



## REVIEWS AND BRIEF NOTICES

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## HISTORY, PHILOSOPHY &amp; ETHICS

THE HUMAN EMBRYONIC STEM CELL DEBATE: SCIENCE, ETHICS, AND PUBLIC POLICY. *Basic Bioethics*.

*Edited by Suzanne Holland, Karen Lebacqz, and Laurie Zoloth. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$24.95 (paper). xxvii + 257 p; ill.; index. ISBN: 0-262-58208-2. 2001.*

The 20 essays in this collection provide a useful and compact summary of the major ethical and religious issues at play in the continuing national debate over human embryonic stem cell research. Since its publication, U.S. President George Bush has announced that the federal government will only fund human embryonic stem cell research that uses stem cells derived from embryos prior to August 9, 2001—the date of his speech on the subject. This means that federal involvement and oversight of this research will be extremely limited, and it can proceed virtually unimpeded in the private sector. This is, I believe, the worse possible public policy because the private sector has consistently demonstrated its almost total inability to restrain itself by any ethical standards of conduct. Indeed, it has been an implicit goal of the biotechnology industry to convince the public that government regulation is not needed, and the industry has recruited bioethicists to help. In this regard, the second subject of this book—the relationship of bioethicists and biotechnology corporations—is more compelling.

Two of the three editors served the Geron Corporation, which holds most of the patents on embryonic stem cell research, as members of its “Ethics Advisory Board.” This must (I assume) be why the first chapter is by the president of Geron. More remarkably, it is essentially a plea for the pub-

lic to support the company’s work. The concluding sentence says it all: “We believe that not to develop the technology would do great harm to over 100 million patients in the United States alone who are affected by diseases potentially treatable by the many applications of hES cells” (pp 11–12). This statement is ridiculous on its face, but is at least partially explained in the book’s final chapter by coeditor Zoloth. She paints an unpretty picture of the corporate seduction and scientific dazzling of Geron’s Ethics Advisory Board, with courtship included, providing the ethicists with white coats and VIP tours of the company’s laboratories. This helped convince these bioethicists that if they “stop this research and defeat the scientific vision, we might be doing an unthinkable moral wrong” (p 229). It is easy to see what Geron gained by seducing these bioethicists; it’s much harder to understand why some good and decent ethicists continue to play a game that they have no chance to win.

GEORGE J ANNAS, *Health Law, School of Public Health, Boston University, Boston, Massachusetts*

## EVOLUTION’S WORKSHOP: GOD AND SCIENCE ON THE GALÁPAGOS ISLANDS.

*By Edward J Larson. New York: Basic Books. \$27.50. xiii + 320 p + 16 pl; ill.; index. ISBN: 0-465-03810-7. 2001.*

“How stupid of me not to have thought of that,” Thomas Huxley famously exclaimed after first reading Charles Darwin’s *Origin of Species*. Historians of science will understand this sentiment after encountering Edward J Larson’s superb new book. The author intrepidly explores this distinctive archipelago’s history, and discovers an arena where the grand interlocking historical dramas of sci-

ence, religion, and nature were played out in microcosm. In retrospect, Larson's topic holds such obvious promise that it is surprising that no one had thought of it before.

The current book lacks the *Origin's* revolutionary import, of course, but, like Darwin's classic, it demonstrates that the true test of a penetrating insight is in its extension and application. Larson, a Pulitzer Prize winner for *Summer for the Gods: The Scopes Trial and American's Continuing Debate over Science and Religion* (1997. New York: Basic Books), employs meticulous and far-ranging research, judicious historical judgment, and graceful prose to tell the story not just of an archipelago, but of four centuries of natural history. These islands do not just offer naturalists a laboratory for studying evolutionary mechanisms and dynamics; they also allow historians to observe broad developments in the perception of nature as they unfold at the crossroads of science and religion. The book's title carries a double meaning: the Galápagos are not just a "workshop" where the mechanisms of nature shape life, but also where scientists strive to understand those mechanisms.

The last 200 years have witnessed dramatic changes in the study of life, changes both reflected and influenced by the Galápagos. No two visitors see exactly the same thing, because no two bring the same agenda or understanding of nature. Where Herman Melville shuddered at inhuman desolation, Elizabeth and Louis Agassiz celebrated the benign handiwork of the Christian God. Perceptions changed as naturalists slowly and painfully abandoned their understanding of nature as a bounty bestowed by a beneficent god in favor of Darwin's indifferent, impersonal, mechanical universe. Visions of the Galápagos have varied with the shifting intellectual and cultural authority of the museum, the field, and the laboratory. A site for yachting holidays for the adventurous rich has become a haven for popular ecotourism. The islands have accommodated vastly different visions of themselves, and of nature—but they simultaneously challenge these visions. Perceptions of the Galápagos are not all equally accurate, sensitive, or honorable, of course, but, as Larson shows, no single one will ever entirely domesticate this phenomenal landscape. The Galápagos will always be contested intellectual terrain, which is why they remain (in the words of World Wildlife Fund chief scientist, Eric Dinerstein) "sacred, a cradle of modern thought" (p 241).

An unexpectedly rich and voluminous literature on the Galápagos, spanning several centuries, provides the foundation for a book that will satisfy both scholarly specialists and casual readers. An edited anthology of this wonderful writing on the

Galápagos would earn Larson even more well-deserved applause.

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

LORDS OF THE HARVEST: BIOTECH, BIG MONEY, AND THE FUTURE OF FOOD.

By Daniel Charles. Cambridge (Massachusetts): Perseus Publishing. \$27.00. xix + 348 p + 8 pl; index. ISBN: 0-7382-0291-6. 2001.

Will genetically engineered crops conquer hunger while saving the environment? Or will they poison humanity, destroy ecosystems, and undermine the global food supply? Daniel Charles's refreshingly balanced book wisely rejects this false dichotomy. The result is an entertaining and informative look at the interplay among science, industry, and public policy.

In contrast to most media coverage of agricultural biotechnology—which tends to be superficial and polemical—this book provides the perspective that readers will need to appreciate the fervor of biotech proponents and critics. In journalistic fashion, the volume traces the origins of genetically modified crops that grow now on millions of acres in the United States and elsewhere. Major coverage is devoted to transgenic crops that either resist herbicides or produce toxins from *Bacillus thuringiensis* (Bt) to control insect pests. The focus is on the pivotal scientific discoveries, commercial battles, and controversies. The book explains not only how genes are transferred into plants, but more importantly, why.

Charles creates a lively narrative, which emphasizes the ambitions, ideals, and personalities of the major actors in the story. His tale illustrates human foibles, as well as noble dreams of making a better world. He describes quirky inspiration, cutthroat scientific competition, corporate arrogance, and fear-mongering environmentalism. This approach is compelling, but some sections seem to be overly dramatized.

I recommend the book to readers who want to better understand the implications of transgenic crop plants. Technical knowledge of biology is not required. I particularly enjoyed the epilogue, which begins: "*Are genetically engineered foods safe to eat? Do they harm earth's environment?*" These questions, which dominate all current discussions of genetically engineered foods, masquerade as simple questions of fact. In truth, they are nothing of the sort" (p 303). Charles explains that deeply held beliefs command judgments about this new technology, while evidence is secondary. This valuable lesson transcends the specific issues at hand.

BRUCE E TABASHNIK, *Entomology, University of Arizona, Tucson, Arizona*

## STEPHEN FORBES AND THE RISE OF AMERICAN ECOLOGY.

By Robert A Croker. *Washington (DC): Smithsonian Institution Press.* \$39.95. ix + 232 p + 12 pl; ill.; index. ISBN: 1-56098-972-6. 2001.

No understanding of science can be complete without exploring the lives and works of its early advocates. Stephen Alfred Forbes (1844–1930) became one of the most influential American naturalists of his time and a strong proponent of the nascent field of ecology. His 1887 essay, *The Lake as a Microcosm*, remains a classic for contemporary graduate courses in ecology. Croker draws upon a wealth of primary sources to recreate Forbes's life and work, beginning with his family's genealogy as well as detailed land records, and moving to his formative years as a soldier in the Civil War. The remainder of the book turns to his major scientific initiatives and achievements in biology.

Forbes joined the Union Army at 17, fought men with weapons and boredom with books, and emerged convinced he must continue to serve the greater good of his country through public service. Following the war he trained first in medicine, but found himself increasingly drawn to natural history, eventually realizing his true calling in teaching and studying the natural sciences. Over a 60-year career he carried out science in service to the public in his pioneering work in economic entomology, aquatic biology, and natural resource management. Among many accomplishments, Forbes created the first freshwater river biological station in the U.S., became first Chief of the Illinois Natural History Survey, and was elected to the National Academy of Sciences. Forbes built a constituency to support his science through his abiding concern for the application of science to the welfare of man. The thorough treatment of Forbes's productive scientific life adds insight into the development of American science and is essential for those who wish to understand the formation of early ecology. The 23 black-and-white photographs and detailed bibliography add to the richness of this biography.

SARA TJOSSSEM, *History and Program on the Environment, University of Washington, Seattle, Washington*

WHY ANIMAL EXPERIMENTATION MATTERS: THE USE OF ANIMALS IN MEDICAL RESEARCH. *New Studies in Social Policy, Number 2.*

Edited by Ellen Frankel Paul and Jeffrey Paul. *New Brunswick (New Jersey) and London (UK): Transaction Publishers.* \$49.95 (hardcover); \$24.95 (paper). ix + 224 p; ill.; index. ISBN: 0-7658-0025-X (hc); 0-7658-0685-1 (pb). 2001.

The title announces that this collection of essays is not intended to be a balanced review of opposing ethical views. The goal, as presented in coeditor

Ellen Frankel Paul's introduction, is to provide scientific, philosophical, and historical arguments for the indispensability of animal experimentation by "our ingenious, dedicated, and compassionate research scientists" (p 3). It should appeal to biologists seeking to justify their own use of animals, or who are contemplating starting research studies using animals.

Most of the authors are philosophers or ethicists. Their arguments center on whether animals have rights or moral relevance, and the degree to which human wants outweigh animal needs. The strongest statement comes from H Tristram Engelhardt, Jr, who states that animals have rights: they have the right to be used by humans and "have a special right to be the object of the culinary arts of Chinese and French chefs" (p 178). Baruch A Brody seeks a formula balancing animal and human concerns, and contrasts U.S. and European approaches in deriving such a formula. Several writers, particularly R G Frey, address the problem of justifying human use of animals without relying on "speciesism" or a higher power. Jerrold Tannenbaum discusses the conceptual and practical implications of a recent belief, supported by many researchers and regulators, that animals are entitled to "happiness" and "enrichment."

Neuroscientists Stuart Zola and Adrian R Morrison take a personal approach. Zola stresses the continuity between basic and applied research. Morrison describes his opposition to the animal rights movement. Both review the importance of animal studies in advancing human medicine and provide examples from their own research.

All of the essays endorse animal research, but only two attempt to provide the answer implied in the title. Nicoll and Russell see animal research as an evolutionary necessity. Historians Kiple and Ornelas review the expanding role of animals in medical progress, and extrapolate its necessity in the future. This is the most compelling argument for *Why Animal Experimentation Matters*.

HARRY KLEMFUSS, *Animal Subjects Program, University of California, San Diego, La Jolla, California*

## CAMBRIDGE SCIENTIFIC MINDS.

Edited by Peter Harman and Simon Mitton. *Cambridge and New York: Cambridge University Press.* \$60.00 (hardcover); \$22.00 (paper). viii + 343 p; ill.; no index. ISBN: 0-521-78100-0 (hc); 0-521-78612-6 (pb). 2002.

The first thing I did when I received this book was to check the index for my favorite Cambridge scientists—Frank Balfour, Michael Foster, Adam Sedgwick (the zoologist, not the geologist), and Dorothy Hodgkin. But the book does not include an index. Now, I have argued before that authors and editors who produce scholarly or reference books without

an index should be shot. I admit this may be extreme. In a book that is biographical and organized around chapters on key individuals (e.g., Harvey, Whewell, Darwin, Maxwell, Turing, and Needham), an index is critical if you want to find those mentioned in chapters or the influence a Cambridge scientist had on many individuals in a field. Michael Foster and physiology being an obvious example.

All of the entries are written by specialists. Perutz wrote his own (but allowed an earlier piece to be included). The emphasis is very much biographical, including personal sketches of the authors. Of course, some favorite scientists will be omitted in such a book, while you wonder why others are included. Some, such as Charles Darwin, were minimally influenced by their short stay at Cambridge. It was just a happy accident that Henslow was at Cambridge; aside from Henslow's influence, Darwin appears to have loitered or spent his time sharpening his shooting skills. Stephen Hawking was in the same department as Paul Dirac for seven years, but never saw Dirac, who preferred to work at home. Only one woman is included, the mathematician Mary Cartwright. I would have included Dorothy Hodgkin and Rosalind Franklin. My bias also would have included the Noble Laureate Lord Rayleigh and his work in physics at the Cavendish, even though his tenure in the chair was short. His wife Evelyn (Balfour) published four papers with Rayleigh, including one that provided the most accurate measurement of the ohm, the unit of electrical resistance. The inclusion of Joseph Needham shows commendable respect for the breadth of impact of a scientific mind. I would also have included Arthur Balfour, whose influence on science in Britain may well be more long lasting than that of some of those individuals who are discussed.

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

THE CORRESPONDENCE OF CHARLES DARWIN. *Volume 12: 1864.*

*Edited by Frederick Burkhardt, Duncan M Porter, Sheila Ann Dean, Paul S White, Sarah Wilmot, Samantha Evans, and Alison M Pearn. Cambridge and New York: Cambridge University Press. \$80.00. xl + 694 p + 13 pl; ill.; index. ISBN: 0-521-59034-5. 2001.*

DARWIN'S MENTOR: JOHN STEVENS HENSLAW, 1796-1861.

*By S M Walters and E A Stow. Cambridge and New York: Cambridge University Press. \$59.95. xx + 338 p + 14 pl; ill.; index. ISBN: 0-521-59146-5. 2001.* The scientist who makes a major discovery or develops a major theory will likely find numerous biographers. The scientist who helps to shape a field in

other ways may be overlooked. The English botanist John Stevens Henslow was the latter sort of scientist. This deficiency in biographical attention has been remedied in this superb new study by Max Walters, formerly Director of the Botanic Garden at the University of Cambridge, and Anne Stow, a former Librarian of the Scientific Periodicals Library, also at Cambridge. Writing with economy and style, and providing pertinent illustrations throughout, they have given Henslow his due.

As a shaper of botany Henslow helped to dislodge the Linnaean method of plant classification in favor of the natural system espoused by the French. He promoted the study of plant physiology. Drawing on his Cambridge training in mathematics, Henslow also pioneered the statistical study of meristic variation in plants. As a shaper of institutions, Henslow cofounded the Cambridge Philosophical Society, was instrumental in reforming the University of Cambridge curriculum to place more emphasis on the sciences (the Natural Science Tripos was fully instituted in 1860), and established the Botanic Garden in Cambridge at its present location.

Yet it is as a shaper of individuals that Henslow did his greatest work. He was, of course, "Darwin's mentor." In that role, he taught Charles Darwin botany, introduced him to Adam Sedgwick who taught him some field geology, recommended Darwin for service on HMS *Beagle* in 1831 (after Henslow had turned down the offer himself), stored specimens for Darwin during the *Beagle* voyage, and described some of Darwin's plant specimens from the Galápagos Islands (one of the best photographs in the book is of Darwin's Galápagos fern specimens mounted according to Henslow's specifications). An ordained Anglican priest, he also served as the young Darwin's model for how one might pursue a joint vocation, should it have proven necessary for Darwin to follow the course his father had laid out for him. In June 1860, Henslow assumed a new role, as Darwin's protector, for he chaired the session of the British Association for the Advancement of Science at which Darwin's *Origin of Species* (1859) was debated. According to the botanist Joseph Hooker, refusing to allow mere declamations, Henslow "would have none speak but those who had arguments to use" (p 172). Henslow died the following year, as firmly loyal to Darwin in 1861 as he had been 30 years earlier.

SANDRA HERBERT, *History, University of Maryland, Baltimore County, Baltimore, Maryland*



## GENERAL BIOLOGY

**QUANTUM EVOLUTION: HOW PHYSICS' WEIRDEST THEORY EXPLAINS LIFE'S BIGGEST MYSTERY.**

By Johnjoe McFadden. New York: W. W. Norton. \$16.95 (paper). xiii + 338 p; ill.; index. ISBN: 0-393-32301-2. 2000.

This book is both a delightful flight across disciplines and the rigorous presentation of an astonishing thesis. The author's argument is a virtuoso performance, which incorporates quantum mechanics, nanotechnology, cellular biology, and evolutionary theory. Although McFadden's insights into the role of quantum mechanical measurement effects on cellular evolution were concurrent with those of other researchers, his book convincingly discusses more general topics.

As in other areas of study, the border between the domains of quantum and classical phenomena in biology must be bridged. McFadden presents an ingenious quantum mechanism whereby a directed process toward systems of greater organization works against the Second Law of Thermodynamics. As anyone familiar with quantum mechanics knows, explanations include a variety of theories from pilot waves to multiple universes, but McFadden's descriptions are models of lucidity. The state of a system prior to measurement is one of superposition where all possibilities exist. Measurement collapses the wave function, or probability distribution, so that only one alternative remains, namely what actually happened. The author attributes the important events in the evolution of peptides and enzymes, as well as the function of subatomic particles within cells to states that exist before the collapse of the wave function. Enzymes play a particularly significant role in intensively "measuring" activity that leads to the formation of more complex molecules. When quantum processes eventually produce a cell, McFadden turns to classical Darwinism to explain its further evolution.

The implications of his speculations concerning psychology are particularly interesting. By analogic reasoning, I had conjectured that awareness is the phenomenal experience of the body from within. McFadden's suggested mechanism for this is an electromagnetic field generated by the nervous system. I question the limitation of such a field to the brain and would welcome a discussion of how systems interact with external quantum fields. Nevertheless, this book is a masterpiece of logical syn-

thetic reasoning. *Quantum Evolution* can profitably be read both by professionals and the intellectually curious.

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**THE ENERGY OF LIFE: THE SCIENCE OF WHAT MAKES OUR MINDS AND BODIES WORK.**

By Guy Brown. New York: The Free Press. xv + 267 p; index. \$25.00. ISBN: 0-684-86257-3. [Originally published by HarperCollins Publishers, 1999.] 2000.

It has not been for many years, perhaps since undergraduate biochemistry, that I have thought deeply about the science of bioenergetics. Surprising perhaps, since every process of life, as well as death, requires a payment in energy, usually in the form of ATP. Phagocytosis, synthesis, catabolism, preservation of the genome, signal transduction, the morphogenesis of tissues and organs, even the initial steps of extracting energy from glucose, as well as some that we may not think of as strictly cellular (such as the binding of an invading virus to its receptor), occur because of a favorable flow of energy. Much of Brown's research has focused on the regulation of mitochondrial respiration. He reviews our current understanding of the "life force" or bioenergetics of individual cells and ultimately that of man.

In the early chapters, the author chronicles science's understanding of work and energy from Sir Isaac Newton to the great physicist Boltzmann, and the classical concepts of transformation of energy at the cellular level to the modern understanding of the mitochondrial cytochrome oxidase system. In subsequent chapters, he discusses the role of mitochondria in programmed cell death (apoptosis), regulation of metabolic rates both at the cellular and organismic level, the increasing plague of obesity in modern society and its biochemical and genetic causes, the role of "fat genes" and the hormone leptin, and exercise and human performance physiology. In the latter half of the book, he reviews the bioenergetics of neurophysiology, our understanding of addiction, central consciousness, and modern psychiatric practice. In an extensive appendix, Brown recounts fascinating vignettes of science history and philosophy from ancient Greece to the modern day.

The book is superbly written and easily read. The major weakness of the volume is perhaps that it attempts too much, covering several broad areas and not spending enough time on any one. This book is as much about philosophy and history as it is about science. Despite this overwhelming task, Brown manages to weave a fascinating tale. This

volume will serve as an eminently readable introduction to the history and current status of bioenergetics for the general public, as well as students and investigators in the field.

JOHN C MORRIS, *Metabolism Branch, Center for Cancer Research, National Cancer Institute, Bethesda, Maryland*

**STRESS OF LIFE: FROM MOLECULES TO MAN.** *Based on a conference held in Budapest, Hungary, 1–5 July 1997. Annals of the New York Academy of Sciences, Volume 851.*

*Edited by Peter Csermely. New York: New York Academy of Sciences; distributed by Johns Hopkins University Press, Baltimore (Maryland). \$29.95 (paper). xv + 547 p; ill.; index of contributors. ISBN: 1-57331-116-2 (hc); 1-57331-117-0 (pb). 1998.*

**EXPERIMENTAL DESIGN AND DATA ANALYSIS FOR BIOLOGISTS.**

*By Gerry P Quinn and Michael J Keough. Cambridge and New York: Cambridge University Press. \$110.00 (hardcover); \$45.00 (paper). xvii + 537 p; ill.; index. ISBN: 0-521-81128-7 (hc); 0-521-00976-6 (pb). 2002.*

Experimental design and statistical analysis are at the core of many areas of biological research. Recent years have seen the development of inexpensive but powerful statistical software for use on personal computers. A major problem for most biologists is that few computer packages discuss the models behind the analysis, proper interpretation of the results, or the pitfalls that one may encounter. The strong point of the current volume is that it serves as a bridge between application and theory. Both authors are biologists and instructors who have a firm grasp of the practical use of experimental design and statistical analysis in biological research.

The authors assume at least some familiarity with statistics. The usual topics covered in most introductory and some more advanced textbooks are discussed in the present work, from hypothesis testing and graphical exploration of data, to analysis of variance, regression, and principal component analysis along with Bayesian analysis. Sufficient references are provided in each section so that more advanced information can be consulted. The topics covered are nicely integrated. The first and last chapters, on the scientific method and presentation of results for publication or at meetings, provide an interesting introduction and useful conclusion to the book. Each chapter contains boxes with worked examples, which cover a wide range

of research situations. The chapters also include a useful section on general issues and hints for analysis that point out the major assumptions of the tests and possible pitfalls if these are not met.

Unlike most statistical textbooks, this volume has an easy style so that it can be read cover to cover, but it will best serve practicing biologists as an up-to-date reference for planning experiments and choosing appropriate statistical methods.

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**BIOLOGICAL THERMODYNAMICS.**

*By Donald T Haynie. Cambridge and New York: Cambridge University Press. \$100.00 (hardcover); \$35.95 (paper). xv + 379 p; ill.; index of names, subject index. ISBN: 0-521-79165-0 (hc); 0-521-79549-4 (pb). 2001.*

Thermodynamics, in its widest sense, is concerned with understanding the properties of matter in so far as they are determined by changes in temperature. One of the central tenets of the theory—the law of conservation of energy (the First Law)—was discovered by a biological scientist, Julius Robert von Mayer (1814–1878). This discovery was based on analysis of the color of human blood. Mayer had observed that blood taken from an individual in the tropics was more red than in colder regions, and argued that since less body heat is required in the tropics, less combustion will take place, and venous blood will retain the bright red color of arterial blood. Mayer realized that besides producing heat, the body also performs mechanical work, moreover, motion via friction also produces heat. These observations suggest that the chemical processes in the body produce motion, work, and heat, and that all these processes must be interconvertible.

In spite of the origins of the First Law in biology, thermodynamic theory has not played a critical role in the development of the biological sciences. It has, however, become a central discipline in physics and chemistry. This state of affairs derives partly from the fact that the Second Law, which expresses the observation that all the energy supplied as heat could not be transformed and delivered as work, has its origin in physical systems—the invention of the steam engine and the combustion engine and the study of the cyclic processes of these machines. These principles do not have an immediate relevance to biological systems that are largely isothermal machines. Accordingly, thermodynamic theory has only been developed in those areas in biology—chemical kinetics and bioenergetics—that interface with physics and chemistry.

Haynie is very well aware of the historical development of the thermodynamic principles, their current applicability to bioenergetics, and their potential to provide a conceptual framework for disciplines such as evolutionary theory. His book delineates these topics. It is a very readable and informed introduction to energy transformation at several levels of biological organization: molecules, cells, and multicellular organisms. Over the last decade, several textbooks have tried to cover a similar area: Morowitz's *Foundations of Bioenergetics* (1978. New York: Academic Press); Klotz's *Introduction to Biomolecular Energetics: Including Ligand-Receptor Interactions* (1986. Orlando (FL): Academic Press); and Garby and Larsen's *Bioenergetics: Its Thermodynamic Foundations* (1995. Cambridge: Cambridge University Press). Haynie's volume differs from these works in that it is intended for students with little or no background in thermodynamics and uses a more informal expository style.

