Fishes* is composed of a series of scientific vignettes with emphasis on ethology and reproductive biology in this diverse teleost family. An ardent champion of natural selection, Barlow succeeds in vividly conveying examples of some flabbergasting adaptations (e.g., those associated with polygynandry, paedophagy, parasitic nesting, and communal care); no genuflection toward San Marco here. Although not many issues are left untouched, coverage is somewhat uneven and few topics are dissected in fine detail; one exception is codification of data on facultative sex reversal in *Oreochromis*; this is new and valuable information. In general, new hypotheses are not advanced nor lines of research suggested; this might be reasonable for a general review, but their inclusion would have extended the appeal of the book further to professional ranks. Coverage is geographically and ecologically restricted, emphasizing the faunas of Lake Nicaragua and the major African lakes; riparian taxa and less studied areas (e.g., unique soda lakes such as Magadi and the endemic Madagascar) receive little coverage.

The literature is quite extensive (500 references), but the superscripted path to them is as complex as a subway map; the glossary appears rushed and multiple definitions are incorrect. Regardless, the book is of value to its intended audience and is a tribute to the scientific career of a distinguished scholar.

IRV KORNFIELD, *Marine Sciences, University of Maine, Orono, Maine*

**ANURAN COMMUNICATION.** *Based on a symposium held at the University of Guelph, Ontario, 1998.*

Edited by *Michael J Ryan. Washington (DC): Smithsonian Institution Press. \$50.00. ix + 252 p; ill.; index. ISBN: 1-56098-973-4. 2001.*

Over the past three decades, communication among anuran amphibians has been investigated intensively by workers from a variety of disciplines, including behaviorists (e.g., female choice of mates), systematists (e.g., character displacement in

calls), neurophysiologists (e.g., call production and perception), endocrinologists (e.g., hormonal influences on calling), and even conservationists (e.g., declining amphibian call surveys). The editor of the present volume states that his purpose is to review recent studies of how anuran amphibians communicate; a second purpose is to celebrate the distinguished career of A S Rand. The chapters are the result of a symposium organized in Rand's honor in 1998. The volume comprises 17 chapters by 25 authors. The volume is separated into five parts: introduction (two chapters); physiology and energetics (four chapters); acoustic and visual signaling (four chapters); neural processing (three chapters); and behavior and evolution (four chapters). Fifteen of the chapters concern acoustic communication.

As is often the case with such volumes, treatment is uneven, not so much in writing style but in scope. Almost all of the chapters are relatively well written, and somewhat surprisingly for an edited compilation, none is too long. Some are thorough reviews of a topic, such as Wells's examination of the energetics of calling, or the discussion of visual signaling by Hödl and Amézquita. Others are more narrowly focused on a particular species, lacking a thorough review of recent literature, and primarily featuring work by the authors and collaborators. I found Rand's review of the history of studies of frog calls especially interesting; he does an admirable job of describing the work on the subject over the past 2000 years. In her introductory contribution, West-Eberhard pleads for more "taxon-centered" biologists like Rand and for recognition of the significance of taxon-centered expertise for the public good; I wholeheartedly agree.

In their coauthored chapter, Ryan and Rand argue convincingly that discrimination trials typically do just that: they tell us about the choices an individual makes between two stimuli, but not about the nature of recognition of appropriate stimuli—information that is best gained through "no choice" trials. In their discussion of "species recognition," Giacoma and Castellano also help clarify a semantic issue, one that is close to my heart and touched on by many of the contributors to the present volume. Only humans "recognize species," whereas conspecifics typically recognize and perhaps discriminate among mates. In circumstances in which selection has directly favored the evolution of mechanisms to ensure mating among conspecifics, "mate recognition" may also be "species recognition," but this does not appear to be common. Indeed, many in the present volume note that females often respond appropriately to novel stimuli outside the domain of species-typical signals, making clear that they are not using these features to "recognize species."

I recommend this book to those desiring an update on the current state of the art of anuran

communication studies, and to anyone with interests in acoustic communication, female choice, and the nature of species boundaries.

BRIAN K SULLIVAN, *Life Sciences, Arizona State University West, Phoenix, Arizona*

#### PIGEONS AND DOVES: A GUIDE TO THE PIGEONS AND DOVES OF THE WORLD.

By David Gibbs, Eustace Barnes, and John Cox. *New Haven (Connecticut): Yale University Press.* \$60.00. 615 p; ill.; index. ISBN: 0-300-07886-2. 2001.

For the first time, all of the pigeons and doves of the world are illustrated in full color in a book of their own. Each plate in this new volume illustrates the plumages of different ages, sexes, and subspecies in each extant species of pigeon or dove. Attempts have even been made to illustrate each species in flight. The plates by John Cox are superb, and it is a shame that his artwork was not used for all of the illustrated species. Following the plates are more detailed accounts for each species that address identification and natural history.

Overall, the book is a good introduction to pigeons and doves for both ornithologists and bird watchers who are unfamiliar with the family. For biologists working with pigeons, there are some problems that should have been avoided. Citations within the natural history section are very inconsistent and it is often difficult to differentiate the authors' observations or opinions from those of peer-reviewed sources. This is especially apparent in the topic of evolutionary relationships within the family. A number of new studies have been either ignored or not cited. Many of these oversights concern the discovery that most island endemics once had much larger ranges, a topic of immense importance to conservation. Also, many recently extinct species were omitted while others were included. These inconsistencies are frustrating, considering the amount of work that must have gone into the book. Nevertheless, this book deserves praise for being the only recent work dedicated to this diverse family of birds that have been so important to humans.

JEFF SAILER, *Miami Metrozoo, Miami, Florida*

#### THE BIRDS OF BRITISH COLUMBIA. Volume 4: *Passerines: Wood-Warblers through Old World Sparrows.*

By R Wayne Campbell, Neil K Dawe, Ian McTaggart-Cowan, John M Cooper, Gary W Kaiser, Andrew C Stewart, and Michael C E McNall. *Published by the UBC Press, Vancouver (Canada), in cooperation with Environment Canada (Canadian Wildlife Service), the British Columbia Ministry of Environment, Lands and Parks Wildlife Branch and Resources Inventory Branch, and the Royal British Columbia Museum.* \$125.00. ii + 741 p; ill.; index. ISBN: 0-7748-0621-4. 2001.



## KANSAS BREEDING BIRD ATLAS.

By William H Busby and John L Zimmerman; illustrated by Dan Kilby, Robert Mengel, and Orville Rice. *Laurence (Kansas): University Press of Kansas.* \$35.00. xii + 466 p; ill.; index. ISBN: 0-7006-1055-3. 2001.

This volume adds admirably to the state and provincial breeding bird atlases that have been published in recent years. It provides welcome data on 203 bird species that were detected during the 1992–1997 Kansas atlas project.

The authors provide a thorough treatment of the methods and criteria used for recording and analyzing data. Full use was made of geographical information system technology to prepare the atlas maps. Analyses presented include a unique look at biogeographic patterns that have great potential for stimulating in-depth research. Other features include tables that present the 20 species most frequently recorded in atlas blocks and the 20 species most frequently confirmed as breeding. There is also a list of species confirmed in only one atlas block and those that were never confirmed during the five-year project. The appendix provides the latitude and longitude of all sampled atlas blocks along with physiographic region and county. This information could be readily used to assist with in-depth research.

The major portion of the book consists of the species accounts that include a map showing the location of blocks in which the species was confirmed breeding, probably breeding, or possibly breeding. A table accompanying the map gives the number of blocks in each breeding category as well as by physiographic region. There is a brief synopsis of the species' status based on atlas data and other sources.

Overall, this book is very free of errors, sturdily bound in hardcover, and is bargain priced. I recommend this book to any professional or amateur with an interest in Kansas and Great Plains ornithology.

ROGER D APPLGATE, *Research & Survey Office, Kansas Department of Wildlife & Parks, Emporia, Kansas*

## THRUSHES.

By Peter Clement; illustrated by Ren Hathway; with additional illustrations by Clive Byers and Jan Wilczur. *Princeton (New Jersey): Princeton University Press.* \$49.50. 463 p; ill.; index of species. ISBN: 0-691-08852-7. 2000.

The 162 species of "true" thrushes in the family Muscicapidae, subfamily Turdinae, include some of the most familiar and widespread of songbirds. For example, the American Robin and Blackbird

are two highly cherished, vocal garden birds in, respectively, North America and Europe. In contrast, at least 29 species, especially the island endemics and those of restricted range, are poorly known. The family is thought to have originated in central or southern Asia and within the past ten million years has colonized all major land masses with the exception of Antarctica and New Zealand (but introduced to the latter by humans). Even remote oceanic islands have been colonized, a case in point being Hawaii. Presumably, a vagrant similar to Townsend's Solitaire (*Myadestes townsendi*) made its way to the archipelago from North America some 10,000 years ago and gave rise to six endemic species of Hawaiian thrush. Although thrushes are mostly forest-inhabiting birds, some species, such as many *Monticola* thrushes, have adapted to arid scrublands. Clearly, thrushes have much to teach us about patterns of adaptation. In this book, Peter Clement provides not just an introduction to this avian family, but a wealth of detailed information on many aspects of thrush biology.

Each species is treated in an individual account that includes notes on identification, description, geographical variation, voice, status and distribution, movements, habitat, behavior, breeding, molt, and measurements; three to ten key references are provided in each account. Introductory chapters offer summaries of the 15 genera covered and discussions of classification, vocalization, foraging behavior, and conservation. The 60 color plates illustrate the main plumages of each of the 162 species; distinct subspecies are also depicted. The artwork is impressive, which is especially evident in the representations of the complex plumages of the *Zoothera* thrushes. Facing each plate are brief species descriptions, three-color range maps, and text page references. Unlike previous bird family books by Princeton University Press, the sequence of facing-page captions often does not match the top-to-bottom order of illustrations on the plate, which is a minor nuisance. There are an estimated 400 references, the most recent from 2000. I discovered only a handful of typographical errors and production flaws, the most serious being the green smudge over the juvenile and first-year male depictions of the Siberian Thrush on Plate 10. These blemishes aside, the text and illustrations constitute a handsome and well-organized project, and required information can be readily found.

The author makes a strong argument for the conservation of endangered thrushes in that three species have gone extinct in recent times and at least three others, notably the Hawaiian thrushes, suffer a precarious existence. In addition, six

other species may face imminent extinction, while another eight are in decline. In view of these disquieting observations, *Thrushes* will appeal not only to ornithologists and birders, but also to conservation biologists with an interest in this family and the avifaunas to which they belong.

MARK RIEGNER, *Environmental Studies, Prescott College, Prescott, Arizona*

PRAIRIE BIRDS: FRAGILE SPLENDOR IN THE GREAT PLAINS.

By Paul A Johnsgard. *Lawrence (Kansas): University Press of Kansas*. \$29.95. xvii + 331 p; ill.; species index. ISBN: 0-7006-1067-7. 2001.

Comprehensive accounts of grassland avifauna have been limited to fairly obscure reports and a few symposia proceedings. Where habitat fragmentation and conversion is of concern, forest birds are the focal species for many ecologists. Yet grasslands continue to be impacted heavily by human activity, and as a result grassland bird populations decline. Paul Johnsgard does an excellent job of presenting the natural history of grassland avifauna, and the problems these species face.

*Prairie Birds* is presented in a "semitechnical" style, which is very readable, yet provides accurate life history and ecosystem function information. The book is well organized into two major parts: the geologic history of the Great Plains (Part One), and species accounts of grassland avifauna (Part Two). Individual species accounts are exhaustive, and are grouped together by a combination of food habits and general habitat affinity. The accounts also include such useful touches as sonograms and excellent line drawings.

Criticisms of the work are few. As is usually the case with discussions of the impacts of grazing and burning on grassland birds, the conclusions drawn are simplistic. Grassland ecosystems are far more complex than many naturalists care to admit, and to treat the subject fairly requires a more complete discussion of the synergistic effects of grazing, fire, and climate. Although Johnsgard covers these topics quite well in Part One, the application in the species accounts leaves a bit to be desired. One species account that is not entirely accurate is that of the lesser prairie-chicken (LPC). Lesser prairie-chicken and greater prairie-chicken (GPC) ranges do indeed overlap in central Kansas, and thus the possibility for hybridization may exist. Other points include misspellings (Ken Giesen is cited as "Geisen" throughout, and John Wiens is cited as "Weins") and a mislabeled figure on page 158, where a western meadowlark is performing a horned lark's flight display. Overall, however, *Prairie Birds* is an excellent book about a long-neglected

group of species. I recommend it to anyone interested in grassland avifauna.

JOHN HUGHES, *U.S. Fish & Wildlife Service, Canadian, Texas*

HERON CONSERVATION.

Edited by James A Kushlan and Heinz Hafner. Published by Academic Press, San Diego (California), in collaboration with the Station Biologique de la Tour du Valat, Le Sambuc (France). \$59.95. xvi + 480 p; ill.; index. ISBN: 0-12-430130-4. 2000.

BIRDS OF THE SOUTHWEST: ARIZONA, NEW MEXICO, SOUTHERN CALIFORNIA & SOUTHERN NEVADA. W. L. Moody, Jr, *Natural History Series, Volume 30*.

By John H Rappole; with photographs by Barth Schorre, Vernon Grove, David Parmelee, William Paff, and VIREO (Philadelphia Academy of Sciences). College Station (Texas): Texas A&M University Press. \$39.95 (hardcover); \$17.95 (paper). xv + 329 p + 456 pl; ill.; index. ISBN: 0-89096-957-4 (hc); 0-89096-958-2 (pb). 2000.

A regional (as opposed to state or national) bird guide to some portion of North America is a good idea. My bookshelf contains regional bird guides to southern South America, southern Africa, the south Pacific and, for that matter, eastern and western North America. Do we need one for the American southwest? Given the incredible diversity of landscapes, vegetation associations, and bird life in the region, most assuredly the answer is yes. Is this such a guide? Yes, but with reservations.

A brief introduction to the region and a few notes on how to use the guide are followed by 456 color photographs of virtually all the species described in the text. As one who came of age as a birder using the artwork of Roger Tory Peterson and Austin Singer, I find photographs generally a distant second to good artists' plates as aids in identifying species. Although many of these photographs are quite suitable, especially for well-marked, gaudy species, a sizable number are near useless. A serious birding visitor to the southwest will wish to carry an additional field identification guide (but most will anyway).

Following the photographs are short, individual species accounts. These are fairly useful, each containing comparisons to similar species, a regional range map, habitat associations, and a "where to find" that names specific sites. The volume concludes with locator information for these sites, potentially the handiest part of the book for visitors. Most of the locations are described sufficiently to be found relatively easily, but this section could have benefited greatly from one or more fine-scale

maps showing more specifically the positions of the sites in relation to each other, and to the major (and even minor) cities, towns, highways, and roads that dot and crisscross the area. Likewise, for most locations there is no description of the habitat type that occurs there.

One final quibble: sure, it occurs (barely) within the scope of the guide, but why put a Dickcissel (a bird characteristic of the grasslands of the Great Plains) on the cover, when there are so many other wonderful species endemic to the American southwest that would be so much more emblematic? Why not a Pyrrhuloxia, Cactus Wren, or Scott's Oriole?

JOHN T ROTENBERRY, *Biology, University of California, Riverside, California*

BIRDS OF THE TEXAS PANHANDLE: THEIR STATUS, DISTRIBUTION, AND HISTORY. W. L. Moody, Jr, *Natural History Series, Volume 29*.

By Kenneth D Seyffert; illustrations by Carolyn Stallwitz. College Station (Texas): Texas A&M University Press. \$49.95 (hardcover); \$24.95 (paper). xv + 501 p; ill.; index. ISBN: 1-58544-091-4 (hc); 1-58544-096-5 (pb). 2001.

This exceptional volume covers the current and historical distribution of the bird life of a large, 26-county region defining the Texas Panhandle. The author draws upon more than 30 years of personal observation and an impressive list of references to describe the occurrence of 406 documented species and to discuss an additional 36 species of questionable status. The opening acknowledgments, in addition to the expected thanks for help and inspiration, provide a brief history of ornithological research for the area. The introductory sections provide general background information about the region's habitats, topography, and climate, as well as the location of numerous state parks, natural areas, lakes, waterways, and wildlife management areas (supplemented with a one-page map). Recent human impact upon the region is discussed and a useful glossary of terms is provided.

The bulk of the volume is composed of individual species accounts, averaging about a single page each, covering species' regional status, county specific occurrence (actual distribution maps are not provided), and nesting habitat when applicable. For many species, a list of significant specimens housed in select natural history collections is included. Historical changes in distribution or status since the 19th century are discussed with impressive detail for most species. Specific location and date information for vagrant and rare species is to be commended. Finally, the ten line drawings by Carolyn Stallwitz, although minimal in number,

lend aesthetic appeal and pay tribute to the diverse avifauna of the Texas Panhandle.

I strongly recommend this book to all amateur birders and professional ornithologists interested in the bird life of Texas or the Great Plains. The volume should prove useful when planning birding trips to the region, when investigating the significance of field observations, and when addressing questions about avian biogeography. This is without question the most up-to-date and authoritative source on birds of the Texas Panhandle and among the most historically comprehensive references I have seen for such a region.

MICHAEL S HUSAK, *Biological Sciences, Mississippi State University, Mississippi State, Mississippi*

THE BIRDS OF ECUADOR: STATUS, DISTRIBUTION, AND TAXONOMY. *Volumes I and II*.

By Robert S Ridgely and Paul J Greenfield; with the collaboration of Mark B Robbins and Paul Coopmans. Published by Comstock Publishing Associates, a division of Cornell University Press, Ithaca (New York), in association with The Academy of Natural Sciences. \$70.00 (Volume I); \$50.00 (Volume II); \$110.00 (2-volume set). (I) xxiii + 848 p; ill.; indexes to English and scientific names. ISBN: 0-8014-8720-X; (II) xxiii + 741 p + 96 pl; ill.; indexes to English and scientific names. ISBN: 0-8014-8721-8; 0-8014-8722-6 (2-volume set). 2001.

The authors correctly presume that in a field guide birders want all species to be illustrated, with full details about distribution, status, and taxonomy, and they also want it to be lightweight and inexpensive. For the American tropics, they cannot have it all at once. The complexity is too great.

Ecuador is about the size of Colorado, but it contains nearly 1,600 species of birds, more than twice as many species as all of North America. Habitats are highly diverse, from deserts to tropical rainforests and from sea level to more than 20,000 feet (6,310 meters). About half of all of the birds in South America and one-sixth of the birds of the world are found in Ecuador. Birding in this country is extremely challenging, with hundreds of species being small, cryptic, and buried in dense vegetation—shadows in the shadows. It also has numerous brilliant and spectacular birds, and is one of the most rewarding countries for birding on Earth.

To solve this overwhelming task that consumed about 20 years, the authors organized the work into two volumes, one with color plates to be carried in the field and the other giving the status, distribution, taxonomy, and numerous other details for each species. This work is a masterpiece in every way. The illustrations are superb and the writing is readable, and all has been done with meticulous atten-

tion to detail. You cannot go birding in Ecuador without these volumes, and they will immensely enrich your birding experience.

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

THE BIRDS OF AFRICA. *Volume VI.*

By C Hilary Fry, Stuart Keith, Adrian J F K Craig, Llewellyn Grimes, Michael P S Irwin, David J Pearson, Emil K Urban, David Wiggins, and Roger Wilkinson; colour plates by Martin Woodcock; line drawings by Ian Willis; discography by Claude Chappuis. San Diego (California): Academic Press. \$189.95. xvii + 724 p + 36 pl; ill.; indexes of scientific, English, and French names. ISBN: 0-12-137306-1. 2000.

This sixth volume in the Birds of Africa series covers 20 bird families: Picathartidae, Timaliidae, Aegithalidae, Paridae, Remizidae, Sittidae, Salpornithidae, Certhiidae, Nectariniidae, Zosteropidae, Promeropidae, Laniidae, Malacotidae, Pycnonotidae, Prionopidae, Oriolidae, Dicruridae, Corvidae, Sturnidae, and Buphagidae. A very comprehensive set of general, regional, family, and acoustic references are provided.

Individual species accounts provide detailed distributional data and descriptions of species, including males, females, and immature and juvenile forms. Measurements are given for subsets of geographic forms. There are discussions of taxonomics. Field characteristics, voice, general habits, food, and breeding habits (nest, eggs, laying dates) are treated comprehensively. The work is notable for breadth of subject and literature coverage.

It was a delight to go through the magnificent plates. All individual figures are of large size. The degree of plumage detail and vividness of the color are exceptional. These are books that one can enjoy for hours.

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

GALÁPAGOS DIARY: A COMPLETE GUIDE TO THE ARCHIPELAGO'S BIRDLIFE.

By Hermann Heinzel and Barnaby Hall. Berkeley (California): University of California Press. \$45.00 (hardcover); \$24.95 (paper). 272 p; ill.; index. ISBN: 0-520-22794-8 (hc); 0-520-22836-7 (pb). 2000.