Chapter 1 provides an introduction to the concept of energy and discusses its different manifestations—thermal, chemical, and electromagnetic. In view of the emphasis on biological issues, the author discusses one of the landmark experiments in biothermodynamics—the experiment of the chemist Lavoisier and the physicist Laplace, which showed that respiration is a form of combustion.

As Haynie concedes, most students (including those from the physical sciences) find the Second Law difficult to grasp. A great deal of this difficulty derives from the abstract nature of the concept entropy. As Clausius argued, the empirical observation that heat flows from high to low temperatures and not the other way around implies the existence of a function,  $S$ , called entropy whose infinitesimal change is given by  $dS = dQ/T$  where  $Q$  denotes the quantity of heat and  $T$  the absolute temperature. Hence, entropy is essentially a mathematical construct and an appreciation of the Second Law requires some mathematical maturity. Haynie has succeeded admirably in presenting an understanding of the law, accessible to biologists with only a basic knowledge of the calculus. Chapters 4 through 8 are applications of the thermodynamic concepts to biochemical systems. Notions such as free energy, enthalpy, and entropy play an important role in the modeling of all processes that involve molecular recognition: enzyme-substrate reaction, protein folding, and antigen-antibody interaction. The treatment presented in the book will be particularly useful to students working in these fields. Although the discussion throughout is elementary, the author also deals with some of the more recent applications of thermodynamic theory to biology—witness the lucid introduction of certain aspects of Marcus's theory of electron transfer.

Chapter 9 addresses topics such as the origin of life, biology and complexity, evolution, and the Second Law. These themes have recently generated considerable attention among physicists and theoretical biologists. The development given in this volume is somewhat fragmentary. It is indeed difficult to deal with such varied themes in approximately 30 pages. A highly controversial topic, the relationship between the Second Law of Thermodynamics and evolutionary theory was first discussed by the population geneticist, R A Fisher, who proved the Fundamental theorem of natural selection—a result which ascribed a directionality to evolutionary processes, and was considered to be an analogue of the Second Law. Fisher's theorem remains a cornerstone in the evolutionary literature that deals with complexity, the Second Law, and related topics. Some comments on Fisher's theorem and the recent efforts to generalize this result would have given the ideas discussed in this chapter greater focus.

Thermodynamics (both classical and statistical) is beginning to play an increasing role in several areas of biology. The application of the ideas to the molecular level of biological organization is already well established. The relevance of the concepts and methodology to the organismal and ecosystem level constitutes an active area of research. The book by Haynie is a good introduction to the new field of biological thermodynamics and represents an important contribution to the literature.

LLOYD DEMETRIUS, *Organismic & Evolutionary Biology, Harvard University, Cambridge, Massachusetts*

#### BIOPHYSICAL PROCESSES IN LIVING SYSTEMS.

*Edited by P Pardha Saradhi. Enfield (New Hampshire): Science Publishers. \$92.00. x + 369 p; ill.; index. ISBN: 1-57808-157-2. 2001.*

#### A LEARNING SYSTEM IN HISTOLOGY: CD-ROM AND GUIDE.

*By Deborah W Vaughn. Oxford and New York: Oxford University Press. \$49.95 (paper). xi + 235 p; ill.; index. ISBN: 0-19-515173-9. [CD-ROM included.] 2002.*

This is an impressive, computer-assisted textbook for medical histology. The supplied CD-ROM contains an attractive set of histological images and electron micrographs that cover the full range of basic histology. This volume will have a wide appeal in an era where "the need to know" now defines the medical curriculum, and the use of microscopes is considered a specialty skill.

With the cost of acquiring and maintaining slide

collections and microscopes, histology and pathology courses are all headed toward computer-based learning. A major complaint about computer images is the inability to scan a slide and identify the context of a specific image. The author addresses this problem by presenting each image at low magnification and then providing multiple areas available at higher magnification. There are also anatomical diagrams that illustrate where the slides were generated, and each image has thorough labeling of specific cells and structures. All of the features are accessed by intuitive mouse commands. The accompanying text emphasizes how the structures reflect function. A thumbnail image of each slide is placed in the book to help guide students to the appropriate image. Specific goals for each section and new vocabulary are clearly stated, an attractive feature for modern students. The text and images are separated by organ systems and can be accessed through a comprehensive index. This combination of text and computer-based imagery eliminates the need for a histology atlas that is usually recommended to accompany most histology volumes, and the cost is no more than a well-illustrated book. There are no clinical correlations included in this volume, something that is now emphasized in most modern histology courses, but this could easily be added in a future edition.

This computer-based volume for learning histology is both an excellent book for students and a useful reference and atlas of histology. Vaughan has generated a work that will set the standard for computer-based learning of histology in the years to come.

GARY W ZIEVE, *Pathology, State University of New York, Stony Brook, New York*

METAL IONS IN BIOLOGICAL SYSTEMS. *Volume 39: Molybdenum and Tungsten: Their Roles in Biological Processes.*

*Edited by Astrid Sigel and Helmut Sigel. New York: Marcel Dekker. \$250.00. lxi + 810 p; ill.; subject index. ISBN: 0-8247-0765-6. 2002.*

BIOLOGICAL SYSTEMS UNDER EXTREME CONDITIONS: STRUCTURE AND FUNCTION. *Biological and Medical Physics Series.*

*Edited by Y Taniguchi, H E Stanley, and H Ludwig. Berlin and New York: Springer. \$74.95. xii + 282 p; ill.; subject index. ISBN: 3-540-65992-7. 2002.*

Using spectroscopic methods, the structure and function of systems under extreme pressures and temperatures can now be investigated. This book describes the theory and applications of these effects.

EARLY LIFE: EVOLUTION ON THE PRECAMBRIAN EARTH. *Second Edition.*

*By Lynn Margulis and Michael F Dolan. Sudbury (Massachusetts): Jones and Bartlett Publishers. \$34.95 (paper). xxiv + 168 p; ill.; index. ISBN: 0-7637-1463-1. 2002.*

The study of early life is exceedingly interdisciplinary, and the authors draw from the fields of cell biology, chemistry, ecology, geology, paleontology, and climatology to paint a history of life. The book is written for nonscientists and many basic concepts (such as mitosis and meiosis) are clearly explained. It is arranged in six chapters that emphasize cellular evolution in a changing environment: evolution of cells, life without oxygen, life with oxygen, a new kind of cell, evolution of sex, and the modern era. The text is interspersed with historical details and suggested readings, and there is a useful glossary and index.

Margulis is known for her research on eukaryotic cells and especially their origin through symbiosis. Naturally, this topic is highlighted in the book. The authors detail evidence supporting the serial acquisition of cellular components such as undulipodia (flagella, cilia) for motility, mitochondria for respiration, and plastids for photosynthesis. Although nearly all biologists accept the symbiotic origins of mitochondria and plastids, many molecular evolutionists reject the notion that an earlier symbiotic event occurred. The current molecular evidence against the full "serial endosymbiosis theory" is weak, and I side with the authors on this matter. I also agree with their use of the "unpopular" terms Archaeobacteria and Eubacteria for the two major groups of prokaryotes, instead of "Archaea" and "Bacteria" (respectively). The word "bacteria" is ingrained in the English language as being synonymous with all prokaryotes and, therefore, using it to formally recognize one group of prokaryotes has created confusion. Margulis and Dolan show that Woese's three-domain system is compatible with a prokaryote-eukaryote distinction, so I applaud the authors for ignoring the status quo.

I have only one mild criticism. A future revision would benefit from consultation or collaboration with a molecular evolutionist, because some of the major advances from molecular phylogenies and clocks are conspicuously absent in this edition. Nonetheless, I wholeheartedly recommend the book for interested nonscientists and even seasoned researchers who would like a refreshing overview of an interdisciplinary topic so fundamental to our understanding of life.

S BLAIR HEDGES, *Biology, Pennsylvania State University, University Park, Pennsylvania*





## FOR TYROS &amp; LAICS

## BODY HEAT: TEMPERATURE AND LIFE ON EARTH.

By Mark S Blumberg. *Cambridge (Massachusetts): Harvard University Press.* \$22.00. ix + 240 p; ill.; index. ISBN: 0-674-00762-X. 2002.

After reading the title of this book, I was not sure whether to expect a soft-core novel or a treatise on biophysics and physiology. My uncertainty was amplified when I spotted an opening quote from *The Doors* ("Come on baby, light my fire"). Reading further, I soon discovered that this was a soft-core science book on how and why temperature is an integral part of the lives of humans, animals, and even plants. Readers should not expect a scholarly treatise. This is a light read intended for the general science audience. It is largely an eclectic collection of thermal anecdotes and stories intended to convince readers that temperature matters to life. It does that very well and entertainingly.

For me, the most enjoyable aspect of the book is its diversity of examples. They are not detailed, but the rapid turnover kept me interested and wondering what would come next. Blumberg's volume is indeed wide ranging and introduces the biophysics of heat flux, Roman thermae (hot and cold tubs), endothermal insects, febrile lizards, linguistics, hot sex, Sudden Infant Death Syndrome (SIDS), Brown Adipose Tissue (BAT), hot chilies, hot flashes, and even ultrasonic crying in rat pups. In the final section, he shifts gears somewhat, and explores energy balance (fat, leptin, and anorexia) and sleep, topics of Blumberg's own research.

As a specialist in thermal biology who shares the author's passion for all things thermal, I wished that the examples—some of which were new to me—were better referenced. Moreover, I would have given more attention to field and conceptual issues and would have revised the treatment of some topics (e.g., the Surface Law). Given that Blumberg wrote for a general audience, such complaints of a specialist should not detract from this book (except as a caveat to other specialists).

Blumberg obviously enjoyed researching and writing this volume, and his enthusiasm is infectious. His book effectively personalizes the many ways that heat influences and governs life on Earth.

RAYMOND B HUEY, *Zoology, University of Washington, Seattle, Washington*

## VISIONS OF THE FUTURE: CHEMISTRY AND LIFE SCIENCE.

Edited by J Michael T Thompson. *Cambridge and New York: Cambridge University Press.* \$24.95 (paper). viii + 199 p; ill.; index. ISBN: 0-521-80539-2. 2001.

Each of the book's ten chapters is an overview of cutting-edge research. The topics cross a wide range of scientific fields, including determination of molecular motion via femtosecond lasers, electron and hydrogen tunneling in enzymes, the use of virtual organs to increase scientific understanding of the intrinsic nature of biological systems, and reverse engineering of the human mind through magnetic stimulation.

These chapters were originally published in the three special Millennium issues of the *Philosophical Transactions of the Royal Society of London*. It is claimed they have been rewritten in language for the general population. But some of the more technically challenging portions of the book require a familiarization with the basic theories of each respective science. For those lacking such an introduction, the passages may become tedious, and the excitement of the science will be quickly lost in the pages. For this reason, undergraduate students are a more suitable audience. The chapters tend to be rather lengthy, but each topic is covered thoroughly, providing readers with a good understanding of the material.

It could prove a useful tool to undergraduate students looking for motivation or career direction. The innovative ideas contained within the volume will leave readers with a renewed appreciation for the amazing advances and unlimited possibilities in the field of science. To recycle a Michael Faraday quotation from the chapter, *Reverse Engineering the Human Mind*, as a summation: "Let the imagination go, guiding it by judgment and principle, but holding it in and directing it by experiment."

SARAH WEHRI, *Biochemistry, Western Michigan University, Kalamazoo, Michigan*



## PALEONTOLOGY

## EXTINCT HUMANS.

By Ian Tattersall and Jeffrey H Schwartz; principal photography by Jeffrey H Schwartz. *A Peter N. Nevaumont Book. Boulder (Colorado): Westview Press.* \$30.00 (paper). 256 p; ill.; index. ISBN: 0-8133-3918-9. 2001.

With its eye-catching cover and title, this book is aimed directly at laics. The dustjacket heralds this as a "superior overview." But it is less a review of

human evolution than a diatribe for taxonomic splitting. The authors assert that most modern paleoanthropologists have been overly influenced by the likes of Charles Darwin, Thomas Henry Huxley, and especially Ernst Mayr, naively adopting a unilineal evolution where only one hominid species existed at any one time, and all hominids evolved into modern humans. They complete the straw man by claiming that paleontologists force the hominid fossil record into this paradigm, categorizing fossils by age rather than morphology.

Tattersall and Schwartz then present their view of the human fossil record "from the perspective of diversity" (p 33). They conclude that our family tree is more of a "bush," containing many more taxa than currently recognized (even suggesting more than one species within the Neanderthal sample). After all, they argue, human evolution is just as complex as that of other taxa, and "[f]or better or for worse, names are our way of expressing the evident complexity of nature" (p 52).

The authors repeatedly claim that any biologist outside of paleoanthropology would recognize many more hominid taxa, but no support for this prediction is provided. The authors do not present background to fundamental concepts such as evolutionary theory, ecology, geochronology, or geology. And misrepresentations abound. According to the Modern Synthesis, evolution is portrayed as a revision of the Great Chain of Being: "For, if it was a general rule that species slowly evolved themselves out of existence by gradual change under natural selection, then the history of human evolution, too, must have boiled down to a long, gradual slog from primitiveness to perfection" (p 46).

The intense focus on a single, extreme view of taxonomy makes the book less than ideal for either the novice or the classroom. But it is a good read for anyone interested in understanding an increasingly influential branch of human evolutionary studies—typological taxonomy.

LESLEA J HLUSKO, *Anthropology, University of Illinois, Urbana, Illinois*

**THE HUMAN FOSSIL RECORD. Volume One: Terminology and Craniodental Morphology of Genus Homo (Europe).**

By Jeffrey H Schwartz and Ian Tattersall. New York: Wiley-Liss. \$125.00. xi + 388 p; ill.; no index. ISBN: 0-471-31927-9. 2002.

Few of us can keep track of the burgeoning human fossil record, so Schwartz and Tattersall's anticipated five-volume catalog of this material is a boon for anthropologists. Volume One begins with a summary of the descriptive terminology used throughout the volumes, and includes rep-

resentative examples of the ranges of variation in the morphological features described. This section will be valuable for those not au fait with the minutiae of anatomical description particular to fossil hominins. Unfortunately, there are many references to fossil specimens not included in Volume One, so readers will need to acquire the other two volumes to fully appreciate the authors' terminology. The anatomical diagrams in this section are clear and well labeled: the locality maps lack latitude and longitude information. There is no index, so if you are looking for Monte Circeo, for example, you will have to intuit that the authors call the site Guattari instead (except where it is inexplicably referred to as Monte Circeo).

The bulk of this volume, and those to come, is a site-by-site description of the fossils, including location, preserved material, context, morphology, and enough references to get interested readers into the primary literature. The repository (including address) of each fossil collection is also listed. The strength of this book inheres in the terse but excellent descriptions of the morphology of the fossils, as one would expect from these authors. The text in this section will be extremely useful to professional physical anthropologists (both teachers and researchers), as well as others interested in human skull evolution. Systematic treatments of the fossils are planned for later volumes.

Unfortunately, the illustrations are disappointing. The photographs of the fossils are of highly variable quality, with many of them lacking sufficient contrast, and others out of focus. It is my hope that the authors and the publisher will address these problems before the release of future volumes.

CALLUM F ROSS, *Anatomical Sciences, State University of New York, Stony Brook, New York*

#### CHINESE FOSSIL VERTEBRATES.

By Spencer G Lucas. New York: Columbia University Press. \$75.00 (hardcover); \$45.00 (paper). xiii + 375 p; ill.; index. ISBN: 0-231-08482-X (hc); 0-231-08483-8 (pb). 2001.

Dragon's bones are vital ingredients in many traditional Chinese medicines, but it was not until the mid-19th century that these curiosities were recognized for what they really were: the remains of extinct animals. Since then, extensive collecting efforts in the vast cornucopia of marine and terrigenous sedimentary deposits that cover much of China's land surface has resulted in the recovery of some of the best fossil vertebrate faunas known in the world. These faunas span the entire Phanerozoic, ranging from Lower Cambrian jawless fish, through Jurassic dinosaurs to Pleistocene mam-

moths. This volume represents a valiant attempt to introduce the staggering diversity of Chinese fossil vertebrates within a temporal framework.

To a certain extent, the book succeeds in this aim by providing a generalized account of the many different faunas and an overview of China's contribution to vertebrate paleontology. All of the main faunas are mentioned, and comments are provided on the species' composition and age of each fauna. Short comments on paleoenvironments, geological history, and the taxonomy and systematics of various groups are also appended. But the ambitious coverage leads to a number of potential drawbacks. Individual faunas are dealt with quickly, leading to a lack of substantial detail and, as Lucas often has to deal with taxa outside of his field of expertise, coverage of some groups (e.g., fish) is often perfunctory. Still, the attempt to pool all of this disparate information is commendable.

It is difficult to determine the potential audience for this volume: the text lacks the explanatory background information on geology, zoology, and geography that would make it instantly accessible to laics, while the lack of detail prevents this from being more than a general reference for specialists. As is common with reviews of this type, the text can read rather like an extended exhibition catalog, while the fossil material is badly compromised by the dreadful standard of photographic reproduction. Nevertheless, this work does represent a useful addition to the corpus of literature on Chinese fossil vertebrates, although I fear that it will soon become dated, given the rapid pace of discovery in this area.

PAUL M BARRETT, *Zoology, University of Oxford, Oxford, United Kingdom*

#### EVOLUTIONARY PATTERNS: GROWTH, FORM, AND TEMPO IN THE FOSSIL RECORD.

*Edited by Jeremy B C Jackson, Scott Lidgard, and Frank K McKinney. Chicago (Illinois): University of Chicago Press. \$85.00 (hardcover); \$30.00 (paper). xvi + 399 p; ill.; index. ISBN: 0-226-38930-8 (hc); 0-226-38931-6 (pb). 2001.*

This multiauthored volume in honor of paleobiologist Alan Cheetham includes a number of chapters that represent significant contributions to macroevolution. Appropriately, given Cheetham's specialization on bryozoans, half of the chapters focus on colonial organisms. The three chapters of Part I treat adaptive and developmental aspects of morphology; the four chapters of the second part deal with aspects of species recognition and rates of speciation and extinction; and the five chapters of the final part cover trends and patterns of macroevolution.

In Part 1, Buss describes elegant experiments, indicating that the gastrovascular cavity of hydroid cnidarians generates currents that influence colony morphology through effects on stolon branching and bud formation. McShea explores the observation that cells contain fewer parts in multicellular organisms than in unicellular organisms. Okamura et al. review evidence, which suggests that acquisition of food rather than space dictates the morphology of encrusting marine organisms.

In Part 2, Pandolfi et al. document the extinction of two widely distributed species of Caribbean corals within the past 80,000 years. Nehm describes paedomorphism in three clades of marine marginellid gastropods, members of which have not all occupied the same kind of environment. In the final part, Hayek and Bura introduce a new approach for estimating true stratigraphic ranges of taxa from an imperfect fossil record, and Foote shows how data on age distributions of taxa can be used to estimate rates of origination and extinction. Budd and Johnson conclude that species of Caribbean corals that are relatively abundant in the fossil record, which is of high quality for individual fossil reefs, had longer durations than rarer species except at times of crisis. Håkansson and Thomsen explore the evolutionary history of asexual propagation in cheilostome bryozoans, concluding, among other things, that individual genets may have survived for more than four million years within some species that experienced little sexual recruitment.

Overall, this is an interesting book with more original contributions than one usually encounters in an edited volume.

STEVEN M STANLEY, *Earth & Planetary Sciences, Johns Hopkins University, Baltimore, Maryland*

#### FOSSILS, PHYLOGENY, AND FORM: AN ANALYTICAL APPROACH. *Topics in Geobiology, Volume 19.*

*Edited by Jonathan M Adrain, Gregory D Edgecombe, and Bruce S Lieberman. New York: Kluwer Academic/Plenum Publishers. \$130.00. xiv + 402 p; ill.; index. ISBN: 0-306-46721-6. 2001.*

Paleobiology in the United States is often, if unfairly, characterized as excessively concerned with the quantitative dissection of patterns of taxic diversity, to the exclusion of attention to changing patterns of form, phylogenetic studies, or other issues. This volume celebrates these other paleobiological approaches. The 11 chapters in this volume emphasize the application of phylogenetic reconstruction and morphometrics, with several authors addressing the troublesome issue of how to parse the continuous variables of shape into discrete characters for morphological analysis.

Wills has produced an incisive chapter on morphological disparity. MacLeod offers another of his comprehensive treatments of morphometrics, although here he focuses on applications to phylogenetic analysis, also the subject of a chapter by Zelditch et al. These three chapters do reveal significant differences in approach, however.

The most troubling aspect of the volume is that the editors do not seem to have a clear idea of whether they were producing a textbook or a monograph. Several of the chapters are essentially introductions to the topic at hand, while others contain considerable introductory material. Adrain and Westrop's chapter, in contrast, considers the application of stratigraphic data to patterns of Cambrian trilobite evolution in North America, and reads more like a primary scientific contribution.

One of the more amusing aspects of this volume is the extent to which the editors have gone to distance the book, and themselves, from the "Chicago School" of paleobiology (the object of the caricature in the first line). None of the contributors represent the Chicago school, despite the fact that Michael Foote and Peter Wagner, to name but two, have been among the most perceptive voices in addressing the topics of this volume.

DOUGLAS HERWIN, *Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington DC*

#### AMMONITES. *The Living Past Series.*

By Neale Monks and Philip Palmer. Published by Smithsonian Institution Press, Washington (DC), in association with The Natural History Museum, London. \$50.00 (hardcover); \$24.95 (paper). 159 p; ill.; index. ISBN: 1-58834-024-4 (hc); 1-58834-047-3 (pb). 2002.

There are few introductory books on ammonites. For English readers, there are Ulrich Lehmann's *The Ammonites: Their Life and Their World* (1981. Cambridge: Cambridge University Press), now out of print, which contains some of the best discussions of ammonite jaws ever written; Neal Larson's *Discovering the Mysterious Ammonites* (1999. Italy: Geofin), which provides descriptions and photographs of some of the most common ammonite fossils; and the current book, *Ammonites*, which emphasizes the paleobiology of ammonites—how they swam, where they lived, and what they ate. The picture that emerges is that most ammonites were fairly sluggish predators that ate small crustaceans and other ammonites and lived near the sea floor.

The book proceeds logically from a general discussion of cephalopods, especially *Nautilus*, to a description of ammonite morphology. The authors also discuss the main theme of cephalopod evolu-

tion—the attainment of neutral buoyancy—with all the attendant challenges of swimming, maneuverability, and orientation. In this context, readers will enjoy the imaginative description of schools of cork-screwed ammonites pirouetting up and down in the water column. This is followed by a clear treatment of sexual dimorphism and reproduction. Speculations about the rate of growth and longevity of ammonites suggest a close similarity to *Nautilus*, but the size of ammonite embryos seems more similar to that of coleoids. There is a very readable overview of the suborders of ammonites with general statements on their morphologic characteristics and temporal and geographic distribution.

The book concludes appropriately enough with a discussion of ammonite radiations and extinctions, with references to the meteorite impact at the end of the Cretaceous. There are a few pages devoted to collecting and preparing ammonites and where to look for further information. The book is illustrated with line drawings and many attractive photographs, both in color and black and white. This volume is especially suitable for amateur collectors and as supplementary reading for undergraduates, although anyone interested in ammonites will enjoy it.

NEIL LANDMAN, *Paleontology, American Museum of Natural History, New York, New York*

#### EOCENE BIODIVERSITY: UNUSUAL OCCURRENCES AND RARELY SAMPLED HABITATS. *Topics in Geobiology, Volume 18.*

Edited by Gregg F Gunnell. New York: Kluwer Academic/Plenum Publishers. \$95.00. xxi + 442 p; ill.; index. ISBN: 0-306-46528-0. 2001.

This interesting and wide-ranging volume discusses unusual fossil occurrences from the Eocene (about 55 to 34 million years ago). In 16 stand-alone chapters, extraordinary fossil occurrences are documented from the western United States (with several chapters on Wyoming localities, and one from Utah), the U.S. Gulf Coast, Germany (Messel Formation), Africa (Tanzania and Tunisia), and Asia (Pakistan).

Why should one care about the Eocene? We are fortunate to have an incredibly rich and diverse Eocene fossil record that can serve as a testing ground for theories of extinction and evolutionary change as influenced by changing physical parameters, such as changes in climate and physiography. These are no longer just academic questions of interest to a few specialists, but issues that are of prime importance as we face global climate change and biodiversity loss in the modern world. It is very much a truism that in order to understand the

impact of humans on ecosystems and biodiversity today, we should understand the past before humans entered the scene. The Eocene provides a marvelous opportunity to do just that.