This is one of the most unusual bird books to land on my desk in a long time. Lacking an introduction or statement of purpose, this travel diary and field

guide begins with an utterly out-of-context story about Cattle Egrets and then moves without hesitation into a massive jumble of observations, drawings, and photographs that would be difficult or impossible to interpret without considerable knowledge of the Galápagos fauna. The sketches and accompanying handwritten notes often are much too "busy" to be effective. Many of the photographs and drawings are unidentified or the identification is hidden within an immense narrative caption, adding to the confusion.

Although Barnaby Hall is a very good, young photographer, some of his hundreds of photographs are out of focus, convey no unique information, and should have been deleted. Hermann Heinzel is a good artist as well. I find his sketches and more finished drawings to be pleasing visually even if not always anatomically accurate, as in the particularly bad bill shapes of Darwin's finches.

The intended audience for this book must be tourists, who flock to the Galápagos by the tens of thousands each year. The text is very wordy and childish in the more-or-less geographically oriented diary section and still pretty chatty in the taxonomically oriented field guide section. The book lacks evidence of scientific review and misspellings are especially common among scientific names of birds. There are no "Literature Cited" or "Further Reading" sections. It all comes off as if Heinzel and Hall were the first ones to study birds in the Enchanted Isles. This, of course, is not true. Much of what Heinzel writes about, the distribution, ecology, and behavior of birds in the Galápagos, is based on a huge scientific literature that he clearly consulted, but does not cite. He even ignores the two, admittedly mediocre, field guides to Galápagos birds that were previously published—Harris's *A Field Guide to the Birds of Galápagos* (Second Edition. 1982. London: William Collins and Sons) and Castro and Phillips's *A Guide to the Birds of the Galápagos Islands* (1996. Princeton (NJ): Princeton University Press). A new, small book by Swash and Still, *Birds, Mammals, & Reptiles of the Galápagos Islands: An Identification Guide* (2000. New Haven (CT): Yale University Press), is finally the good field guide that we all have awaited for decades.

Who edited the book by Heinzel and Hall? As far as I can tell, no one at the University of California Press did. Rather, it is one of many recent bird books produced in Britain and then marketed unchanged by a U.S.-based publisher. Some of these works are excellent, but the book by Heinzel and Hall is part of a growing and disturbing trend among university presses to publish books that may sell well to the masses, but are deficient in

scholarship. University presses need to make a profit just like any other business, but when this profit comes at the expense of scholarship, university presses undermine the single quality that could and should distinguish them from most other publishers.

DAVID W STEADMAN, *Florida Museum of Natural History, University of Florida, Gainesville, Florida*

**BIRDS, MAMMALS, & REPTILES OF THE GALÁPAGOS ISLANDS: AN IDENTIFICATION GUIDE.**

*By Andy Swash and Rob Still; with illustrations by Ian Lewington. New Haven (Connecticut): Yale University Press. \$24.95. 168 p; ill.; index of English and scientific names. ISBN: 0-300-08864-7. 2000.*

More than 50,000 tourists visit the Galápagos each year (a large fraction of them are ecotourists) and most are fascinated by the large animals. One needs no prior training to see the difference between a sea lion and an albatross, but distinguishing a sea lion from a fur seal is not so easy. Up to now, visitors have been well served by guidebooks to identify birds, but mammals and reptiles have been neglected. The current volume rectifies the latter omission while simultaneously elevating the standard of the bird guides. I am happy to recommend this as the essential field companion for Galápagos visitors with a vertebrate orientation.

The book takes the innovative approach of using actual photographs to illustrate the species, and arranges them in groups for critical comparisons. It is also packed with supporting information. Thumbnail sketches describe the essential features for making an identification. These include appearance, behavior, voice, and where in the archipelago each species is likely to be found. Status (resident or transient) and approximate numbers are given as well. Handy additional features at the back include a checklist of the regularly occurring species accompanied by habitat preferences and distribution, a glossary, references to electronic media, and a list of 16 Galápagos National Parks Rules.

The book is designed to stand up to rough field use. A colleague of mine put it to the ultimate field test, and it passed with honor. He was impressed by the excellent comparative pictures and photographs of Darwin's finches, and thought they could be used in teaching an evolution course since they supersede the usual black-and-white illustrations found in textbooks. That is quite a fringe benefit for a field guide.

PETER R GRANT, *Ecology & Evolutionary Biology, Princeton University, Princeton, New Jersey*

**BATS OF PAPUA NEW GUINEA. *Tropical Field Guide Series, Volume 2.***

*By Frank J Bonaccorso; edited by William R Konstant, Charles G Burg, and Russell A Mittermeier; illustrated by Fiona Reid, Aldi Oyarzabal, Stephen Nash, Lester Seri, and Michael Hedemark. Washington (DC): Conservation International. \$40.00 (paper). 489 p; ill.; no index. ISBN: 1-881173-26-7. 1998.*

Papua New Guinea is one of the most fascinating areas of the world in terms of its rich and endemic biodiversity. Ninety-one bat species have been recorded there, comprising about 9% of the global biodiversity of the Chiroptera. Almost 40% of Papua New Guinea's mammal species are bats, and this field guide will be invaluable for scientists hoping to study them.

Bonaccorso has researched bat biology for 30 years, and most of his studies have been focused on Papua New Guinea. This book is based on his extensive experience, and contains important information on identification, measurements, geographic range (including distribution maps and localities), natural history, and conservation status. The guide is easily portable in the field. There is a key covering all species, and over 50 are illustrated in high-quality color plates. Some information on echolocation calls is provided, although sonagrams would be a useful addition to future editions as the technology for recording and analyzing ultrasound becomes more readily available. The text is thoroughly referenced, and cites studies up to 1998. Important information on species that range into Indonesia, Australia, the Philippines, and Malaysia is included. I found the extensive observations on ecology and natural history made by the author interesting. Considerable emphasis is placed on the metabolic rates of bats, because of the author's expertise in this field. Bonaccorso's personal observations on behavior, morphology, and foraging ecology are especially valuable. This new information will be of use to scientists working on these amazing mammals throughout the world.

The rich tropical rainforests of Papua New Guinea are increasingly under threat. Megachiropteran bats play important roles in pollination and seed dispersal in these habitats, and deserve further attention and research. I hope this guide stimulates research on the rich bat fauna of Papua New Guinea and promotes bat conservation there at a critical time. I also hope that future field guides to other bat faunas will follow the high standards laid down by Bonaccorso.

GARETH JONES, *Biological Sciences, University of Bristol, Bristol, United Kingdom*



A MANUAL FOR WILDLIFE RADIO TAGGING.

By Robert E Kenward. San Diego (California): Academic Press. \$65.00. x + 311 p; ill.; index. ISBN: 0-12-404242-2. 2001.

Radiotelemetry has brought clarity to studies of wildlife ranging and habitat selection by removing observational bias. Moreover, tagging directed at survival rate estimation has refined demographic assessment to a degree unapproachable by other methods. A proliferation of studies in recent decades has produced numerous methodological solutions pertaining to study design, radio tagging, tracking, and analysis. This book considers the technical aspects of that literature, explains advancements in both equipment and analytical procedures, and offers the insights and guidance of an experienced field biologist. The text is readable, friendly, rarely dry, clearly illustrated, and contains a depth of technical information not found in the methods sections of journal articles, yet is essential to anyone planning to use radiotelemetry for the first time. Little material is duplicated from the author's previous volume, *Wildlife Radio Tagging: Equipment, Techniques, and Analysis* (1987. London (UK): Academic Press).

The first chapter stresses the need for planning, warns of the expense and difficulty of radio tagging, and advocates pilot studies. The next two chapters describe basic tagging and tracking equipment, including satellite tracking and other automated systems. Chapter 4 offers explanations and warnings about equipment and software selection and further emphasizes the importance of careful preparation. The next two chapters explain how radio tags are made and describe tested ways that transmitters have been attached to birds, mammals, and fish, with emphasis on procedures minimizing effects upon the animal. In addition to the important moral considerations, transmitter effects that alter behavior or survival violate core assumptions of virtually any wildlife study involving telemetry. Chapter 7 details the principles, techniques, and equipment configurations for radio tracking on foot, road vehicle, and aircraft (e.g., how to configure equipment, take a bearing, triangulate, and home to a transmitter). The author discusses the problems associated with signal reception and interpretation. Chapter 8 stresses the importance of systematic sampling in ranging and survival studies, and describes basic methods, with emphasis on avoiding bias associated with autocorrelation, sampling intervals, and locational accuracy. The author urges carefully designed protocols based on pilot studies, and continuing refinement of data collecting procedures as studies progress. The penultimate chapter deals with the analysis of seasonal movements and home

range, and considers the virtues and pitfalls of a variety of estimators pertaining to the latter. I find these sections more difficult to follow because no simple solutions emerge within the author's faithful consideration of a diverse literature and his own considerable experience with home range studies. The last chapter discusses the analysis of density, survival, habitat selection, and social interaction.

As radio tagging continues to elucidate many otherwise inaccessible aspects of wildlife ecology and conservation, one looks for further development of programmable transmitters, satellite tracking systems, GPS integration, analytical theory, and software. In particular, one anticipates even smaller, more streamlined tags, the most humane ways of attachment, and the animal's opportunity to shed them once their batteries have expired.

W GRAINGER HUNT, *Predatory Bird Research Group, Long Marine Laboratory, University of California, Santa Cruz, California*

ACTIVITY PATTERNS IN SMALL MAMMALS: AN ECOLOGICAL APPROACH. *Ecological Studies, Volume 141.*

Edited by S Halle and N C Stenseth. Berlin and New York: Springer. \$109.00. xxii + 320 p; ill.; subject index. ISBN: 3-540-59244-X. 2000.

This volume contains five perspective papers and ten empirical reports regarding daily activity patterns of mammals. The book covers a broad base of mammalian species and theoretical perspectives. Following an introduction by the editors, three chapters attempt to provide a theoretical framework for the collection of empirical reports that follow. These papers discuss fundamentals of biological rhythms, relations between activity and metabolism, and behavioral ecology of circadian activity rhythms. A statement by Enright summarizes the theoretical underpinnings of this informative new volume: "No description of where an animal lives and what it does can be complete without considering when the activity takes place" (1970. *Annual Review of Ecology and Systematics* 1:221-238). This book integrates the study of circadian rhythms (largely a laboratory-based endeavor) with that of behavioral ecology, and achieves its stated goal of providing the conceptual framework for distinguishing "chronoecology" as a subdiscipline of animal behavior.

An excellent chapter by Bartness and Albers (Activity Patterns and the Biological Clock in Mammals) provides a solid review of circadian biology. This chapter, along with an Appendix covering experimental techniques and data analysis for chronobiology, should be required reading for any advanced student of biological rhythms. The chapter by Weiner (Activity Patterns and Metabolism)

integrates a large body of information on the costs and constraints associated with foraging in small mammals. A thought-provoking chapter by Halle (Ecological Relevance of Daily Activity Patterns) considers the establishment of "temporal niches" by small mammals and the importance of predator-prey interactions in the evolution of temporally restricted activity.

Enright reasoned that the ubiquity and complexity of biological timekeeping mechanisms (e.g., daily and annual clocks) implied substantial fitness benefits associated with the ability to tell time. Such fitness benefits could be a consequence of either synchronization of the organism's internal milieu, or synchronization of the organism with the external world. This book heavily favors the latter of these two adaptive scenarios—focusing on how an individual animal's timing of behavior and metabolic activity permits adaptation to the local environment. The diversity of species covered by the empirical reports (weasels, martens, civets and genets; squirrels, kangaroo rats, gerbils and wood mice; shrews and bats) suggests that comparative chronoecology has a solid foundation. Most of these chapters review data collected, at least in part, from wild populations and are amply illustrated. Reviews by Ruf and Heldmaier (Djungarian Hamsters—Small Graminivores with Daily Torpor) and Halle (Voles—Small Graminivores with Polyphasic Patterns) provide interesting accounts of seasonal influences on circadian changes in physiology and behavior. Overall, this comparative approach permits insight into *why* animals do things when they do—metabolic constraints on activity and the importance of predator-prey interactions (on both intra- and interindividual timing of activity) emerge as two important influences on the evolution of activity patterns.

With the current emphasis on the molecular mechanisms of the circadian clock, it is refreshing to encounter a volume that considers why such clocks are important in the first place. This book would be excellent for a seminar on biological rhythms, and I recommend it to colleagues of all biological inclinations, but especially chronobiologists and behavioral ecologists.

BRIAN J PRENDERGAST, *Psychology and Neuroscience, Ohio State University, Columbus, Ohio*

PRIMATE TAXONOMY. *Smithsonian Series in Comparative Evolutionary Biology.*

By Colin Groves. Washington (DC): Smithsonian Institution Press. \$65.00. viii + 350 p; ill.; index. ISBN: 1-56098-872-X. 2001.

During the next hundred years, the diversity of living primates will undoubtedly decline dramatically in the face of an ever-increasing human population

and expanding demand for natural resources from the world's forests. Because of this pending catastrophe, it seems imperative to take stock of what we have, even as we lose it. It is with this goal in mind that Colin Groves has written *Primate Taxonomy*—to provide both a practical and philosophical guide to systematics, and a comprehensive taxonomy of the order for anyone interested in biodiversity. Certainly no one is more qualified to do so. Groves has been a major figure in primate systematics for over 40 years, as well as one of the most delightful people in the field.

The first part, *The Theory of Primate Taxonomy*, is an engaging but scholarly introduction to systematics with chapters such as *What Taxonomy is Meant to Do and How It Should Do It*, *Taxonomic Ranking and Nomenclature*, *The Species-Group*, *A Brief History of Primate Taxonomy*, and *Taxonomy of Primates above the Family Level*. These chapters are a delight to read as Groves provides a broad and remarkably balanced primer and critique on all sorts of difficult subjects such as methods of phylogeny reconstruction, species concepts, how to classify fossils, and the value of molecular and morphological data. It also includes useful information about primates in museum collections around the world.

In the next part, *Putting Primate Taxonomy into Practice*, Groves provides his own current view of primate taxonomy down to the subspecies level. For both practical and political reasons, he adopts a phylogenetic species concept—best characterized by paraphrasing Simpson's quip about paleontology: "If two specimens are different, they are different species. If they are the same, they are different subspecies." Thus, Groves recognizes considerably greater specific diversity than most other taxonomies of the past 100 years. As he emphasizes throughout the book, however, taxonomy is a dynamic business that should always reflect our increasing knowledge of the biology and evolution of the organisms being classified. Appeals for stability are misguided. In this spirit, *Primate Taxonomy* is by no means the final word on the subject, but it is certainly the place to start.

JOHN G FLEAGLE, *Anatomical Sciences, State University of New York, Stony Brook, New York*

THE ORANGUTANS.

By Gisela Kaplan and Lesley J Rogers. Cambridge (Massachusetts): Perseus Publishing. \$23.00. vii + 191 p + 12 pl; ill.; index. ISBN: 0-7382-0290-8. 2000.

This rather slim volume is separated into three parts: evolution (three chapters), behavior (five chapters), and the future of the species (two chap-

ters). The book is written in a conversational style, which makes it easy to read and quite entertaining. The authors, however, present an extremely biased view of orangutan behavior and "intelligence." Although they caution that "it is easy to overinterpret animal behavior" (p 119), it is clear that they have done just that throughout the book. For example, a female orangutan is described as having a psychological ailment, living with "no focus in life" until giving birth, when her "smiling suggested that she was a proud and contented mother" (p 52). Anecdotal descriptions of orangutan behavior, although engaging, do not provide convincing scientific evidence for the interpretations the authors suggest. The results of the few carefully controlled studies that do exist (in areas such as problem solving and imitation) are summarily dismissed by the authors. Orangutans and humans do share many cognitive abilities; there are also some notable (and interesting) differences. The authors minimize or dismiss these differences, citing problems with collecting data from captive-raised orangutans, arguing that captivity strips them of their "culture," and thus changes their cognitive abilities. Although this may be true, no evidence is presented for this view.

Overall, the book is strongest when it focuses on conservation issues and the importance of preserving this species as well as the habitat in which it lives. It is clear that the book was not written for a scientific audience, but instead to increase public awareness of this endangered great ape.

SUZANNE E MACDONALD and JENNIFER VONK,  
*Psychology, York University, Toronto, Ontario, Canada*



### AQUATIC SCIENCES

REFLECTIONS ON WATER: NEW APPROACHES TO TRANSBOUNDARY CONFLICTS AND COOPERATION. *American and Comparative Environmental Policy Series.*

*Edited by Joachim Blatter and Helen Ingram. Cambridge (Massachusetts): MIT Press. \$67.00 (hardcover); \$26.95 (paper). xvi + 358 p; ill.; index. ISBN: 0-262-02487-X (hc); 0-262-52284-5 (pb). 2001.*

This book consists of two introductory chapters, eight case studies, and two concluding chapters. The editors wish to bring new perspectives, chiefly postmodern social theory, to the study of water issues. They call for new approaches that recognize "multiple meanings" of water and consider values that conflict with scientific, economic, or utilitarian models.

They also discuss the growing numbers of "actors" involved, including nongovernmental organizations, tribal groups, and local governments.

Do the case studies and summaries offer new perspectives to help scientists contribute toward resolving these issues? Some of the case studies offered interesting insights, in particular, the chapter on Lake Constance (Blatter) and, to a lesser degree, the chapters on the Yellowstone to Yukon conservation initiative (Levesque) and on the U.S.-Canadian salmon conflict (Sullivan). Most of the other case studies are vague, lacking information on which to base judgments. In the final chapter, the editors cite anthropologist Clifford Geertz's notion of "thick description" as the type of information needed to understand emerging problems in water management. Unfortunately, the descriptions given in many of the chapters are thin. There are only two data tables and one timeline in the entire book. Nearly all the maps lack scale bars and in one case east and west seem to be reversed. The real problem, however, is that the case studies are too complex to be summarized in 30 to 40 pages and require a much deeper understanding of all the issues (scientific, social, political, and cultural) than the authors are able to muster. Some spend many pages applying various theories and methods to their issue, without showing that the results are of practical, as opposed to academic, interest.

For students or scientists seeking to gain broader perspectives on environmental issues, this book is not a good place to begin. It would be better to go to general works (both pro and con) on postmodernism and postmodern environmentalism, such as the ones cited by the chapter authors. Those already familiar with the major points can probably do just as well trying them on their own cases, without this collection as a guide.

WILLIAM J CROMARTIE, *Environmental Studies, Richard Stockton College of New Jersey, Pomona, New Jersey*

ANCIENT LAKES: BIODIVERSITY, EVOLUTION AND ECOLOGY. *Advances in Ecological Research Series, Volume 31.*

*Edited by A Rossiter and H Kawanabe. San Diego (California): Academic Press. \$129.95. xlvii + 624 p; ill.; index. ISBN: 0-12-013931-6. 2000.*



## ENVIRONMENTAL SCIENCES

INSATIABLE APPETITE: THE UNITED STATES AND THE ECOLOGICAL DEGRADATION OF THE TROPICAL WORLD.

By Richard P Tucker. Berkeley (California): University of California Press. \$45.00. xiii + 551 p; ill.; index. ISBN: 0-520-22087-0. 2000.

The author's magisterial history of the American ecological empire shows how the rise of the United States as a global economic power produced ecological degradation throughout the tropical world. Although recognizing that the causes of this degradation involved a complex mix of local, national, and global factors, Tucker argues that the underlying causes of much of this destruction can be traced back to the U.S.'s insatiable appetite for tropical commodities. The author takes an innovative global approach, showing the connections between production in the tropics and consumption in the U.S. He traces its impact on tropical environments in Latin America, the Pacific Ocean basin (focusing on Hawaii and the Philippines), and Africa. Each chapter is devoted to a particular commodity, including sugar, bananas, coffee, rubber, cattle, and timber. These case studies allow Tucker to identify a range of linkages among U.S. markets and tropical producers. Sometimes the linkages were direct: U.S. corporations owned and managed the land and shipped their products to the U.S. market, as exemplified by the vertically integrated operations of the United Fruit Company in tropical Latin America. In other cases, the linkages were indirect: local producers owned the land and controlled production, but their main goal was to supply U.S. markets. For example, Brazilian coffee producers cleared tens of thousands of acres of primary forest to produce a crop that was destined almost entirely to the U.S. Whether the intervention was direct or indirect, the drive to supply U.S. markets with crops, beef, and timber transformed complex tropical ecosystems into radically simplified, commodity-centered agroecosystems, many of which were neither economically nor ecologically sustainable. Tucker argues that this period ended around 1960, after which a new era of environmental management that emphasized protection and sustainability began to emerge. Many pioneers in this movement were biologists and foresters from the U.S., which shows that their influence on tropical environments was not wholly malign.

The author's arguments are sure to stimulate debate, particularly about the relative importance of the U.S. in the processes he describes. Nonetheless, *Insatiable Appetite* is an eloquent and compelling synthesis, which would serve well both as an undergraduate textbook and as a resource for more advanced researchers.

STUART MCCOOK, *History, College of New Jersey, Ewing, New Jersey*

TROPICAL ECOSYSTEMS AND ECOLOGICAL CONCEPTS.

By Patrick L Osborne. Cambridge and New York: Cambridge University Press. \$110.00 (hardcover); \$39.95 (paper). xiv + 464 p; ill.; index. ISBN: 0-521-64251-5 (hc); 0-521-64523-9 (pb). 2000.

The author has explored an interesting idea in this book. Instead of the usual method of organizing a textbook around the principles of the subject field, with an illustrative example for each concept, he has done it the other way round. Each chapter describes a different tropical ecosystem, with a principle of ecology used as an example. Thus, the Grasslands chapter discusses primary productivity, and the Lakes chapter is used to illustrate energy flow and biogeochemical cycling. There are chapters on 11 different ecosystems, plus Cities and Global Ecology. To assess how well this scheme works, I will evaluate the two chapters on ecosystems in which I have done research: Tropical rain forests and biodiversity, and Coral reefs and community ecology. In general, both chapters present the best short descriptions I have ever read on these ecosystems. The chapters contain excellent reviews of the literature. Although I am familiar with the scientific work in both systems, I discovered several references that were new to me.

In regard to the principles of ecology that each is designed to illustrate, the treatment of biodiversity in the chapter on tropical rainforests is covered well. Methods of measurement of diversity, its variation with latitude, altitude, climate and soils, and the roles of disturbance, competition, and natural enemies are all discussed. Although many of the references were to textbooks or symposium chapters, most were to papers in peer-reviewed journals, so students and interested laics can follow up the leads. Lastly, a discussion of the effects of logging and the spread of agriculture that lead to fragmentation and the accelerating reduction in diversity is followed by a good discussion of methods of conservation of tropical rainforest biodiversity.

The treatment of community ecology in the chapter on coral reefs is narrowly focused on a single hypothesis of community assembly—niche differentiation. This constraint is permissible,

since many other aspects of ecological communities are dealt with in other chapters (e.g., environmental physical factors, primary production, population dynamics, energy flow and biogeochemical cycling, disturbance, succession, zonation and gradients, decomposition, diversity, and biogeography). These are then linked to human ecology, conservation, and sustainable development. I feel that the author has succeeded admirably in his approach and has given readers an excellent introduction to the fields of general ecology and tropical ecosystems.

JOSEPH H CONNELL, *Ecology, Evolution & Marine Biology, University of California, Santa Barbara, California*

#### A NATURALIST'S GUIDE TO THE TROPICS.

By Marco Lambertini; translated by John Venerella; with illustrations by Kitty Capua. Chicago (Illinois): University of Chicago Press. \$25.00 (paper). xxvi + 312 p; ill.; index. ISBN: 0-226-46828-3. [Originally published as *Guida alla natura tropicale*, 1992, Franco Muzzio & Company, Padova, Italy.] 2000.

For the debutant tropical ecotourist this book is a delight. It has many stunning photographs, color plates, and line drawings, and is written in a lively style. It focuses attention very accessibly on many interesting aspects of natural history. Most chapters cover tropical rainforests, followed by others on coral reefs, savannas, and deserts. The final two chapters discuss the tropics in peril and tropical dangers and precautions.

Scratch the surface, though, and you uncover serious flaws, obvious to a tropical biologist. First, there are numerous spelling mistakes. The figures should have scales: are marsupial mice really the same size as marsupial cats (p 14), or humming birds as hornbills (p 86)? Factual errors abound, such as leaf cutter ants are confined to the New World (p 73), "the underbush" of the "Amazon jungles" are definitely *not* dominated by "Begonias and philodendra" (p 53), nor by saprophytes (p 119); *Licuala grandis* is Vanuatuan, not South American, and rarely has a tall stem (p 45); the whole of Borneo and New Guinea are "megadiverse" not solely the Indonesian parts (p 80); and there are certainly not over 1000 species of *Senecio* or *Vernonia* in Malaysia (p 47), or even in Malesia. Most serious are accounts badly garbled due to compression and failed comprehension. Shifting agriculture (p 30) depends on biomass nutrients. Continental drift does indeed underlie biogeography, but the shifting of biota (not mentioned) has been one of its vital aspects. The accounts of deforestation rates are very dated as is the discus-

sion of logging. The author strongly advocates a ban on using tropical timber. It is now accepted that such a boycott would not save forests. Instead, certain low-impact logging (which maintains biodiversity), combined with ecolabeling of timber (which gives a powerful incentive to good practice), is considered to be the best method for success.

From the references it seems that the author was unable to distinguish coffee-table books and derivative student textbooks from authoritative volumes that can be relied on for veracity. The overall concept and presentation of this guide are magnificent. After comprehensive correction a new edition could be thoroughly recommended.

T C WHITMORE, *Geography, Cambridge University, Cambridge, United Kingdom*

#### RESPONSES OF NORTHERN U.S. FORESTS TO ENVIRONMENTAL CHANGE. *Ecological Studies, Volume 139.*

Edited by Robert A Mickle, Richard A Birdsey, and John Hom. New York: Springer. \$189.00. xix + 578 p + 47 pl; ill.; index. ISBN: 0-387-98900-5. 2000.

This is an exceptional synthesis of the complex responses of northern U.S. forests to changing regional and global environments. It is a most impressive compilation of studies, many funded by the U.S. Department of Agriculture's Forest Service Global Change Research Program, that carefully explores the factors that affect forest health and productivity. These factors (i.e., global climate change, atmospheric deposition, ozone, disease, insect infestation, nutrient limitation, and drought, and their interrelationships—both historically and into the future) are thoroughly examined throughout this book.

Fifteen chapters comprise four main sections: An Introduction to Northern U.S. Forest Ecosystems; Global Change Impacts on Tree Physiology; Ecosystem-Scale Interactions with Global Change; and Summary. Chapters in Section 1 cover the forest resources and conditions; geologic and edaphic factors; climate and atmospheric deposition patterns and trends; and forest declines in response to environmental change. Section 2 examines tree health and physiology relative to multiple stresses and their interactions; the physiological and environmental causes of freezing injury in red spruce; and atmospheric deposition effects on surface waters, soils, and forest productivity. Chapters in the third section discuss nitrogen saturation; soil warming effects on carbon and nitrogen cycling; impacts of climate change, elevated carbon dioxide, and ozone on forest productivity; effects of climate change on forest and disease outbreaks; and impacts of climate change on past (through pale-



oecological and paleoclimatic information) and future (through predictive models) forest composition. The Summary section successfully pares down the previous 540 pages into findings grouped by various degrees of certainty and following specific lines of evidence.

The chapters are very complementary and integrated. Data based on field observation and experimentation, laboratory research, and sophisticated modeling efforts provide the analytical bases for most of these chapters. Each presents a balanced, rational argument for specific factors that affect forest health and productivity, and discusses the many uncertainties and alternative explanations for growth declines and mortality events. Most of the chapters include 120 to 200 literature citations with some as recent as 1999. Citations also include the classical and foreign literature.

My primary criticism of this book is that it includes too many minor, but annoying, grammatical errors (especially noun-verb agreements) and various production glitches. For example, I found it nearly impossible to distinguish among some of the "Probability of Occurrence" color classes in the four color figures in Chapter 1. Table 1.8 includes the tree species "Edropline" and at least three other mistakes. In another example, Figure 5.1 (a photograph) appears reversed, and the legend for Figure 5.2 does not inform the reader what "CF" means (although the legend for Figure 5.1 suggests "charcoal-filtered"). And in Chapter 10, "Marine" instead of "Maine" (p 358) is another reminder how spell-checkers still are not ready to replace good proofreaders.

Who should read this book? Well, anyone interested in the health of forests anywhere should read at least the Summary chapter (Chapter 15). Everyone working on forest health issues, especially in the northeastern U.S., should digest this entire book. Except for its prohibitive price (especially to students), this book would make an outstanding foundation for an upper-level undergraduate or graduate-level course or seminar on forest health. All readers will likely understand much more about the complex nature of forest health and productivity.

DONALD J LEOPOLD, *Environmental & Forest Biology, College of Environmental Science & Forestry, State University of New York, Syracuse, New York*

#### THE NATURE OF MEDITERRANEAN EUROPE: AN ECOLOGICAL HISTORY.

By A T Grove and Oliver Rackham. *New Haven (Connecticut): Yale University Press.* \$75.00. 384 p; ill.; index. ISBN: 0-300-08443-9. 2001.

#### WILD SOLUTIONS: HOW BIODIVERSITY IS MONEY IN THE BANK.

By Andrew Beattie and Paul R Ehrlich; with illustrations by Christine Turnbull. *New Haven (Connecticut): Yale University Press.* \$25.95. xiii + 239 p; ill.; index. ISBN: 0-300-07636-3. 2001.

How do we confront the world's ongoing ecological crisis? Should we fear it as apocalypse (the "predictions" of the Club of Rome), mourn the loss of natural beauty (the resurgence of interest in natural history and biodiversity), flog ourselves (as the authors of a current mass extinction), retreat to Masada (ecowarriors fighting their hopeless battle against overwhelming economic and political forces), weep at the tragedy ("the tragedy of the commons" and "lifeboat ethics"), or laugh at the farce (Julia "Butterfly" Hill sitting in Luna, her pet redwood tree)? In this book, the authors offer another approach, one more optimistic and practical. The living world is ecological capital: wetlands that process sewage and control floods, estuaries that nurture fisheries, and reservoirs of untapped genetic resources for new pharmaceuticals, crops, and materials. In short, we should care about biodiversity and preserving it because it is ultimately money in the bank. This is not a new idea, of course, and the authors do not present it as such. But they do take the issue into the public square to persuade readers, with their collective suspicions of "environmental wackos," to the view that conservation is actually a form of civic virtue, akin to supporting fire and rescue teams and education of the young.

Beattie and Ehrlich succeed admirably. The book is separated into thematic chapters that present topics in terms of utility to humans. What would an extraterrestrial colony need to survive? How can we ensure a steady supply of pure water? Are there better ways to deal with our burgeoning stream of garbage? How can an ecosystem warn us of its poor health? Are there better ways to manufacture and extract raw materials? Can we grow our food crops more efficiently? From what do we draw inspiration for new pharmaceuticals? Each question is informed by the authors' impressive knowledge of biodiversity and natural history, and they lead readers repeatedly to a common theme: solutions to our problems are out there, provided courtesy of natural selection, and because natural selection is much smarter than we are, there is no shortage of interesting solutions to our problems. In short, conservation is not simply a moral imperative, it is mere prudence.

The book is clearly not written for biologists. As I was reading it, I was struck by the authors' blithe disregard for the many obstacles to their optimistic vision. How to develop a discovery to a useful

product, how to reconcile national interests in “genetic patrimony,” and many others all are left unconsidered. Nevertheless, the book is refreshingly optimistic, always fascinating, and never preachy.

J SCOTT TURNER, *Environmental & Forest Biology, College of Environmental Science & Forestry, State University of New York, Syracuse, New York*

ENRICHING THE EARTH: FRITZ HABER, CARL BOSCH, AND THE TRANSFORMATION OF WORLD FOOD PRODUCTION.

By Vaclav Smil. Cambridge (Massachusetts): MIT Press. \$34.95. xix + 338 p; ill.; name and subject indexes. ISBN: 0-262-19449-X. 2001.

This is the last of a series of books in which the author explores the energy flows underpinning agricultural production. Here Smil examines the industrial synthesis of ammonia from nitrogen and hydrogen, a process he labels as the most significant invention of the 20th century. He argues his case in an extremely well-organized book, supported by a wealth of numerical data. The first three chapters provide readers with the necessary background knowledge on the nitrogen cycle, the nitrogen balances in traditional agriculture, and the 19th century search for new sources of nitrogen by chemists and agronomists. The second part of the book covers Fritz Haber’s research on nitrogen fixation, the commercialization of his laboratory process of ammonia synthesis by Carl Bosch at BASF in the 1910s, and the changes in ammonia synthesis since the 1920s. Industrially synthesized ammonia enters our agroecosystems as a variety of nitrogen fertilizers. Smil examines their role in global crop production (and thus our reliance on the Haber-Bosch synthetic process) in the final part of the book. Tampering with the nitrogen cycle entails a variety of environmental problems as fertilizer nitrogen is lost at an extraordinary rate into our aquatic ecosystems and the atmosphere. The author reviews the possible solutions to these problems created by our dependence on nitrogen, from more efficient agronomic practices to more rational (i.e., less beef-centered) diets and stabilized populations.

The core of *Enriching the Earth*—a highly technical historical account of the Haber-Bosch process—is not a compelling narrative that will catch the attention of historians. Yet Smil’s strength lies elsewhere, namely, in his ability to produce a work that offers insight into the agronomical significance, historical development, and ecological consequences of the industrial synthesis of ammonia. This comprehensiveness makes *Enriching the Earth*

a very welcome contribution to the interdisciplinary field of environmental studies.

JUAN ILERBAIG, *Program in History of Science & Technology, University of Minnesota, Minneapolis, Minnesota*

YOU CAN’T EAT GNP: ECONOMICS AS IF ECOLOGY MATTERED.

By Eric A Davidson; Foreword by George M Woodwell. A Merloyd Lawrence Book. Cambridge (Massachusetts): Perseus Publishing. \$17.00 (paper). xvii + 247 p; ill.; index. ISBN: 0-7382-0487-0. 2000.

Through the fixation and flow of energy and the cycling of water and nutrients, natural ecosystems provide many services to the human economy. Natural ecosystems control and ameliorate climate, maintain the composition and quality of the atmosphere, regulate the hydrologic cycle, and build and maintain soil fertility. The biological diversity contained within these systems provides additional goods and services such as food, forage, building products, medicines, pest-resistant genes, crop pollination, pest control, and profitable recreational opportunities. Yet, neither ecosystem nor biodiversity goods and services appear as line items in the balance sheets of classical economics. Why? Because no money changes hands when these goods and services are provided. Consequently, degradation and losses of natural ecosystems and their constituent biodiversity is not commonly subtracted when calculating a gross national product (GNP). Worse, a GNP actually may increase when it becomes necessary to spend enormous sums of money to replace the losses of previously unaccounted for ecological goods and services.

There is a lot that is wrong with this picture, as Eric Davidson lucidly explains in discussing the three fallacies of mainstream economics. The first fallacy is that most economists fail to recognize the extent to which human economic activity is dependent upon the Earth’s ecological systems and instead labor under the illusion that the market alone makes the world go round. The second is the assumption that technology will miraculously come to the rescue and save us from ecological disaster. The third fallacy is complacency. Because there have been some successes in dealing with environmental problems, the assumption is made that all such problems are easily solved. Davidson elaborates on these themes in some detail as well as providing useful insights into flawed economic concepts such as cost-benefit analysis, discounting, and “externalities.” He also provides a modest list of national and international initiatives and positive

personal steps that can be undertaken to acknowledge the interdependence of ecological and economic systems.

This book is a quick read, and Davidson writes well. It should be required reading in classes in ecology, environmental science, and resource management. It also should be required in economics classes, but perhaps that is expecting too much. Most importantly, copies should be sent to complacent relatives, politicians, and mainstream economists. These small acts may at least help slow the rate of irreversible biotic—and ultimately economic—impoverishment that the human enterprise is currently imposing on Earth.

PETER F BRUSSARD, *Biology, University of Nevada, Reno, Nevada*

ALL THE WILD AND LONELY PLACES: JOURNEYS IN A DESERT LANDSCAPE.

By Lawrence Hogue. *A Shearwater Book. Washington (DC): Island Press. \$24.95. ix + 272 p; ill.; index. ISBN: 1-55963-651-3. 2000.*

In this book, the author chronicles the story of the Anza-Borrego region of southern California east of San Diego through its geology, biota, and human history. Geologically, this area has been shaped by plate tectonics, the Colorado River, and climate change, leaving a region with elevations as high as Mt. San Jacinto (approximately 10,000 feet) and as low as Salton Sea (227 feet below sea level). Aridity characterizes the terrain, yet from about AD 900 to AD 1500 the Salton Basin was fed by the Colorado River, creating a huge body of freshwater, Lake Cahuilla. This windfall for the native peoples was 185 km long by 56 km wide by 91 m deep and provided fishes and wetlands that were exploited for the native diet. The saline Salton Sea is the remnant of botched irrigation practices of 1901 and now functions as a sump for agricultural runoff. Ironically, this nature park exists only because of misguided human practices, yet considerable effort has gone into salvaging the habitat.

As the author indicates, practically everything about the Anza-Borrego region has been impacted by humans for up to 10,000 years, varying only in degree and consequence. During the Holocene, Native Americans inhabited the region, and Europeans did not enter a pristine wilderness, but rather an environment engineered by the Cahuilla and Kumeyaay peoples and their predecessors. Native American management and manipulation included fires to promote the yield of date palms and chaparral containment to enhance grasslands that were seeded for future harvest. The Indians transplanted favored plants and altered streams to

encourage wetlands, efforts that augmented biological diversity in advance of western science. In 1769 the Spanish (Serra, Crespi) permanently entered this setting and brought their “old world baggage” that included disease, plants, animals, and ultimately fire suppression, groundwater pumping, and damming. Not only were the populations of native peoples decimated, but the land was irreversibly changed. The nature of wilderness is a central issue in this book. After establishing that the Indians “influenced almost every aspect of their surroundings” (p 51), Hogue approaches controversial issues such as herbicide application to control exotic introductions (particularly tamarisk) in wild areas and shooting mountain lions to assist declining populations of desert bighorn, the borrego of Anza-Borrego. The real cause of habitat degradation is human overpopulation, resulting in encroachment on wild areas coupled with a thoughtless ethic of inconsideration of the basic right of other species to exist. Hogue is well read and makes extensive reference to environmental writers, including Mary Austin, Aldo Leopold, Edward Abbey, Edward O Wilson, Henry David Thoreau, and Jack Turner. Hogue seems to present a collage of authors with topics reminiscent of Marc Reisner (*Cadillac Desert*), Donald Grayson (*The Desert's Past*), Jon Krakauer (*Into the Wild*), and Wallace Stegner. Curiously, he does not mention Jared Diamond (*Guns, Germs, and Steel*).

Hogue's topics are introduced from a personal viewpoint while hiking in isolated areas where he describes the region, then expands on historical, geographical, or philosophical perspectives. For a full appreciation of the geography under discussion, readers should have a detailed map; the one provided does not contain all of the locations referenced. The book's style occasionally demonstrates the author's sense of humor and enjoyment of his work: “In the movies, this is how it looks when God is about to speak” (p 22); “I feel as if I could be Lawrence of Arabia, or Clint Eastwood in the beginning of *The Good, the Bad, and the Ugly*” (pp 27–28); “Chocolate Mountains aren't merely brown but look like the frosting creation of a pastry chef on acid” (p 129).

The book is thoughtfully orchestrated to climax with the dramatic epilogue in which Hogue relates his encounter with a mountain lion that puts “wilderness” in perspective. His sobering awareness of a significant mammalian predator outside his flimsy tent led him to state: “To me, a wild animal is one with enough power or will to challenge my feeling of being in control” (p 232).

KENNETH W GOBALET, *Biology, California State University, Bakersfield, California*

ECO-PRAGMATISM: MAKING SENSIBLE ENVIRONMENTAL DECISIONS IN AN UNCERTAIN WORLD.

By Daniel A Farber. Chicago (Illinois): University of Chicago Press. \$23.00 (hardcover); \$15.00 (paper). xi + 210 p; index. ISBN: 0-226-23806-7. 1999.

This is an excellent introduction to the deeper issues of environmental policy. Farber's goal is to step back from extreme positions and accept the challenge of developing an environmental policy that is politically sustainable. To do so, he draws on the natural and social sciences, but with an eye toward the limitations of any one method. In six chapters he considers the fundamental problem of making policy in the face of uncertainty; differing methods of discerning public values; cost-benefit analysis, its critics, and alternatives; the development of an environmental baseline; the difficulty of balancing future benefits against current costs; and the need for a regulatory process that adapts as science progresses. Such a brief list cannot do justice to the extensive discussion of each topic. This could serve as an assigned textbook for students who are just beginning their study of environmental policy, and as a refreshing critique of basic methodologies for more experienced researchers.

I have only a few minor critical comments. First, the book says little about the history and politics of the environmental movement. This is quite understandable: the goal is to suggest improved approaches to rational policymaking. Yet, as the book acknowledges but does not discuss, environmental policy is still highly politicized. Thus, if assigned to students, the book will need to be supplemented by more historical or political analyses. Second, some of the footnote references are a bit dated. This is to be expected in a book that obviously took some years to complete, and does not detract from the text itself. Finally, at times the book ventures into the hypothetical world of economic models, assuming facts to illustrate method. Some readers might find these parts a bit slow going.

GILBERT WHITTEMORE, *Stalter & Kennedy, Boston, Massachusetts*

RESEARCH TECHNIQUES IN ANIMAL ECOLOGY: CONTROVERSIES AND CONSEQUENCES. *Methods and Cases in Conservation Science.*

Edited by Luigi Boitani and Todd K Fuller. New York: Columbia University Press. \$32.00 (paper). xxxiii + 442 p; ill.; index. ISBN: 0-231-11340-4 (hc); 0-231-11341-2 (pb). 2000.