What constitutes an “unusual” or “rare” fossil occurrence such that it merits inclusion in this volume? Incredibly preserved specimens (e.g., complete organisms with soft-body outlines), mass-death assemblages that provide statistical data on a single population in the past, habitats and regions (such as uplands) not normally represented in the fossil record, and geographic regions where few Eocene fossils have been found, are discussed. It should be noted, however, that in some ways the title of the book is a misnomer. It might have been called *Eocene Vertebrate Biodiversity*, as the chapters focus on vertebrates, and all but a couple (such as chapters on Green River Formation fish faunas of western Wyoming, and fossils found in lake beds overlying kimberlite pipes in Tanzania), are predominantly or exclusively on fossil mammals. Eocene marine invertebrates are not covered in this book. Personally, I would have appreciated a chapter or two on plant fossils from the Eocene, as well as a bit more coverage of amphibians, reptiles, birds, and invertebrates. Also, there are important and unusual vertebrate faunas from the Eocene of South America, China, and Australia that are not discussed. Still, Eocene biodiversity is a huge topic and no single volume could do it complete justice.

The papers in this volume are of consistently high quality and each will be a valuable contribution to the field. I highly recommend this book to anyone interested in the Eocene specifically, or the history of global biodiversity through geologic time.

ROBERT M SCHOCH, *College of General Studies, Boston University, Boston, Massachusetts*

MAMMOTHS, SABERTOOTH, AND HOMINIDS: 65 MILLION YEARS OF MAMMALIAN EVOLUTION IN EUROPE.

By Jordi Agustí and Mauricio Antón. New York: Columbia University Press. \$39.50. xi + 313 p + 16 pl; ill.; index. ISBN: 0-231-11640-3. 2002.

Vertebrate paleontology began in the early 1800s with the study of Cenozoic fossil mammals from Europe when Georges Cuvier documented the Eocene mammals that he and others were collecting in the Paris basin. Indeed, these mammals, especially the ceratomorph perissodactyls, formed the crucible in which Cuvier forged his ideas on comparative anatomy and extinction. Since Cuvier, an extensive fossil record of mammals has been collected from European Cenozoic rocks, ranging from the beginning of the age of mammals during the Paleocene, when an odd assortment of paleo-

placentals inhabited the European archipelago, to the last ice ages when cave bears, giant elk, and hominids graced the landscape.

In *Mammoths, Sabertooths, and Hominids*, Agustí and Antón present a very readable and well-documented book on the Cenozoic history of mammals in Europe that betrays a close study of the details and a deep understanding of the issues. For example, the authors argue that Paleocene mammals are really the terminus of an evolutionary diversification that began during the Late Cretaceous. Less astute students have equated a major turnover in mammalian evolution with the dinosaur extinction at the end of the Cretaceous.

The illustrations are a strong point of this book—a plethora of excellent reconstructions and restorations of Europe’s extinct mammals, augmented by 16 color plates that bring to life the continent’s Cenozoic landscapes. Too bad that the book lacks maps and charts to add an easily followed geographic and time stratigraphic dimension to the story. Yet, despite this flaw, Agustí and Antón’s book is a must for every paleomammalogist and mammalogist. *Mammoths, Sabertooths, and Hominids* is a readable, insightful, and well-referenced history of the complex and fascinating evolution of mammals on the European continent.

SPENCER G LUCAS, *Paleontology & Geology, New Mexico Museum of Natural History, Albuquerque, New Mexico*



## MOLECULAR BIOLOGY

AN INTRODUCTION TO COMPUTATIONAL BIOCHEMISTRY.

By C Stan Tsai. New York: Wiley-Liss. \$69.95 (paper). x + 368 p; ill.; index. ISBN: 0-471-40120-X. 2002.

This is unlike any other science textbook I have encountered. To begin, it is intended as an introduction to a field that is not yet defined: computational biochemistry. According to Tsai, this field covers the entire overlap between biochemistry and any use of computation. Thus, it does not only contain hot topics such as molecular modeling and proteomics, but also good old kinetics, receptor-ligand interactions, thermodynamics, and even some standard techniques of biostatistics and data management, and in only 368 pages. So, how does Tsai do it? Clearly, there is no place for detailed explanation, and instead of “introductory courseware” (p ix), I would call the book a refresher for those who have done “computational biochemistry” before, but would like to brush up on forgotten details.

Some of the chapter introductions are easy to follow, but other material reads almost like an encyclopedia. Every sentence is packed with new information; sometimes there is hardly a transition. After the factual part of each chapter, the style changes to a comprehensive description of databanks, software packages, and Web tools. This information is quite detailed, often down to individual mouse clicks, and reinforced with "workshops," which follow the examples in the body of the chapter. Unfortunately, many exercises contain nucleotide or amino acid sequences, and it is up to readers to retype the seemingly endless strings or find them somewhere on the Web.

Countless typographical errors, misplaced or missing articles, mismatches between subject and verb, and unusual sentence structures become gradually more annoying, and should not have been left uncorrected. Overall, the book is not an introduction. For that, there are far too many terms left undefined and unexplained. It also does not present a "unified approach" (p ix) to the field and does not "at an entry level . . . teach students biochemical principles" (p ix). Rather, the book could well serve as an annotated guide to modern topics and Web tools in bioinformatics and computational biology. If used as such, it will be a very helpful resource and refresher for both students and researchers.

EBERHARD O VOIT, *Biometry & Epidemiology, Medical University of South Carolina, Charleston, South Carolina*

ANNUAL REVIEW OF BIOCHEMISTRY. *Volume 71: 2002.* Edited by Charles C Richardson, Roger Kornberg, Christian R H Raetz, and Jeremy W Thorne. Palo Alto (California): Annual Reviews. \$77.00. xxvi + 1051 p; ill.; author and subject indexes; cumulative indexes (contributing authors and chapter titles, Volumes 67–71). ISBN: 0–8243–0871–9. 2002.

#### COMBINATORIAL STRATEGIES IN BIOLOGY AND CHEMISTRY.

By Annette Beck-Sickinger and Peter Weber; translated by Michael Soderman and Allan Wier. Chichester (United Kingdom) and New York: Wiley. \$75.00 (hardcover); \$35.00 (paper). xiii + 179 p; ill.; index. ISBN: 0–471–49726–6 (hc); 0–471–49727–4 (pb). [Originally published as *Kombinatorische Methoden in Chemie und Biologie*, by Spektrum Akademischer Verlag GmbH, Heidelberg/Berlin, 1999.] 2002.

This book covers the broad scope of combinatorial technologies in chemistry and biology. Overall, it is a very useful, thorough, and timely volume. Fol-

lowing the introduction, the authors discuss peptide libraries, nonpeptide libraries, libraries based on mixtures, parallel synthesis and automation, combinatorial approaches using molecular biological techniques, and analysis of libraries and arrays. The translation reads well and has abundant references to the literature.

One of the strengths of the volume is the exemplary scholarship throughout. Many will appreciate the excellent overview of protection schemes employed in solid phase syntheses, resins, and linkers. The book also surveys a satisfying sweep of the early nonpeptide library chemistries, although this pales to the variety of chemistries now available in the pharmaceutical industry as new resins and solid and solution phase reactions are used with greater facility. The authors do an excellent job of extending the scope of combinatorial methods beyond the life sciences (such as materials discovery) and remind readers of biological tools such as phage or ribosomal display. Even exotic combinatorial methods are mentioned, such as circular permutations, an admittedly unusual application of biological or polymer chemistries. A minor criticism is the lengthy description of coding and iterative techniques, especially as these are not commonly employed in modern pharmaceutical research. This is understandable, given the authors' experience in the field and the intended audience.

The book is well written and should be easily read by those in the biological or chemical sciences. Anyone beginning to use combinatorial chemistry will find it to be an invaluable guide, and intermediate investigators may think so too. Long-term practitioners of combinatorial methods are likely to find it useful as a reference tool, and may even be delightfully surprised by a few aspects they had not thought of before. I think it is a "must have" volume for those interested in the field, especially since there has now been sufficient time to put the technology into some kind of historical perspective, and there are so few books with such depth and scope available to date.

DAVID S THORPE, *Discovery Biology, Aventis Pharmaceuticals, Tucson, Arizona*

#### ANNUAL REVIEW OF BIOPHYSICS AND BIOMOLECULAR STRUCTURE. *Volume 31: 2002.*

Edited by Robert M Stroud, Wilma K Olson, and Michael P Sheetz. Palo Alto (California): Annual Reviews. \$77.00. viii + 559 p + 41 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 27–31). ISBN: 0–8245–1831–5. 2002.

DNA-PROTEIN INTERACTIONS: PRINCIPLES AND PROTOCOLS. *Second Edition. Methods in Molecular Biology, Volume 148.*

*Edited by Tom Moss. Totowa (New Jersey): Humana Press. \$125.00 (hardcover); \$89.00 (comb binding). xvii + 638 p; ill.; index. ISBN: 0-89603-625-1 (hc); 0-89603-671-5 (cb). 2001.*

Identification and study of DNA-protein interactions are important aspects in molecular cell biology research. A vast range of molecular techniques has been developed in the past few decades to explore and understand DNA-protein interactions both in vitro and in vivo. The current book provides readers with an extensive and comprehensive collection of modern techniques for analyzing DNA-protein interactions. The techniques range from the most classical and basic methods (such as electrophoretic mobility shift assay and DNA footprinting) to recent and more sophisticated methods (such as atomic force microscopy and two-wavelength femtosecond laser-induced DNA-protein cross linking). The book not only deals with the identification of specific DNA-protein interactions, but also provides tools for functional analysis of such interactions, both in vivo and in vitro. For example, in Chapter 30, a genetic analysis approach is described for studying DNA-protein interaction in vivo in live yeast cells. This method can allow rapid identification of mutant molecules altered in their affinity or specificity to DNA recognition elements. In another example, in vitro assays for measuring the transcription activation function of transcription factors are presented in Chapter 31. These assays can be used for qualitative location of transcription starts on DNA sequences, as well as for qualitative kinetic analysis of transcription factors.

The book, written by an impressive list of worldwide contributors, will provide readers with nearly all the necessary tools for studying DNA-protein interactions, making it a perfect cell biology laboratory manual.

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

GENE REGULATION AND METABOLISM: POSTGENOMIC COMPUTATIONAL APPROACHES. *Computational Molecular Biology.*

*Edited by Julio Collado-Vides and Ralf Hofestädt. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$45.00. x + 310 p; ill.; index. ISBN: 0-262-03297-X. 2002.*



## CELLULAR BIOLOGY

MECHANICS OF THE CELL.

*By David Boal. Cambridge and New York: Cambridge University Press. \$120.00 (hardcover); \$45.00 (paper). xiv + 406 p; ill.; index. ISBN: 0-521-79258-4 (hc); 0-521-79681-4 (pb). 2002.*

This bioengineering textbook addresses the questions of how cells, and the material they are composed of, survive in environments full of thermal fluctuations, compressions, shear forces, and other types of stress. The volume begins with a series of interesting analogies between basic concepts of cell architecture and familiar ideas in the architecture of hot air balloons, walled cities, and boats.

The book is separated into three parts. In Part I, the author focuses on the filaments that form the basis of the uniform and three-dimensional network of chains that give cells their structure, their strength, and their ability to endure stress. The description and mathematical formulation of these material properties are fully enumerated. The author always begins with the biological basis and methods for studying these properties and so every equation is in context. Part II covers lipid membranes and begins with the types of components in biological membranes and the assemblies they form. It then discusses membrane properties, which include curvature, compression, and undulation. With all of this background in hand, the author then progresses into the properties of whole cells, starting with simple, isolated cells, cell-cell interactions, cell dynamics and movement and, finally, animal tissue.

Each chapter concludes with problem sets that deal with biological applications and formal development and extension. The book also includes a glossary, as well as several useful appendixes on cell and tissue data, the basic biochemical structures, statistical mechanics, and elasticity. Although the volume is geared toward upper-level undergraduate and graduate students, other students in physics, chemistry, and biochemistry would find it useful. A detailed understanding of the mathematical formulas is not critical to appreciate the concepts in the book, which would also make it appealing to other biology-related students with little training in college-level mathematics. I highly recommend this volume for all bioengineering students, as well as those interested in how cells are constructed.

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CHROMATIN AND GENE REGULATION: MECHANISMS IN EPIGENETICS.

By Bryan M Turner. *Oxford and Malden (Massachusetts): Blackwell Science.* \$39.95 (paper). xii + 284 p + 5 pl; ill.; index. ISBN: 0-865-42743-7. 2001. The proclamations of the central dogma—DNA yields RNA and thence protein—define DNA as the guardian of our genetic blueprint. But simple as this scheme may appear, it belies the immense complexity of control that is needed to generate each multicellular organism. The crux of this operational complexity lies in the fact that different cell types—in humans roughly 300—carry the same genetic information, although only a fraction is expressed in each. How this is achieved is the focus of *Chromatin and Gene Regulation: Mechanisms in Epigenetics*.

This is a most enjoyable book. As the author concedes, it is a daunting task to provide an enlightened, yet up-to-the-minute account of any research field that is quite so dynamic as the study of gene regulation. Here, the basics are set in place with the minimum of fuss. As the title implies, cells are not what they are because of the genes they have, but because of the genes they express. This simplest of statements encapsulates the most fundamental, yet complex question in modern molecular biology: How is genetic complexity revealed?

Happily, this mystery is unfolded in easy stages that will entice readers from one set of concepts to the next. This journey begins by analyzing the role of DNA protein interactions in the control of RNA synthesis in prokaryotes. From such simple beginnings the story builds to incorporate the added complexity found in multicellular organisms. The problems associated with increased genome complexity are discussed to reveal how chromatin organization and higher order nuclear architecture each influence gene expression. Advancing beyond linear thought we then delve into the dynamics of gene expression and how chromatin modification influences expressional status and long-term gene silencing. To complete the story, two final chapters describe how epigenetic factors influence gene imprinting and “dosage compensation” mechanisms that have evolved to provide balanced gene expression from the sex chromosomes in male and female cells.

As a voyage of discovery, this book is a delight. The problems and issues are addressed lucidly and even the most complex questions are treated with a clarity that is worthy of congratulation. For students who yearn to understand the link between chromatin structure and gene expression, I would recommend this work as an invaluable first step on the road to enlightenment.

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DICTYOSTELIUM: EVOLUTION, CELL BIOLOGY, AND THE DEVELOPMENT OF MULTICELLULARITY. *Developmental and Cell Biology Series, Volume 38.*

By Richard H Kessin. *Cambridge and New York: Cambridge University Press.* \$90.00. xiv + 294 p + 6 pl; ill.; index. ISBN: 0-521-58364-0. 2001.

In the life cycle of *Dictyostelium discoideum*, a vegetatively growing single celled amoebae, when starved, chemotactically aggregate together and undergo a series of morphogenetic changes, resulting in the formation of a sorocarp, or fruiting body. This structure, containing approximately  $10^5$  cells, consists of only two cell types—spore cells and stalk cells. Since the species was first described by Kenneth Raper in 1935, *Dictyostelium* has been a model system for differentiation and development. The paramount questions have been: How does an amoeba differentiate into a spore or stalk cell? How does an amoeba know which cell type to become, so as to produce a properly proportioned fruiting body? Despite 65 years of research, the detailed answers to these questions have yet to be worked out.

Over the last 20 years, *Dictyostelium* has also become one of the favored model systems for the rapidly developing field of molecular cell biology. As a single celled haploid amoeba, it displays a range of cell biological phenomena, including chemotaxis, phagocytosis, cell motility, cell-cell adhesion, and cell-substratum adhesion.

The *Dictyostelium* world has been fortunate over the years in having some of its leading researchers write volumes that summarize the state of the field. When done well, these monographs have a greater unity, and provide a better view and vision of a field than does a collection of review articles. The current volume is the latest such effort, and it succeeds magnificently. The chapters are logically presented so it can either be read from end to end or used as a reference source for a specific topic. It covers both the developmental and cell biological aspects of *Dictyostelium*. The writing is exceptionally clear throughout. The book is part of the Developmental and Cell Biology Series, and its editor suggests that the series is intended for advanced undergraduates and graduate students. This monograph will work well for those groups. I suspect that it will also find its way onto the shelves of those workers in the *Dictyostelium* community looking for an up-to-date, broad view of their field. Finally, I would also recommend it to workers in other fields searching for an introduction to *Dictyostelium*.

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TIGHT JUNCTIONS. *Second Edition.*

*Edited by Marcelino Cereijido and James Anderson.*  
Boca Raton (Florida): CRC Press. \$119.95. xviii + 772 p; ill.; index. ISBN: 0-8493-2383-5. 2001.

Although epithelia have been recognized to provide a "barrier" for well over 100 years, it was not until the 1950s, with the advent of the electron microscope, that the tight junction was identified as an anatomic structure. Nevertheless, it has only been within the past ten years that the molecular mysteries of the epithelial cell tight junction have begun to unravel. This second edition of *Tight Junctions* is a comprehensive, state-of-the-art compendium of the basic structure and function of the epithelial tight junction. The editors have put together a detailed review that brings unique expertise and approaches to the topic.

The book is organized into relatively short, generally lucid, and thoroughly referenced chapters. The book is separated into three broad areas: the beginning chapters review physical and ultrastructural features of the tight junction (TJ), as well as some methods for study. The next group of chapters review exciting advances in new proteins identified within the tight junction, especially occludin and claudin. Discussion of an expanding list of proteins found in or near the junction is comprehensive, and there are concise summaries of the complex signaling pathways identified so far to regulate the junction. The final section of the book addresses cell/tissue specific issues relevant to the TJ. These include chapters on microbial pathogens, leukocyte transmigration across epithelia, and unique features of the TJ in intestine, liver, kidney, urogenital, ocular, and nervous systems. Because of its scope, *Tight Junctions* will be a comprehensive resource for investigators interested in epithelial cell biology, as well as clinicians and students of other fields who are curious about pathophysiologic mechanisms.

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## GENETICS & EVOLUTION

WHAT IT MEANS TO BE 98% CHIMPANZEE: APES, PEOPLE, AND THEIR GENES.

*By Jonathan Marks. Berkeley (California): University of California Press. \$27.50. xiii + 312 p; ill.; index. ISBN: 0-520-22615-1. 2002.*

Intended for a general audience, this book is an idiosyncratic exploration of contemporary issues in molecular anthropology. The author's primary

focus is on the genetic relationship between apes and humans, and what it can tell us about human nature. His short answer to this question is "nothing," and harsh words follow for those who think otherwise.

Marks spends a considerable amount of time condemning the notion that because humans and chimpanzees share 98% of their DNA, humans are "deep down" behaviorally and morphologically 98% chimpanzee. It is never entirely clear who is meant to have ever believed this remarkable idea, though. Marks singles out the biochemist Emile Zuckerkandl as a likely perpetrator, quoting his statement that "from the point of view of hemoglobin structure, it appears that gorilla is just an abnormal human, or man an abnormal gorilla" (p 42). Marks neglects to inform readers, however, that it was Zuckerkandl who noted in the mid-1960s that there is a clear disconnect between genetic similarity and phenotypic similarity. This observation gave rise to the concept of the molecular clock, and the widely accepted idea that genetic similarities give us information about phylogeny, but not specific phenotypic attributes.

Surprisingly, phylogeny is a topic that receives short shrift in this volume. Marks mentions the early DNA hybridization work of Sibley and Ahlquist (which concluded that chimpanzees and humans are each others' closest relatives to the exclusion of gorillas), but only to dismiss it as flawed. He ultimately concludes that the phylogenetic relations of the apes remain "quite ambiguous" (p 263).

What Marks omits here is the fact that subsequent DNA hybridization work by Caccone and Powell produced the same phylogeny reported by Sibley and Ahlquist using different methods. Nor does he mention that this phylogeny has been convincingly corroborated by DNA sequence data from multiple independent loci. This is an astonishing omission from a book that purports to address the issue of genetic similarity between apes and humans.

In ignoring phylogeny Marks overlooks what most anthropologists really do think is interesting about that magic 98% figure—namely that it is higher than the comparable number for gorillas and chimpanzees. It is worth considering what a piece of good fortune this is for anthropologists. If chimpanzees and gorillas were each others' closest relatives, then it would be much more difficult to draw inferences about the common ancestor of chimpanzees and humans, because any traits shared between chimpanzees and gorillas could potentially be derived. The fact that chimpanzees and humans form a group to the exclusion of gorillas, plus the fact that chimpanzees and gorillas are so similar, strongly suggests that the common ancestor of chimpanzees and humans was rather like a chimpanzee. This pro-

vides a crucial starting point for our narratives of human evolution.

There is a kernel of truth to the author's grumbling about the ubiquity of the 98% figure in the popular science media and the animal rights literature. Marks himself points out, though, that the number is usually cited as a mere rhetorical device. The case for the usefulness of chimpanzees in studies of human behavioral evolution is based primarily on cognitive and behavioral similarities between these two species—not on the 98% statistic. The same is true for the argument that apes are deserving of legal protection beyond that offered to other nonhuman animals (an idea that is anathema to Marks).

At several points, Marks moves away from the genetic data, and into the realms of behavior and cognition in order to argue that such similarities are illusory. His lack of expertise in these fields is evident, and his treatment of them is cursory and superficial. For example, he relies upon experimental work by Daniel Povinelli to establish that the chimpanzee mind models the world in radically different ways from the human mind. He neglects to mention serious methodological problems with Povinelli's data (including the fact that his experiments were all done with juvenile chimpanzees), and completely overlooks a burgeoning literature in comparative psychology (from experimentalists like Michael Tomasello and Brian Hare), suggesting that chimpanzees and humans share complex mental attributes (including aspects of theory of mind) not documented in other primates, including gorillas. Marks also expresses disbelief that lethal intergroup aggression and territoriality are important features of chimpanzee society, maintaining that these are cultural projections of western primatologists. Given the concordance of accumulated data from decades of research at field sites across East and West Africa, such wishful thinking is simply no longer tenable.

Unfortunately, the frequency with which Marks commits serious errors of omission, and introduces straw men into the debate, will make it difficult for most scholars familiar with the field to take this book seriously. It is one thing to disagree with an interpretation of a data set; it is quite another to pretend that the data do not exist. And even non-specialists will quickly key into the fact that Marks oversimplifies or dichotomizes complicated issues in unhelpful ways for the sake of scoring debating points. A few readers might appreciate Marks's bombastic prose purely on the level of rhetoric. Readers seeking an honest, topical review of what chimpanzees can tell us about human evolution are advised to look elsewhere.

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CAPTIVATING LIFE: A NATURALIST IN THE AGE OF GENETICS.

By John C. Avise. Washington (DC): Smithsonian Institution Press. \$24.95. ix + 212 p; ill.; index. ISBN: 1-56098-957-2. 2001.

Individuals who write autobiographies need sufficient ego to undertake such a project and a good life story to sustain it. Ego suffuses this book. By his own admission, John Avise has had a career devoted to an "unprecedented marriage of genetics and natural history" that people who lack a "fascination with nature usually cannot begin to fathom" (p 1). Yet, Avise's career follows a path well trodden by many other ecologists, evolutionary biologists, and naturalists of his generation.

The author has been a major participant in the molecular "revolution" of population genetics, and is one of the founders of the subsdiscipline of phylogeography. His early work with isozymes, and more recent research on molecular markers, all conducted across an exceptionally broad range of taxa, earned him election to the National Academy of Sciences in 1991, at the tender age of 43. The goal of this autobiography is to explain to others how he came to be entranced with nature and scientific research.

Unfortunately, it is not clear for whom this book is written. Given current demographic trends, few readers will have grown up in rural communities or have had experiences actually contacting nature as opposed to viewing it on the Web. Draft deferments, which were instrumental in the choice of many individuals (including Avise) to attend both college and graduate school, are a thing of the past. Aspiring scientists who, like Avise, were hooked on nature at a young age and are already on a defined career path, will easily find themselves in his narrative, but others are unlikely to relate.

On the other hand, it is refreshing to read a scientist being upfront about his struggle with Vietnam-era politics and his nature-based reasons for seeking conscientious objector (CO) status. The half-page essay excerpted from his application for CO status is worth the price of the book and succinctly sums up his entire career. It also stands the test of time, and is as relevant now as it was 32 years ago: "I determined to pursue studies in natural resources in the hope of strengthening convictions that man and the earth could only survive by harmonious interactions. . . . I therefore cannot allow myself to be a part of practices which must, if continued, ultimately destroy the earth" (p 37).

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GENOMIC REGULATORY SYSTEMS: DEVELOPMENT AND EVOLUTION.

By Eric H Davidson. San Diego (California): Academic Press. \$49.95. xii + 261 p; ill.; index. ISBN: 0-12-205351-6. 2001.

One of the enduring challenges of biology and evolution is to understand the genetic events that direct a single fertilized egg to give rise to millions of cells of hundreds of functionally distinct cell types in diverse organisms. It has long been accepted that the blueprint for developmental events is embedded in the genome, and that the specification of any single cell type is the product of one or more regulatory cascades that direct tissue-specific gene transcription in a temporal and spatial manner. The past 20 years of research in developmental biology and genetics has led to the identification of genes and gene arrays that participate in these cascades. These studies have revealed extensive similarities of components and pathways that give rise to very different looking adult insects, mammals, and other intermediate species. In *Genomic Regulatory Systems*, Davidson synthesizes these findings in developmental and evolutionary contexts in a cohesive, insightful, and accessible volume.