This edited volume contains an introductory overview followed by 11 chapters that are accurately titled by content. The book is based on the lectures and writings of 19 international authorities, many

of whom gathered at a workshop in 1996 to "discuss the accuracy of spatial wildlife habitat models, the dichotomy of inductive versus deductive modeling, and the problem of transferability of models in space and time" (p xxxi). This volume bursts forth with new and exciting thinking far beyond the topic of modeling, and provides many "meaty nuggets" of historic and modern perspectives on critical ecological concepts. In this light, the book's title is somewhat misleading. This volume will advance the thinking of readers regarding ecological principles, application and interpretation of ecological techniques and data (mostly based on vertebrate studies), and on the limitations of our present understanding of ecological concepts.

The authors (from government, private, and university settings) synthesized ecological principles into crisp, clear paragraphs of thought-provoking material supported by extensive literature and their own "hands-on" research data. The literature cited in each chapter is very inclusive, consistent with past and current knowledge of topics, and is in itself a reason to read this book. The first chapter, Hypothesis Testing in Ecology, discusses the use of terms such as laws, principles, theories, hypotheses, models, experiments, and facts. With philosophical undertones, Krebs presents sharp and critical recommendations and debate about hypotheses and their use for studying "significant" problems. Chapter 2, A Critical Review of the Effects of Marking on the Biology of Vertebrates, engages debate about marking vertebrates for field studies and details numerous methods, presents survey information about subjects studied, and evaluates the use of marking methods for each. Information is presented about study protocols and recent technical advancements. The essential need for scientists to validate techniques and for reviewers and editors to help writers cite and publish technique evaluations is emphasized. Chapter 3, Animal Home Ranges and Territories and Home Range Estimators, addresses the basic ecological questions of distribution and abundance with a very detailed review of the concepts of territoriality and home range. Powell promotes the need to understand how animals conceive and perceive their place in the landscape, and describes the value of kernel estimators and home range cores for this knowledge. The next chapter, Delusions in Habitat Evaluation: Measuring Use, Selection, and Importance, addresses the topic of determining a species' habitat in relation to fitness. The scope of the problems involved in habitat evaluation are discussed and complement other chapter discussions of animal home ranges. Of concern is how to identify and measure use areas while also adequately identifying quality and availability of resources

essential to a species. Chapter 5, *Investigating Food Habits of Terrestrial Vertebrates*, describes traditional and recently designed methods for identifying a species' food habits and feeding behavior. A plethora of food habit data exists, but so does the need to understand the relationship with fitness, community structure, and foraging theory. The following chapter, *Detecting Stability and Cause of Change in Population Density*, focuses on the techniques used to identify the dynamics of population systems and related data. The debate about density dependence and populations and key factor analysis are updated, and it is suggested that future studies be done with a "healthy skepticism of all the techniques and to take a multipronged approach" (p 208).

Chapter 7, *Monitoring Populations*, identifies the importance of the population as the critical element in ecological studies, and addresses the need for setting clear goals before any study is undertaken. The validity of the chosen population index is essential when attempting to identify a significant or meaningful index change in the population. The next chapter, *Modeling Predator-Prey Dynamics*, identifies modeling and the related mathematical language as a way of "thinking" (and as a technique) by which assumptions can be tested and data gathered in a meaningful way. The model is "fitted" to the datum and used for the analysis. Chapter 9, *Population Viability Analysis: Data Requirements and Essential Analyses*, describes the use of Population Viability Analysis (PVA) to estimate the probability that a population will persist for a specific period of time. This chapter deals with modeling of populations, and the application of PVA to demographic studies. It also discusses the importance of obtaining meaningful data to "drive the model." A list of "essential ingredients" for developing a useful PVA is given. Chapter 10, *Measuring the Dynamics of Mammalian Societies: An Ecologist's Guide to the Ethological Methods*, introduces readers to the science of ethology (animal behavior) and its potential influence on animal populations and distribution. The concepts of social behavior are introduced and basic ethology techniques and terminology detailed. This lengthy chapter is a mini-course in ethology and includes methods for data sampling and recording, techniques for behavioral measurement, statistical analysis, and ways to understand animal population and social dynamics. The chapter is of a different style than others in this book and readers should recognize that behavioral ecology is essential to the discipline of animal ecology. The final chapter, *Modeling Species Distribution with GIS*, introduces the use of Global Information Systems (GIS) for identifying large amounts of spatial data (hab-

itat data) and analyzing spatial relationships of organisms. The paper is based on the reviews of 82 papers that used GIS or Remote Sensing (RS) and discusses the use of GIS for the multidimensional analysis of species-environment relationships that feature large amounts of data. Essential terminology, including a debate about the term *habitat*, and the importance of quality and quantity of location data and GIS layers, is discussed. Sources of error in map production and modeling are presented and remedies proposed. The chapter provides an effective introduction to GIS use for analytical purposes and complements other publications in this rapidly developing branch of ecological study.

The chapters in this volume are of consistent quality and style. There are no photographs or color, and the tables and black-and-white ink figures are clean and well placed. The editing is well done, the writing informative, and chapter contents well identified. The content is appropriate for both novice and experienced animal ecologists, and the book is an excellent additional basic reading and reference for those educated via traditional ecology textbooks and manuals.

THOMAS C DUNSTAN, *Biological Sciences, Western Illinois University, Macomb, Illinois*

NATURE AND THE MARKETPLACE: CAPTURING THE VALUE OF ECOSYSTEM SERVICES.

By Geoffrey Heal. Washington (DC): Island Press. \$50.00 (hardcover); \$25.00 (paper). xv + 203 p; ill.; index. ISBN: 1-55963-795-1 (hc); 1-55963-796-X (pb). 2000.

Environmental destruction and the loss of biodiversity is the largest calamity and greatest challenge facing humanity in the 21st century. Traditional conservation and natural resource management programs have attempted to conserve the environment through protected areas, regulations on resource use, environmental policies, and integrated conservation and development strategies. One very new plan is frankly economic: ecosystems are recognized as "natural capital" producing a flow, not only of goods, but also of services (such as climate stabilization, soil generation, pollination) that directly and indirectly sustain and fulfill human life. The question is how to use economics to preserve rather than destroy these services.

This new book explains, in a lucid and compelling fashion, exactly how and when a market-based economy can promote environmental conservation. Heal's volume also shows why it is essential that we foster markets that assign value to nature's services, before these vital services become degraded beyond repair. The author, a world-class economist and professor in Columbia University's



Business School, unabashedly takes the economist's perspective in examining "how natural systems and processes benefit human societies" and in seeking "the economic policies and institutions needed to maintain their integrity" (p x). The book begins by describing the basic environmental infrastructure upon which humanity depends, and the essential economic principles that one must understand when considering goods and services that traditionally have no market value. It goes on to explore the most promising opportunities for using markets to protect the environment, namely watersheds, ecotourism, and carbon sequestration. Finally, Heal explores the market potential of other environmental services, explains how these services can be valued, looks at nonmarket policy options, and examines the question of sustainability and intergenerational equity.

One need be neither an economist nor an ecologist to understand this book, as it is written in a remarkably accessible manner. The volume should indeed be essential for anyone interested either in humanity's future or environmental protection. As a conservationist, I hope that many businessmen will read the book. For biologists and especially conservation biologists, this book will not only provide a wealth of examples, but a good understanding of the newest strategy in the conservation toolkit: marketing nature's services.

CLAIRE KREMEN, *Ecology & Evolutionary Biology, Princeton University, Princeton, New Jersey*

THE BIOLOGY OF MANGROVES. *Biology of Habitats.*

By Peter J Hogarth. Oxford and New York: Oxford University Press. \$75.00 (hardcover); \$34.95 (paper). ix + 228 p; ill.; index. ISBN: 0-19-850223-0 (hc); 0-19-850222-2 (pb). 1999.

This book launches readers into the strange and wondrous world of tropical tidal habitats with a breadth of topics ranging from descriptions of mangroves and their creature inhabitants, to lists of factors that affect them. Specific subjects include a definition of mangroves; description of mangroves as habitat for flora and fauna from both terrestrial and marine origins; a list of assessment and study methodologies; an account on mangrove communities and their relationship with adjacent ecosystems; a discussion of mangrove biodiversity and biogeography; and a listing of impacts on mangroves from human and natural disturbance plus their recovery and restoration, exemplified in a case study from the Indus Delta. The book is generously capped-off with sections listing further reading and a comprehensive bibliography, plus an essential glossary and index to assist navigation through the pages. This rare compilation offers

recent information on both flora and fauna from this unique habitat. Recommended beneficiaries, notwithstanding a few shortcomings in style and presentation, include teachers and students of marine biology as well as anyone interested in gaining an introductory view of the entire mangrove ecosystem.

Several aspects detract from *The Biology of Mangroves* as a book that might otherwise have become a fundamental source reference. There are many recent publications listed, but several are inappropriately cited and referenced throughout the text. Key questions raised are also left unanswered, and prescriptions for innovative deduction are not explored. From the definition of "what is a mangrove?" (which is not saved from its tautology here), to a discussion of the future of mangroves, the author misses the opportunity to develop and identify crucial themes. As for the definition, there is none (pp 1-2). Perhaps the same could be said for the future of mangroves (p 198). Although the habitat is under dire threat, this point alone does not identify the urgent need to discover practical political-management solutions needed to preserve remaining intact stands of this rapidly dwindling habitat. We have an abundance of scientific and technical knowledge and expertise to save mangrove forests, but without the political will and popular support, I fear the habitat will be progressively degraded and lost. It is my hope that *The Biology of Mangroves* will assist those who can pass on the message.

NORMAN C DUKE, *Botany, University of Queensland, Brisbane, Queensland, Australia*

ORKNEY NATURE. *Poyser Natural History Series.*

By R.J Berry; illustrations by John Holloway. San Diego (California): Academic Press. \$49.95. x + 308 p; ill.; index. ISBN: 0-85661-104-2. 2000.

This book provides a scientifically sound and highly readable introduction to the landscapes and natural history of Orkney, an archipelago lying north of the Scottish mainland. It covers the environment of Orkney, the geological basis of the islands, the wide range of habitats and their flora and fauna, and the activities and lifestyles of human inhabitants past and present, giving readers a powerful impression of the diversity and interest of the islands.

The bulk of the volume is based on *The Natural History of Orkney* (R J Berry. 1985. London (UK): Collins), which was published as part of the well-respected *New Naturalist* series, and has sadly been out of print for several years now. The text has been restructured and updated, and is now complemented by a large number of excellent photo-

graphs, beautifully reproduced and highly evocative of the landscapes and wildlife of Orkney. Other illustrations, including maps, tables, and reproductions of archival photographs, are well chosen and well positioned. The book also contains full lists of flowering plants, ferns, and bird species found in Orkney, notes on other groups of organisms that identify members of particular Orcadian interest, and full references to more comprehensive sources.

At first sight, the lavish use of photographs, glossy paper, and incorporation of the works of Orcadian poets and writers both as chapter headings and in the text might suggest this is a coffee-table book intended for tourists, and of little interest to either professional or amateur biologists. This is a false impression; *Orkney Nature* is as informative and useful, if a little less portable, as the well-worn second-hand paperback edition of the *New Naturalist* volume that accompanied me on my first visits to Orkney as a PhD student over ten years ago. The content is well chosen, up to date, and supported by references to the original scientific literature. Each chapter ends with a summary of pointers to additional reading. The book will be useful and enjoyable not just for those visiting Orkney, but for anyone interested in islands and their natural history; the attractive presentation is just an added bonus.

M JANE BUNTING, *Geography, University of Hull, Hull, United Kingdom*

**THE TAKAHE: FIFTY YEARS OF CONSERVATION MANAGEMENT AND RESEARCH.**

*Edited by William G Lee and Ian G Jamieson. Dunedin (New Zealand): University of Otago Press. \$39.95 (paper). 132 p + 14 pl; ill.; index. ISBN: 1-877276-01-4. 2001.*

**MARINE COMMUNITY ECOLOGY.**

*Edited by Mark D Bertness, Steven D Gaines, and Mark E Hay. Sunderland (Massachusetts): Sinauer Associates. \$59.95. ix + 550 p; ill.; index. ISBN: 0-87893-057-4. 2001.*

This book focuses on various aspects of marine communities, and each chapter is written by authors familiar with a particular facet of marine ecology. The volume is a collection of 19 chapters separated into three parts: Processes Influencing Pattern in Marine Communities includes physical processes, disturbance, life histories, and species interactions; Community Types discusses intertidal, subtidal, and deep sea communities, as well as coral reefs, mangroves, salt marshes, and seagrasses; and Conservation Issues is a relatively short section with three chapters that address human impacts, conservation and management, and marine protected areas.

The purpose of this book as stated by the authors is to provide an overview of the history and present status of marine community ecology, and to give students an entrée into the literature and exposure to exciting areas of discovery and directions for future research. There are many strengths to this book and some authors clearly achieved the stated goals. The extensive bibliographies in many chapters will provide new graduate students and those from other fields access to the primary literature in specific areas (such as rocky intertidal or seagrass communities). There are some shortcomings, and as with many multi-authored books, the chapters are eclectic in their coverage, and different chapters seem to be intended for audiences at different levels. Some chapters are very thorough and informative (e.g., chapters by Denny and Wethey, Menge and Branch, and Williams and Heck), while others are weaker (e.g., Lenihan and Micheli). Overall, it is unclear to what audience this book is intended. It would be difficult to use as a textbook for a class, but would be a very good reference for advanced students and researchers in marine ecology.

DIANNA K PADILLA and BENGT J ALLEN, *Ecology & Evolution, State University of New York, Stony Brook, New York*

**BLUE FRONTIER: SAVING AMERICA'S LIVING SEAS.**

*By David Helvarg. New York: W. H. Freeman. \$24.95. vii + 299 p; index. ISBN: 0-7167-3715-9. 2001.*

The author describes the way in which U.S. citizens interact with each other in coastal environments and with the sea. The chapters cover people as they relate to fishing, marine sanctuaries, coral reefs, recreational areas, and pollution. Several decades ago, I visited many of the places Helvarg describes and found them hard to reconcile with my memories. It was depressing to realize how much humans have altered coastal environments during my lifetime. For anyone interested in preservation, one or two chapters will make you angry. But there are a few bright spots, areas where people are working hard to preserve features of the ocean, and even examples where they have succeeded. But the stories Helvarg tells about federal and state agencies that are directed to preserve and protect the oceans are not encouraging. For example, the marine sanctuaries program is terribly underfunded and generally designates, but does not manage, sanctuaries. His coverage of biology and oceanography is adequate for the general public; trained scientists would point out a few deficiencies. To the extent I am familiar with public policy and ocean management, Helvarg's discussion is insightful and accurate; if errors connected with

policy and management are no more important than those in the science, there is nothing to worry about.

Readers of the *QRB* who are interested in the preservation of the marine environment, especially those of us whose livelihoods depend on preservation of marine systems, should buy this book and be incensed by much of the material therein. Being so incensed, they should use their expertise to protect the blue frontier.

JOHN M TEAL, *Woods Hole Oceanographic Institution, Woods Hole, Massachusetts*

ENVIRONMENTAL SCIENCE: A STUDY OF INTER-RELATIONSHIPS. *Seventh Edition.*

By Eldon D Enger and Bradley F Smith. Boston (Massachusetts): McGraw-Hill Higher Education. \$65.31. xxii + 434 p; ill.; index. ISBN: 0-07-248749-6. 2000.

Introductory environmental science textbooks and their authors take many different approaches to this complex subject. Volumes range from those with precious little quantitative information to books based on the science of Earth systems. Enger and Smith's approach is centered on human interrelationships with the environment and discusses these interrelations in five parts. The first part, interrelatedness, focuses on linkages and ethics. Part Two, on ecological principles and applications, examines ecosystem-, community- and population-scale interactions. The third part, on energy, examines energy concepts in ecological and human-dominated systems. The remaining two parts focus on human interactions with ecosystems, one from a natural resource perspective and the other targeted at pollution and policy. The treatment is appropriate for an introductory, semester-long course in environmental science. The scope is decidedly human, and quantitative information is used appropriately, if not extensively, throughout.

Like most modern textbooks, this volume is supported by supplemental materials, including the publisher's website where students can find up-to-date information and links. Chapters include interest boxes (environmental close-ups, global perspectives, and analysis) examining topical issues and requiring critical thinking. Subjects are presented succinctly and range from ecoterrorism to land-use planning, with a few to many inserts in each chapter. The text strikes a good balance in presenting the basics and asking students to think without giving "the answers." The book is true to its purpose: a one-semester volume with an appropriate reading level for an audience of students with a wide variety of career goals.

To their great credit, the authors are diligent in not preaching; material on activism is presented as an appendix. Because of the even-handed approach, scientists confronted with the very real economic and political pressures of environmental decisions will find much to like in this book. Those looking for a systems-based approach centered on the union of biological, ecological, and physical systems will need to look elsewhere for a quantitatively rigorous textbook for majors. College and university faculty looking for an updated, broad treatment of environmental science, issues, and problems should consider this book for their introductory course for nonmajors.

JAMES R PRATT, *Environmental Science, Portland State University, Portland, Oregon*

THE NATURAL HISTORY OF AN ARCTIC OIL FIELD: DEVELOPMENT AND THE BIOTA.

Edited by Joe C Truett and Stephen R Johnson. San Diego (California): Academic Press. \$69.95. xvi + 422 p + 19 pl; ill.; index. ISBN: 0-12-701235-4. 2000.

Over 30 years ago, oil development began on the arctic coastal plain of northern Alaska. As development progressed, numerous environmental research activities were conducted and continue to be carried out to this day, largely in an effort to minimize any ecological impacts. Much of this research was funded by the oil industry, in particular BP Exploration (Alaska) Inc. (BPX) and its predecessors. Because the major stimulus for this research was to develop mitigation measures to reduce developmental impact, much of this work has not been published. Sensing the usefulness of this information and desirous of disseminating the material to a wider audience, the Environmental and Regulatory Affairs Department of BPX sponsored the development of this book. The result is a very interesting and informative collection of peer-reviewed articles that deal with this arctic coastal plain ecosystem in light of the oil field development that is taking place in this region.

The book is separated into five parts: Introduction to Arctic Ecosystems (three papers); Mammals of an Arctic Oil Field (five papers); Birds of an Arctic Oil Field (six papers); Marine and Freshwater Life (four papers); and Synthesis (one paper). Most chapters begin with a brief overview and a map. One might think that this would become somewhat redundant, but although they may again show the location of the major oil fields, they also present things such as caribou migration routes or areas surveyed for tundra swans, and they allow each chapter to stand on its own. In addition to the maps, there are approximately 40 other

black-and-white figures, 50 tables, and over 60 color photographs. These photographs are especially helpful and attractive, although most are rather small and some suffer from a lack of scale.

The arctic environment is harsh, with cold-climate processes a dominant control factor on the region's biota. Industrial development has certainly had an impact on this environment, and the studies presented in this compilation show that changes caused by human activities have been mostly localized and probably of limited effect. Although population changes (mostly increases) have been observed in birds and mammals, scientists are unable to determine if these changes are attributable to oil field development. Research must and will continue, and this book is a step in the right direction. It contains the type of information needed for the wise management of an ecosystem undergoing increasing human influence, and it should find wide use among biologists, planners, and administrators.

JAMES C WALTERS, *Earth Science, University of Northern Iowa, Cedar Falls, Iowa*

CONSERVATION IN A CHANGING WORLD. *Based on a symposium held in London, September 1996. Conservation Biology, Volume 1.*

*Edited by Georgina M Mace, Andrew Balmford, and Joshua R Ginsberg. Published by Cambridge University Press, Cambridge and New York, in association with the Zoological Society of London. \$80.00. xi + 308 p + 6 pl; ill.; index. ISBN: 0-521-63270-6 (hc); 0-521-63445-8 (pb). 1998.*

With the scramble to conserve the Earth's biodiversity has come the challenge of what exactly to preserve. The default of most conservation organizations has been to focus on preserving pattern—maximize where species diversity and endemism is highest and protect those regions. In this volume the editors and contributors challenge this approach by emphasizing the need to preserve not only the pattern of biodiversity, but also the processes that produce and maintain it. In 13 chapters, the contributors attempt to identify the processes important to conservation and offer various ways of integrating these ecological and evolutionary processes into conservation planning. This volume is intended more for academics than for conservation practitioners or reserve managers. Nevertheless, the contributors make numerous suggestions of ways that these processes may be incorporated into conservation planning. These include ways of integrating metapopulation dynamics to minimize sinks and methods to maximize microevolutionary potential, such as preserving habitats along gradients. At-

tention is also paid to issues of conservation in severely altered habitats under siege by increasing human populations and the challenge of conserving ecological and evolutionary processes.

With protected areas covering roughly 5% of the Earth's land surface, what goes on outside of parks is obviously closely linked to preserving what is inside them. The idea that parks are not islands is elaborated on by Mayer and Pimm in explaining how water and fire requiems outside Everglades National Park are important to the health of populations within the park. A similar case is made in a chapter by Stotz for ecological processes along elevational gradients in the Andes. Here destruction of low-elevation forests may impact essential high-elevation seed dispersers and pollinators that seasonally migrate down slope. Another concern discussed in a chapter by Huntley is how to manage for disturbance processes—which are key to many plant communities—and how paleoecological data can help explain historical processes that shaped present patterns and may shape future ones. In another chapter, Spector and Forsyth illustrate how the concept of indicator species, at least with respect to dung beetles, is alive and well. They illustrate how dung beetle diversity can be used to assess mammal diversity in neotropical forests.

In sum, the contributed papers offer an eclectic sampling of why it is important to preserve process when doing conservation. Given that conservation efforts of the new century will likely focus on restoration, this volume is ahead of the curve in helping us see which processes will be most important to understand and to preserve.

THOMAS B SMITH, *Biology and Center for Tropical Research, San Francisco State University, San Francisco, California*

BEHAVIOUR AND CONSERVATION. *Conservation Biology, Volume 2.*

*Edited by L Morris Gosling and William J Sutherland. Published by Cambridge University Press, Cambridge and New York, in association with The Zoological Society of London. \$110.00 (hardcover); \$39.95 (paper). xi + 438 p; ill.; index. ISBN: 0-521-66230-3 (hc); 0-521-66539-6 (pb). 2000.*

Appreciation for the ways in which insights from behavioral ecology can inform conservation has increased among both behavioral ecologists and conservation biologists. This is a promising development for the world's most endangered species, whose futures are too precarious to be left to chance. It is also why *Behaviour and Conservation* is appropriately included in the Conservation Biology series, and why its message is a serious one to take.

The 19 contributions in this volume are separated into five parts, beginning with a brief but

informative introductory chapter by Sutherland and Gosling. Subsequent parts focus on the Conservation impact of people (four chapters), Habitat loss and fragmentation (four chapters), Sexual selection, threats and population viability (five chapters), and Conservation applications of behaviour (five chapters). Each of these sections includes case studies of particular species or taxonomic groups (e.g., army ants, butterflies, shorebirds, marine life, cheetah, carnivores, and humans), as well as more general contributions on topics such as the conservation implications of life histories, sexual selection, mating systems, kin selection, migration, predation, and social perturbations.

Some of the chapters (Thomas et al.; Woodroffe and Ginsberg; Boswell et al.; and Pettifor et al.) elaborate on obvious considerations, such as whether protected areas are large enough and contain sufficient suitable habitats to meet the ranging and foraging needs of the species they are designed to protect. Other chapters examine the more subtle implications of animal displays (Møller), communication (McGregor et al.), and learning processes (Cowan et al. and Wallace) for evaluating population extinction risks and implementing management strategies. Among the most intriguing chapters are those that explore the predictions of life-history analyses for human demography (Mace) and of game theory for patterns of human resource exploitation (Borgerhoff Mulder and Ruttan).

Except for the unified bibliography at the end of the book, the chapters stand alone and can be read selectively or in sequences focused on behavioral instead of conservation topics. Most chapters assume a basic understanding of behavioral ecology and several include mathematical models. The book is well suited for upper-level classes and graduate seminars in behavioral ecology and conservation biology, and is a valuable resource for both aspiring and established researchers in these fields.

*Behaviour and Conservation* is a testimony to how far behavioral ecology has advanced in its brief history as a discipline. It is also a stimulating view into the tremendous potential of its applications to conservation. Funding agencies and conservationists should exploit this potential before it is too late.

KAREN B STRIER, *Anthropology, University of Wisconsin, Madison, Wisconsin*

#### QUANTITATIVE METHODS FOR CONSERVATION BIOLOGY.

*Edited by Scott Ferson and Mark Burgman. New York: Springer. \$125.00. xi + 322 p; ill.; index. ISBN: 0-387-94322-6. 2000.*

The current and future status of biological diversity has become a major focus for land managers, biologists, and policymakers, yet the information and

resources available with which to devise recovery strategies are often inadequate. As a result, many conservation decisions are qualitative and subjective. This book, an edited volume of 17 chapters, addresses this problem by providing an assemblage of quantitative tools for monitoring species, assessing extinction risks, and evaluating management strategies when the available information is less than optimal. Although no amount of mathematical wizardry can cover for inadequate biological information, the quantitative tools introduced here attempt to make best use of the information at hand and, if nothing else, highlight the importance of building uncertainty into our management practices.

The approaches covered focus primarily on the management and conservation of a single species, rather than landscape or ecosystem perspectives, and although some tools considered are already widely used (e.g., matrix models, risk assessment, and population genetic analysis), others are sparsely known or applied in conservation (e.g., inferring extinction risk from collections, Bayesian Networks, Branching Processes, and Decision Theory). Chapters on mainstream tools such as Population Viability Analysis (PVA) and projection matrices risk redundancy, but the authors (i.e., Chapter 10 on matrix models and Chapter 11 on risk analysis) cover new ground by considering opportunities and limits to management. As is often the case, the chapters on genetics were less successful in making the link with specific management applications. Due to the highly specific nature of the parameters involved, the chapters on species-specific models (fisheries, whales) are of interest, but will be of less value to conservationists in general.

Overall, there is a reasonable representation from plant and animal systems, although rarely within any given topic. Most papers are pleasantly succinct and well integrated toward a common goal, a credit to the organizers and editors. This brevity sometimes has a cost in terms of depth, but by including conceptual definitions as well as specific cases, most papers provide a window on the relevant literature. Although the book is not intended to be comprehensive, readers need be aware of many additional techniques—e.g., Global Information Systems (GIS) and metapopulation models—that are not covered. The book is refreshing in that it increases the profile of a variety of approaches not widely known among conservationists and thus provides a valuable reference for land managers, graduate students, and conservation researchers.

BRIAN C HUSBAND, *Botany, University of Guelph, Guelph, Ontario, Canada*





## NEURAL SCIENCES

## KEEPING MOZART IN MIND.

By Gordon L. Shaw. *San Diego (California): Academic Press.* \$49.95. xx + 374 p + 8 pl; ill.; index. ISBN: 0-12-639290-0. [CD-ROM included.] 2000.

With this book, the author, a physicist turned cognitive neuroscientist, joins the company of Karl Pribram, John Eccles, William Calvin, Antonio Damasio, and other prominent neuroscientists who have taken to the medium of popularization to offer inspiring conjectures, thereby skirting a certain antitheoretical bias of neurobehavioral science. Anecdotes and warm observations of personal relationships with colleagues are often good parts of this game, but this book about the “Mozart Effect” should have been edited more diligently to temper its excesses of diary-like style and to make additional connections with the large scientific literature in developmental and cognitive psychologies (including expert performance and human factors), intelligence, and auditory and visual perception, as well as with the literature of musicology. Reinventing areas of study is a fine route to fresh ideas; afterward, one has a lot of catch-up homework to do. That task is especially great if one has great ideas.

Why does music exist? Many human tastes easily lend themselves to hypotheses about survival—breathing fresh air, eating, making love, and nurturing children. Even curiosity and creativity often have useful outcomes. But why, in particular, does music, with its seemingly arbitrary formal patterns, attract us? Perhaps music reflects “a common, inherent internal neuronal language throughout the mammalian cortex at the columnar level” (p 36). Then perhaps, Shaw suggests, hearing a piece of music that is archetypally excellent—say Mozart’s *Sonata for Two Pianos in D Major* (K448)—might echo causally back into the brain to sharpen cognitive processing in some measurable ways. In Chapter 15, Shaw describes how, with colleagues Mark Bodner, Johannes Sarnthein, and others, he has explored ways in which such an effect might relate to the present search by neuroscientists for brain wave coherence associated with cognitive events.

Shaw’s interesting hypothesis is worth exploring, while remaining aware that music has other possible adaptive *raison d’être*. For example, the abstract forms of instrumental melodies may be represen-

tational of the prosody in human emotional dialogues. Thus, if abstract painting is an adaptive human endeavor—perhaps for the way it presses us to reflect on the significances of the real things that meet our gaze—instrumental music may be adaptive in much the same way. Such a hypothetical adaptive function occurs at a higher cognitive level than by tapping directly into the electrodynamic managerial processes of our brains’ operating systems. I have also recently theorized that brain electrical activity may have harmonic structure (1999. *Brain Research Bulletin* 50(2):77–93).

The 23 chapters are grouped into five parts, in which the first is introductory and the last a forward-looking recapitulation, with references to Alzheimer’s Dementia, William’s Syndrome, and other neurological conditions demanding new approaches. Part II, Structured Brain and Symmetry, includes an unusually good explanation for laics of the basic concepts about the brain (Chapter 6), and uses a variant of the “powers of ten” idea (P Morrison and P Morrison. 1982. *Powers of Ten: A Book About the Relative Size of Things in the Universe and the Effect of Adding Another Zero*. Redding (CT): Scientific American Library) to explain the many spatial and temporal scales that are relevant to neuronal function (Chapter 7), in addition to introducing the important ideas about “trions” and symmetries. Part III, Tests of Predictions in Human Behavior, and Part IV, Tests from Brain Imaging and Animal Studies, round out the picture.

The book argues that spatiotemporal reasoning is particularly amenable to enhancement by listening to Mozart’s music. Studies by Shaw’s colleague, experimental psychologist (and concert cellist) Frances Rauscher, have yielded confirming findings, and there has been a healthy, published scientific back-and-forth with other laboratories that have tried to replicate these observations. Although I am among those who have made specific comparisons of laboratory rats and humans in comparable tasks, I have to admit that the fact that some of Rauscher’s findings include a study with laboratory rats listening to music makes it more difficult for me to believe them. Her experimental psychology methodology seems fine, however, with reasonable controls. Chapter 18, Animal Behavior While Listening to Music and Doing Higher Brain Functions, follows up on this matter with some convincing illustrations of an affinity for music-like sounds in certain animal species.

Making additional scholarly connections is perhaps especially important in evaluating the engaging Spatial Temporal Animation Reasoning (S.T.A.R.) software demonstration CD-ROM included with the book, created by Shaw’s student

Matthew Peterson, and intended eventually for use in education. Particularly relevant is a considerable body of literature on the effectiveness of different forms of feedback (or Knowledge of Results), with attention to its consistency, intensity, delay, and other variables. For example, sometimes more consistent feedback and shorter delays can actually have negative effects on performance by interfering with the development of intrinsic self-control. The S.T.A.R. software is intended particularly to help children absorb the intuitions necessary to solve proportional relationship problems in math. Some of the preliminary experimental data of Shaw's colleagues suggest that it may have such a salutary effect, when musical keyboard training is also used to boost the child's appreciation of interval relationships.

The book proffers two central theoretical ideas about the deep structure of brain electrical dynamics: First, *symmetries* must be prominent in spatial and temporal dimensions of brain activity; and second, the brain's fundamental information processing unit has an activation range of three essential levels: below average, average, and above average. This hypothesized unit, labeled the *trion*, is viewed in more concrete terms as an idealized cortical minicolumn (V B Mountcastle. 1997. *Brain* 120:701–722). These two interesting intuitions, about symmetries and “trions,” deserve fuller explanations having greater logical continuity with the experimental ideas and findings that Shaw presents. In particular, I believe that hypothetically identifying three-level information processing units (“trions”) with the minicolumn unnecessarily constrains the empirical search. Natural selection may well have exploited, at larger or smaller scales in the nervous system, a unique combinatorial efficiency of informational elements having three levels of activation. This is related to the surprising “cost-effectiveness” of an integer base-3 counting system, a fact about ternary notation (a close cousin of a property of the constant  $e$  when raised to exponents) known in computer science since as early as 1950 (B Hayes. 2001. *American Scientist* 89(6):490–494).

These issues deserve the additional empirical attention that Shaw hopes to give them. The possibility that the independent variables his group has looked at empirically merely “teach to the test” in a narrow set of isolated skills, must be borne in mind in planning the more ambitious and wide-ranging experiments, for which financial support is required. They might well also look back at the history of music in the West, further joining their sensitivities in humanities and natural sciences. Before the 20th century, with its burgeoning, ubiquitous electronic media, the average educated per-

son was probably more actively involved in the *production* of music than today. If you wanted to hear it you had to play it—or get together with others who could. Robert Greenberg summarizes this history in a delightful set of audiotapes (1998. *How to Listen to and Understand Great Music*. Springfield (VA): The Teaching Company). Altogether, this must have led to a richer set of sensory-motor and social experiences—involving the whole person—than today's typical computer activities give. Is there any historical evidence that such engagement in music once correlated with mathematical prowess, or with spatiotemporal abilities outside of music, or with other indications of success in life? Perhaps as computers advance, more of the things we do with them will become more genuinely enriching in such ways.

Because the issues in this book have so captured the public imagination, the careful attention of other scientists is especially important. Although it seems evident from some of his comments that Shaw is responding to criticisms of this sort, there does remain a “patent medicine” quality at many points. The book is nevertheless refreshing, and contains genuine possibilities of important new ways of seeing the connection between mind and brain.

ROBERT B GLASSMAN, *Psychology, Lake Forest College, Lake Forest, Illinois*

#### ALTERED EGOS: HOW THE BRAIN CREATES THE SELF.

By Todd E Feinberg. Oxford and New York: Oxford University Press. \$25.00. ix + 205 p; ill.; index. ISBN: 0-19-513625-X. 2001.

“What is mind? No matter. What is matter? Never mind.” This old Joe Miller jest has acquired new meaning in the light of current concerns about consciousness. Is its riddle to be transcended by holism, dissipated by modularity, or surrendered to mystery? In this book, Feinberg brings his experience as a psychiatrist and neuroscientist, and his extensive reading in the philosophy of mind, to bear on the mind/body issue. He has little time for the mongers of mystery. He is concerned about the tension between unity and multiplicity that the phenomena of mind and brain present. As William James so vividly described it, the subjective self is experienced as a seamless continuity, yet the material self comprises a number of distinguishable aspects, including the body and its parts. Damage to the brain, through injury or disease, can cause breakdown of the integration between subjective self and material self, resulting in the altered egos of Feinberg's title. The first six chapters of the book survey the variety of ways in which things can fall

apart in the mind/body relationship. Despite such disruption, however, there is a center that continues to hold. The latter part of the book grapples with the question of how the unified subjective self supervenes on the neural multiplicity underlying it.

Much of the material about effects of brain damage will be familiar to readers of the books by Oliver Sacks and Antonio Damasio, among others. What distinguishes Feinberg's account is his inclusion of quotations from what people afflicted with such conditions have had to say about them. As a practicing psychiatrist he has been able to record comments and responses to questions of patients in his care. These first-person expressions of what it is like to be in one of the states of fragmented mind/body relation—such as “asomatognosia” in which patients disown some part of their bodies—tax the resources of empathy in the intact majority of us. They also disclose that what we take for granted as coherently embodied selves is dependent on a harmoniously orchestrated material ensemble, the instruments of which can go out of tune to dissonant effect.

How is the mental thus forthcoming from the material? To deal with this question Feinberg deploys two main conceptions: nested hierarchy and emergent property. Hierarchies are systems organized as sets of levels. Many control systems have this type of organization, such as military ranks and Tinbergen's well-known model of instinct (cited in the book). Feinberg does not have much use for this “boss of” (as Richard Dawkins once put it) kind of hierarchy if it is taken to imply a single top control center in the brain, a place to which all sensory input converges and from which all orders for action originate. He is in agreement with those such as Daniel Dennett who view both reception and control as widely dispersed functions of the brain. A nested hierarchy has to do with compositional structure, the upper levels being made up of elements of the lower as in taxonomy. So cells combine to form tissues, tissues constitute organs, organs make up systems, and systems cohere as bodies. The concept of supraorganism extends the clustering pattern into social castes, as in colonies of ants and termites. Likewise, neurons constitute the lowest level of brain organization, physically underpinning all the functional divisions of increasingly comprehensive levels culminating in the subjective self. To account for qualitatively distinct features of the different neural and functional levels Feinberg turns to emergence. Consider water: the elements composing it are gases, the combination of which produces a property—liquidity—present in neither by itself. So the liquidity of water is an emergent property. Comparably, according to Feinberg, three-dimen-

sional vision is emergent from the combination of the disparate input from the two eyes, and the separate neural processing of information having to do with shape, color, motion, and other aspects of the retinal image. “These components are combined to create a single and unified cyclopean eye that ‘emerges’ in consciousness as a single cyclopean image. . . . The whole of the cyclopean eye is greater than the sum of its parts that are contributed by each eye alone” (p 125). Likewise, the unified subjective self can be thought of as emergent from the combined operations of the lower levels of the neural hierarchy of the brain. The emergent self is, however, not to be conceived as an immaterial entity at the apex of the cerebral hierarchy, as Roger Sperry once argued. There is no such apex to brain organization where everything comes together, and the conception of the hierarchy as nested avoids having to assume it. What the brain does create to produce the unified sense of subjective self is a “*nested hierarchy of meaning and purpose*” (p 138). At this point I got the impression that the hard question of consciousness was being “solved” by sleight of hand, that a kind of category confusion was being used to effect the transition from the material to the mental. Feinberg's deployment of the notions of nested hierarchy and emergent property does a good job of describing what the current state of consciousness studies is concerned about, but it seems to me still to leave us in a quandary about how to seek its explanation.

At just over 200 pages the book is brief compared with what is typical in the field. Accordingly, it is less than comprehensive in its coverage. For example, it pays no attention to the controversial issue of multiple personality, which might be considered to involve a *prima facie* category of altered egos. But the book does not pretend to be encyclopedic. It is a clear and lively introduction to the mind/body problem as currently and variously viewed from neurological, psychiatric, and philosophical perspectives. There is a useful glossary, and good guidance to further reading. If it delivers less than its subtitle promises, that makes it no different than other books that have claimed to explain consciousness. We still do not understand how a mind of matter can comprehend the matter of mind.

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

#### BRAIN MAPPING: THE SYSTEMS.

*Edited by Arthur W Toga and John C Mazziotta. San Diego (California): Academic Press. \$199.95. xiv + 654 p; ill.; index. ISBN: 0-12-692545-3. 2000.*

This is the second in a trilogy of volumes that includes books on methods and disorders. In this edited volume, Toga and Mazziotta have collected

a distinguished series of authors whose expertise cover a tremendously broad range from somatomotor systems to abstract questions of consciousness, theory of mind, and mental imagery. The 22 chapters are separated formally into four sections: Types of Maps, Maps by Location, Functional Systems, and Dynamic Systems. Except for the first, these seem largely arbitrary organizational structures.

The individual chapters include carefully chosen content areas that reasonably represent the field of brain mapping as currently practiced, but in a few hundred pages these authors can do little more than give a top level review of this rapidly growing field. Perhaps as a consequence, the best chapters are the historical overviews of functional mapping (Raichle) and neuroanatomical mapping (Swanson). The former is particularly distinguished in helping readers to understand the intellectual history of brain mapping and to appreciate the changing fashions and context that guide researchers. Further, it allows us to gain the sort of perspective needed to appreciate the poorly explored or developed disciplines. Sections on the more current and active research areas generally tend to show a bias toward the authors' own works; several include figures representing the work of only a single laboratory.

This volume is strongest when viewed in context with the other books in this Brain Mapping series. *The Methods* gives an authoritative background to the tools that are likely to sustain this field for the foreseeable future. *The Systems* is more of a snapshot of the current dogma. For newcomers to brain mapping, it provides a valuable overview of the science, and between the lines, of the personalities that make up the field. For more established brain mappers it may be a useful resource in understanding some of the other content areas that make up the field.

MARK S COHEN, *Brain Mapping Division, University of California, Los Angeles, California*

#### PHARMACOLOGY OF ENDOGENOUS NEUROTOXINS: A HANDBOOK.

*Edited by Andreas Moser. Boston and Basel (Switzerland): Birkhäuser Boston. \$120.00. xvii + 273 p; ill.; index. ISBN: 3-7643-3993-4 (Basel); 0-8176-3993-4 (Boston). 1998.*

The mechanisms responsible for causing neurodegeneration in a variety of illnesses (including Parkinson's disease and Alzheimer's disease) remain unknown. One working hypothesis of these illnesses is that they involve the toxic effects of endogenously produced neurotoxins and this has been an area of considerable research activity. This volume comprises 12 chapters that make up what

is described as a handbook of the pharmacology of endogenous neurotoxins. The first seven chapters are devoted to the formation and action of a range of potential toxins. In essence, the book deals largely with isoquinolines and  $\beta$ -carbolines that make up five of the initial seven chapters. The chapter by Prell deals with *pro*-methylimidazole-acetic acid (p-MIAA) as a potential neurotoxin. Although this compound is present in increased amounts in cerebrospinal fluids (CSF) in Parkinson's disease, its source remains a mystery, as does its contribution to the pathology of the illness. Even the author concludes that we know very little about the activity of p-MIAA in the mammalian brain.