The primary emphasis of the *Genomic Regulatory Systems* is on the role of *cis*-elements, located within the noncoding DNA, in providing specificity for the transcriptional regulation of individual genes. These *cis*-elements are organized as discrete modules with a role to process environmental cues for directing temporal and spatial patterns of gene expression during development. This scholarly account is extremely timely, as the genome projects are generating the raw material for systematic computational and laboratory approaches to identify and delineate the function of *cis*-elements and uncover the true complexity of developmental pathways. It will help shape this emerging field as it outlines, articulates, and elaborates concepts in the organization of these *cis*-elements.

In the first two chapters of the book, the fundamental concepts of *cis*-regulatory modules are introduced along with the operating principles by which they are able to regulate specification and pattern formation during embryonic development. Well-characterized *cis*-regulatory systems from *Strongylocentrotus purpuratus* (sea urchin) and *Drosophila melanogaster* (fruit fly) are effectively used to demonstrate how the composition of repressor and enhancer elements within a module affects its function. A third order of complexity is then introduced by examining the relationship of multiple *cis*-regulatory modules in determining the transcription of genes that are expressed more than once or in diverse tissues during development. This is followed in Chapters 3 and 4 with an examination of the role

of *cis*-regulatory modules in directing cell type specification.

The author separates his discussion into simple systems where specification occurs early during embryogenesis and more complex organisms where the formation of distinct adult body parts precedes specification. As with the introduction, the majority of the examples are drawn from *D. melanogaster* and *S. purpuratus*, where the link between *cis*-elements and the developmental pattern of gene transcription is better understood (classic vertebrate models of heart, limb, and hindbrain development are also included for a more complete discussion). The developmental aspects are written with an integrated evolutionary genomic approach (especially Chapter 5), which is an important and advanced feature of the scholarly text. The wealth of knowledge in this first edition will be most accessible to senior graduate students and experts in developmental biology, evolution of development, and genetics. Inclusion of a more detailed introduction in a future edition is likely to make it accessible to readers outside developmental biology.

This book accomplishes its goal of presenting a clear illustration of the contribution of *cis*-regulatory elements to the regulatory cascades that shape embryo development. Most of the figures are a composite of primary data from research papers, models, and circuitry diagrams, which effectively guide readers through complex regulatory systems. It will leave a lasting impression about the importance of taking an integrative evolutionary genomic approach to understanding blueprints of developmental networks. *Genomic Regulatory Systems* will be essential for anyone interested in delving into how adult animals form and how their body plans evolve over time.

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MODERN GENETIC ANALYSIS: INTEGRATING GENES AND GENOMES. *Second Edition.*

By Anthony J F Griffiths, William M Gelbart, Richard C Lewontin, and Jeffrey H Miller. New York: W. H. Freeman. \$75.00. xxi + 736 p; ill.; index. ISBN: 0-7167-4382-5. 2002.

In 1976, David Suzuki and Anthony Griffiths published an undergraduate genetics textbook that used a classical *genetics-first* approach. It started with Mendel's contributions and emphasized that the historical development of the field of genetics is an instructive device to present important genetic concepts. Undergraduate genetics textbooks have extensively employed this approach in the past. *Modern Genetic Analysis* takes an alternative *genome-first* approach to introduce genetic principles. For

example, there is no stand-alone chapter devoted to Mendelian principles in this book, as these are distributed in the context of molecular genetics in Chapters 2 through 6. Therefore, the emphasis is on integrating genes and genomes in a natural way to teach molecular genetics.

*Modern Genetic Analysis* contains 19 chapters, two appendixes, a glossary, a list of further readings, a section with answers to selected problems, and an extensive index. The volume begins with a description of DNA as the genetic material (Part 1) and proceeds to discuss methods of genetic manipulation by genetic engineering and mutations. An appreciation of genetic variation is provided at the outset. Gene and genome structures are presented in a comparative genomic approach. Gene function, DNA transmission, and inheritance of simple genetic differences are then illustrated elegantly. Part 2 of the book contains five chapters, which describe a wide array of genetic manipulation tools from traditional to modern approaches. The presentation is well motivated and the text is written in a lucid style. Connections between the blueprint of life and the phenotype are presented in Part 3. It consists of four chapters that cover topics from gene transcription and regulation to developmental genetics. The final three chapters comprise Part 4, which presents detailed discussion of the quantitative aspects of genetics, including population genetics, evolutionary genetics, and molecular evolution. The treatment of the subject matter in this section is advanced, but still highly accessible.

Genetics instructors might be faced with a decision to select between the widely used *An Introduction to Genetic Analysis* (A J F Griffiths et al. Seventh Edition. 2000. New York: W. H. Freeman and Company) and this relative newcomer *Modern Genetic Analysis*. The list of authors for each of these textbooks has a great deal of overlap. How do these books differ? *Modern Genetic Analysis* is a survey textbook with modern *genome-first* emphasis, whereas *An Introduction to Genetic Analysis* is a comprehensive textbook with classical *genetics-first* emphasis. Survey textbooks are usually shorter and are typically useful in introductory genetics courses intended for college sophomores with only rudimentary biology and chemistry backgrounds. Comprehensive volumes are usually much larger, provide more detailed explanations, and are typically used in advanced genetics courses aimed at college seniors with extensive backgrounds in biology and chemistry. In our view, *Modern Genetic Analysis* could easily be used for junior and senior undergraduate courses, as it is detailed enough for those interested in specializing in molecular genetics.

In the second edition, *Modern Genetic Analysis* places greater emphasis on bioinformatics by

including Web-based tutorials and a resource list. In addition, the importance of population and evolutionary genetics is now underscored by devoting complete chapters on these topics. This is truly how modern genetic analysis differs from the classical genetic analysis. *Modern Genetic Analysis* captures this transition superbly and presents opportunities to genetics teachers to impart that knowledge in an easily accessible form to prepare undergraduates for tomorrow's research challenges in academic and commercial contexts.

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THE GENETICS AND BIOLOGY OF SEX DETERMINATION. *Based on a symposium held in London, 1–3 May 2001. Novartis Foundation Symposium, Volume 244.*

*Edited by Derek Chadwick and Jamie Goode. Chichester (United Kingdom) and New York: John Wiley & Sons. \$125.00. ix + 266 p; ill.; index of contributors, subject index. ISBN: 0-470-84346-2. 2002.*

The basic dichotomy of life is sexual and how different species of vertebrates establish this dichotomy was the subject of a symposium that was held in 2001. This book contains a series of 15 invited papers and the accompanying discussions from this symposium. These papers examine recent developments in our understanding of male sex determination in mammals, birds, and reptiles.

Males have gonads that produce small, motile gametes and females have gonads that produce large, immotile gametes. The genetic basis for this phenomenon in some species—sex chromosome dimorphism—was discovered almost 100 years ago and represented the first exception to Mendelian transmission that was identified by geneticists. Sex chromosome dimorphism can work either way with the heterogametic sex being male in mammals (XY) or female in birds (ZW). Over the course of evolution, nature developed a multiplicity of solutions for sex determination, including X-autosome ratio in insects and nematodes, temperature of rearing in amphibians, and social context in some species of fish. Amid this diversity, there is a shared repertoire of molecules in the gonads. How to shoehorn the diversity of sex-determining solutions into a series of similar genetic pathways has become a challenge of recent times. As Gerd Scherer suggests in this volume, this challenge is like a jigsaw puzzle for which only some of the pieces have been put into place. Among the corner pieces of the puzzle that have been placed are the identification of a dozen or so sex-determining genes in mammals, the identification of the basic cell types in the gonad and their precursors, and the evolutionary mechanisms associated with sex determination.

There are some significant limitations to this volume. The discussion of the genetic mechanisms of abnormal sex determination in humans is incomplete. There is a limited presentation of ovarian development in vertebrates and virtually no discussion about the mechanisms of sex determination in nematodes and insects. Despite these shortcomings, this is a good source for recent, in-depth information about male sex determination in vertebrates.

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#### FISH SKULLS: A STUDY OF THE EVOLUTION OF NATURAL MECHANISMS.

By William K Gregory. *Malabar (Florida): Krieger Publishing.* \$79.50. vii + 75–481 pp + 1 foldout; ill.; index. ISBN: 1–57524–214–1. [Originally published in the transactions of the *American Philosophical Society*, Volume Twenty-Three, Part Two, 1933.] ISBN: 1–57524–214–1. 2002.



#### REPRODUCTION & DEVELOPMENT

##### BEYOND HETEROCHRONY: THE EVOLUTION OF DEVELOPMENT.

Edited by Miriam Leah Zelditch. *New York: Wiley-Liss.* \$99.95. xviii + 371 p; ill.; index. ISBN: 0–471–37973–5. 2001.

Certain books can be important because they are “firsts” and because they make big impacts. The current volume satisfies on both fronts. It is indeed the first of its kind in a field otherwise packed with treatments of heterochrony—a term that has come to mean many things to many researchers. Traditionally, it connotes changes in developmental rate or timing, resulting in a parallelism between ontogeny and phylogeny. By contrast, the broadest definition used today can refer to any evolutionary change in ontogeny—heterochrony explains everything and, therefore, pretty much nothing at all. As stated in the preface, there is a tremendous imbalance in favor of works that find heterochrony all over the place. If one did not greet some accounts with the requisite level of scientific skepticism, heterochrony so defined could be viewed as the sole force behind evolutionary novelty. The value of the book lies in its own novelty in challenging that view.

The impact factor is also high because of the judicious selection of contributors, and the perspicacious guidance that Zelditch has given them.

Often, edited volumes are compilations of disparate papers that wander all over a field without ever finding the main trajectory again. No such problem here. Each paper defines terms and adheres to the main idea of going beyond heterochrony for an explanation of a given novelty. The ten papers use organisms such as gastropods, bivalves, trilobites, snakes, piranhas, lizards, frogs, and angiosperms to develop inventive ways of testing heterochrony. Tests are performed in the context of the stated definitions, sometimes with developmental data that can go right down through the cellular to the molecular, and sometimes with morphometric analyses that can chew on entire morphologies simultaneously. The continuity in the volume persists in spite of the fact that each paper can stand independently as an original contribution. Many find that heterotopy, or evolutionary alteration in developmental location, is a better fit in explaining their measurements of evolutionary novelty. For example, an explicit morphometric test of a system in trilobites, traditionally viewed as a classic heterochrony (Webster et al.), is convincing in its destruction of that view. In fact, only a single paper (Nehm) finds in favor of heterochrony.

One hopes that this does not signify a swing of the pendulum to the far end of the arc, in which we set up our tests in such a way that we find only heterotopy. I eagerly await more tests of “classic” examples of heterochrony to see how robust the original declarations of things such as paedomorphosis actually were. What would happen if we aimed our partial warps at axolotl, for example? This anticipation is a huge part of the attraction in a groundbreaking book such as this. Of course, I share the view of many of the contributors that evolution should not be forced to select from among the various processes covered by all these “hetero-” topics. Surely nature paints with all the available colors in complicated ways that make the field endlessly rewarding and exciting. The book makes me feel as though we are on the edge of something great—perhaps even on the cusp of a kind of paradigm shift. I have little doubt that the change will be fueled in part by the powerful tests and techniques found in this volume.

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## MICROBIOLOGY

INTRODUCTION TO MODERN VIROLOGY. *Fifth Edition.*

By N J Dimmock, A J Easton, and K N Leppard.  
Oxford and Malden (Massachusetts): Blackwell Science. \$56.95 (paper). vii + 449 p; ill.; index.  
ISBN: 0-632-05509-X. 2001.

Like its predecessors, the fifth edition of this volume is a comprehensive textbook for teachers and serious students of virology. The authors have continued the broad but in-depth treatment of bacteriophage, plant, and animal viruses that is traditionally found in textbooks on this subject. The accompanying discussions of virus evolution, novel virus-host relationships, and current antiviral strategies are what make this volume unique. In particular, information on viral gene expression and regulation, viral pathogenesis, HIV and AIDS, emerging infections, and prion diseases have been revised and expanded in the current edition.

Several features of the book will make it a useful reference for teachers and students. Although not formally delineated, the 22 chapters are organized into two parts: the first 11 chapters treat the subject of animal virology in a straightforward, didactic fashion. As presented, beginning students may find the description of the Baltimore scheme classification (Chapter 4) cryptic, as its explanation is not accompanied with specific examples. Rather, virus classification and nomenclature are listed much later in the volume (Chapter 22). Nevertheless, the highly structured presentation of the text makes it easy to find descriptions of specific replication aspects. Also, chapters conclude with references to both classical papers and helpful websites. Chapter 12, Lytic and lysogenic replication of bacteriophage  $\lambda$ , serves as a transition discussion and provides clues about virus-host interactions that are further elaborated in the succeeding chapters.

Chapters 13 through 21 offer in-depth information and perspectives that are usually lacking in virology textbooks. They complement the basic information in the earlier chapters and include several interesting discussions, e.g., strategies underlying genetic engineering of vaccines and virus evolution in the context of influenza virus pathogenesis. The presentations and models in this section of the book are more engaging than the information-dense tables in the earlier chapters. Perhaps appropriately, the style of the final

chapter, Trends in virology, is more anecdotal than objective, and will leave readers with short discussions on a plethora of thought-provoking topics. Several of these may presage chapters in future editions of textbooks that describe the ever-evolving field of animal virology.

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## PLANT SCIENCES

FIRST FRUIT: THE CREATION OF THE FLAVR SAVR<sup>TM</sup> TOMATO AND THE BIRTH OF BIOTECH FOODS.

By Belinda Martineau. New York: McGraw-Hill. \$24.95. xvii + 269 p; index. ISBN: 0-07-136056-5. 2001.

Scientific breakthroughs, corporate intrigue, high-stakes scientific competition, nasty office politics . . . Belinda Martineau's account of the research, development, commercialization, and ultimate demise of the first genetically engineered food product is interesting from many different perspectives. In seven chapters, plus a preface and epilogue, readers are treated to an insider's view during the heady and high-pressure times at Calgene, Inc. during the development of the Flavr Savr<sup>TM</sup> tomato. Martineau was employed by Calgene and its subsidiary, Calgene Fresh, during this period and worked on various scientific and regulatory aspects of the project.

The Flavr Savr<sup>TM</sup> tomato was the first genetically engineered foodstuff approved by U.S. regulatory agencies. The tomato was transformed with an anti-sense copy of the polygalacturonase gene, which was claimed to result in a delay in tissue softening. This delay was supposed to enable the tomato to ripen on the vine (enhancing flavor), but still allow conventional harvesting and shipping methods, as used for green-picked tomatoes.

Reading Martineau's book is like eavesdropping behind the closed doors of Calgene as it grew from its basic science based beginnings to the "darling" of the agricultural biotechnology sector, pioneering its way through the newly forged gauntlets of the regulatory process. The author leads us through this scientific, corporate, and regulatory maze: the overexpectation of data and people; the chasms between scientists' and business' modus operandi; the challenge of meeting regulatory guidelines not yet well defined; the race to patent; the defence of patents; the elation of successes; and the psychological grind of setbacks. As a research scientist working in a University setting, with only occasional interac-

tion with commercialization types, I found this book fascinating, and sometimes disturbing. I was amazed at times with the author's frankness, but at other times I wondered if some things were left unsaid.

This book is an engaging read for anyone interested in biotechnology and the commercialization of biotechnology. Although the author states in the preface that she has attempted to make the content as comprehensible as possible, many aspects of the molecular biology and physiology of microbes and plants will mystify laics.

Martineau proposes that the lack of commercial success of the Flavr Savr<sup>™</sup> tomato was not due to failure of the scientific process, the regulatory process, or the attitude of the general public at the time toward genetically engineered food, but due to a small company getting too big too fast and entering areas without the required expertise. Whether one agrees or disagrees with the author, this book is an engrossing account of this pioneering effort in agricultural biotechnology.

J KEVIN VESSEY, *Plant Science, University of Manitoba, Winnipeg, Manitoba, Canada*

**FRUIT QUALITY AND ITS BIOLOGICAL BASIS.** *Sheffield Biological Sciences.*

*Edited by Michael Knee. Sheffield (United Kingdom): Sheffield Academic Press; Boca Raton (Florida): CRC Press. \$135.95. xiii + 279 p; ill.; index. ISBN: 1-84127-230-2 (Sheffield Academic Press); 0-8493-9781-2 (CRC Press). 2002.*

This book treats fruit postharvest physiology from a horticultural, that is to say practical, perspective in terms of fruit quality and the various biological factors and physical and environmental treatments that may affect quality. Readers will likely be active fruit science researchers or practitioners of fruit postharvest technology who want to find overviews of the various topics related to fruit quality that are contained in this book, and I predict that most will be quite satisfied with what they find. Each chapter gives an excellent introduction and overview of its topic that should be well received and appreciated by those whose main interest in fruit physiology or quality may be in only one of the other topics covered. This volume would be an excellent starting point for students interested in learning about fruit physiology and quality.

The book is organized into ten chapters, beginning with an introduction to fruits, their place in international markets, and the various aspects of fruit quality. The second chapter considers the role of preharvest mineral nutrition of the plant in determining fruit quality. The next two chapters address important aspects of fruit quality, namely texture and flavor. The biochemical basis of the former is covered in much greater detail than the

latter, which is in line with the large role that fruit research has played in increasing our overall understanding of plant cell wall metabolism, while fruit flavor research has dwelt largely in the realm of the food scientist, more interested in developing artificial flavors for candies and desserts than understanding the physiological and biochemical roles of flavor development in living fruits. The following two chapters deal with outside influences on fruit postharvest physiology: temperature and atmospheric gases. Management of these factors constitutes the basis for fruit storage technology. Chapter 7 is a review of fruit mechanical injury, how it happens, and how the fruit anatomy and physiology explain the response to injury. The chapter on the ripening hormone ethylene covers its biosynthesis, perception, and action, and also the technology of ethylene management in fruit handling operations. The fruit postharvest pathology chapter touches on most if not all of the topics covered in other chapters in terms of how postharvest fruit disease is influenced and controlled. The final chapter reviews the history of the development of our understanding of the genetic control of fruit ripening. This chapter is a purely scientific discussion, steering clear of the debate over commercialization of genetically modified organisms.

JEFFREY K BRECHT, *Horticultural Sciences, University of Florida, Gainesville, Florida*

**ANNUAL REVIEW OF PLANT BIOLOGY.** *Volume 53: 2002.*

*Edited by Deborah P Delmer, Hans J Bohnert, and Sabeeha Merchant. Palo Alto (California): Annual Reviews. \$67.00. xii + 629 p + 34 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 43-53). ISBN: 0-8243-0653-8. 2002.*

**WILD ORCHIDS OF FLORIDA: WITH REFERENCES TO THE ATLANTIC AND GULF COASTAL PLAINS.**

*By Paul Martin Brown; drawings by Stan Folsom. Gainesville (Florida): University Press of Florida. \$50.00 (hardcover); \$24.95 (flexibind). xvii + 409 p; ill.; index. ISBN: 0-8130-2438-2 (hc); 0-8130-2439-0 (pb). 2002.*

**DIRR'S TREES AND SHRUBS FOR WARM CLIMATES: AN ILLUSTRATED ENCYCLOPEDIA.**

*By Michael A Dirr. Portland (Oregon): Timber Press. \$69.95. 446 p; ill.; index of plant scientific names, index of plant common names. ISBN: 0-88192-525-X. 2002.*

A southern gardener will relish this book that covers over 400 species described in detail, including hundreds of cultivars and varieties. The polished

photographs have the flair of both a biologist and a landscape architect, as they depict subtle differences in leaf or flower arrangement or form, allowing one to appreciate unique differences among plants, while highlighting the structure and function of the plant within a habitat. The text is written in a welcoming manner, as if the author was standing in the garden with readers. There are excellent suggestions given to alternatives and substitutions to some of the more common plants if one wishes to diversify a garden, as well as ideas on innovative uses as espalier or container-grown specimens. Additionally, the contents cover field experience in both growing and propagating these plants, and afford readers practical information to make informed choices. For more experienced plant growers, the tables on selecting plants for specific characteristics or purposes are invaluable. These plant lists allow one to research plant characteristics such as tolerances, fall color, cultural attributes, and maintenance in an extremely user-friendly structure.

This conglomerate guide provides readers with ample opportunity to recognize and cultivate many diverse species selected for the particularities of the southern landscape.

CALLIE JO SCHWEITZER, *Southern Research Station, USDA Forest Service, Normal, Alabama*

THE JEPSON DESERT MANUAL: VASCULAR PLANTS OF SOUTHEASTERN CALIFORNIA.

*Edited by Bruce G Baldwin, Steve Boyd, Barbara J Ertter, Robert W Patterson, Thomas J Rosatti, and Dieter H Wilken; Managing Editor: Margriet Wetherwax. Berkeley (California): University of California Press. \$35.00 (paper). xiv + 626 + 128 pl; ill.; index. ISBN: 0-520-22775-1. 2002.*



ANIMAL SCIENCES

MOSQUITO: A NATURAL HISTORY OF OUR MOST PERSISTENT AND DEADLY FOE.

*By Andrew Spielman and Michael D'Antonio. New York: Hyperion. \$22.95. xix + 247 p + 8 pl; ill.; index. ISBN: 0-7868-6781-7. 2001.*

This book is all about one of the peskiest insects ever to plague humans, with special focus on the ecology and transmission of mosquito-borne diseases. The first author is a world-renowned expert on the epidemiology of these diseases. The second author is a science journalist, and his contribution helps to place the book within the increasingly

common genre of science books written for educated laics.

Throughout *Mosquito* factual information is interspersed with reminiscences from Spielman's experiences as an epidemiologist. The first part of the book provides an overview of the life cycles of adult and immature mosquitoes and the mechanisms by which mosquitoes (and the diseases they carry) can spread across space. Part Two is concerned with the history of human attempts to determine the human-mosquito-disease link. This is probably the most interesting part of the book and gives a real sense of the paths scientists have taken to discovery and the collaborations and rivalries encountered along the way. The third part centers on human attempts to control mosquito populations, with special emphasis on the successes and failures of DDT and other pesticides, as well as the recent introduction and spread of West Nile virus within the United States.

*Mosquito* touches on most of the major mosquito species and mosquito-borne diseases affecting humans, but because of the great diversity in both the insect and the diseases, the discussions tend to be superficial. Readers will acquire a broad sense of important issues, but no one disease is covered sufficiently to gain understanding of its full impact on human populations through time. In addition, readers unfamiliar with mosquito biology may have a difficult time comprehending the diversity of mosquitoes and how that relates to the distribution and ecology of the diseases they carry. A figure summarizing differences between major species and maps that show the distribution of malaria, dengue fever, and West Nile fever are included at the end of the book, but these are not explained well and are not referred to within the text. Furthermore, the volume includes no references whatsoever, either within the body of the text or in a list at the end. This may limit the book's usefulness as a course supplement.

LISA SATTENSPIEL, *Anthropology, University of Missouri, Columbia, Missouri*

BIOLOGY OF THE PLANT BUGS (HEMIPTERA: MIRIDAE): PESTS, PREDATORS, OPPORTUNISTS.

*By Alfred G Wheeler, Jr; Foreword by T Richard E Southwood. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$95.00. xvii + 507 p + 24 pl; ill.; index to scientific names of animals and subject index. ISBN: 0-8014-3827-6. 2001.*

This book is about our competition with the Miridae—the largest family of heteropterous Hemiptera (insects with piercing sucking mouthparts)—the beneficial effects of predatory mirids, and the



complication posed by those species that can be both pests of certain crops and yet protectors of other crops. Although the book emphasizes feeding habits, the work embraces far more than biology and feeding. It is a whole treatise on the Miridae, which includes collection and preservation, general morphology, and classification (both well illustrated). The perspectives section, particularly the Chapter 6 overview, is a masterstroke, with every page packed with useful information. So is the whole book; it is a delight to read, and is written in an appealing style that will retain the interest of readers. Coverage is truly global, and species of noneconomic significance are included. There are many high-quality color photographs of mirid damage to plants and fruit. Several quick reference tables occur through the text. There are 18 chapters in five sections, including conclusions, references, a glossary, and helpful appendixes to both valid scientific and common names of mirids and plants mentioned. An index to scientific names of animals and a subject index are also provided.

This work will enhance an awareness of mirids and their importance in ecosystems. Much is known (as collated in the book) not only about their ability to damage plants, their external predigestion, the spectacular success in biological control by some predacious mirids, and progress with others in integrated management systems, but also about some of the complex factors leading to the success of mirids, such as ovipositing in plant tissue, synchronization of hatching with budburst of plant host or with hatching/appearance of prey, ability to survive on alternative hosts, and the capacity of adults to feed on flowers of plants they do not breed on. Yet we are still far from the end of unraveling all the complexities of mirid feeding and ecological impact: this is keenly stressed by the author throughout, and in his suggestions for future research. Wheeler is to be commended for the compilation of this review of the literature up to 2000 into a single volume. This is a valuable resource that is intended for a wide readership.