Of the remaining contributions, Bringmann et al. discuss halogenated tetrahydro- $\beta$ -carbolines, which formed in vivo, are derived from ingested drug or solvent sources and so are not truly of endogenous origin. The chapter by Dryhurst that describes neurotoxins derived from biogenic amines is fascinating in that it eloquently demonstrates the production of highly potent dihydrobenzothiazines from conjugates of monoamines and glutathione or cysteine. This may be extremely important as far as the pathophysiological mechanisms underlying Parkinson's disease are concerned. The second part of the volume contains five chapters that supposedly deal with enzymes and enzymatic pathways relevant to the formation and pharmacology and biochemistry of endogenous neurotoxins. These chapters sit unhappily with the earlier contents of the volume and contain basic information on enzymes such as tyrosine hydroxylase. Indeed, the role of toxins is limited to the manner in which they can act as inhibitors of tyrosine hydroxylase and monoamine oxidase.

This volume is more a collection of chapters on specific research areas than a handbook. Although it contains a great deal of interesting information, much of it is now dated, with few references appearing after 1997 and most only up to 1995. With its publication date and relatively high cost, I would not purchase the volume for personal use, but it could be a valuable addition to a library collection on neurotoxins.

PETER JENNER, *Pharmacology and Therapeutics, Guy's, King's & St Thomas' School of Biomedical Sciences, King's College London, London, United Kingdom*

#### ANNUAL REVIEW OF NEUROSCIENCE. Volume 24: 2001.

*Edited by W Maxwell Cowan, Steven E Hyman, Eric M Shooter, and Charles F Stevens. Palo Alto (California): Annual Reviews. \$65.00. x + 1350 p + 35 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 15-24). ISBN: 0-8243-2424-2. 2001.*

## DEVELOPMENT OF THE NERVOUS SYSTEM.

By Dan H Sanes, Thomas A Reh, and William A Harris. San Diego (California): Academic Press. \$84.95. xiv + 500 p; ill.; index. ISBN: 0-12-300330-X. 2000.

Undergraduate students will find that this highly readable textbook offers a comprehensive overview of developmental neurobiology. An especially appealing feature is that the authors have framed their discussion with an historical perspective—they acknowledge the classical experiments that have shaped current concepts and principles, and they illustrate those principles with modern experiments that have uncovered the underlying molecular mechanisms. The text is amply illustrated with marvelously elegant and appealing schematic drawings that convey simply but accurately the essence of specific experimental strategies and the results obtained.

Students with some background in introductory biochemistry will be most comfortable with the level of molecular detail provided in this book; those with less preparation may require additional background information. All students would benefit from supplemental material including a glossary of molecules (genes, growth factors, and enzymes) and additional discussion of some of the more complex molecular mechanisms.

The subject of this textbook is the developing vertebrate nervous system, although key experiments done on selected invertebrate species (*Drosophila*, *C. elegans*, and *Aplysia*) are introduced, as appropriate. The scope is broad, ranging from early steps in the induction of the nervous system in the embryo to the biological basis of the development of human behavior. The didactic approach is to summarize and interpret published experiments, and then weave these results into a narrative that guides students toward an understanding of key concepts. The reference list includes over a thousand citations, most from the last decade of the 20th century, establishing this textbook as a very up-to-date treatment of a rapidly advancing topic. Neuroscientists and other biologists who are interested in learning about developmental neurobiology will find this to be an exceptionally useful introduction to the field and a valuable reference.

PAMELA A RAYMOND, *Cell & Developmental Biology*, University of Michigan Medical School, Ann Arbor, Michigan

## BEHAVIOR AND MOOD DISORDERS IN FOCAL BRAIN LESIONS.

Edited by Julien Bogousslavsky and Jeffrey L Cummings. Cambridge and New York: Cambridge University Press. \$80.00 (paper). xiii + 554 p; ill.; index. ISBN: 0-521-77482-9. 2000.

In 1939 Kurt Goldstein noted that patients with left hemisphere strokes often appear anxious and depressed. He called this behavior the catastrophic

reaction. Subsequently, emotional and mood changes have been noted to be associated with lesions in a variety of anatomic areas. Degenerative disease has also been noted to be associated with mood changes. This multiauthored book contains 18 chapters that review the current knowledge about the relationships between brain damage and mood. Many of the authors are leaders in neuropsychiatric research. Although this collection is of high quality and fairly comprehensive, I was disappointed that there was little discussion of emotional facial expressions and the influence of neurotransmitters on mood. The final two chapters (anosognosia and confusional states) are of excellent quality, but not consistent with the overall theme of the book.

KENNETH M HEILMAN, *Neurology*, College of Medicine, University of Florida, Gainesville, Florida

## HUMAN PERCEPTION OF OBJECTS: EARLY VISUAL PROCESSING OF SPATIAL FORM DEFINED BY LUMINANCE, COLOR, TEXTURE, MOTION, AND BINOCULAR DISPARITY.

By David Regan. Sunderland (Massachusetts): Sinauer Associates. \$39.95 (paper). xxix + 577 p + 7 pl; ill.; index. ISBN: 0-87893-753-6. 2000.

This book is intended as a comprehensive introduction to visual psychophysics for research students. The writing conveys the author's enthusiasm, and the book is sprinkled with a wide array of interesting anecdotes and analogies that reveal Regan's skills as an imaginative teacher; the Introductory Chapter is especially wide-ranging and interesting. Over 100 pages are devoted to appendixes that tackle a variety of topics that will interest new students; these range from discussions of systems analysis to the nature of scientific hypotheses. But this is really a monograph, a review of the author's many and varied contributions to a wide science. It cites the work of other authors uncritically and it avoids discussion of controversial issues of methodology or interpretation. The book's subtitle indicates that it is not about perception (the high-level *interpretation* of a visual stimulus), but about low-level detection and discrimination. These topics are usually discussed in relation to the behavior of neurons in the retina or visual cortex, but here the author says that "psychophysics is not physiology," and this book has no critical comparison of psychophysical and neurophysiological phenomena. The bulk of the volume is comprised of five chapters, one for each of the mechanisms for defining form as listed in the subtitle. Chapters 3 (color) through 6 (disparity) concentrate primarily on the author's own research and are well focused. Chapter 2 (Luminance-Defined Form) is,



however, enormously long (142 pages) and it lacks a clear theme and lucid subheadings. Chapter 7 (Integration of the Five Kinds of Spatial Information: Speculation) is, disappointingly, only nine pages long.

The book is too ambitious: the attempt to make it more wide-ranging than a monograph is not a success. It is too long, and the themes and organization are elusive. It would have been better to concentrate on the subplot of a scientific autobiography, since the book does convey one person's lifelong fascination with science.

DAVID TOLHURST, *Physiology, University of Cambridge, Cambridge, United Kingdom*



## BEHAVIOR

### THE MYTH OF MONOGAMY: FIDELITY AND INFIDELITY IN ANIMALS AND PEOPLE.

By David P Barash and Judith Eve Lipton. New York: W. H. Freeman. \$24.95. x + 227 p; ill.; index. ISBN: 0-7167-4004-4. 2001.

When it comes to infidelity, the well-publicized exploits of some humans pale in comparison to those of certain animals. The superb fairy-wren, a diminutive Australian bird, reigns supreme; males and females pair for life, but neighbors sire most of their offspring. In *The Myth of Monogamy*, a pair of socially monogamous humans—Barash, an evolutionary biologist, and his partner Lipton, a psychiatrist—summarize recent discoveries about animal mating systems and ask what insights they offer about mating behavior in *Homo sapiens*.

Most of this book concerns the evolutionary significance of mating with multiple partners, from male and female perspectives. The authors mainly discuss studies of wild animals, but strive to draw analogies with humans. Although the coverage of animal studies is broad, sound, and punctuated with eclectic and often humorous literary quotes, the shameless anthropomorphizing is tedious (animals are regularly described as “happily married” or “jealous,” and mating partners as “girlfriends”). The book is clearly intended for the general public (perhaps the language was chosen to maintain interest), but this tabloid style trivializes the science.

*The Myth of Monogamy* unintentionally highlights the fact that our understanding of human mating systems is woefully behind that of wild animals. The range of topics for which relevance is claimed here—from sexual dimorphism and bimaturism to

jealousy, pornography, and domestic violence—is impressive, but the explanations are usually overreached. What we know about choice and inclination in humans is based mainly on data from campus questionnaires and some high-profile but largely discredited studies of human sperm competition. Ironically, there is little information on genetic mating patterns in humans, yet it is precisely these kinds of data that have fueled our current understanding of animal mating systems.

There is little new here for behavioral ecologists, except for the relatively few pages devoted to humans. The general public might enjoy *The Myth of Monogamy*, but would be better informed by Tim Birkhead's *Promiscuity: An Evolutionary History of Sperm Competition* (2000. Cambridge (MA): Harvard University Press), which offers a richer seam of examples and more careful scholarship. The latter will also prove more useful for teaching since each example is carefully attributed. The awkward referencing style of *The Myth of Monogamy* makes it impossible to guess from the text which statements are referenced, resulting in much fruitless leafing to the end of the book.

RAOUL A MULDER, *Zoology, University of Melbourne, Melbourne, Victoria, Australia*

### ON THE MOVE: HOW AND WHY ANIMALS TRAVEL IN GROUPS.

Edited by Sue Boinski and Paul A Garber. Chicago (Illinois): University of Chicago Press. \$95.00 (hardcover); \$35.00 (paper). xi + 811 p; ill.; subject and species indexes. ISBN: 0-226-06339-9 (hc); 0-226-06340-2 (pb). 2000.

Watching a group of monkeys traveling through a rainforest, it is impossible not to wonder how the group decides where to go at any given time and how quickly to go there. Does the group have one leader who is ultimately responsible for these decisions, or are the decisions reached through some sort of process of general consensus? If so, how? The literature on field studies of animals has long been filled with intriguing descriptions of the apparent decisions about travel routes made by social groups. The ways that such decisions are reached, which group members make the decisions, and how the decisions are communicated among group members, have been very difficult questions to address beyond the level of anecdotes. This book brings together contributions by anthropologists, primatologists, biologists, and psychologists on ecological and cognitive aspects of group living and group travel. The main taxonomic focus of the book is nonhuman primates, but other taxa are covered as well, including honey bees, birds, dolphins, carnivores, and humans.

The book contains 22 chapters, grouped into five parts that discuss the ecological costs and benefits of group travel (five chapters); the cognitive processes involved in the coordination and planning of group travel (four chapters); the specific travel decisions made by individuals and groups (five chapters); the social processes involved in group travel (three chapters); and group travel patterns in taxa other than primates (five chapters).

This volume contains a unique and innovative combination of ecological and cognitive approaches to understanding group travel. It is my hope that this book will inspire many young scientists to further explore this research area, which is at present only in its infancy. The only general criticism of the book is that many of the chapters could have been considerably more concise, which would have made this very long book easier to read.

ANNE GOLDIZEN, *Zoology & Entomology, University of Queensland, Brisbane, Queensland, Australia*

PRIMATE MALES: CAUSES AND CONSEQUENCES OF VARIATION IN GROUP COMPOSITION.

*Edited by Peter M Kappeler. Cambridge and New York: Cambridge University Press. \$85.00 (hardcover); \$37.95 (paper). xii + 316 p; ill.; index. ISBN: 0-521-65119-0 (hc); 0-521-65846-2 (pb). 2000.*

Why do some social groups of lemurs, monkeys, and apes contain a single male, whereas others contain several or many males, in addition to females and offspring? This question has been much debated over the years. In the introductory chapter to this volume, the editor provides a clear overview of the various theories that seek to account for numbers of males in primate groups. Do ecological factors influence numbers of males, or do short mating seasons favor larger numbers of males because a single male cannot monopolize access to all of the females? Have predation pressures, or the risk of male infanticide, influenced the evolution of group composition? Or is it the case that numbers of females is the critical issue, as in cercopithecines where groups containing up to five females usually have a single male, whereas groups of 10 (or more) females are multimale in composition? These issues are addressed in the remaining 22 chapters of a book that has several strengths. First, there is the inclusion of comparative work on species other than primates. Davies reviews work on multimale groups of avian species and Jarman provides an excellent overview of social organization in wallabies and kangaroos. Second, the question of male membership of primate groups is addressed with respect to particular taxa (lemurs, New World monkeys, Cercopithecines, colobines, and the apes). Third, there are

some strong theoretical reviews that seek to establish correlations and causative mechanisms for group composition across the Order Primates as a whole.

Inevitably, readers will find plenty to disagree with in this excellent set of chapters. The mandrill, whose brightly colored face adorns the cover of the book, is classified by Barton as living in groups composed of one-male units. In reality, the mandrill's social (and mating) system is not known in the wild. Semifree ranging groups of mandrills have a multimale-multifemale system. The quality of data used for comparative analysis of primate socioecology is always a problem. The biological relevance of correlations is also a difficult issue. In his review on "social counterstrategies against infanticide," van Schaik establishes a correlation between occurrences of postpartum conceptions and reduced risk of male infanticide. Females of species with lengthy periods of lactational infertility are more likely to be subject to male infanticide. But, van Schaik's examples of species in which females conceive soon after giving birth consist predominantly of New World callitrichids (such as marmosets and tamarins) and nocturnal prosimians (such as bushbabies and pottos). Callitrichids live in small family groups in which adult males exhibit parental care of offspring. Relative certainty of paternity renders male infanticide highly unlikely under these conditions. Nocturnal prosimians such as the potto are nongregarious and the details of their reproductive behavior are poorly known. Elizabeth Pimley recently spent two years radiotracking pottos in Cameroon. Males and infants were almost never observed together and we have no idea whether infanticides might occur. To ascribe the evolution of primate social organization to male infanticide (or its avoidance) is a hazardous exercise. Most infanticides occur in relatively few species (such as langurs or baboons). Lengthy lactational intervals are more common in these monkeys than in monogamous callitrichids or nocturnal prosimians. Correlations between infanticide risk and postpartum fertility are likely to be indirect and not causal. Should we construct theories for the whole of primate social evolution, based upon observations of relatively small numbers of cases and species?

Despite these criticisms, this is an excellent book. Anyone interested in primate social organization, reproduction, sexual selection, and socioecology should buy it. We still do not know what precise amalgam of factors might govern male numbers within primate groups.

ALAN DIXSON, *Zoological Society of San Diego, San Diego, California*

## ANIMAL TRADITIONS: BEHAVIOURAL INHERITANCE IN EVOLUTION.

By Eytan Avital and Eva Jablonka. Cambridge and New York: Cambridge University Press. \$80.00. xiii + 432 p; indexes of species and subjects. ISBN: 0-521-66273-7. 2000.

For perhaps half of this book I was resistant to its title. It seemed like an interesting book about early animal learning, but not really about tradition. Eventually, all the fresh and interesting new research reported by the authors, as well as the slant they place on old research, began to make it clear that the authors are right—many behaviors are not just learned, but are also passed down for at least three or four generations, and that is what a tradition is. Moreover, and while avoiding any new Lamarckianism, the authors show how these traditions can influence and determine the evolution of specific traits or even the survival of a species.

The book focuses on traditions in birds and non-human mammals, and claims to correct the mistake of sociobiologists and others who think of behavior as being almost entirely genetic. I am not persuaded, however, that most sociobiologists (or their suzerains such as evolutionary ecologists) will reject the argument made in this book; rather, such disciplines have divided up those areas of research that explore behavior that is genetically determined or inclined. Indeed, ethologists (forerunners of sociobiology) already blurred the same lines that this book blurs even more permanently, with their frequent statement that many animals (including humans) come supplied with an “internal schoolmarm” that inexorably inclines the organism to expect to complete its genetic capabilities with information learned after birth. Nonetheless, the authors are probably correct in thinking that in some circles the balance has tilted in favor of the genetic components of behavior, and needs to be restored. This book will go a long way toward accomplishing that goal.

MICHAEL CAVANAUGH, *Baton Rouge, Louisiana*



## HUMAN BIOLOGY &amp; HEALTH

THE MAKING OF INTELLIGENCE. *Maps of the Mind.*

By Ken Richardson. New York: Columbia University Press. \$24.95. ix + 210 p; ill.; index. ISBN: 0-231-12004-4. 2000.

This book is a “must” read. It gives a detailed but succinct, objective yet compassionate, and very true account of the IQ saga and all the trappings that go

along with it. In the middle of a field so confused, scientifically dubious, emotionally charged, and so much blown up with the latest false promises of genomics and brain imaging, *The Making of Intelligence* stands out as an oasis of intellectual clarity. It debunks in a painstakingly methodical fashion quite a few “just so” stories on intelligence, from genetics to brains to language to computers; stories that have relied on weak data, slippery grounds, preconceived notions, crude ideas, and bad science—yet so appealing to the ears of those IQ “true believers.” Whatever the scientific evidence, people will continue to jump to unwarranted conclusions, for it is a characteristic of human psychology that people cling on to their beliefs. So, arguments and the evaluation of the evidence will have to be documented, as Richardson has done, but there is no hope that this will change the mind of the “true believer”: the genomically inclined will still tell you that the IQ gene has just been found, and the modern phrenologist will assure you that the discovery of the IQ spot on the brain map is just around the corner.

But Richardson’s contribution in this book goes a long way beyond exposing the multifaceted IQ saga. In my opinion, he has clearly grasped the enormous importance of the interactions among elements in a population as the key aspect in the function of any complex system (be it brain or society), and the systematic covariation in these interactions as the single most important factor underlying knowledge or intelligence, at the social or brain domains. Moreover, in an evolving system, population attributes will change with experience, and the interactions and covariations among populations reflecting different experiential levels become of utmost importance. Focusing on these interactions is conceptually challenging and methodologically difficult, almost requiring a novel way to look at the problem; I would say, neither absolute nor relative, but relational. I think it is definitely worth the effort, and *The Making of Intelligence* has shown us the way.

APOSTOLOS P GEORGOPOULOS, *Brain Sciences Center, Veterans Affairs Medical Center, Minneapolis, Minnesota*

## ON BIOCULTURAL DIVERSITY: LINKING LANGUAGE, KNOWLEDGE, AND THE ENVIRONMENT.

Edited by Luisa Maffi. Washington (DC): Smithsonian Institution Press. \$65.00 (hardcover); \$34.95 (paper). xxi + 578 p; ill.; index. ISBN: 1-56098-905-X (hc); 1-56098-930-0 (pb). 2001.

This collection of articles is separated into four parts: the interdisciplinary anthropological, biological, and linguistic framework (13 chapters); case studies (eight chapters); an action agenda (ten chapters); and calls for new ways of thinking

(two chapters). The main thrust of the volume is to demonstrate the inextricable links among peoples' knowledge about their environment, the environment itself, and the languages they use to encode their knowledge. It also aims to show why endangered cultures and languages should be preserved, and suggests programs to achieve this.

In particular, Majnep and Pawley's lucid account of the ecological knowledge encoded in Kalam, and Hunn's discussion of the relative ecological richness of Zapotec compared to Spanish, demonstrate convincingly how languages are adapted to the environment in which they are spoken. Two very different reasons are presented for promoting the preservation of language: anthropologists and biologists are concerned with culture and biodiversity, regarding language as a repository of information and as a tool for its maintenance, whereas linguists naturally view language itself as an object of scientific study, as Corbett argues, "to do linguistics properly, we need every last language" (p 91). Batibo's excellent paper illustrates the difficulties inherent in preserving languages with few speakers, showing how those who speak the many minority languages in Botswana are torn between maintaining their language and culture, and integrating into wider society by speaking a lingua franca.

Programs for maintaining diversity are also discussed, from legalistic rights-based approaches (Skutnabb-Kangas; Posey; Maffi) to a repository of Brazilian language recordings (Moore). All of the schemes, however, propose to preserve minority languages while also encouraging multilingualism for their speakers, rather than "preservation by growth," by encouraging outsiders to learn minority languages.

The book covers a great deal of ground and has many valuable contributions that show the importance of diversity in cultural and linguistic spheres. The challenge, which to the book's credit is not avoided, is that people cannot be forced to maintain languages and cultures despite the knowledge contained therein, and will only do so if they recognize them as valuable and a source of pride.

ANDREW D M SMITH, *Theoretical & Applied Linguistics, University of Edinburgh, Edinburgh, United Kingdom*

PATHWAYS TO LANGUAGE: FROM FETUS TO ADOLESCENT. *The Developing Child Series.*

By Kyra Karmiloff and Annette Karmiloff-Smith. Cambridge (Massachusetts): Harvard University Press. \$27.95. xi + 256 p; ill.; index. ISBN: 0-674-00476-0. 2001.

This is an excellent book for anyone not in the field of language acquisition, who wants to have an up-to-date introduction to its data, theories, and

controversies. The writing style is aimed at intelligent but uninformed readers with most terminology clearly and simply defined when it is introduced, and overviews that include the major researchers and methods. An early and particularly useful chapter presents an excellent summary of the many ingenious techniques that language researchers have devised to study questions in speech perception, language comprehension, and production. Then the volume progresses from covering the very early development of speech perception, and the acquisition of words and grammar, to the fairly late development of narrative skills. The authors also weigh in on the nature (language is innately pre-programmed into the brain) versus nurture (language is learned) debate. In the field of language acquisition, this debate is centered squarely in grammar development. The numerous theories of grammar acquisition are thoroughly covered in Chapter 5, but without the confusion of detail that tends to cloud this area. Also influencing this debate is grammar acquisition in atypical populations, and among the populations covered in Chapter 7, which are the two most popular supporters for the argument that there is a specific gene involved in grammar acquisition. This argument maintains that people with a damaged grammar gene will be normal in all other aspects, but have trouble with grammar (as is claimed for specific language impairment), while people with an intact grammar gene and other genetic damage will have other cognitive problems, but no trouble with grammar (as is claimed for Williams syndrome). The authors offer a clear, alternative explanation to the grammar gene argument, and urge caution in general in making assumptions about normal development from atypical populations.

The book concludes with a chapter summarizing the authors' viewpoint that evolution has served to make humans highly adaptable to their environment through a set of learning mechanisms in combination with a lengthy period of development. They surmise that language, like other skills, is not innately programmed into the brain, but emerges as extant mechanisms gradually specialized to process the linguistic input in the environment.

JANET L McDONALD, *Psychology, Louisiana State University, Baton Rouge, Louisiana*

THE FEELING OF WHAT HAPPENS: BODY AND EMOTION IN THE MAKING OF CONSCIOUSNESS.

By Antonio R Damasio. A Harvest Book. San Diego (California): Harcourt Trade. \$15.00 (paper). xiv + 386 p; ill.; index. ISBN: 1-15-601075-5. 1999.

This is a book that focuses on the problem of how the brain generates the sense that there is an observer of a movie, not on the "other" problem

of consciousness, how the movie-in-the-brain is generated. Damasio, a neurologist and neuroscientist, theorizes from a biological stance that does not consider the problem of consciousness as insoluble. His materialism, however, can easily avert accusations of reductionism or naïveté. “After considering how consciousness may be produced within the three pounds of flesh we call brain, we may revere life and respect human beings more, rather than less” (p 28), the author writes, and he understands the limitations of neurophysiological knowledge to explain the subjective mental experience (most notably in Chapter 10, *Using Consciousness*).

This book and its predecessor, *Descartes' Error: Emotion, Reason, and the Human Brain* (1994, New York: Putnam) have enjoyed critical acclaim and readership success, both in the U.S. and internationally. The notoriety of Damasio's books are in contrast to that of a number of volumes in the field published over the last decade. Perhaps this can be explained by the unique amalgam of empirical science and humanism of Damasio's prose. He is often poetic and at times truly touching. He displays an obvious appreciation for the artistic and philosophical products of Western culture. In addition, his discussions of clinical vignettes reflect a sensitivity for psychological nuance and compassion for his patients.

Four towering contributions of this ambitious book can be highlighted. First, the relationship between the body, emotions, and memory to produce consciousness (A Damasio. 1996. *Transactions of the Royal Society of London, Series B (Biological Sciences)* 351 (1346):1413–1420). Second, the heuristic division of consciousness into two types—core and extended—and their corresponding senses of self, core, and autobiographical. Third, the pivotal role that a sense of self plays in knowing, but also in the processing of whatever gets to be known. Fourth, the survival value of consciousness that results from interconnecting the regulation of the internal milieu with the manipulation of images that represent the inside and the outside of the organism.

Damasio's scientific training and humanistic disposition establish a tightrope that this book travels with irregular results. He is mostly eloquent, even moving, and capable of explaining intricate clinical and scientific constructs in clear terms. The appendix, *Notes on Mind and Brain*, is a useful addition. At times, however, he becomes verbose and redundant, and may lose his general and professional but nonspecialist audience—for example, the lack of a footnote to “a consciousness version of the Turing test” (p 314) assumes more than a passing knowledge of computer science and artificial intelligence.

Readers who are interested in psychoanalysis and meditative practices such as Buddhism (with high stakes in unconscious processes and consciousness, respectively) may be particularly disappointed. In view of his own definitions, the statement “the psychoanalytic unconscious has its roots in . . . autobiographical memory, and psychoanalysis is . . . a means to see into the tangled web of psychological connections within autobiographical memory” (p 228) ignores the psychoanalytic work with the core self. In addition, recent efforts to bridge psychoanalysis and cognitive science and neurobiology deserve to be mentioned (K Kaplan-Solms and M Solms. 2000. *Clinical Studies in Neuro-Psychoanalysis: Introduction to a Depth Neuropsychology*. London: Karnac Books; D J Stein. 1997. *Cognitive Science and the Unconscious*. Washington (DC): American Psychiatric Press).

Anything more than a passing reference to metaphysical or spiritual views on consciousness in a book dealing with its neurobiology could be deemed out of place. Damasio's claim, however, that “[i]mpaired extended consciousness possibly contributes to the dissolution of the self associated with . . . states of mystical selflessness” (p 216; emphasis added) is a biased opinion as long as it remains unsubstantiated.

ANDRES SCIOLLA, *Psychiatry, University of California, San Diego, La Jolla, California*

#### PSYCHIATRY AND THE HUMAN CONDITION.

By Bruce Charlton. Abingdon (United Kingdom): Radcliffe Medical Press. £19.95 (paper). xiv + 250 p; index. ISBN: 1-85775-314-3. 2000.

In the preface to this book, the author notes the “scientific deficiencies of contemporary psychiatry” (p ix) and describes current categories of psychiatric diagnosis as “cultural fossils” (p x). To combat these flaws, Charlton attempts “a new and more rigorous way of conceptualising psychiatry” (p ix) that is based, in part, on cognitive neuroscience principles. This is an ambitious undertaking that, unfortunately, falls miserably short.

Structurally, *Psychiatry and the Human Condition* is organized in a chaotic fashion with subchapters of additional discussion and references positioned at the end of the text. After an initial chapter that describes pervasive unhappiness as an outgrowth of societal evolution, Charlton goes on to a brief discussion of the “somatic marker mechanism” underlying human social intelligence (this is detailed further in a 41-page Appendix that seems irrelevant to the book's stated emphasis on psychiatric disorders). He then jumps to the shortcomings of psychiatric classification before moving on to consider specific psychiatric disorders and treatments.



The most intriguing segment of the book proposes roles for social intelligence and "theory-of-mind" mechanisms in the pathogenesis of delusional disorder. Since many of the specific beliefs in delusional disorder revolve around social issues (e.g., morbid jealousy, persecutory ideas), Charlton suggests that these disorders arise from persisting but faulty inferences about the states of mind of other individuals. In the following sections, one expects to find permutations of this theory that explain other psychiatric symptoms and syndromes. Surprisingly, Charlton shifts gears entirely. He evokes a theory that hallucinations and bizarre delusions result from delirium despite the fact that few psychotic patients have clinical or electroencephalographic evidence of delirium. Furthermore, delirious patients may have tactile, visual, or auditory illusions and hallucinations, but bizarre delusions are rare. The proposal that electroconvulsive therapy (ECT) acts as an "anti-delirium" treatment is equally flawed. Although there are several case reports using ECT to treat delirium, it is much more common for it to induce or exacerbate delirious states. In addition, the greatest benefits of ECT are seen in major depressive disorder, which Charlton attributes not to delirium, but to cytokine-associated "malaise." Similar misconceptions pepper the remainder of the book and result in erroneous inferences and hypotheses. Consequently, this book fails to live up to the grandiose aims of its preface, and cannot be recommended for anything other than its colorful cover.

LAURA J FOCHTMANN, *Psychiatry & Behavioral Science and Pharmacological Sciences, State University of New York, Stony Brook, New York*

HUNTER-GATHERERS: AN INTERDISCIPLINARY PERSPECTIVE. *Biosocial Society Symposium Series.*

*Edited by Catherine Panter-Brick, Robert H Layton, and Peter Rowley-Conwy. Cambridge and New York: Cambridge University Press. \$90.00 (hardcover); \$29.95 (paper). xii + 341 p; ill.; index. ISBN: 0-521-77210-9 (hc); 0-521-77672-4 (pb). 2001.*

This volume brings together 11 essays of various disciplinary approaches in an attempt to characterize "hunter-gatherers" in the past, the present, and in different geographical contexts. Offered as a counter to increasing fragmentation of hunter-gatherer studies, the volume contains essays that explore the behavioral ecology of hunters and foragers (Winterhalder), their technology (Torrence), changing languages (McConvell), nutritional standards (Jenike), evolutionary biology and health status (Froment), material culture (Conkey), and historical engagements with non-foraging and hunting peoples and nation states

(Layton). The editors defend the category of hunter-gatherer as a meaningful one that unifies these wide-ranging approaches; drawing from Lee and Daly, they provide a "working definition" of hunter-gatherers as those who hunt, gather, and fish for subsistence and exercise "no deliberate alteration of the *gene pool* of exploited resources" (p 2).

This attempt to synthesize different disciplinary, temporal, and geographical perspectives on hunter-gatherer populations is laudable. And some of the essays in the volume stand out. Rowley-Conwy's critique of entrenched assumptions concerning hunter-gatherers as "the Original Affluent Society" is an important intervention, as is McConvell's synthetic discussion of language shifts and expansions, Froment's analysis of evolutionary biology and health (which also discounts some of widespread, but unfounded claims about hunting and foraging peoples), and Conkey's examination of the methods and complexities of interpreting material culture. Nevertheless, the volume falls short of its central aim of promoting real interdisciplinary dialogue. To be sure, it contains contributions by scholars of various disciplines (evolutionary biology, archaeology, and anthropology), but most are concerned with *material* dimensions of subsistence: how, why, where, and to what material effects various hunting and foraging peoples have exploited their environments in both the distant past and the present. Such questions are important, but only two contributors (Layton and Conkey) focus on cultural, social, and symbolic dimensions of hunter-gatherers' lives, and no historians are included in the volume.

Hence, the volume gives relatively short shrift to the diverse (and equally relevant) nonmaterial values and beliefs that can shape how hunting and foraging peoples use and act upon their environments. It also neglects more recent comparative 19th and 20th century histories of hunting and foraging peoples, who have engaged with powerful political and economic changes in diverse ways. The editors might also have encouraged more explicit exchanges among the contributors to reveal specifically how different disciplinary (and interdisciplinary) approaches can add to the study of hunting and foraging populations. Some authors (Winterhalder and Torrence), so focused on linking hunter-gatherer activities to rational choices and material concerns, should have productively considered Conkey's observation that "materiality is . . . integral to a fuller understanding" of hunter-gatherer ecology and diet, but it is also "so rooted in and constitutive of social and symbolic life that it is not possible to comprehend one without explicit reference to the other" (p 282). In the end, it remained unclear exactly what a

truly multi- and interdisciplinary dialogue of hunter-gatherer studies should look like, and what future the editors envision for such investigations.

TAMARA GILES-VERNICK, *History, Baruch College, City University of New York, New York, New York*

**HEALTH AND DISEASE IN HUMAN HISTORY: A *Journal of Interdisciplinary History* READER.**

*Edited by Robert I Rotberg. Cambridge (Massachusetts): MIT Press. \$25.00 (paper). viii + 345 p; ill.; no index. ISBN: 0-262-18207-6 (hc); 0-262-68122-6 (pb). 2000.*

The editor has selected 13 essays that appeared in the *Journal of Interdisciplinary History* from 1975 to 1996 as representative of the journal's "pathbreaking" (p 2) approach to the history of disease. Rotberg intended this volume to demonstrate what historians have taught us about disease, but it also reveals the extent to which historians, not unlike medical practitioners and researchers, are sometimes seduced by a theoretical construct and constrained by available data sets.

Until the 1990s most of these interdisciplinary explorations focused on statistical analyses of retrospective data sets, such a mortality records or military records, to test a number of widely held theories of disease. For example, Appleby relies on bills of mortality and finds little connection between nutritional deficiencies and subsequent susceptibility to epidemic outbreaks in early modern London. But Hardy's analysis of London bills of mortality for a later period finds them unreliable if not useless sources for retrospective disease diagnoses. Historians of disease have focused much attention on McKeown's claim that improved nutrition was the key to declines in mortality, but Woods and Hinde's study of late 19th century England and Wales ties the decline to improvements in water quality. In the 1980s a number of historians were attracted to Tanner's theories that suggested adult height was a proxy for childhood nutrition as well as for increased risk for earlier death. Employing this so-called anthropometric methodology Riley found that although English adult males were taller and experienced increased longevity from 1860 to 1980, Scottish males lived longer, but lost stature. Like Riley, a number of other studies have questioned simplistic correlations between height and mortality.

A second emphasis found in this volume focuses on risk factors as indicators of population health. Hanley's fascinating examination of the relationship between Japanese cultural customs—removal of shoes, bowing instead of hand shaking, individual eating utensils—and the relative resistance to infection of those living in cities during the Tokugawa period demonstrates the necessity of comparative perspectives. McCaa's reexamination of Nahuatl and Spanish documents, combined with a nuanced understanding of the importance of genetics in virgin soil epidemics, provides a crushing blow to revisionist claims by Brooks (in a *JIH* article *not* reproduced in this volume) that the role of smallpox in the decimation of 16th century native Americans was greatly exaggerated. Alden and Miller provide an interesting analysis of how the slave trade connected drought and famine in Africa to smallpox outbreaks among slaves in Brazil. Kiple and Kiple's investigation of vitamin A and thiamine deficiency among Caribbean slaves demonstrates the importance of historians' engagement with the complexities and interactions of biological, social, and cultural conditions. This interaction is most convincingly demonstrated by Hecht who uses her skills as an historian to trace the ancestry of a patient diagnosed with the hereditary disorder acute intermittent porphyria. Competence in genetics combined with social anthropological skills enabled Hecht to make use of the variety of historical documents to solve a genetic mystery that takes us to South Africa, the Netherlands, and then back to western Oregon.

This collection demonstrates the value of an interdisciplinary and comparative historical approach for coming to terms with the factors that influence disease and health. Biologists will find much of value in this volume.

HOWARD I KUSHNER, *Rollins School of Public Health, Emory University, Atlanta, Georgia*

**INFERTILITY IN THE MODERN WORLD: PRESENT AND FUTURE PROSPECTS. *Based on a symposium held in Cambridge, United Kingdom, May 1998. Biosocial Society Symposium Series, Volume 12.***

*Edited by Gillian R Bentley and C G Nicholas Mascie-Taylor. Cambridge and New York: Cambridge University Press. \$69.95. xii + 264 p; ill.; index. ISBN: 0-521-64364-3 (hc); 0-521-64387-2 (pb). 2000.*

This book is definitely worth reading because it deals with timely, interesting, and important subjects, including the ways in which biology and culture affect human fertility and how modern technology is used to treat infertility. The volume includes an introduction (Chapter 1) and three parts, each containing two chapters. Part I deals with biomedical perspectives on fertility and consists of chapters on reproductive possibilities for infertile couples and genetic influences on human infertility. These two chapters nicely complement each other because one discusses the genetic causes of infertility that often require couples to seek the treatments described in the other. The

second part deals with environmental influences on fertility and consists of a chapter on environmental pollutants and one that covers sexual transmitted disease (STD) epidemics and AIDS, with a sociodemographic and epidemiological perspective on sub-Saharan Africa. The former chapter is extremely timely because much attention has been focused on the potential for environmental chemicals to adversely affect fertility in recent years. It clearly presents the strengths and limitations of the currently available data. The latter chapter is important because it concentrates on infertility in a geographic region with the highest reported incidence of STDs (i.e., sub-Saharan Africa) and presents information on how sociocultural, historical, and behavioral circumstances have led to the spread of STDs in this region. Part III deals with social perspectives on infertility and consists of a chapter on voluntary childlessness and another on sexual orientation and fertility. The former is particularly unique because it presents both qualitative and quantitative data on the numbers of couples who voluntarily elect to remain childless and on the reasons for their decision. The latter also is unique because it is one of the few articles that present data on infertility among gays and lesbians.

Taken together, the well-written chapters in this book provide useful, current, and comprehensive information for physicians, students, teachers, and laics.

JODI ANNE FLAWS, *Epidemiology & Preventive Medicine, School of Medicine, University of Maryland, Baltimore, Maryland*

#### FUNCTIONAL NEUROBIOLOGY OF AGING.

*Edited by Patrick R Hof and Charles V Mobbs. San Diego (California): Academic Press. \$169.95. xxvii + 960 p + 23 pl; ill.; index. ISBN: 0-12-351830-X. 2001.*

Until the publication of the current book there has not been a comprehensive resource on this topic. The title reflects the emphasis of the volume on vulnerable neurobiological functions, and its organization is based on four major functions (memory, senses, locomotion, and homeostasis). Each of the 64 chapters is written by one or more leading investigators. For the most part, the chapters provide timely and thorough reviews of their topic area, although in some instances the content is primarily the research and opinion of the contributing author. Overall, the editors have succeeded in presenting a thorough survey of the neurobiological alterations associated with aging and late-onset neurodegenerative disorders.

A major strength of this volume is the clear distinction between neurobiological changes that occur during "usual" aging and the alterations asso-

ciated with age-associated neurological diseases and disorders. Memory impairment and Alzheimer's disease are covered in some detail, in addition to vascular dementia, frontotemporal dementias, progressive supranuclear palsy, Huntington's disease, Parkinson's disease, and other disorders with Lewy bodies. Other topic areas include brain aging in primates, dogs, and rodents; brain energy metabolism; auditory, visual, and olfactory impairment; thermoregulation; neuroendocrine changes and reproduction; glucocorticoid secretion; and the aged sympathetic nervous system. The Foreword, contributed by Caleb Finch, provides an excellent historical perspective on previous landmark publications relating to the present volume.

Given the need for such a book and its many strengths, the weaknesses are very minor. One such weakness is the chapter organization. Discussions of Alzheimer's disease are scattered throughout the book, even though a subsection entitled Alzheimer's Disease is indicated in the Table of Contents. Similarly, two chapters on receptor alterations appear in completely different sections. Although more information on cellular and biochemical mechanisms underlying the age-related alterations in neuronal function would have been welcome, it is difficult to see how the editors could have squeezed more information into this volume. This is an excellent reference for an academic course and will also find a prominent spot on the bookshelf of researchers and clinicians working on the neurobiology of aging and related diseases.

JAMES W GEDDES, *Sanders-Brown Center on Aging, University of Kentucky, Lexington, Kentucky*



#### BIOMEDICAL SCIENCES

##### EXPLORING THE BIOMEDICAL REVOLUTION: A LOOK AT THE WORK OF FRONTLINE SCIENTISTS AND HOW THEY ARE CHANGING MEDICINE.

*Edited by Myna Pines. Chevy Chase (Maryland): Howard Hughes Medical Institute; distributed by Johns Hopkins University Press, Baltimore (Maryland). \$19.95 (paper). ix + 432 p; ill.; index. ISBN: 0-8018-6398-8. [Stereo Viewer included.] 1999.*

For high school and college science students, this book offers an enticing introduction to recent biomedical research. It is not a textbook and is not intended to present subjects in detail or to cover a specific curriculum in a balanced fashion. Its strength is in presenting a few highly complex subjects in an appealing format through carefully

crafted stories written by some of the best science writers in the United States. The stunning photography and graphics—all carefully vetted by Howard Hughes Medical Institute (HHMI) scientists—are designed to teach additional information, not just illustrate the written word. A stereo viewer is even included to permit students to see protein images in three dimensions. Teachers are provided with a classroom guide that includes inquiry-based activities, mini-laboratory investigations, and evaluation instruments, complete with grading rubrics. The entire package is affordable for most students as individual buyers or for school systems in bulk.

The book was compiled from seven HHMI reports to the public over the past decade. In the first section, *Blazing a Genetic Trail*, Maya Pines (general editor and principal writer) leads readers through basic concepts in genetics via a story about one researcher who sought to understand his own genetic disease, cystic fibrosis. Later articles in that section discuss mice models and knockout genes, and provide a description of how family studies help to locate disease genes that can be studied in the laboratory and may one day provide the basis for successful gene therapy. Another section of the book addresses the genetics of embryological development and molecular neurology. A section on blood includes a discussion of stem cells, mutated hemoglobin genes and the diseases they can produce and, again, the promise of gene therapy. Two sections deal with infectious diseases and molecular immunology. The final chapter focuses on the tools (such as x-ray crystallography) that made the molecular revolution possible.

My only complaint about the book is its weight, which at three pounds seems on the heavy side for student backpacks. As supplementary classroom material, however, this book should be a teacher's delight. It demonstrates what an exceptionally fine learning tool a well-endowed philanthropy can produce. Other scientific and humanistic disciplines should hope to find so generous a patron to help introduce the intellectual rewards of research to students.

VICTORIA A HARDEN, *DeWitt Stetten, Jr.*, Museum of Medical Research, National Institutes of Health, Bethesda, Maryland

PROSTATE CANCER: BIOLOGY, GENETICS, AND THE NEW THERAPEUTICS. *Contemporary Cancer Research.*

*Edited by Leland W K Chung, William B Isaacs, and Jonathan W Simons. Totowa (New Jersey): Humana Press. \$145.00. xviii + 531 p; ill.; index. ISBN: 0-89603-868-8. 2001.*

This book is dedicated to Don Coffey, a pioneer and devoted investigator in the field of prostate cancer. The breadth and depth of the various top-

ics covered are true testimonies to Coffey's contributions and to the recent progress in the field. Overall, the editors have done a remarkable job in selecting the topics and compiling the various articles into a comprehensive and easily accessible volume. The chapters are concise and informative, covering highly innovative studies being conducted in the field in recent years.