A C EYLES, *Paraparumu Beach, New Zealand*

#### DRAGONFLIES OF THE WORLD.

By *Jill Silsby*. Published by Smithsonian Institution Press, Washington (DC), in association with CSIRO Publishing, Collingwood (Australia). \$39.95. viii + 216 p; ill.; index of species and general index. ISBN: 1-56098-959-9. 2001.

At first glance the title of this book may seem ambitious, but the scope is actually larger than the initial impression yields. The insect order Odonata contains both dragonflies and damselflies, and this book is actually about the Odonata of the world.

Further, it is not only a taxonomic treatise, but the first 70 pages and the final two chapters are a primer on dragonfly biology, morphology, behavior, rearing, evolution, and conservation. The pages in between are a description of the damselfly and dragonfly families and subfamilies with descriptions of species of interest in each group. The book has 12 chapters, five of which are written by authors other than Silsby. Thirteen authors contribute to the descriptions of the various species.

The book is well illustrated with photographs and drawings, the majority of which are excellent. The Odonata are notoriously difficult subjects for photography not only by temperament, but by the long planes of their body plan. It is hard to get all of them in focus at once. Illustrations are conveniently placed near the portion of the text that discusses them. In situations where this does not occur, readers are referred to the page number where the illustration may be found. The text is meant to be accessible to general readers and is written in a first person, sometimes narrative style. The authors do not shy away from technical detail, but make a strong attempt to impart this information in nontechnical language. Indeed, the book is laced with conversational terms. Most people will find it pleasant to see this information along with personal experiences presented in a manner that is easy to read and understand. If readers have prior experience with English names used in North America, there may be some slight confusion, as common names for the Odonata have not been standardized and the sources used in this book are European. For example, the name for the Aeshnidae is "hawker" in Europe and "darter" in North America. Overall, this book is both a fine introduction and an excellent resource on these insects.

FORREST L MITCHELL, *Texas Agricultural Experiment Station, Texas A&M University, Stephenville, Texas*

#### SOLITARY WASPS: BEHAVIOR AND NATURAL HISTORY. *Cornell Series in Arthropod Biology.*

By *Kevin M O'Neill*; illustrated by *Catherine Seibert*. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$39.95. xv + 406 p; ill.; index. ISBN: 0-8014-3721-0. 2001.

Most species of living things are insects, and terrestrial ecology consists largely of interactions between insects and plants. The biologies of major insect groups such as Hymenoptera should be well documented and well known. Amazingly, they are not. The world is awash in excellent reviews of current knowledge about the much less diverse and less ecologically significant mammals and birds.

But there are relatively few accessible and up-to-date accounts of hymenopteran biology, suitable for beginners seeking education and entry to the primary literature. The last three decades have seen the publication of *The Wasps*, by Howard E. Evans and Mary Jane West-Eberhard (1970. Ann Arbor (MI): University of Michigan Press), *The Insect Societies*, by Edward O. Wilson (1971. Cambridge (MA): Harvard University Press), *The Hymenoptera*, edited by Ian Gauld and Barry Bolton (1988. Oxford: Oxford University Press), *The Ants*, by Bert Hölldobler and Edward O. Wilson (1990. Cambridge (MA): Harvard University Press), *Parasitic Wasps*, by Donald L. J. Quicke (1997. London: Chapman and Hall), and *The Bees of the World*, by Charles D. Michener (2000. Baltimore (MD): Johns Hopkins University Press), among others. Now Kevin O'Neill gives us *Solitary Wasps*, which skillfully synthesizes a huge but scattered literature on the habits of the tens of thousands of aculeate (stinging) Hymenoptera that are neither bees nor social.

O'Neill devotes a brief Chapter 1 to the still somewhat murky phylogenetic background, but most of the book is organized under a series of behavioral and ecological issues, including foraging (four chapters), nesting, defense against natural enemies, male mating strategies and female choice, thermoregulation and overwintering, and parental investment (one chapter each). O'Neill uses a single, well-studied species to illustrate each topic and then provides a comparative survey. Detailed information is summarized in tables that provide synoptic views of current knowledge and easy access to the literature. This organizational scheme is very effective. Readers will learn the extent and limits of current knowledge, and are introduced to still unanswered questions. Readers can gain an appreciation for the immense phenotypic and ecological variation among solitary wasps, and for the ways in which this variation informs and challenges current theories in behavioral ecology. Indeed, with some additional readings from the primary literature, this volume could serve as the main textbook for an upper-division or graduate course.

O'Neill points out in his preface that wasps have played important but underappreciated roles in the development of many subjects. For example, the solitary sphecid *Philanthus triangulum* was the object of Niko Tinbergen's first experiments, which define modern field ethology. By the end of this book, readers will understand why these hard-working, clever, and charismatic insects have inspired so much scientific innovation, and why they surely will continue to do so in the future.

ROBERT L. MINCKLEY and JON SEGER, *Biology, University of Utah, Salt Lake City, Utah*

KATYDIDS AND BUSH-CRICKETS: REPRODUCTIVE BEHAVIOR AND EVOLUTION OF THE TETTIGONIIDAE. *Cornell Series in Arthropod Biology*.

By Darryl T. Gwynne. Comstock Publishing Associates. Ithaca (New York): Cornell University Press. \$42.50. xiii + 317 p + 24 pl; ill.; index. ISBN: 0-8014-3655-9. 2001.

To professional biologists, the Tettigoniidae are probably best known for providing many of the classic model species for functional, mechanistic, and neurobiological studies of acoustic communication. That is changing, and they are becoming key species for evolutionary biologists, particularly those interested in behavioral ecology, the evolution of sex roles, and nuptial feeding (the habit of presenting your prospective sexual partner with a meal as an inducement to mate). Gwynne has probably done the most to drive this recent change, and his book is an entertaining and informative account of tettigoniid taxonomy and evolution based largely on his own work, concentrating mainly on reproductive strategies and sexually selected behaviors.

Nine chapters of the book cover tettigoniid taxonomy, life cycles, predators and parasites, and acoustic behavior. But the main course concerns the evolution of the tettigoniid "spermatophore"—the protein rich meal males present to the female during copulation. In some species this simply seems to protect the sperm during insemination (by keeping the female occupied during sperm transfer). In a few of the species it has become exaggerated in size and may represent male investment in offspring, by providing nutrients to the female which eventually increase offspring quality. Under certain conditions (if other nutrients are rare) this can lead to sex role reversal, with females competing for access to choosy, coy males. Gwynne and others have used this remarkable mating system to explore fully the flexibility of sex roles and other consequences of the spermatophore, and are described in detail in the final four chapters. Clearly aimed at the academic, these chapters conclude with suggestions for future research. The orientation is the "individual selectionist thinking" typical of behavioral ecology.

Overall, the style of the book is somewhere between a hard-nosed academic treatise and a more popular read. The figures are particularly well presented and the research background and theory are described clearly and in detail. Yet the book is enjoyably personal in outlook, beginning with an account of the author's first encounter with the variable mating strategies of Mormon crickets, which came to underpin much of his research. The history of orthopteran research is alluded to in a liberal sprinkling of enjoyable quotations and accounts of early studies, and each chapter is preceded by a series of quotations from sources as diverse as Fabre to Dean Martin. There

is also a series of tales about the impact of tettigoniid outbreaks on humans (mainly settlers in the New World) and other human interactions (it is somewhat disappointing that he has not experimentally tested their Chinese reputation as an aphrodisiac, although the African belief that eating tettigoniids causes beard growth in human females perhaps suggests they may well influence testosterone).

This book is a "must have" for tettigoniid researchers and aficionados, and should be a good read also for behavioral ecologists and curious natural historians.

MIKE RITCHIE, *Biology, University of St. Andrews, St. Andrews, United Kingdom*

GRASSHOPPERS OF FLORIDA. *Invertebrates of Florida Series.*

By John L Capinera, Clay W Scherer, and Jason M Squitier. Gainesville (Florida): University Press of Florida. \$34.95 (paper). xxi + 143 p; ill.; index. ISBN: 0-8130-2426-9. 2001.

Settling in Florida from Britain over 20 years ago, I was surprised and disappointed to find virtually no field guides to the insects. Colleagues suggested I write my own. This volume is a wonderful field guide to the grasshoppers of Florida, written by experts in the field. It was difficult for me to find fault with the book. It is lavishly illustrated in full color throughout. The superb color photographs of all species, which will make identification easy, are a major strength of this volume. Usually these photographs are of adult specimens on vegetation, as they appear in nature. Sometimes they are accompanied by photographs of pinned specimens, with wings spread, to illustrate a particular taxonomic feature. There may also be separate photographs of males and females, or of nymphs, where these differ from one another, to facilitate identification. The photographs are accompanied by descriptions of the species, characteristic features that allow distinctions to be made from similar species, notes on habitat preferences and life history, and excellent maps of North American distributions. At the beginning of the book there are useful sections on Florida habitats, grasshopper life histories, and collection and pinning techniques. This is followed by an abbreviated key to Florida grasshoppers. There is a mine of useful information here. For example, we learn that of the 70 or so species of grasshopper found in Florida, 18 (or about one-quarter) are unique to the state.

I thoroughly recommend this book for both professional and amateur entomologists. It did not escape my notice that the frontispiece lists the volume as part of the *Invertebrates of Florida Series*. I do hope other volumes will soon follow.

PETER STILING, *Biology, University of South Florida, Tampa, Florida*

NATURE'S FLYERS: BIRDS, INSECTS, AND THE BIOMECHANICS OF FLIGHT.

By David E Alexander; Foreword by Steven Vogel. Baltimore (Maryland): Johns Hopkins University Press. \$49.95. xxi + 358 p; ill.; index. ISBN: 0-8018-6756-8. 2002.

The atmosphere was the last natural frontier. It was relatively simple for organisms to evolve a means to move through water and on land. The conquest of this frontier by birds, bats, insects, and even seeds and pterosaurs is the subject of this fascinating book.

The volume is organized as one would organize a course on the subject. Indeed it would make an excellent supplement to a biomechanics course. The author does not assume any prior knowledge of flight on the part of readers and does an outstanding job of defining relevant terms. The glossary is rather incomplete, but combined with the index, readers will find detailed explanations of all of the important terminology. The book begins with the general use of wings for lift production, gliding and soaring, and flapping flight. The author then turns to stability and control and power requirements to fly before discussing the evolution of flight. This is where Alexander shows his ability to discuss complex topics with prose that is easy to read and understand. Moreover, given that many advances in our understanding of flight have been made in the last ten years, the book is very much up to date. Perhaps it is only missing the last two years of results on unsteady aerodynamics and its relevance to lift production. The author then discusses migration and navigation before concluding with the relevance of flying organisms to humans. Here I found the prose to be weak. If we are to challenge students to learn about flight, the relevance of flight to humans should be integrated into the chapters. After all, many of the author's examples are very interesting. They just fail to stand on their own.

ROBERT B SRYGLEY, *Zoology, University of Oxford, Oxford, United Kingdom*

BIRDING ACROSS NORTH AMERICA: A NATURALIST'S OBSERVATIONS.

Text and Photographs by Philip E Keenan. Portland (Oregon): Timber Press. \$29.95. 257 p; ill.; index of bird names. ISBN: 0-88192-528-4. 2002.

THE WORLD OF THE HUMMINGBIRD.

By Robert Burton. Buffalo (New York): Firefly Books. \$40.00. 158 p; ill.; index. ISBN: 1-55209-607-6. 2001.

So many popular and technical books have been written about hummingbirds that one could argue that the market is saturated. Yet who tires of recount-

ing the feats of a three gram bird capable of flying backwards, beating its wings up to 200 times per second, and of migrating 1400 miles without stopping? Robert Burton's stunning new book justifies itself, providing a concise overview of the biology and diversity of these amazing creatures.

This richly illustrated volume is separated into seven chapters that cover general biology, flight, relations to flowers, daily and social lives, migration, nesting, and roles in human history. Burton maintains a judicious balance between well-known and new information that will appeal to both general readers and seasoned biologists. In a personal style that imparts a sense of enthusiasm and wonder, Burton outlines how recent research has changed our views of these birds (close, mutualistic relationships between hummingbirds and nectar-providing plants prove rare; many hummingbirds are belligerent and highly aggressive in competition for nectar or mates), and reveals many remarkable new attributes (ability to learn songs and to see ultraviolet colors invisible to humans; the dietary importance of arthropods and the varied and often comical behaviors used to catch them). Sometimes Burton does not go far enough in highlighting paradoxical aspects of hummingbird biology (for example, his discussion of why many hummingbird flowers are red states that the birds' eyes are very sensitive to that color, whereas experiments show that hummingbirds' ability to discriminate physical wavelengths actually is poorest at the red end of the spectrum). Nevertheless, Burton provides thoughtful summaries that consider the limits of our present understanding on many topics. He also voices appropriate concern that habitat destruction threatens a number of less familiar South American species. Finally, the numerous stop-action color photographs by noted wildlife artists depict some of the variety in form and color among members of this species-rich family, enhancing the attraction of the subject and book. These striking images, combined with the engaging text, are enough to motivate even casual naturalists to learn more about these avian nonpareils.

ROBERT BLEIWEISS, *Zoology, University of Wisconsin, Madison, Wisconsin*

#### OF BIRDS AND TEXAS.

*By Stuart Gentling and Scott Gentling; with an essay by John Graves. Austin (Texas): University of Texas Press. \$75.00. 223 p; ill.; no index. ISBN: 0-292-72834-4. 2001.*

In 1986, Stuart and Scott Gentling released their elephant-sized folio *Of Birds and Texas* (Gentling Editions) to great acclaim. This collection of ten plates depicting Texas landscapes and 40 plates of select

Texas birds, along with an introduction by Harry Tennison and essay by John Graves, was considered by many to be one of the greatest contributions in Texas publishing. The current volume, with the same title, represents a long-time desire of the artist brothers to reproduce this earlier work in a smaller trade edition. In addition to original folio materials, this edition features another 29 bird illustrations (remarques and title page insert), a revised essay by John Graves, a new preface and acknowledgments, and an essay that describes the more than 20 years that have transpired from project conception to completion through the eyes of the artists.

All of the plates are beautifully produced. Illustrative style is not that of photographic realism, which has become commonly expected of wildlife artists today, but rather 19th-century romanticism. The influence of Audubon, to whom the folio was dedicated, is evident in many of the plates. The influence of other artists, both Western and Eastern, and from 19th and 20th centuries, can also be felt throughout the volume. Unfortunately, there are a few minor problems among the remarques. A Common Yellowthroat is titled "Yellow-throated Warbler" (p 202) and the "Wood Thrush" (p 210) looks more like a Swainson's Thrush (except for the dark bill and bold eye ring).

Although the greatest treasures are the plates, this is also a work of literature. Throughout the book, the Gentling brothers provide commentary ranging from natural history notes to personal inspiration for subjects illustrated (one to two pages per plate). These thoughts lend to a better understanding of the artists' goals and a greater appreciation of the final product. This new volume should make a wonderful addition to the shelves or coffee tables of those who truly appreciate wildlife art, as well as those who have not given up understanding the simple pleasures of stopping to watch a bird.

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

#### SYLVIA WARBLERS.

*By Hadoram Shirihai, Gabriel Gargallo, and Andreas J Helbig; illustrated by Alan Harris; photographic editor and field photographer: David Cottridge; distribution maps by C S Roselaar; edited by Guy M Kirwan and Lars Svensson. Princeton (New Jersey): Princeton University Press. \$75.00. 576 p; ill.; index. ISBN: 0-691-08833-0. 2001.*

A flourishing genre in recent books on birds is the monograph or handbook on a particular taxonomic unit (rather than, say, the birds of a particular nation or region). The commercial success of the format is borne out by the fact that several different publishers now utilize a similar approach.

The first such volumes were designed as in-depth identification guides, and some were pioneering efforts that greatly advanced the field study of their subjects—a prime example is Peter Harrison's *Sea-birds: An Identification Guide* (1983. Boston (MA): Houghton-Mifflin). More recently, monographs of this type have expanded to include a broader range of life-history topics, with a focus clearly on subjects other than the fine points of identification.

The focus of *Sylvia Warblers* very definitely is on identification. This book is not a throwback, but rather represents a significant extension of the handbook genre. The 22 species accounts address not only identification in the field, with full emphasis given to related topics such as geographic variation and voice, but also tackle the case of the bird in the hand (where vocal and behavioral cues to identification are not relevant). The reviews of these subjects, as well as molt, age, and sex variation in plumage, are exhaustive and are as well done as any that I have encountered. Most aspects of "general biology" (habitat, diet, and breeding biology) also receive good treatment, although not in the same depth as topics related to identification.

All aspects of this book reflect considerable attention to detail: the large scale color-coded species distribution maps; the abundant color photographs that supplement the handsome paintings of all species; the diagrams of wing shapes; the large amount of biometric data; and the sonagrams that accompany the transcriptions of bird vocalizations. These features go well above and beyond prior handbooks. I can express little but awe at the scholarship of the authors and of the remarkably comprehensive nature of this volume, which now sets a very high bar indeed.

THOMAS S SCHULENBERG, *Environmental & Conservation Programs, Field Museum of Natural History, Chicago, Illinois*

#### BATS.

By Phil Richardson. Published by Smithsonian Institution Press, Washington (DC), in association with The Natural History Museum, London. \$16.95 (paper). 112 p; ill.; index. ISBN: 1-58834-020-1. 2002.

This concise and readable book provides an excellent introduction to the biology of bats. Nearly every page includes a clear and informative color photograph. Solid, almost always up-to-date, and accurate scientific information is presented clearly and intriguingly. The worldwide spectrum of bat variety is adequately presented, although many examples are based on European species. Three chapters deal with evolution, behavior, and con-

servation, and seven chapters discuss particular groups, mega- and microbats, carnivorous bats, vampire bats, and several groups of insectivores. Echolocation, bat detectors, and bat houses are described in enough detail to stimulate the interest of readers.

On page 5, a diphyletic evolutionary origin of Mega- and Microchiroptera is asserted without the qualification that would be appropriate in view of recent evidence. The suggestion that an acoustic shadow of an insect alters the strong echo from a tree trunk (p 25) seems speculative. The author implies that the unusual longevity of bats compared to other small mammals ensured survival of the species (p 34). Better perhaps to emphasize that longevity and low reproductive rate correlate with a relatively safe life. It would be helpful to explain whether in the photograph on page 93 shows two pipistrelles flying very close together or if two strobe flashes show the same bat. But these are minor quibbles, and this book should be in every museum bookstore and wherever books about animals are available.

DONALD R GRIFFIN, *Concord Field Station, Harvard University, Bedford, Massachusetts*

#### MAMMALS OF THE SOVIET UNION. Volume II, Part 1b: Carnivora (Weasels; Additional Species).

By V G Heptner, N P Naumov, P B Yurgenson, A A Sludskii, A F Chirkova, and A G Bannikov; illustrated by A N Komarov and N N Kondakov; Scientific Editor: Robert S Hoffmann. Enfield (New Hampshire): Science Publishers. \$190.00. x + 735-1152 pp + 4 pl; ill.; index of Latin names of taxa. ISBN: 1-57808-170-X. [Originally published as *Mlekopitayushchie Sovetskogo Soyuza*, by Vysshaya Shkola Publishers, Moscow, 1967.] 2002.

#### KEEPERS OF THE WOLVES: THE EARLY YEARS OF WOLF RECOVERY IN WISCONSIN.

By Richard P Thiel. Madison (Wisconsin): University of Wisconsin Press. \$50.00 (hardcover); \$19.95 (paper). xiii + 227 p; ill.; index. ISBN: 0-299-17470-0 (hc); 0-299-17474-3 (pb). 2001.

The author has produced a sequel to his first book, *The Timber Wolf in Wisconsin: The Death and Life of a Majestic Predator* (1993. Madison (WI): University of Wisconsin Press), which outlined the persecution and eventual extinction of wolves (*Canis lupus*) in Wisconsin in the mid-20th century. By the middle of the last century, wolves had been persecuted by hunting and trapping and finally eliminated from the state in the mid-1950s. The story in the first volume is a sad one, but not an uncommon reflection of attitudes and wildlife management. This

second book relates the happier story of wolf reestablishment in the state. *Keepers of the Wolves* nicely caps the story that began in the first book, and reads like the sequel to a good mystery.

In this new volume, Thiel refines the enthusiasm and energy that comes through in his first book. He relates how, as a suburban Milwaukee 13 year-old, his imagination became ignited by the knowledge that wolves were once at home in Wisconsin. Historical research, and eventually attending the University of Wisconsin-Stevens Point to study wildlife management, continued to fuel his strong interest in wolves into the early 1970s. By this time, under protection of the U.S. Endangered Species Act, the remaining wolf population in Minnesota began to grow, and a combination of wish and belief led the author to begin a search for evidence of wolves once again in northern Wisconsin. In fact, it was Thiel who, as a student, gradually pieced together scattered first-hand field evidence and accounts from others that wolves had returned to the state. Initially, evidence for the presence of scattered individual wolves was accumulated. Finally, a pack was located, which provided evidence of establishment and breeding. By 1980, the Wisconsin Department of Natural Resources (DNR) was compelled to act, and Thiel was hired as the first wolf biologist, a temporary position. His job was to conduct a field survey that would provide better information on the number and extent of wolves in Wisconsin.

This point begins a very interesting part of the story, and one that would be valuable for conservation-minded readers and students in conservation biology courses. Many times such courses are taught as applied ecology, but remain quite abstract and, often naive. Thiel's book would be an ideal counterpoint to such course material.

In 1980, wildlife agencies had little experience dealing with managing or protecting predators. For at least two generations, wildlife biology—really, game management—had been a fairly narrow and commodity-oriented field. It is a credit that Thiel came through such a system with his broader, youthful interests intact. His tale outlines his role in nurturing and nudging a traditional natural resources agency along a path of protection for wolves—sometimes confronting outright hostility for his work and goals. Eventually, his initial temporary position became more secure, and he initiated field surveys and systematic radiocollaring of wolves in the early 1980s. This foresight and effort have led to a continuous and invaluable dataset through to the present time, which documents the movement and growth of a wolf population. These data have continued to yield valuable information to wolf researchers and to management.

In the 1980s, the Wisconsin DNR took tentative steps to grant the wolf official status and protection. Interestingly, a goal of 80 wolves was set for the state, a number that of necessity was based on little biological information. Few thought that the wolf could reach such numbers in the state. The belief was that wolves had become extinct because they could not live in the increasingly human-dominated landscapes of the 20th century. The theory was that wolves were a true wilderness species, as evidenced by their persistence in the Boundary Waters Canoe Area Wilderness of northeastern Minnesota. Some even suggested (for a larger conservation agenda) that wolves might require old-growth forest.

We know now, thanks to the work of Thiel and others, that so much of this is not true. Wolves are in fact incredibly fecund and, as outlined in Thiel's first book, it took a very concerted effort of hunting and trapping to eliminate the last wolves from the state. Under protection as an endangered species, the wolves have rebounded dramatically. In an ultimate irony, the human-dominated landscapes of today, with the excess of deer, the main prey of wolves, proved an ideal home. Basically, given adequate prey and protection, wolves continue to show that they can live in areas we never dreamed possible twenty, or even ten, years ago. The result is that over 350 wolves are now known to exist in Wisconsin, with the population extending down to the middle of the state.

Also noteworthy in Thiel's story is that the Wisconsin DNR never assisted wolf reestablishment by introducing or transplanting wolves. A conservative approach was taken, with protection, and significant funds allocated to public education. This has turned out to be a great success, to the surprise (and sometimes consternation) of many who did not believe that a permanent wolf population was possible.

Thiel's story ends with, for now, successful reestablishment for the wolf in Wisconsin. He has moved on professionally to another position in the agency, with the wolf program continuing on with others. Success has brought other problems, however. Now that public education has convinced people of the value of wolves to the ecosystem, and raised sympathy for protection, managers are now faced with growing numbers of conflicts between wolves and people, as the population continues to increase (now doubling every 4 to 5 years) and wolves continue to press further into the humanized landscape. Are we willing to tolerate the occasional predation on livestock and pets, as well as taking a few of the abundant deer population?

Thiel's book is also great fun to read, as it overflows with his optimism and enthusiasm. There are

many stories of fieldwork, and the anecdotes range from informative and heartwarming, to hilarious. Thiel's sketches are interspersed throughout the book. What the sketches may lack artistically is more than made up for by how they contribute to the genuine feel of the story that Thiel has to tell.

This book would make a wonderful addition to the library of any biologist, conservationist, or interested enthusiast for wolves. The volume would be an excellent "real world" reading component to college courses in conservation biology. As with the first book, this volume is a great read for a couple of evenings, or on the trail or at the cabin. It also pleasantly brings the more discouraging first part of the tale to a happier end, for now. I recommend it highly.

DAVID J MLADENOFF, *Forest Ecology & Management, University of Wisconsin, Madison, Wisconsin*

MASON'S WORLD DICTIONARY OF LIVESTOCK BREEDS, TYPES AND VARIETIES. *Fifth Edition.*

Revised by Valerie Porter. Wallingford (United Kingdom) and New York: CABI Publishing. \$110.00. xviii + 380 p; no index. ISBN: 0-85199-430-X. 2002.

PRIMATE DENTITION: AN INTRODUCTION TO THE TEETH OF NON-HUMAN PRIMATES. *Cambridge Studies in Biological and Evolutionary Anthropology, Volume 32.*

By Daris R Swindler; illustrated by Robert M George. Cambridge and New York: Cambridge University Press. \$80.00. xv + 296 p; ill.; taxonomic index. ISBN: 0-521-65289-8. 2002.

Despite the prominence of teeth in primate and human evolution, broad surveys of primate dental morphology are surprisingly rare. Gregory's *The Origin and Evolution of the Human Dentition* (1922. Baltimore (MD): Williams and Wilkins), long out of print, remains the outstanding book on primate dental evolution. Gregory's insights into primate evolution have withstood the decades extremely well. For the past quarter century, Daris Swindler's book, *The Dentition of Living Primates* (1976. London: Academic Press), has provided a valuable introduction to the diversity of primate dental form with descriptions, illustrations, and measurements of the deciduous and permanent dentitions of most extant species. The descriptions of individual species were all based on a series of dental casts of primate teeth that the author made in several museums in the United States during the 1960s. The quantitative samples of individual taxa are variable in size and origin and do not represent populations in any statistical sense. Nevertheless, they offer a good overview of primate diversity in size and dental proportions.

*Primate Dentition* is a revision of the earlier volume. The pictures and tables of measurements are reprinted from the previous work, based on the same sample of casts. The author has revised the systematics, added new sections on dental development and microstructure, and updated the descriptions of individual taxa with observations (and references) from more recent literature. The book is a useful introduction to primate dental diversity for students and a handy reference for professionals.

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

MOUNTAIN GORILLAS: THREE DECADES OF RESEARCH AT KARISOKE. *Cambridge Studies in Biological and Evolutionary Anthropology, Volume 27.*

Edited by Martha M Robbins, Pascale Sicotte, and Kelly J Stewart. Cambridge and New York: Cambridge University Press. \$80.00. xiv + 431 p; ill.; index. ISBN: 0-521-78004-7. 2001.

It is somewhat ironic that, while the gorillas that most of us see in zoos and animal parks are western lowland gorillas, the vast majority of research done in the wild has been achieved with mountain gorillas. These are the endangered animals that have enjoyed a worldwide popularity following the pioneering works of George Schaller and Dian Fossey, and are the subject of the current book.

The introductory chapter reviews the intellectual background that drove Fossey's original work, the ecological setting of the Karisoke Research Center, and the research and conservation work done at the Center from the 1970s until the turn of the century. It is an extraordinary compilation of a range of publications, as well as the political and cultural events that impacted the work at the Center. Toward the end of the book is a brief review of the impact of the genocide and then the rebel activities of the 1990s that destroyed the Center and resulted in the deaths of a number of Karisoke workers.

The rest of the book is similarly worthwhile. The volume includes both newly presented and previously published data. Although most of the book rightly focuses on mountain gorillas, there are chapters that examine the other two subspecies in a comparative fashion. The volume is separated into four parts that discuss the social system of gorillas, including male and female sexual selection, infanticide, and emigration; within-group social behavior, including changes in mother-infant and immature-silverback relationships, female relationships, and the role of vocalizations in group interactions; feeding behavior, including substantial differences in the feeding ecology of two populations of mountain gorillas living at different altitudes, but only approximately 10 km apart, as well

as an examination of the "cognitive niche" that gorillas inhabit as demonstrated by the specific food processing skills of gorillas; and conservation and management of mountain gorillas, including veterinary interventions and the hormonal analysis of the reproductive and stress status of the Karisoke gorillas, as well as the threats to the survival and viability of the gorillas.

This book is a great addition to the publications that have come out of Karisoke; it opens the door to more of the decades of work that has been done at the Center. It will be of great interest to researchers, zoo personnel, and gorilla aficionados.

MICHAEL P HOFF, *Social Sciences, Dalton State College, Dalton, Georgia*



## AQUATIC SCIENCES

### FRESHWATER MEIOFAUNA: BIOLOGY AND ECOLOGY.

*Edited by SD Rundle, A.L. Robertson, and J.M. Schmid-Araya. Leiden (The Netherlands): Backhuys Publishers. \$92.00. xvi + 369 p; ill.; subject and taxonomic indexes. ISBN: 90-5782-109-5. 2002.*

This interesting book is a compilation of 14 chapters. The first seven deal with the biology and ecology of specific taxa common in the freshwater meiofauna (Microturbellaria, Rotifera, Gastrotricha, Nematoda, Hydrachnidia, Microcrustacea, and Tardigrada), six chapters that either review or provide a framework for continuing research on various aspects of ecological studies with freshwater meiofauna, and a final chapter on the status of the new freshwater meiobenthic taxon—the Micrognathozoa.

The specific taxon chapters vary in quality. Most are well done, but the nematode chapter by Traunspurger is outstanding, providing insight and up-to-date compilations. Although all the chapters are organized in the same format, the subheadings change from chapter to chapter. For example, in Chapter 1 (Microturbellaria) the second heading is "Classification and ecological origin" (p 1), whereas in Chapter 2 (Rotifera) it is entitled "Systematics" (p 17). Such differences occur in other subheadings and chapters. Consistency in wording would have made the book more user friendly. But all of these chapters provide good information on the taxon in question.

The ecology chapters are all well done. As reviews, they cover spatial (small and large geographic scale) and temporal variations, and trophic relationships. I particularly liked the chapters by Boulton et al. and Hakenkamp et al. that deal with interactions of meiofauna in the sediments and the overlying water

and the functional role of meiofauna in freshwater, respectively. Hakenkamp et al. argue for an increasingly recognized energetic role of meiofauna and predict in what habitats meiofauna are most likely to be important energetically.

The book is obligatory for all who plan (or have started) research on freshwater benthos and is highly recommended for all aquatic scientists. They will learn about new, interesting, and heretofore unknown organisms and processes. The cost of the book will probably preclude its use by individual students, but it certainly needs to be available in libraries.

BRUCE C COULL, *School of the Environment, University of South Carolina, Columbia, South Carolina*

### THE FRESHWATER ALGAL FLORA OF THE BRITISH ISLES: AN IDENTIFICATION GUIDE TO FRESHWATER AND TERRESTRIAL ALGAE.

*Edited by David M John, Brian A Whitton, and Alan J Brook; CD-ROM compiled by Peter V York, David M John, and Leslie R Johnson. Cambridge and New York: Cambridge University Press. \$125.00. xii + 702 p; ill.; taxonomic and subject indexes. ISBN: 0-521-77051-3. [CD-ROM included.] 2002.*

### ENCYCLOPEDIA OF MARINE MAMMALS.

*Edited by William F Perrin, Bernd Würsig, and J G M Theewissen. San Diego (California): Academic Press. \$139.95. xxxviii + 1414 p + 16 pl; ill.; index. ISBN: 0-12-551340-2. 2002.*

### THE INLAND FISHES OF MISSISSIPPI.

*By Stephen T Ross; with William M Brennehan, William T Slack, Martin T O'Connell, and Tanya L Peterson; illustrated by Derek G Ross. Jackson (Mississippi): University Press of Mississippi. \$50.00. xx + 624 p; ill.; systematic and general indexes. ISBN: 1-57806-246-2. 2001.*

The first book on Mississippi fishes, *Freshwater Fishes in Mississippi* (F A Cook, 1959. Jackson (MS): Mississippi Game and Fish Commission), was based on extensive collections throughout the state over a 25-year timespan. Since its appearance, much has been learned about Mississippi's ichthyofauna. The current volume provides a comprehensive treatment of Mississippi's freshwater fishes, which includes species accounts for 204 native freshwater or diadromous species; 50 more than what appeared in Cook's work. It was made possible by Ross's personal energies, including a decade of sampling areas in need of collection and visits to virtually all museums having Mississippi fishes.

The first five chapters of the book provide valuable information on the state's history of ichthyology, basins and drainages, distributions of species



by drainage, and important conservation issues. There is a useful chapter on fish identification, complete with diagrams, a basic glossary of counts and measurements, and a key to families. The majority of the book (nearly 500 pages) is devoted to species accounts. The pictures are striking and very well done. The keys are excellent and well illustrated with useful and diagnostic characters. I have been using these keys in my ichthyology class for seven years with success and few student complaints once they are familiarized with the morphological structures and associated terminology. The state distribution maps are very useful. They were created using a geographical information system and show individual spot localities ( $n = 4710$ ) for each species. Spots are coded for two general time periods, before and after 1982. My only criticism is that there is no inset to show the geographical distribution of species outside of Mississippi. For readers outside of the state, this would be a particularly useful feature. The species-specific biological information provided is quite thorough and is enhanced by over 20 years of personal research on Mississippi fishes by Ross. There is a glossary, 71 pages of literature cited, and two indexes (systematic and general).

As an ichthyologist, my first glance at the book was a bit surprising. A nonnative species to the state (known only from one collection) appears on the cover along with several game species. Upon inquiry, my suspicions were confirmed; the cover design was not Ross's idea. Beyond its cover, the book is beautifully illustrated with habitat shots taken from Mississippi's diverse freshwater aquatic resources.

Without question, the scholarly nature of this book is exemplary. Anyone working with fishes in the southeastern U.S. will want a copy for their reference. I found it to be a nicely presented, up-to-date guide to Mississippi's inland fishes and an indispensable resource for proper identification of species. It will stand as the definitive book on fishes of Mississippi for generations to come.

CHRISTOPHER M TAYLOR, *Biological Sciences, Mississippi State University, Mississippi State, Mississippi*

INLAND FISHES OF CALIFORNIA. *Revised and Expanded Edition.*

By Peter B Moyle; illustrations by Chris Mari van Dyck and Joe Tomelleri. Berkeley (California): University of California Press. \$70.00. xv + 502 p + 37 pl; ill.; index. ISBN: 0-520-22754-9. 2002.

The preparation of this superb book was driven by concern for the perilous existence of the highly endemic California fish fauna. This volume, a revision of the first edition, was therefore published with the hope that it will reduce the loss of the state's native fishes. To that end, the ecology of

native and invasive species in California environments is emphasized.

The book comprises five chapters, the last and largest of which includes a key to the inland fishes and species accounts arranged by family. The first chapter addresses the distributions of fishes among each of the six ichthyological provinces of California. The ecology of the fishes is treated in the second chapter. The third chapter extends this topic to human-induced changes in piscine environments through water diversion projects, habitat modifications, pollution, invasive species, fish hatcheries, and exploitation. A strategy for conserving California fishes is considered in the fourth chapter. In each of these chapters, clear emphasis is given to the origins, adaptations, and contemporary ecologies of native fishes.

The section on identification of California fishes begins with a key to each of the families. Individual keys to fishes in each of the families follow. The species descriptions that compose the bulk of the volume include very clever distribution maps with symbols to indicate status and lifestyle. Each species account addresses information on the identification, taxonomy, and meaning of the scientific name before moving on to present the distribution, life history, and status of the species. Species status is given extensive coverage where appropriate. The account concludes with a list of the references, with the full citations for each reference appearing at the end of the book. The entire presentation is marvelous in its scope, organization, and clarity. The keys are well written and easy to use, and the figures—which include exceptional color plates—are excellent.

Anyone interested in the fishes of California should be pleased to own this book, and those concerned about the precarious existence of the native species surely will want a copy. We have so much to learn about the biology of the threatened and endangered fishes native to California and so little time to acquire that knowledge. Moyle has made a supreme effort to summarize what we now know about these fishes and to slow their loss.

DAVID C HEINS, *Ecology & Evolutionary Biology, Tulane University, New Orleans, Louisiana*

CORAL REEF FISHES: INDO-PACIFIC AND CARIBBEAN. *Revised Edition. Princeton Pocket Guides.*

By Ewald Lieske and Robert Myers. Princeton (New Jersey): Princeton University Press. \$24.95 (paper). 400 p; ill.; scientific and common name indexes. ISBN: 0-691-08995-7. [Originally published as *Collins Pocket Guide to Coral Reef Fishes*, Harper-Collins, 2001.] 2001.

As with the previous editions, the revised field guide by Lieske and Myers provides a very informed account of the major species of reef fishes from the

Indo-Pacific and the Caribbean. The revision, with 2118 illustrated species, contains largely identical text and plates as the 1996 edition, but includes 44 additional species and more juvenile phases, corrections to a misplaced color plate, and much better color resolution in the illustrations of the fish.

The 18 pages of text include a brief background to the origin of coral reefs and a description of the evolution and zoogeography of the reefs in the Indo-Pacific and the western Atlantic, the two major geographical areas of coral reefs. General reef structure, cross sectional profiles, and major reef habitats are described. Most of the text is devoted to concise treatments of the ecology of reef fishes, social interactions among fishes, reproduction and development, protective resemblance and mimicry, symbiosis, conservation, dangerous fishes, classification, and sensory physiology. Although brief, there is enough background here for nonprofessionals, naturalists, and specialists.

The major substance of the field guide is the 175 color plates of which 139 are devoted to the Indo-Pacific and 36 to the Caribbean, reflecting the relative abundance of fish taxa in the two major areas. Each of the plates has about 12 species illustrated in lateral profile, often with line pointers directed at species distinguishing features. The plates begin with the sharks and rays, then move through the full series of bony fishes, including "less-derived" groups such as morays and catfish, through to more advanced groups such as squirrelfish, scorpionfish, groupers, cardinalfishes, snappers, butterflyfishes, angelfishes, damselfishes, wrasses, parrotfishes and, finally, to the highly derived puffers and porcupine fishes. The taxonomic sequence is the same to that found in most modern ichthyology textbooks. Opposite each plate is a page with information on each species, including common and scientific names, distinguishing features, general habitat on the reef, diet, and geographical range.

The continued degradation of coral reef habitats, largely from human impact, has focused conservation strategies to protect this rich ecosystem. There is a tight coupling between coral diversity and reef fish diversity that exists among the major zoogeographic equatorial zones. It is a sobering thought that the more than 4000 species of coral reef fishes, which represent one of the most diverse groups of vertebrates on the planet, with morphological, behavioral, and sensory complexity that is unparalleled, are specialized to an ecosystem that is in rapid global decline. Loss of coral diversity will equate to the loss of fish diversity. Identifying these effects over time are essential to any conservation effort. This authoritative field guide by Lieske and Myers provides a valuable tool for the species identification of a remarkable group of vertebrates.

T E REIMCHEN, *Biology, University of Victoria, Victoria, British Columbia, Canada*

GLOBAL INVADER: THE EUROPEAN GREEN CRAB.

By Sylvia Behrens Yamada. *Corvallis (Oregon): Oregon Sea Grant*. \$15.00. xiii + 123 p; ill.; index. ISBN: 1-881826-24-4. 2001.

This book, produced by a collaboration between the Oregon and Washington Sea Grant programs, was stimulated by a call for a source of information on the green crab, especially focused on the Pacific Northwest, and its history as a successful invader. It is intended for a scientific audience, unfamiliar with the green crab, seeking basic information on the biology and ecology of this species, as well as a citation source of previous green crab research. Thus, the appendixes, which contain very nice illustrations and color plates of the green crab and common Pacific Northwest species, will be appreciated by readers. The intended audience includes university and agency-based researchers, as well as resource managers and shellfish aquaculturalists.

The goal of the volume is to summarize what is known about the green crab and use that information to help predict its role on the Pacific Northwest and potential future sites of invasion. The first chapter covers topics that include taxonomy, a description of the major life-history stages, distribution and abundance, feeding, and ecosystem impact. The second chapter reviews five instances of successful invasion by the green crab, including Atlantic North America, Australia and Tasmania, South Africa, Japan, and western North America. The book succeeds, as a "green crab primer," but may leave those just beyond the intended audience wanting more information. For example, there is a good description of the unique mating system in which females mate after molting and subsequently produce broods of eggs, but it is not clear if this occurs annually. If so, is remating required, or how many broods may be produced (per season or per lifetime)? These issues are critical for understanding why this species is a successful invader and predicting its future role in the Pacific Northwest and elsewhere. Although a section of Chapter 2 is somewhat repetitive with the first chapter, the second chapter on case studies reviews the major issues concerning the potential impact of green crab invasions. This book will be helpful to anyone, particularly in the Pacific Northwest, looking for an initial source of information on the green crab.

PAUL JIVOFF, *Smithsonian Environmental Research Center, Edgewater, Maryland*



## ENVIRONMENTAL SCIENCES

PRIMATES FACE TO FACE: THE CONSERVATION IMPLICATIONS OF HUMAN-NONHUMAN PRIMATE INTERCONNECTIONS. *Cambridge Studies in Biological and Evolutionary Anthropology, Volume 29.*

*Edited by Agustín Fuentes and Linda D Wolfe. Cambridge and New York: Cambridge University Press. \$90.00. xvii + 340 p; ill.; index. ISBN: 0-521-79109-X. 2002.*

This volume contains 15 articles that review human and nonhuman primate interconnections, a timely subject given that a majority of nonhuman primate species are presently threatened or endangered due largely to these interconnections. As noted by the editors, although many primatologists are in anthropology departments as are ethnographers, there has been limited collaborative research among these scholars on the interrelatedness of human and nonhuman primate behavior and ecology. Thus, this volume is innovative in its inclusion of articles that combine a sincere interest in both the local peoples and the nonhuman primates where they coexist. Some of the articles are outstanding, including Fouts et al.'s critique of biomedical research on chimpanzees; Cormier's discussion of the interrelationships among concepts of kinship, symbolism, botany, and monkeys by the Guajá of Brazil; and Rose's detailed discussion of the bushmeat commerce in Africa. This book will certainly be of interest to primatologists and, I hope, to a number of cultural anthropologists. And although there is disagreement among the various authors about how the interconnections among humans and nonhuman primates affect the health of nonhuman primate species, this book does a good job of introducing readers to the complex range of issues that are involved in this discussion.

Finally, a couple of nitpicks. First, the editors agree with one of the author's position "that the best park rangers are often the local people because they are familiar with the forest" (p 273). This certainly can be true, but this view overlaps with the notion of George W Bush that CEOs of major corporations make the best watchdogs for big business because of their familiarity with business. This sort of familiarity also allows for "insider trading" that is often not in the best interest of conservation or business. Second, Eudey provides a rather negative critique of the Endangered Primate Rescue Center (EPRC) in Vietnam, and notes

in passing that "[t]his is not to say that the rescue center has not been effective" (p 281). In fact, the record of the EPRC for breeding highly endangered primates is outstanding, and one that the Vietnamese administration at Cuc Phuong National Park is quite proud; noting this would have brought some balance to this brief discussion.

HERBERT H COVERT, *Anthropology, University of Colorado, Boulder, Colorado*

PRIORITIES FOR THE CONSERVATION OF MAMMALIAN DIVERSITY: HAS THE PANDA HAD ITS DAY? *Conservation Biology, Volume 3.*

*Edited by Abigail Entwistle and Nigel Dunstone. Published by Cambridge University Press, Cambridge and New York, in association with The Zoological Society of London. \$110.00 (hardcover); \$39.95 (paper). xvii + 455 p; ill.; index. ISBN: 0-521-77279-6 (hc); 0-521-77536-1 (pb). 2000.*

Almost 30% of extant mammal species are vulnerable to extinction (IUCN red list). This review by 41 authors from four continents includes 21 chapters that are separated into three parts: justification; setting priorities; and conservation approaches. The chapters explore relationships between species conservation and conservation of biodiversity. Several discuss the importance of flagship species to conservation. In their chapter, Leader-Williams and Dublin define the concept clearly and describe how it differs from the keystone, indicator, and umbrella species concepts.

Approaches to setting priorities are discussed, including flagship species, hotspots (of total richness, endemism, or complementary richness), rarity and declining populations, and ecological redundancy. The section concludes cogently that conservation of biodiversity is as much about people as about wildlife and that mammals provide synergistic benefits in conservation because of their ecological roles, public support, and utility in research.

MacDonald et al. discuss inequities in conservation, from armchair conservationists in the comforts of Europe urging Third World countries to be noble and self-sacrificing to a proposal for a radical conservation future in Britain called FREE (foster, record, enhance, enrich). They make a plea of landscape-level conservation. Muruthi et al. review African efforts and suggest that conservation of large mammals should be within the contexts of habitats and politics (political support is key and all stakeholders need to participate fully). Balmford concludes that captive breeding is less important than the educational role of zoos. Feistner et al. argue that ensuring ecosystem function is the main aim. Zhi et al. illustrate how captive breeding and rescue centers lack efficacy in panda con-

ervation and how research on basic life history and ecology is prerequisite to effective conservation. Entwistle and Dunstone conclude the book with a good summary of why, what, and how, and the three Ps: politics, participation, and partnerships. This book will be most interesting to mammalogists; it is still too narrowly framed to be of interest to the full conservation audience.

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

AFRICAN RAIN FOREST ECOLOGY AND CONSERVATION: AN INTERDISCIPLINARY PERSPECTIVE.

*Edited by William Weber, Lee J T White, Amy Vedder, and Lisa Naughton-Treves. New Haven (Connecticut): Yale University Press. \$65.00. xiii + 588 p; ill.; index. ISBN: 0-300-08433-1. 2001.*

The late tropical rainforest biologist Paul Richards considered the African rainforest to be the "odd man out." In comparison to American and Indo-Malaysian forests, it has fewer total species, fewer species in large tropical families, and more widely dispersed taxa. Africa also is the most poorly known tropical region. The present volume does much to mitigate this knowledge deficit.

The book begins with two chapters that describe the continent's climate, vegetation, and human inhabitants. The Guineo-Congolian region contains about 8,000 plant species, four-fifths of which are endemic, and ten endemic families (p 10). The cultural diversity is even more impressive. Four hundred ethnic groups live within the African rainforests and another 1,000 groups inhabit the surrounding areas (pp 35-36).

Seven chapters in Part II examine geology, refugia, endemism, and deforestation. Africa's lowland rainforests support about 270 mammal species; an additional 100 species are confined to montane forests (p 88). In the third part, eight chapters discuss forest dynamics, ungulates, elephants, carnivores, birds, fish, and herpetofauna. White argues that Tropical Africa's extensive Marantaceae Forests are the product of human burning (p 166). Africa's charismatic megafauna usually receives the bulk of attention. Admirably, this volume considers less-studied taxa as well. Twenty-eight percent of Africa's rich fish fauna is endemic to the rainforest region (p 263). Cameroon contains one-tenth of the world's herpetofauna (p 291). Lawson and Klemens posit that, "some of this perceived gulf between the Old and New Worlds is the result of a lack of basic inventories and collections" (p 294). The relative dearth of African studies is a recurring theme in the book.

Six chapters in Part IV focus on the human dimension of the rainforest. Noss describes "boom-

and-bust cycles" associated with foreign enterprises. These have perfect parallels in the Neotropics and in Southeastern Asia. Almquist describes horticulture and hunting in the Congo Basin. The Apagibeti people cultivate plantains, manioc, maize, and peanuts (all of which are introduced from other tropical regions). Ironically, even though cultivated crops provide the bulk of the calories, they are considered of lesser status than food obtained by hunting and trapping.

Part V takes a practical approach, focusing on reserve design, resource management, animal responses to logging, and community-based conservation. Kremen et al. admonish researchers to consider more than just the large mammal fauna so as not to miss fine-scale patterns of geographical diversity. White and Tutin describe differential responses of chimpanzees and gorillas to logging based on trophic and behavioral differences of the two primates.

The book's ultimate section considers trends and challenges in rainforest conservation in Africa and offers insight to protection in war-ravaged countries. Africa has lost more than two-thirds of its original forests. Complicating the matter, until recently little attention has been given to the region's indigenous people. Peterson received a poignant and insightful response from an African farmer he tried to interview: "Don't trouble me with all your questions. What good is this all going to do for me? You know life here is one endless crisis. What are you going to do to help? You *wazungu* (white people) come and study us Africans and say they live this way, they plant this and that, they fish or hunt or sell their goods, but how does that ever bring any good back to us? Don't trouble me" (p 356). *African Rain Forest Ecology and Conservation* makes a solid case for considering the role of local people in conservation. Another theme of the book is the lack of trained African researchers, largely due to colonial neglect of higher education. Fewer than 20 PhD-level Africans work in conservation in the Congo Basin (p 555), and Rwanda's only doctoral-level field biologist left the country because of political hostilities (p 559).