The articles are arranged in four sections. Following an introduction, the second section is devoted to the genetic basis of prostate cancer. This section provides a comprehensive review of the current understanding of the molecular genetics of prostate cancer. The book reviews current efforts to identify prostate cancer susceptibility genes and provides updates on other genetic alterations that are likely to play a significant role in the development of prostate cancer. The next section focuses on the basic biology of the disease and the mechanisms that control prostate cancer growth and progression. Among the topics included are the roles of the nuclear matrix and cytoskeleton in prostate cancer, cell adhesion molecules, angiogenesis, and stromal-epithelial interaction. Other articles review the role of the androgen receptor in the development of androgen-independent cells, the role of caveolin, and other cellular pathways in prostate tumorigenesis. The final section deals with a variety of therapeutic approaches to combat prostate cancer including surgical, chemo-, immuno-, and gene therapy. Overall, the complexity of prostate cancer biology is well represented in the book, and the resourceful information can benefit not only those who are interested in prostate biology, but also those researchers employing molecular and cellular approaches to solve other important biological questions.

YAACOV HOD, *Prostate Cancer Research Center and Urology, State University of New York, Stony Brook, New York*

SIGNALING NETWORKS AND CELL CYCLE CONTROL: THE MOLECULAR BASIS OF CANCER AND OTHER DISEASES. *Cancer Drug Discovery and Development, Volume 5.*

*Edited by J Silvio Gutkind. Totowa (New Jersey): Humana Press. \$165.00. xiv + 578 p; ill.; index. ISBN: 0-89603-710-X. 2000.*

In the course of the last decade, the scientific discipline known as signal transduction, which describes how cells recognize and respond to environmental signals, has rapidly emerged from the "black box" era to a mature, sophisticated science. How far we have come is made evident in this volume, which describes aspects of signal transduction as diverse as the basics of receptor tyrosine

kinases and cell cycle checkpoints to the more recently developed areas such as sphingolipid signaling and the role of oxidative species in mitogenesis. Although it is impossible to cover every important aspect of signal transduction in a single volume, the range of topics included in this book is impressive, and I believe it will be a standard reference in the field for some years to come.

This volume works well on many levels. For graduate students struggling to assimilate the large body of signaling literature, the first half of the book offers what amounts to a comprehensive review of the most basic aspects of signal transduction. For experts, these same chapters serve as a point of departure for the second half, which deals with the emerging body of literature on how one can manipulate signaling pathways in the treatment of disease. It is the combination of basic and applied aspects of signal transduction that makes this book unique.

A few minor quibbles are inevitable. In all but a few chapters, the most recent references date from 1998; already an eternity in such a rapidly evolving field. As a result, some important areas have been shortchanged, such as the omission of a chapter on protein tyrosine phosphatases and the tumor suppressor phosphatase (PTEN). Nevertheless, the editor has done a remarkable job in selecting and assembling reviews from experts in signal transduction, and for presenting such a lucid discussion of this complex field.

JONATHAN CHERNOFF, *Molecular Oncology, Fox Chase Cancer Center, Philadelphia, Pennsylvania*

ANNUAL REVIEW OF BIOMEDICAL ENGINEERING. *Volume 3: 2001.*

*Edited by Martin L Yarmush, Kenneth R Diller, and Mehmet Toner. Palo Alto (California): Annual Reviews. \$65.00. xxxix + 486 p + 15 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 1-3). ISBN: 0-8243-3503-1. 2001.*

PRINCIPLES OF IMMUNOPHARMACOLOGY.

*Edited by F P Nijkamp and M J Parnham. Basel (Switzerland) and Boston (Massachusetts): Birkhäuser Verlag. DM 138.00. xvi + 496 p; ill.; subject index. ISBN: 3-7643-5780-0 (Basel); 0-8176-5780-0 (Boston). 1999.*

The field of immunology has undergone rapid and fundamental advances over the past several years. Accordingly, this maturation has spawned new sub-disciplines. The current book effectively integrates knowledge in basic and applied immunology with the emerging disciplines of immunodiagnostics

and immunotherapeutics. The volume contains 26 chapters (each written by different authors) that are organized into four sections: Mechanisms of immunity, Immunodiagnosis, Immunotherapeutics, and Immunotoxicology. The book generally is well written, but since it is a multiauthored volume, the quality of individual chapters ranges from adequate to outstanding. One particularly useful detail is that keywords (in large, bold print) are offset in the margins next to where major concepts are introduced.

The first section, Mechanisms of immunity, contains 12 chapters and is an excellent, succinct review of basic and applied immunology. The Immunodiagnosis section contains three chapters that describe methods of antibody detection, immune diagnosis of leukemias and lymphomas, and immunoassay development and protocols. The primary focus of this book is contained within the Immunotherapeutics section (ten chapters), which describes what one would think of as immunopharmacology (i.e., vaccines, immunotherapy, and immunostimulatory and immunosuppressive agents and their effectiveness in certain diseases). The final section, Immunotoxicology, is composed of one chapter that probably could have been incorporated into the previous section.

This book is intended as a general reference for physicians, scientists, and students who already have at least a basic understanding of immunology. It is a unique volume that would be a worthwhile acquisition for anyone with an ardent interest in immune therapy. The only critique is that the information is more than two years old and, therefore, very recent advances obviously have not been included. Nevertheless, this is an excellent volume that will be useful for several years to come.

RICHARD R KEW, *Pathology, State University of New York, Stony Brook, New York*

IMMUNOSTIMULATORY DNA SEQUENCES.

*Edited by Eyal Raz. Berlin and New York: Springer. \$90.00. viii + 183 p; ill.; no index. ISBN: 3-540-67749-6. 2001.*

IMMUNOCYTOCHEMISTRY AND IN SITU HYBRIDIZATION IN THE BIOMEDICAL SCIENCES.

*Edited by Julian E Beesley. Boston (Massachusetts): Birkhäuser. \$69.95. xi + 267 p; ill.; index. ISBN: 0-8176-4065-7. 2001.*

Immunocytochemistry and in situ hybridization continue to be important methodologies in basic and applied biomedical sciences. This slim volume is intended to fulfill a need in the research community for ready access to information related to



these techniques. The book is separated into 11 chapters, each prepared by a different set of authors. There are chapters devoted to various aspects of immunocytochemistry, including specimen preparation, general principles of immunocytochemistry, and antigen retrieval. Likewise, the general principles of *in situ* hybridization are discussed. Chapters dealing with fluorescence-based *in situ* hybridization and signal amplification through *in situ* PCR are included. Other chapters are devoted to image analysis and quantitative immunocytochemistry, laboratory safety, and applications of affinity labeling.

The book does not have a unified format, instead each of the chapters reflects the styles of the different contributing authors. Some chapters provide greater amounts of background information, while others are primarily methodological, with step-by-step protocols. The illustrations are generally of high quality. This volume will be most useful to new investigators or nonspecialists who are seeking a quick introduction to techniques related to immunocytochemistry and *in situ* hybridization. Viewed in that light the book is successful.

JOHN M ROBINSON, *Physiology & Cell Biology, Ohio State University, Columbus, Ohio*

#### PREVENTIVE MANAGEMENT OF CHILDREN WITH CONGENITAL ANOMALIES AND SYNDROMES.

By Golder N Wilson and W Carl Cooley. Cambridge and New York: Cambridge University Press. \$74.95 (paper). xxvi + 538 p + 8 pl; ill.; index. ISBN: 0-521-77673-2. [CD-ROM included.] 2000.

This is intended as a reference manual for general pediatricians who follow, in their general practice, children with congenital anomalies or genetic syndromes. Although most of these children are evaluated on a regular basis by specialists appropriate to their disorder, ongoing general pediatric care must still continue, and the generalist must often struggle to locate basic data about the congenital disorder. Wilson and Cooley have tried to remedy this situation for the generalist in this volume. As the title states, their goal is the prevention of complications that may arise in these conditions. Since pediatricians are the professionals most apt to have an overview of the patient's care, they are in the best position to coordinate preventive measures for their patients. This requires, however, that they be well informed about the specifics of congenital anomalies and syndromes that they will rarely see in their practice. Based on frequency, the authors have chosen 120 disorders, with the 30 most common ones discussed in greater detail. The generalist only has to look up the syndrome, read the appropriate information, and, if it is a more com-

mon disorder, copy the appropriate checklist for inclusion in the patient's chart. The checklists are also available to download from a CD-ROM that is included with the book. This is a very handy feature since the CD-ROM can simply be stored in a pocket within the book and can be utilized as soon as a need for one of these checklists arises. This manual also includes information about support groups relevant to the disorder and general resources for patients.

The authors have clearly given a lot of thought to their recommendations for prevention and acknowledge that their checklists do not take the place of good clinical judgment. The suggestions in this book have been reviewed by four additional clinicians in the fields of medical genetics, developmental pediatrics, and general pediatrics and incorporate the recommendations of The Committee on Genetics of the American Academy of Pediatrics. There is a comprehensive glossary covering basic to advanced terminology and 62 pages of references at the end of the book so that the clinician can read further on any given condition; key references are given on the first page of each checklist.

This volume is an excellent reference for general pediatricians who will treat at least a few children with congenital anomalies and syndromes during their career. The manual is both comprehensive and concise, and would be an excellent investment for any pediatrician. The accompanying CD-ROM is a real boon.

ANN CARLSON, *Pediatrics, Weill Medical College, Cornell University, New York, New York*

#### HUMAN GROWTH HORMONE: RESEARCH AND CLINICAL PRACTICE. *Contemporary Endocrinology, Volume 19.*

Edited by Roy G Smith and Michael O Thoner. Totowa (New Jersey): Humana Press. \$135.00. x + 348 p; ill.; index. ISBN: 0-89603-505-0. 2000.

This is a comprehensive review of recent research on regulatory peptides and receptors that are involved in the control of growth hormone (GH) secretion and well as the use of GH and GH secretagogues in various clinical disorders. The editors represent a hybrid dimer of a basic scientist and a clinical investigator, both highly qualified in their respective fields, and the text reflects this quality. The varied contributions are quite detailed, with excellent, up-to-date references. This textbook will be of prime interest to endocrinologists, gerontologists, and those wishing to have ready access to a review of the most current literature in this field.

Following an introductory overview, the book is separated into two parts. The first part (Research) details in considerable depth the advances that

have been made in the understanding of the regulation of growth hormone (GH) secretion, and its mechanism of action at the cellular level. Topics include a detailed historical perspective of GH Releasing Peptides (GHRPs) by Bowers, followed by chapters dealing with the development of new peptidomimetic GH secretagogues, the molecular characterization of GH secretagogues receptors, identification of central actions of peptide and nonpeptide GH secretagogues, and the pharmacology of GH Releasing Hormone (GHRH) and its peptide analogues. This section concludes with a novel summary of the evidence for the Central Nervous System (CNS) as a direct target for GH action.

Part II, Clinical Practice, reviews selected clinical topics including the relevance of GH administration in pediatric and adult subjects with GH deficiency, currently approved indications, and proposed use in adults with osteoporosis, Syndrome X, AIDS, and in aging subjects with sleep disorders. Chapter 13 provides a particularly balanced approach to the use of GH in adults. The book concludes with separate chapters that present the potential (not yet realized) clinical application of GHRH and GH secretagogues. All chapters in this part provide current and comprehensive clinical information with extensive references.

HARVEY J GUYDA, *Pediatrics, Montreal Children's Hospital, McGill University, Montreal, Quebec, Canada*

ANNUAL REVIEW OF NUTRITION. *Volume 21: 2001.*  
*Edited by Donald B McCormick, Dennis M Bier, and Robert J Cousins. Palo Alto (California): Annual Reviews. \$65.00. xiv + 529 p + 6 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 17-21). ISBN: 0-8243-2821-3. 2001.*

HEARING: ITS PHYSIOLOGY AND PATHOPHYSIOLOGY.  
*By Aage R Møller. San Diego (California): Academic Press. \$79.95. xvi + 515 p; ill.; index. ISBN: 0-12-504255-8. 2000.*

This textbook attempts to help prepare clinicians, clinical researchers, and basic scientists in the many fundamental concepts of auditory physiology, and their relevance to pathophysiology. The author is a highly-regarded basic researcher as well as an experienced clinician, so his treatment of complex physical and measurement concepts (such as impedance) can be relied upon as useful introductions that often make quantitative as well as intuitive sense.

The book contains four sections that discuss the ear, auditory nervous system, acoustic reflexes, and disorders of the auditory system and their pathophysiology. Chapters begin with an abstract in the form of numbered summary points, but lack a conclusions section. References are numbered, pointing to several sectional bibliographies. This, and the lack of reference dates in the text, are mildly annoying. Historical summaries of basic phenomena and their measurement (e.g., brainstem auditory evoked potentials) are unusual and valuable. Most of the figures are reprinted from the experimental literature (some are not well reproduced) that require readers to pay close attention in order to completely decode and relate them to the text. Chapters on physiology of the auditory central nervous system emphasize the old, yet still present, controversy over spatial versus temporal representations and computations underlying frequency analysis.

I recommend this book as an introduction to auditory physiology for new basic researchers because of its general competence and its emphasis on the clinical issues that are the foundation for much of the research funding available in this field. For clinicians and clinical researchers, the book offers what are at times rather deep and uneven excursions into systems-level physiology and measurement issues. The book is notably "light" on the concepts of modern molecular and cell biology. I do not believe, however, that this is a critical omission because new scientists and practitioners in this field tend to be more knowledgeable about molecular biology than the systems physiology of hearing.

RICHARD R FAY, *Parmly Hearing Institute and Psychology, Loyola University Chicago, Chicago, Illinois*



DE OMNIBUS REBUS ET QUIBUSDAM ALIIS

DYNAMIC MODELING. *Second Edition. Modeling Dynamic Systems.*

*By Bruce Hannon and Matthias Ruth; Foreword by Donella H Meadows. New York: Springer. \$64.95. xviii + 409 p; ill.; index. ISBN: 0-387-98868-8. [Includes CD-ROM.] 2001.*

An introductory remark such as: "virtually anyone can explore the nature of complex systems and their dynamic behavior" (p vii) is unlikely to win plaudits from researchers who have devoted much of their lives to modeling complex systems and know how difficult it is. The adage "rubbish-in,

rubbish-out" still describes too much of current modeling efforts. The problem of complex system modeling is not so much the modeling per se (which, as the authors remark, is much facilitated by software), but understanding the subject well enough to make happy approximations, giving models that say something useful. In my own field, plant ecosystem modeling, relevant sciences cover a wide spectrum. Besides the authors, virtually no one can investigate such systems single-handedly, and we have not yet learned how to build effective teams. *Dynamic Modeling* gives an overblown view of modeling. It is written in a style that may irritate.

The book comprises eight parts, with 38 chapters. It is based on STELLA modeling software and a CD-ROM is provided. Parts 1 and 2 introduce STELLA and modeling methodology. Parts 3 and 4 present three chemistry and three genetics models. Nine ecological models are described in Part 5, followed by 12 economic models in Part 6, three engineering models in Part 7, and the final part discusses chaos.

Not unexpectedly, STELLA did not always do as expected. The version provided had no help facility and it was not possible to create and save new models—even the small exercise models of the text. The treatment is rather labored, as is setting up a model in STELLA. Grasping that rate of change of a stock = inputs – outputs, and that inputs/outputs depend generally only on stock levels and parameters, is the key modeling concept. The STELLA approach of “convertors” and “connectors” may obscure matters rather than elucidate them. The notion that a software package can

substitute for comprehending the quite elementary mathematics of dynamic modeling is perhaps an illusion. The use of upper-case text and figures without legends may also be uncomfortable. The text is not free from errors.

The goal of the book is to be educational. A valuable range of simple models is discussed. Any beginning modeler who works through these examples will have an excellent base for constructing more realistic, and usually more complex, models. It is a matter of taste if a reader is comfortable with STELLA. A serious student would require the full version. An alternative presentation could significantly condense the book; brevity and clarity often go together. Dynamic modeling is very “standard” mathematics indeed. There is modeling software—Advanced Continuous Simulation Language (ACSL)—that, if one can write down the rates of change for each stock (or state variable), give expressions for the flows (inputs, outputs), and specify initial values and parameters, then the program is practically specified.

J H M THORNLEY, *Centre for Ecology & Hydrology, Edinburgh, United Kingdom*

IMAGE PROCESSING AND ANALYSIS: A PRACTICAL APPROACH. *The Practical Approach Series.*

*Edited by Richard Baldock and Jim Graham. Oxford and New York: Oxford University Press. \$120.00 (hardcover); \$60.00 (paper). xx + 301 p; ill.; index. ISBN: 0-19-963701-6 (hc); 0-19-963700-8 (pb). 2000.*

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- Prometheus Books, 59 John Glenn Drive, Amherst NY 14228-2197; 716-691-0133; 800-421-0351; [www.prometheusbooks.com](http://www.prometheusbooks.com).
- Radcliffe Medical Press, 18 Marcham Road, Abingdon, Oxon OX14 1AA, United Kingdom; +44 1235 528820; [www.radcliffe-oxford.com](http://www.radcliffe-oxford.com).
- Regnery Publishing, 1 Massachusetts Avenue NW, Washington DC 20001; 202-216-0600; 888-219-4747; [www.regnery.com](http://www.regnery.com).
- Science Publishers, P O Box 699, May Street, Enfield NH 03748; 603-632-7377; [www.scipub.net](http://www.scipub.net).
- Sheffield Academic Press, Mansion House, 19 Kingfield Road, Sheffield S11 9AS, United Kingdom; +44 114 255-4433; [www.shaf-ac-press.co.uk](http://www.shaf-ac-press.co.uk).
- Simon & Schuster, 1230 Avenue of the Americas, New York NY 10020; 212-698-7000; 800-223-2348; [www.simonsays.com](http://www.simonsays.com).
- Sinauer Associates, P O Box 407, 23 Plumtree Road, Sunderland MA 01375-0407; 413-549-4300; [www.sinauer.com](http://www.sinauer.com).
- Smithsonian Institution Press, 750 Ninth Street NW, Suite 4300, Washington DC 20560-0950; 202-275-2300; 800-782-4612; [www.si.edu/organization/offices/sipress](http://www.si.edu/organization/offices/sipress).
- Springer, 175 Fifth Avenue, New York NY 10010; 212-460-1500; 800-777-4643; [www.springer-ny.com](http://www.springer-ny.com).
- T & A D Poyser, 24-28 Oval Road, London NW1 7DX, United Kingdom; +44 171 4244200; [www.apnet.com](http://www.apnet.com).

- Texas A&M University Press, Drawer C, College Station TX 77843-4354; 409-845-1436; 800-826-8911; [www.tamu.edu/upress](http://www.tamu.edu/upress).
- Timber Press, 133 SW Second Avenue, Suite 450, Portland OR 97204-3527; 503-227-2878; 800-327-5680; [www.timber-press.com](http://www.timber-press.com).
- UBC Press, University of British Columbia, 2029 West Mall, Vancouver, British Columbia, V6T 1Z2, Canada; 604-822-5959; 800-663-8583; [www.ubcpres.ubc.ca](http://www.ubcpres.ubc.ca).
- University of California Press, 2120 Berkeley Way, Berkeley CA 94720; 510-642-4247; 800-777-4726; [www.ucpress.berkeley.edu](http://www.ucpress.berkeley.edu).
- University of Chicago Press, 1427 East 60th Street, Chicago IL 60637-2954; 773-702-7700; 800-621-2736; [www.press.uchicago.edu](http://www.press.uchicago.edu).
- University of Otago Press, 56 Union Street, P O Box 56, Dunedin, New Zealand; +64 3 479-8807.
- University Press of Florida, 15 NW 15th Street, Gainesville FL 32611-2079; 352-392-1351; 800-226-3822; [www.upf.com](http://www.upf.com).
- University Press of Kansas, 2501 West 15th Street, Lawrence KS 66049; 785-864-4155; [www.kansaspres.ku.edu](http://www.kansaspres.ku.edu).
- W. H. Freeman and Company, 41 Madison Avenue, New York NY 10010; 212-576-9400; 800-877-5351; [www.whfreeman.com](http://www.whfreeman.com).
- W. W. Norton, 500 Fifth Avenue, New York NY 10110; 212-354-5500; 800-233-4830; [www.wwnorton.com](http://www.wwnorton.com).
- Weidenfeld & Nicolson, The Orion Publishing Group, Orion House, 5 Upper Saint Martin's Lane, London WC2H 9EA, United Kingdom; +44 171 2403444.
- Wiley, 605 Third Avenue, New York NY 10158-0012; 212-850-6000; 800-225-5945; [www.wiley.com](http://www.wiley.com).
- Yale University Press, 302 Temple Street, New Haven CT 06511; 203-432-0960; 800-987-7323; [www.yale.edu/yup](http://www.yale.edu/yup).
- Zed Books, 7 Cynthia Street, London N1 9JF, United Kingdom; +44 207 8374014; [www.zedbooks.demon.co.uk](http://www.zedbooks.demon.co.uk).