*African Rain Forest Ecology and Conservation* is a "must read" for those interested in Africa's tropical forests, its people, and their conservation. It is truly interdisciplinary and a well-edited volume (with a few small errors such as confusion of rank within Leguminosae). The book should sit on every tropical biologist's bookshelf, next to such standards as Whitmore's *Tropical Rain Forests of the Far East* (Second Edition, 1984. Oxford: Clarendon Press) and Prance and Lovejoy's *Amazonia* (1985. Oxford: Pergamon Press).

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

MONTEVERDE: ECOLOGY AND CONSERVATION OF A TROPICAL CLOUD FOREST.

*Edited by Nalini M Nadkarni and Nathaniel T Wheelwright. Oxford and New York: Oxford University Press. \$130.00 (hardcover); \$34.95 (paper). xxiii + 573 p + 8 pl; ill.; index. ISBN: 0-19-509560-X (hc); 0-19-513310-2 (pb). 2000.*

The Monteverde conserved wildlands, perched at the lower margin of Costa Rica's cloud forest, and blurring out into a dry forest agroscape to the Pacific and seriously intact rainforest toward the Atlantic, has long been a mecca for tropical biologists to live, conduct research, teach field biology courses, and be a colony of the very environmentally conscious. This compilation of their experiences and accumulated local scientific and street knowledge is first and foremost a basic textbook for those courses, a category of ecotourism still on the rise in Costa Rica. Complemented by other volumes such as Janzen's *Costa Rican Natural History* (1983. Chicago (IL): University of Chicago Press), McDade et al.'s *La Selva: Ecology and Natural History of a Neotropical Rain Forest* (1994. Chicago (IL): University of Chicago Press), Henderson's *Field Guide to the Wildlife of Costa Rica* (2002. Austin (TX): University of Texas Press); Kappelle and Brown's *Bosques Nublados del Neotrópico* (2001. Santo Domingo de Heredia (Costa Rica): INBio), and the dozen modern field guides and essays on Costa Rican natural history and conservation, any field biology course of any length in the Monteverde area (or for that matter, any other part of Costa Rica) has all the written materials it could ever ask for. The resource in short supply becomes experiences with real organisms doing real things in the wild.

This is a lucidly and cleanly written group effort by 114 contributors, all with experience with Monteverde field biology. The contributions range from detailed treatments of prominent (or prominently researched) species to integrated accounts of climate and history to conservation analyses and prognoses. Just as the history of Monteverde is very much that of pioneers integrating with the forest and climate as much as eliminating it, this book is saturated with the human impact. The thorough checklist of Monteverde plants, social wasps, herps, birds, and mammals will go far toward backstopping both course activities and future conservation analyses. All we could wish for is that all of this material was available on a website or CD-ROM (and in this manner all those superb black-and-white photographs could be available in their much more useful color morph).

DANIEL H JANZEN, *Biology, University of Pennsylvania, Philadelphia, Pennsylvania*

EVOLUTIONARY ECOLOGY: CONCEPTS AND CASE STUDIES.

*Edited by Charles W Fox, Derek A Roff, and Daphne J Fairbairn. Oxford and New York: Oxford University Press. \$85.00 (hardcover); \$45.00 (paper). xii + 424 p; ill.; index. ISBN: 0-19-513154-1 (hc); 0-19-513155-X (pb). 2001.*

The very clearly stated goal of this volume was to "provide a collection of readings . . . that would serve as an introduction to contemporary research programs in evolutionary ecology" (p v). Consequently, the editors also indicate that the book is intended for graduate or advanced undergraduate students, rather than "experts." The editors are clearly too modest here, even experts working within particular areas of the field will find many of the chapters outside their primary area of research interesting and stimulating. This should not be surprising, as the 35 authors constitute a veritable "who's who" in the field.

The 28 chapters are separated into five major subject areas: Recurring Themes (seven chapters); Life Histories (seven chapters); Behavior (five chapters); Interspecific Interactions (six chapters); and Adaptation to Anthropogenic Change (three chapters). Despite admitted omissions (there are no chapters on speciation or on specialized methodologies), the breadth of coverage is impressive. Unexpected were chapters on Cooperation and Altruism (by D S Wilson), The Evolutionary Ecology of Movement (by H Dingle and M Holyoak), and the final three chapters on adaptation of the "rest of life" to the presence of humans.

Chapters are generally consistent in style and coverage, proceed in a logical order, and are linked to one another at numerous points. Each chapter provides an overview of important historical and conceptual topics, is followed by one or more case studies, and concludes with speculations on where future research might prove most profitable (great thinkers publish both facts and opinions, and both are worth listening to). Figures are clear, crisp, and almost invariably easily understood. In many respects the book has a cohesiveness usually found only in single authored works. Still, chapters do reflect the individual personalities of the authors. In fact, one of the most striking things about the volume is that many of the chapters come across less as formal textbooks than as semiformal lectures. This is produced, in part, by minimizing unnecessary technical jargon, and also by permitting (encouraging?) the authors to be creative in making important points. For example, Wilson offers the opinion that progress in understanding the evolution of cooperation and altruism was less like "a heroic march to the truth" than like "the Three Stooges trying to move a piano" (p 222). These

features will make the volume easier and more pleasant reading for students—a fact that will undoubtedly facilitate learning. The relative paucity of literature will disappoint those seeking comprehensive reviews. Notwithstanding that the editors expressly forbade such contributions, the low citation density does not impair the book at all. The references that are used possess an especially high average “value.” Combining all the citations at the conclusion of the book instead of at the end of individual chapters may also disappoint some, but it certainly reduces redundancy and in some ways is actually a convenience.

The students (and young assistant professors?) targeted by this volume must be thrifty in order to maximize the collective value of the books they purchase. With that in mind, I offer the following: for about \$50 you can get a thick filet, a carafe of good wine, and dessert at a decent steak house. Alternatively, you could buy this book, then have a cheeseburger with the money left over. I do not want to indicate how you should spend your money, but was there not a song about a “cheeseburger in paradise”?

JOHN A BAKER, *Biology, Clark University, Worcester, Massachusetts*

#### SCALING RELATIONS IN EXPERIMENTAL ECOLOGY. *Complexity in Ecological Systems Series.*

*Edited by Robert H Gardner, W Michael Kemp, Victor S Kennedy, and John E Petersen. New York: Columbia University Press. \$65.00 (hardcover); \$30.00 (paper). xxx + 373 p; ill.; index. ISBN: 0-231-11498-2 (hc); 0-231-11499-0 (pb). 2001.*

Challenging concepts in ecology usually undergo tortuous semantic examination before being adopted as conventions. The word “scale” continues to experience growing pains. In 12 chapters stemming from a workshop held in 1997, the authors’ main goal is to relate inferences from aquatic mesocosm experiments to nature and thereby improve predictions about ponds, lakes, and the sea. Chapters are separated into four sections: Background (one paper); Scaling Theory (three papers); Scaling Mesocosms to Nature (four papers); and Scale and Experiment in Different Systems (four papers). Literature cited sections appear at the end of each chapter of this fully indexed volume. At least seven editorial errors appear, including mathematical notation in one equation.

Readers with a damp orientation will feel at home given the heavy emphasis on aquatic ecology. Landlubbers willing to peer into a wet world can witness the ontology of a scientific community that is developing in parallel with its terrestrial coun-

terpart. The viewpoints span from that of the aquatic experimentalist to the advanced practitioner of scaling methods, especially dimensional analysis. This approach, de rigueur in physics and engineering, blossomed briefly in ecology during the early 1980s, but died on the vine. Chapter 4, Spatial Allometry: Theory and Application to Experimental and Natural Aquatic Ecosystems, should be required reading for all students wanting to help rekindle this topic, where “scaling” is about how parameters, not states, of systems change with scale. Here and in Chapters 2 (Wiens) and 12 (Scheurer et al.) the authors identify compelling questions about the origin of scaling relations in ecology, although it would be a mistake to naively follow the latter’s recipe for dimensional analysis without consulting original sources. Curiously, relevant literature from hydrology is not cited, where the scaling of whole distributions follows the functional equation  $G(\lambda x) = \lambda^{\theta} G(x)$ .

Clearly, *Scaling Relations* indicates a strong desire among ecologists to adopt proven quantitative theory, thereby making scaling a centerpiece of experimental design, on a par with replication and control.

BRUCE T MILNE, *Biology, University of New Mexico, Albuquerque, New Mexico*

#### THE BLACK SEA: ECOLOGY AND OCEANOGRAPHY. *Biology of Inland Waters.*

*By Yuri I Sorokin. Leiden (The Netherlands): Backhuys Publishers. \$210.00. x + 875 p; ill.; no index. ISBN: 90-5782-105-2. 2002.*

The Black Sea is the world’s largest meromictic (permanently stratified) lake and its largest body of anoxic waters. As such, it presents one of the best examples for biologists and chemists of the critical interactions among microbial processes and redox gradients, which profoundly affect ecosystem structure and dynamics. This book, the third in the *Biology of Inland Waters* series, by the renowned Russian microbiologist Yuri Sorokin, is aimed at providing a monographic treatment of the vast Russian and Romanian literature on the Black Sea in English. Sadly, the Black Sea is also distinguished as one of the world’s ecosystems most catastrophically devastated by anthropogenic influences, ranging from cultural eutrophication and overfishing to exotic species introductions. Sorokin goes to some length to document these effects. The book is separated into three parts: physical oceanography (two chapters), chemical oceanography (three chapters), and biological oceanography (six chapters), and includes 75 pages of references (mostly Russian) extending to 1998. It is abundantly illustrated with many maps, charts, and

tables of generally good quality. Unfortunately, many graphs are reprinted from the original Soviet publications and show overly idealized, smoothed vertical profiles, lacking the data points actually measured. There is no index.

I was disappointed that Sorokin perpetuates the traditional interpretation of the suboxic zone (or C-layer in Russian usage) as a region in the water column of coexistence of hydrogen sulfide and oxygen. He explains recent observations showing no coexistence, but rather absence of both species as methodological artifacts, whereas this newer view of Murray, Oguz, and colleagues is now more widely accepted by western and many former Soviet scientists. To be fair, however, he does present both views. This book's great value lies in the concentration in a single volume of nearly all the modern, as well as older, observations on this unique ecosystem. For example, his collection of bacteria, phytoplankton, and zooplankton data should be particularly valuable for modelers. The coverage of bacterial processes is detailed and comprehensive. It is a book that should be in most university libraries, even though the price will discourage many readers from obtaining personal copies.

HUGH DUCKLOW, *School of Marine Science, College of William and Mary, Gloucester Point, Virginia*

#### DIVIDED NATURES: FRENCH CONTRIBUTIONS TO POLITICAL ECOLOGY.

By Kerry H Whiteside. *Cambridge (Massachusetts): MIT Press.* \$62.00 (hardcover); \$24.95 (paper). xi + 323 p; index. ISBN: 0-262-23221-9 (hc); 0-262-73147-9 (pb). 2002.

This volume attempts to introduce English-speaking readers to a broad range of French environmental political thought. The author assumes that the literature is largely unknown in the United States, and he has good reasons to believe so. For most of the 20th century, the philosophical tradition in the Anglo-American world has differed dramatically from that of continental philosophers. Although significant inroads have been made in the humanities by various fashionable French philosophical movements, the impact on science and philosophy of science has remained slight. In addition, environmental issues in the U.S. and in France have been formulated from quite different perspectives. This is hardly surprising if one considers how radically different the landscapes are. There are no stands of "virgin timber" (real or imagined) in France, nor are there vast tracts of "wilderness." France has been densely populated and its land "managed" for many centuries.

Whiteside notes that most environmental advo-

cates in the U.S. approach their subject from one of two major standpoints: anthropocentric or ecocentric, whereas the French debates tackle environmental issues without separating into these camps. In *Divided Natures*, the author sketches five major French movements and discusses examples of each. His hope is that by making U.S. readers familiar with alternative ways of conceptualizing the issues, we may be able to move beyond the stalemates that seem to characterize many of the U.S. debates. It is difficult to believe that such a goal is likely to be reached. The linguistic and postmodern movements in U.S. humanities disciplines are running out of steam, and it is hard to imagine that writers such as Bruno Latour will experience a renaissance of popularity in the U.S. scientific community (it would certainly give the "Culture Wars" an ironic twist).

Although the book suffers from a number of problems, such as a lack of distinction between environmental and ecological issues, and ignores the impact of the colonial experience (France may not have large "wilderness" areas, but French Africa did), *Divided Natures* may be useful to remind U.S. readers that there are other ways to conceptualize environmental debates. It is, however, more likely to be of interest to those who study French intellectual history, rather than its intended audience of American green theorists.

PAUL LAWRENCE FARBER, *History and Zoology, Oregon State University, Corvallis, Oregon*

#### THE FUNCTIONAL CONSEQUENCES OF BIODIVERSITY: EMPIRICAL PROGRESS AND THEORETICAL EXTENSIONS. *Monographs in Population Biology, Volume 33.*

*Edited by Ann P Kinzig, Stephen W Pacala, and David Tilman. Princeton (New Jersey): Princeton University Press.* \$75.00 (hardcover); \$29.95 (paper). xxvi + 365 p; ill.; index. ISBN: 0-691-08821-7 (hc); 0-691-08822-5 (pb). 2002.

It was a matter of considerable interest when some ecologists early in the last decade suggested that there was an unfulfilled need to consider how global and regional losses in biodiversity might be impacting the functioning of ecosystems. This statement, in Schulze and Mooney's edited volume, *Biodiversity and Ecosystem Function* (1993. Berlin: Springer-Verlag), had remarkable consequences. It did not, as we might have expected, result in more attention to the overfished oceans, warming ice caps and mountain tops, overgrazed arid lands, and dwindling tropical forests. Instead, we saw funding allocated to two large-scale experiments, one in Minnesota and one spread across eight sites in Europe, in both of which the objective was to examine the consequences (for productivity and

other ecosystem properties) of synthesizing, from seed in grassland plots, model plant communities differing in species richness.

Clearly these two ventures will be justified if the focus on such well-worked grassland ecosystems enables progress of a generic kind in our understanding of how ecosystems respond to species impoverishment. This volume provides the first opportunity to make such an assessment in that chapters are contributed by all the main players associated with both experiments, and readers are provided with the latest results and analyses (five chapters) and various theoretical and experimental extensions (nine chapters). Careful reading of each chapter reveals variation in the strength of commitment to this distinctive approach to ecosystems. David Tilman appears unwavering in his belief that a new paradigm has been created and that biodiversity is soon to join the pantheon of established ecological drivers such as temperature and moisture supply. Others appear less certain and some authors diverge conspicuously and sometimes completely from this agenda and adopt an approach that owes little to the "new paradigm" and is, in fact, mainstream ecosystem ecology.

Sadly, no space is provided for contributions from the many well-known ecologists who have expressed reservations about this new research. This leaves the volume vulnerable to charges of advocacy, and a stance that is iconoclastic and marginal to the established practice of science. As Lawlor et al. recognize in Chapter 13, the random deletions used in the model experiments do not correspond to the phenomena by which the planet is losing diversity. A proper assessment of the value of experiments with model plant communities will depend upon their assimilation into the larger volume of existing published work that already describes the functional substitutions that coincide on a worldwide scale with particular ecosystem changes and losses of species, and identifies the narrow range of circumstances in which plant number, rather than plant type, may be currently exercising some control of ecosystem functioning.

J P GRIME, *Animal & Plant Sciences, University of Sheffield, Sheffield, United Kingdom*

THE LAND THAT COULD BE: ENVIRONMENTALISM AND DEMOCRACY IN THE TWENTY-FIRST CENTURY. *Urban and Industrial Environments.*

By William A Shutkin; Foreword by David Brower. Cambridge (Massachusetts): MIT Press. \$29.95 (hardcover); \$16.95 (paper). xxi + 273 p; index. ISBN: 0-262-19435-X (hc); 0-262-69270-8 (pb). 2000.

Democracy and environmental conservation are two things associated with American society. This book treats the intersection of these two ideals, arguing

that civic involvement by all citizens is needed to protect the quality of life afforded by a healthy environment. At the turn of the 21st century, many environmental problems originate and cause impacts at the local scale. Shutkin argues that to anticipate, prevent, and solve these problems communities must take local initiative. This initiative requires a minimal amount of social capital (e.g., cooperative grassroots organizations) and political will for pursuing a positive future. Nationwide policies can fail to tap the expertise and creativity of local individuals, but local solutions can grow out of consensus among local parties when they act as cooperative members of the same community.

The book consists of eight chapters. The first three lay out the author's primary argument, the next four present case studies of local environmental action consistent with his proposed model, and the final chapter is a reprise highlighting the book's central points. Shutkin treats environmental quality as a common resource, a democratic possession, in the same sense of the parable known as the tragedy of the commons. He addresses the question of how best to protect environmental health and asserts that mainstream national agencies and nonprofit groups (e.g., EPA, Sierra Club) fall short because of their historical orientation toward broad-scale policies and middle-class professionals. Moreover, poor and minority segments of the population have been disproportionately affected by environmental problems.

Shutkin's assessment of environmentalism provides compelling insights for citizens concerned about the health of their local community. The book is, however, not an easy read. It assumes a degree of knowledge of economics, sociology, and politics. Many examples are provided to support the primary points, but they are referred to repeatedly to the extent of being redundant. The content of the first three chapters could have been delivered in 80 pages rather than 140. Ironically, this book will be more influential on environmentalists with a background in social science rather than ordinary citizens on the street.

SCOTT M PEARSON, *Biology, Mars Hill College, Mars Hill, North Carolina*

THE NATIONAL ENVIRONMENTAL POLICY ACT: JUDICIAL MISCONSTRUCTION, LEGISLATIVE INDIFFERENCE, & EXECUTIVE NEGLIGENCE. *Environmental History Series, Volume 17.*

By Matthew J Lindstrom and Zachary A Smith; Foreword by Lynton K Caldwell. College Station (Texas): Texas A&M University Press. \$34.95. xv + 188 p; ill.; index. ISBN: 1-58544-125-2. 2001.

An environmental impact statement (EIS) is a tool that provides individuals with a means to evaluate how our proposed actions may impact the natural,



and indirectly the social, environments in which we live. The Council for Environmental Quality (CEQ) is an oversight mechanism that guides procedures for evaluating environmental impacts and related policy compliance at the federal level. These two mechanisms were created by the National Environmental Policy Act of 1969 (NEPA). Both are essentially procedural; that is, they are concerned with our actions. NEPA is not a regulatory statute, but a substantive declaration of environmental values. It is a comprehensive, forward-looking statement regarding the important role of the natural environment to our existence.

This book examines the policy, administrative, and legal ramifications of NEPA. The authors' examination is thorough and well conceived. They provide a historical context for the development, interpretation, and (lack of) implementation of NEPA. From the very beginning, the authors construct their argument that the substantive component of NEPA (the declaration of values) is disregarded or weakened through administrative neglect and judicial misconstruction. From the initial legislative compromises (e.g., removal from the Act's original text of any reference to a Constitutional right to a healthful environment) to the court interpretations and rulings, the argument is reinforced. The authors' development of the legislative, administrative, and judicial histories of NEPA provides an insight into the evolution of national values and is accomplished in a succinct manner accessible to a broad audience. The book also includes the full text of NEPA in an appendix.

The book concludes with an evaluation of how the substantive intent of NEPA may be actualized. The suggestions range from developing an environmental amendment to the Constitution to political and financial support of the CEQ to strengthening the procedural requirements of an EIS. Overall, this book would be a good resource for anyone interested in environmental policy or the political and judicial process, and a welcomed supplement to any library.

RANDALL S ROSENBERGER, *Agricultural & Resource Economics, West Virginia University, Morgantown, West Virginia*

A NATURAL HISTORY OF THE CHICAGO REGION.  
*Center Books on Chicago and Environs, Volume 2.*

By Joel Greenberg. *Chicago (Illinois): University of Chicago Press.* \$40.00. xviii + 595 p; ill.; index. ISBN: 0-226-30648-8. 2002.

This fine book provides the Chicago region with a single volume overview of its natural areas, waterways, and wildlife. The text also makes clear how these various biomes have changed over the last

200 years, the efforts to save them, and what remains. After introducing readers to the landforms of the area, Greenberg organizes the book by habitat types, beginning with prairies, and moving on through savanna shrublands, forests, wetlands, and the Great Lake itself. The natural vegetation and its recent history begin each section; unusual or important species are then treated in more detail. Later chapters cover insects, amphibians and reptiles, birds, and mammals. The author's discussions of birds and mammals are especially rich in historical perspective. The final chapter considers prospects for the future. The book covers 19 counties near the southern end of Lake Michigan, from southeastern Wisconsin, through Illinois and Indiana to the southwestern corner of Michigan. The volume presents a broad overview; there are no species listings or means for identification.

The author has done his homework well. Early writings and recent reports are all generously quoted and referenced. The political and economic battles to preserve specific natural areas are recounted in many of the chapters; the losses as well as the successes. Many different sources provide insights into the region's past glories, the relentless advance of our modern society, and what is going on around us today. Having trekked (but not studied) Chicagoland's dunes, forest preserves, and marshes for more than 30 years, I find Greenberg's views consistent with my own understanding of these landscapes. In addition, he has brought together historical records and the expertise of many local naturalists in an authoritative and clearly organized manner. The book is impressive in every way; with plenty of notes, a rich bibliography, and an ample index. Best of all, the author communicates all of this information with a deep affection for nature, in a warm and lively prose. Here is a volume that every library planning to cover our nation's natural heritage should possess.

WILLIAM BURGER, *Botany, Field Museum of Natural History, Chicago, Illinois*

POPULATION VIABILITY ANALYSIS.

*Edited by Steven R Beissinger and Dale R McCullough. Chicago (Illinois): University of Chicago Press.* \$95.00 (hardcover); \$35.00 (paper). xvi + 577 p; ill.; index. ISBN: 0-226-04177-8 (hc); 0-226-04178-6 (pb). 2002.

A key goal in conservation is to maintain or enhance the long-term survival of endangered taxa. This task is not trivial, as a multitude of confounding life history, demographic, and genetic factors can result in population endangerment. The job of identifying, quantifying, and predicting

the impact of these factors falls within the domain of population viability analysis (PVA).

Most practitioners of PVA will have cut their teeth on the volume by Soulé, *Viable Populations for Conservation* (1987. Cambridge: Cambridge University Press). This has remained the definitive desktop reference for students and research professionals for 15 years. An explosion of new data, including "in the field" assessments of models that once existed only as computer simulations, has led to a substantial revision of PVA theory and implementation.

This new volume provides a comprehensive overview of this diverse field. The book consists of 25 papers, separated into four sections: an overview of PVA; issues in the parameterization and construction of PVA models; integrating theory and practice in the use of PVA; and the future of PVA. The list of contributors is a veritable who's who of the field, and the quality of the contributions is collectively very high.

The intended audience is broad, and this book will likely appeal to students, teachers, and practitioners of conservation biology. The overviews in Part I should prove popular with anyone new to the field and will be valuable aids for teachers and students of conservation biology. The other offerings, particularly Parts II and III, are aimed more toward individuals who are actively pursuing research in this area, although some of the case studies (Part III) provide useful examples for undergraduate and postgraduate teaching. To me, the final part of this book was the most interesting, as it provides some tantalizing insights into the current trends in PVA—most notably the issue of whether we should continue to increase the complexity of PVA models, or whether we should employ simpler models and recognize their limitations.

Overall, I think that this book will become something of a classic. It covers the myriad approaches to and applications of PVA, highlighting both the strengths and weaknesses of current theory and practice. It is not a methodological guide, rather it is a timely synthesis of this important conservation biology tool that provides a framework from which others can build and extend.

The scope for errors in PVA prediction is vast, but with an increasing number of taxa around the world facing extinction and the resources available to prevent this loss of biodiversity being extraordinarily limited, we need to employ every trick in this book and some that we have not even thought of yet. Perhaps, like the volume by Soulé, this compendium will have its greatest influence as a catalyst, promoting new investigators to pursue the

challenges presented in maintaining viable populations for conservation.

NEIL J GEMMELL, *Zoology, University of Canterbury, Christchurch, New Zealand*

ENVIRONMENTAL REGIME EFFECTIVENESS: CONFRONTING THEORY WITH EVIDENCE. *Global Environmental Accord: Strategies for Sustainability and Institutional Innovation.*

By Edward L Miles, Arild Underdal, Steinar Andreassen, Jørgen Wettestad, Jon Birger Skjærseth, and Elaine M Carlin. Cambridge (Massachusetts): MIT Press. \$70.00 (hardcover); \$28.95 (paper). xxii + 508 p; ill.; index. ISBN: 0-262-13394-6 (hc); 0-262-63241-1 (pb). 2002.

This extensive volume is a joint enterprise between groups of U.S. and Norwegian scientists. It addresses the effectiveness of a range of regulatory issues and regimes in controlling the problem of environmental degradation. It analyzes 14 case studies in both qualitative and quantitative ways. Details of the regulatory regimes, their effectiveness, and shortcomings, are discussed together with conclusions as to why some such regimes succeed and other fail. The regulatory regimes that are discussed are separated into those that have been effective, and those that have produced mixed performances for various reasons.

The effective regimes that are reviewed include: the end of dumping in the North Sea; sea dumping of low-level radioactive wastes; management of tuna fisheries in the west central and southwest Pacific; and the Vienna Convention and Montreal Protocol on ozone layer depletion. Their common positive features and reasons for their effectiveness in addressing the issues are discussed. The regulatory regimes that resulted in mixed performance in effectiveness include: cleaning up the North Sea; long-range transboundary air pollution; satellite telecommunications; salmon in the North Pacific; nuclear war proliferation; a Mediterranean action plan; oil pollution from ships at sea; the International Whaling Commission; and conservation of Antarctic marine resources.

There is no space in this brief review to discuss the fine details, merits, and demerits of these studies. The chapters vary greatly in approach, thoroughness, and readability. The book is, however, unique in that there is no other publication in the international relations field that addresses the details and effectiveness of such a wide range of international environmental regimes and agreements. It is a long and inexpensive volume that provides useful reference reviews of these important topics and justifies a place on the bookshelves

of all scientists, politicians, and laics who work in this field.

CLIVE A EDWARDS, *Entomology, Ohio State University, Columbus, Ohio*

#### INTRODUCTION TO CONSERVATION GENETICS.

By Richard Frankham, Jonathan D Ballou, and David A Briscoe; line drawings by Karina H McInness. Cambridge and New York: Cambridge University Press. \$130.00 (hardcover); \$50.00 (paper). xxi + 617 p; ill.; index. ISBN: 0-521-63014-2 (hc); 0-521-63985-9 (pb). 2002.

Quantitative genetics (the study of multigene traits) and population genetics are mature fields with robust textbooks summarizing vast empirical experience and large bodies of mathematical and statistical theory. Now, conservation genetics—a younger discipline that applies genetic principles to biodiversity management—has its own teaching textbook. Although edited volumes on conservation genetics exist, and a journal by that title was launched in 2000, *Introduction to Conservation Genetics* fills an open classroom niche, and is a welcome sign that this field too has begun to mature scientifically.

With more than half of all vertebrate and 12% of plant species now categorized by the World Conservation Union as threatened with extinction, mostly from human activities, it is sadly imperative that the biodiversity disciplines adopt an applied focus. This book explains why genetic outlooks should be included in management plans for both wild and captive populations.

Genetic perspectives mostly have been neglected in past conservation efforts, one reason perhaps being that the mathematics of population and quantitative genetics can be daunting. This primer will help to make that material more accessible to a wide audience. Frankham et al. introduce the relevant theory in comparatively simple terms, and bring the conservation relevance of population and quantitative genetics to life with clear numerical examples on endangered species. The book walks the narrow line between advocacy and chauvinism for genetic viewpoints. For example, by showing how losses of genetic variation can interact with ecological and stochastic factors to trap small, inbred populations in extinction vortices, it captures the proper notion that genetics, ecology, and demography can all be important and often mutually reinforcing elements in a species decline.

The book's central tenet and mantra is that genetic variation is relevant, both ecologically and evolutionarily. Sixteen of the book's 20 chapters emphasize the within-population component of genetic variability—how “heterozygosity” is gener-

ated and maintained, lost in small closed populations, empirically quantified at single genes and in polygenic traits, monitored with respect to fitness consequences, and sometimes managed in breeding programs to improve the immediate or long-term survival prospects of endangered species. The remaining chapters survey additional topics for which genetic theory or data (often from molecular markers) have management relevance: assessing population fragmentation, demarcating management units, improving taxonomies, identifying wildlife products via DNA forensics, and unveiling the natural histories or cryptic behaviors in threatened species. Although a more even breakdown between the “heterozygosity” and “other” applications might be a better representation of the developing field of conservation genetics, the book's inclusion of both areas is itself unusual and to be applauded.

Readers should find this treatment user-friendly and not intimidating. The book is richly embellished with line drawings of endangered species, useful tables and figures, numerical examples, problem sets with worked solutions, and case histories illustrating real-life pertinence to biodiversity preservation. Many conservation biologists come to the field with a background in natural history, behavioral ecology, or other “organismal” specialties. To them especially, I recommend this book as a fine introduction to population genetics and quantitative genetics in a conservation arena.

JOHN C AVISE, *Genetics, University of Georgia, Athens, Georgia*

#### FUNDAMENTALS OF CONSERVATION BIOLOGY. *Second Edition.*

By Malcolm L Hunter, Jr; illustrated by Andrea Sulzer. Malden (Massachusetts): Blackwell Science. \$65.95. xvi + 547 p; ill.; literature cited and author index, species index, and subject index. ISBN: 0-86542-029-7. 2002.

Conservation biology is a discipline confronted with complex ecological and social challenges. Solutions typically involve understanding not just biology, but difficult economic and ethical issues. As an introduction to the broad range of issues associated with protecting the Earth's biodiversity, *Fundamentals of Conservation Biology* is an excellent textbook. This clearly written and well-organized volume would be suitable at any level of undergraduate instruction.

The book is peppered with numerous examples that do an excellent job of highlighting the practical application of conservation biology. Each chapter concludes with a case study in conservation, and my favorites included the direct popula-

tion manipulation of Black Robins and the population viability analysis of the Eastern Barred Bandicoot. I would have liked to see even more of these formal case studies, but the numerous examples throughout the book offer compelling illustrations of conservation biology in action.

Hunter is particularly skilled at raising the difficult dilemmas faced by conservation biologists. How much and what types of human intervention should be used to rescue a species from extinction? How should we allocate scarce conservation funds? This book excels at raising tough questions and presenting students with alternative considerations. The numerous questions raised in each chapter provide excellent material for classroom discussions.

In general, the book is well organized and thorough, with many current references for interested students to explore. The one chapter that I did not like was the first. Rather than introduce students to a brief description of the discipline's history, a more compelling approach would be to elaborate questions and problems faced currently by conservation biologists. One minor shortcoming of this book is the lack of detail given to empirical or theoretical ecology's contribution to conservation biology. Often, a small amount of space is devoted to important ecological ideas or studies (e.g., island biogeography, biodiversity experiments, and metapopulation and source-sink biology). Because these explanations are so brief, they may confuse students.

Overall, this is an excellent textbook. Importantly, undergraduate readers will be better prepared to face the complex challenges involved in conserving the Earth's biodiversity.

NICK M HADDAD, *Zoology, North Carolina State University, Raleigh, North Carolina*

#### FLORIDA'S FRAGILE WILDLIFE: CONSERVATION AND MANAGEMENT.

By Don A Wood. *Gainesville (Florida): University Press of Florida.* \$39.95. xxiv + 211 p; ill.; index. ISBN: 0-8130-1888-9. 2001.

Conservation biologists monitor animal and plant populations that are declining because of man's activities, diagnose the causes of the declines, and seek ways to return the populations to stable or increasing numbers. To that end, this small book examines some of the best-known case histories of birds, mammals, and reptiles that have been listed (federally, by the state, or both) as threatened or endangered in Florida. For each case, the author summarizes the species' current status, distinguishing characteristics, habitat, life history, and behavior; then he describes ways to monitor its populations and makes management recommendations.

Although the prose is dry, general readers will find interesting details about the life history of each animal. More critical readers familiar with the subject matter will be disappointed, however. Wood omits many important aspects of the subject, even some of those well covered in the "relevant literature" section at the end of each chapter. I could find very little on conservation genetics, safe harbor agreements, or habitat conservation plans. Wood is not fully up to date on current methods of sampling wild populations or on state and federal permitting regulations for the management of endangered species on either public or private property. His management recommendations would probably benefit the species he discusses, but a more authoritative source would be direct contact with the relevant agencies, the U.S. Fish and Wildlife Service (<http://endangered.fws.gov>) and the Florida Fish and Wildlife Conservation Commission (<http://www.floridaconservation.org/pubs/endanger.html>). For example, Florida has developed official management plans for gopher tortoises (*Gopherus polyphemus*) and burrowing owls (*Athene cunicularia*), and is developing plans for other species. The federal government published a draft revised recovery plan for the red-cockaded woodpecker (*Picoides borealis*) in 2000 and will soon release a final draft.

Wood's objectives are laudable. He describes extreme cases in which vertebrate animals are negatively affected by man's activities and suggests how scientific study and better land management, at least partly promoted by government regulations, could help. I hope this initial effort will stimulate others to construct more definitive treatments of the same subject.

FRANCES C JAMES, *Biological Science, Florida State University, Tallahassee, Florida*

#### NATURALIST'S BIG BEND: AN INTRODUCTION TO THE TREES AND SHRUBS, WILDFLOWERS, CACTI, MAMMALS, BIRDS, REPTILES AND AMPHIBIANS, FISH, AND INSECTS. *Louise Lindsey Merrick Natural Environmental Series, Volume 33.*

By Roland H Wauer and Carl M Fleming. *College Station (Texas): Texas A&M University Press.* \$29.95 (hardcover); \$15.95 (paper). x + 185 p + 8 pl; ill.; index. ISBN: 1-58544-155-4 (hc); 1-58544-156-2 (pb). 2002.

This overview of the natural history of Big Bend National Park is an update of two previous editions. The book is written in a style that is accessible to laics who may be visiting the park for the first time, but also contains enough details to make it useful to professional biologists interested in the Big Bend region. The 12 chapters cover the organisms

listed in the title, plus a brief history of the ecology, geology, and human use of the region. Scientific names are provided alongside common names for all species except birds. Illustrations include 28 black-and-white photographs of locations, habitat, and selected plants and animals; 15 color plates of habitats and scenic vistas; and 90 line drawings of plants. A bibliography of more than 800 books, journal articles, and unpublished reports (organized by major topic) is appended. Unfortunately, the volume does not include a map of the park.

I should emphasize that this is not an exhaustive field guide to the park's diverse biota (that book has yet to be written). Some chapters are little more than annotated checklists of species, whereas others include brief, but interesting life-history data. The unevenness in coverage possibly reflects the interests and expertise of the authors; alternatively, it may have been intended to emphasize those fauna and flora that average park visitors are most likely to encounter. For example, although the cacti, wildflowers, and birds are generally well covered in their respective chapters, the section on fishes is fairly slim. Characteristics for identifying species in the field are also highly variable, ranging from no information to brief, but adequate, descriptions. Although this book will make a nice companion for the average visitor to Big Bend, I am certain that hardcore naturalists will still want to carry several of the more detailed regional field guides that are listed in the bibliography.

JAMES N STUART, *Conservation Services, New Mexico Department of Game & Fish, Santa Fe, New Mexico*



## NEURAL SCIENCES

WHAT MAKES US THINK?: A NEUROSCIENTIST AND A PHILOSOPHER ARGUE ABOUT ETHICS, HUMAN NATURE, AND THE BRAIN.

By Jean-Pierre Changeux and Paul Ricoeur; translated by M B DeBevoise. Princeton (New Jersey): Princeton University Press. \$29.95. x + 335 p; ill.; index. ISBN: 0-691-00940-6. [Originally published as *Ce Qui Nous Fait Penser: La Nature et la Règle*, by Editions Odile Jacob, 1998.] 2000.

If you would really like to know what makes us think, you will not get the answer by reading this book—the title is just a misnomer. The volume is a good after-hours read on the views and exchanges of two prominent researchers, Jean-Pierre Changeux, a neuroscientist, and Paul Ricoeur, a philosopher. They argue about a lot of issues, from evolution to

brain to ethics, rarely reaching an agreement on the role of modern-age neuroscience in shaping human values and experience. Changeux envisions an overarching role of neuroscience on human affairs. He writes, “[t]he knowledge that we are now in the process of piecing together about the human brain ought to allow us to have a clearer idea—I am perhaps overly optimistic—of the direction in which we wish to see human society develop” (p 27). Ricoeur holds steadfastly to every millimeter occupied by the totality of human experience and its unique value, seeing no special role in it for neuroscience *qua* neuroscience. For example, the authors engage in the following exchange: “Changeux: . . . Today . . . I think that observational methods make it possible to obtain physical facts about subjective psychological states. A physics of introspection may even be possible. Are we in agreement on this point? Ricoeur: In humans a function is not reducible to an observable behavior. . . . There is a hermeneutics of daily life that gives introspection the dimension of an interpersonal practice. . . . This is what I find expressed in the phrase *for intérieur*, one’s heart of hearts—literally, a ‘forum’ in which one speaks to oneself. This heart of hearts has its own particular status that it would appear you will never succeed in explaining in your science. And so my answer to your question is no” (pp 67–69).

In the course of the book, no real convergence is achieved; each one ends where he started, asserting his own beliefs, visions, and concerns. Has anything been gained in the process? The intense and occasionally pointed dialogues bring forth an incremental, but substantial clarification of the issues at hand, the issues at stake, and their potential (but not actual) interaction. The fact of the matter is that neuroscience has no privileged bearing on human affairs simply because it deals with the brain. Why push it to realms in which it does not belong?

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ANNUAL REVIEW OF NEUROSCIENCE. Volume 25: 2002.

Edited by W Maxwell Cowan, Steven E Hyman, Thomas M Jessell, and Charles F Stevens. Palo Alto (California): Annual Reviews. \$67.00. ix + 622 p + 20 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 16–25). ISBN: 0-8243-2425-0. 2002.



## BEHAVIOR

## SIGNALERS AND RECEIVERS: MECHANISMS AND EVOLUTION OF ARTHROPOD COMMUNICATION.

By Michael D Greenfield. Oxford and New York: Oxford University Press. \$80.00. xii + 414 p; ill.; taxonomic and subject indexes. ISBN: 0-19-513452-4. 2002.

To achieve rapid advances in our understanding of animal communication, there is no more powerful combination of tools than a first-hand knowledge of natural history, a mastery of the pertinent scientific literature, and an insightful evolutionary perspective. Without the knowledge of natural history and the literature, the evolutionary perspective sometimes amounts to little more than "just-so" storytelling. Without the evolutionary approach, the bits and pieces of accumulated knowledge, no matter how extensive, do not allow one to identify patterns and make predictions. *Signalers and Receivers: Mechanisms and Evolution of Arthropod Communication*, by Michael Greenfield, has it all. If you only scan the contents, you might be disappointed in the evolutionary treatment of communication because the chapters dealing with sexual selection (Chapter 6) and signal evolution (Chapter 7) were very short (together only 21 out of 414 pages). But the core chapters on chemical (Chapter 3), sound and vibration (Chapter 4), and visual communication (Chapter 5) include not only a thorough documentation of the tremendous diversity of mechanisms of signal production and reception in arthropods, but these are discussed in an evolutionary context.

The author does a particularly good job of presenting the physical characteristics of and constraints on each channel of communication. Throughout the book, Greenfield makes valuable connections and contrasts between the three major modalities of communication, leaving readers with an appreciation of the environment-specific advantages and disadvantages of each mode of communication and the value of multimodal communication. Although readers might quibble with a few specifics, this book is packed with information that is accurate and up to date. It might be tempting to use this volume as a well-indexed desk reference, but in doing so one might miss out on those ubiquitous insights that are not so easily indexed; even the extensive footnotes should not be glossed over. The greatest value of this book, and perhaps what makes it unique, is

Greenfield's clear delineation of the limits of our knowledge, which suggests many lines for future research.

KENNETH F HAYNES, *Entomology, University of Kentucky, Lexington, Kentucky*



## HUMAN BIOLOGY &amp; HEALTH

## THE DREAM OF ETERNAL LIFE: BIOMEDICINE, AGING, AND IMMORTALITY.

By Mark Benecke; translated by Rachel Rubenstein. New York: Columbia University Press. \$27.95. xi + 196 p; ill.; index. ISBN: 0-231-11672-1. [Originally published as *Der Traum vom ewigen Leben: Die Biomedizin entschlüsselt das Geheimnis des Alterns*, Rowohlt, 1998.] 2002.

This is one of those books that must be clearly described as "popular science," which the author does immediately in the Acknowledgments. The discussion is breezy, with an editorial level that roughly matches that of a weekend newspaper supplement. Readers should not expect news of the latest in research on the subject of immortality, a topic that has been becoming more popular over the last ten years. The author is a forensic entomologist, not a specialist on aging, demography, or immortality. Names like Carey, Curtsinger, Gavrilov, and Vaupel—leading figures in this research over the last decade—do not appear in the index.

Benecke's main preoccupation is death. He works with cadavers. Indeed, he should have appropriated the title of Raymond Pearl's volume, *The Biology of Death* (1922. Philadelphia (PA): J B Lippincott) for this book. Benecke offers a wide range of anecdotes, including topics such as cell suicide, mummification, vampires, brain death, cryonics, comas, and Barbara Cartland. On the other hand, he discusses antiaging prescriptions ranging from Hufeland's macrobiotics to sports to drinking kefir to brain transplantation. If you like death too, this book is packed with bonbons.

Benecke has a magpie's discretion in the range of topics incorporated in his thanatology. He discusses at some length global warming, Gaia, Biosphere II, the origin of life, extraction of banana DNA, neotenus aliens from outer space, the war in Vietnam, and Fliess's biorhythm theory. All interesting topics, but their juxtaposition with the main themes of death and survival is bewildering. The material on vampires is more sensible coverage.

The tone of the book is dark, but almost reveling in the darkness, a young Nosferatu's book of bed-

time stories. It is peculiar and digressive, but this book can be recommended to all who share its ghoulish obsessions.

MICHAEL R ROSE, *Ecology & Evolutionary Biology, University of California, Irvine, California*

**HUMAN BIOLOGY: HEALTH, HOMEOSTASIS, AND THE ENVIRONMENT. Fourth Edition.**

By Daniel D Chiras. Sudbury (Massachusetts): Jones and Bartlett Publishers. \$74.95 (paper). xxix + 627 p; ill.; index. ISBN: 0-7637-1880-7. 2002.

This textbook provides a wealth of readable and understandable information about the structure, function, pathology, and pathophysiology of the human body. There is less, but well-presented, information about cell and molecular biology, genetics, biochemistry, and biotechnology. The final four chapters introduce students to the principles of evolution in general, human evolution in particular, and ecology and environmental issues relevant to human populations. The book is written at a level of an introductory textbook for a course in human biology.

There are many features that recommend this volume. First, throughout the book, biological processes and structures are not only simply and clearly described, but they are also beautifully illustrated through pictures, drawings, and diagrams. Second, each chapter begins and ends with a "thinking critically" box, which is designed to develop scientific thinking skills related to the chapter content. Third, in many chapters there are useful point-counterpoint discussions (for example, tracking people with AIDS) written by advocates that allow students to see how scientific information is used to support arguments. Fourth, each chapter ends with a well-organized summary and useful questions. Fifth, the glossary at the end of the book is substantial, providing understandable definitions of well over 1200 terms. Finally, there is reference to a website ([www.jbpub.com/humanbiology](http://www.jbpub.com/humanbiology)) that provides further information about many of the topics covered.

The book also presents information relevant to the student's lives, such as how anabolic steroids affect athletes or what various methods of birth control are and how they work. In these descriptions, however, the presentation is sometimes colored by the author's advocacy. Missing is any discussion of human adaptability and how some human populations survive in extreme environmental conditions, such as high-altitude hypoxia, or severe cold or heat. This information would be useful in conveying more fully the richness of human biological variation.

Despite these few shortcomings, this is a wonderful book. It is an excellent teaching tool for

undergraduate students in human biology. I highly recommend it.

GARY D JAMES, *Institute for Primary & Preventative Health Care, Decker School of Nursing, Binghamton University, Binghamton, New York*

**SIGNIFICANT OTHERS: THE APE-HUMAN CONTINUUM AND THE QUEST FOR HUMAN NATURE.**

By Craig Stanford. New York: Basic Books. \$28.00. xix + 236 p; index. ISBN: 0-465-08171-1. 2001. With this book, the author joins the field of those researchers who provide an evolutionary perspective on human behavior. In contrast to other recent examples, he focuses more narrowly on the great apes, particularly the better-known chimpanzees and gorillas. These are species Stanford has studied in their natural habitats, so his approach makes up with familiarity and insight for what it lacks in breadth.

After providing an overview of the social organization and mating systems of the African great apes, Stanford takes up four specific behaviors: hunting, mate choice, infanticide, and parent-offspring interactions. After laying out the theoretical importance of each topic, he uses observations of great apes to illuminate the bases of these behaviors in humans.

Stanford then presents evidence for culture and language ability in the great apes and takes on two disparate camps, evolutionary psychologists and postmodernists. Criticizing what he regards as the facile theorizing of some evolutionary psychologists, the author argues that evolutionary psychology fails because its claims about the adaptedness of many human behaviors cannot be falsified. According to Stanford, postmodernists object to any suggestion of a genetic contribution to human behavior, an argument leveled against sociobiology from the political left (from within and outside biology) in the 1970s. Although clear continuities between human and ape behavior make the postmodernists' position scientifically untenable, Stanford points out that all hypotheses about the evolution of human behavior require the same rigorous testing as any in science.

Midway through the book the author shifts from a broad perspective to address more academic issues. He describes the frustration felt by many biological anthropologists with the postmodernist position on the relative roles of genetics and the environment in human behavior. Nevertheless, this book is useful for biologists seeking a concise discussion of recent fieldwork on great apes and for nonspecialists wishing to evaluate more popular treatments of the evolution of human behavior.

Stanford concludes the book with a poignant description of the struggle by African great apes to survive the combined destructive forces of habitat

loss, hunting (the bush-meat crisis), and political turmoil. Whether one accepts that apes have true language or culture, his argument that these highly complex and social beings deserve a better fate than long solitary confinement for medical experiments or becoming the entrée in a restaurant in Kinshasa or Paris is persuasive.

JANICE CHISM, *Biology, Winthrop University, Rock Hill, South Carolina*

**GREAT APES & HUMANS: THE ETHICS OF COEXISTENCE.** *Based on a workshop held in Lake Buena Vista, Florida, 21–24 June 1998. Zoo and Aquarium Biology and Conservation Series.*

*Edited by Benjamin B Beck, Tara S Stoinski, Michael Hutchins, Terry L Maple, Bryan Norton, Andrew Rowan, Elizabeth F Stevens, and Arnold Arluke. Published by Smithsonian Institution Press, Washington (DC), in cooperation with the American Zoo and Aquarium Association, Silver Springs (Maryland). \$34.95. xxiv + 388 p; ill.; index. ISBN: 1-56098-969-6. 2001.*

I must confess an interest: *Great Apes & Humans* is the result of a workshop held to consider the underlying assumptions and implications of the Great Ape Project, a book that I coedited with Paola Cavalieri, and which gave rise to the organization of the same name over which I currently preside (for further information see [www.greatapeproject.org](http://www.greatapeproject.org)). The current volume consists of 19 essays, plus a moving introduction by Jane Goodall. Four essays deal with great apes in the wild, three discuss great apes in captivity, three describe the history and evolution of apes and humans, and nine consider ethical and legal questions.

The opening section begins with Thomas Butynski's masterly overview of the four species of African nonhuman great apes (common chimpanzee, gracile chimpanzee or bonobo, and the western and eastern gorilla). For each species, Butynski estimates the surviving population, classified by subspecies and by country. A comparison with earlier population estimates paints an alarming picture of dwindling populations, extinct in many parts of their original range, and endangered in others. Eye-opening essays by Karl Ammann and David Wilkie cover the killing of apes for "bush-meat," and show how the opening of forests for logging has added immensely to the problem. Herman Rijksen describes the conservation issues that will determine the survival of the orangutan in Indonesia. The section on apes in captivity deals with zoos, sanctuaries, and the issue of "retirement" for apes used in research—can slaves retire? Would manumission be a better term? The chapters on history and evolution focus on the boundary between human and nonhuman great apes,

both in the way we have imagined that boundary, and in more standard evolutionary and phylogenetic terms.

Of the ten essays in the section on ethical and legal issues, the one by Sarah Boysen and Valerie Kuhlmeier is mostly about the conceptual capacities of chimpanzees, and although a valuable contribution, it might have been better placed in another section, for it discusses ethical issues only at the end. The essay by Hutchins et al. provides the most forceful criticism of the Great Ape Project, but much of it misses the mark, for the authors attribute to the project as a whole the more hard-line animal rights views held by only some of the contributors to the original book. It is not accurate to say that the Great Ape Project holds that "all sentient animals" have an inalienable right to life and liberty—in fact, the project does not even hold that great apes have inalienable rights to life and liberty, if that term means that these rights must never be violated in any circumstances. Nor is it accurate to suggest, as the authors of this chapter do, that the project always opposes captivity (p 353), for it supports sanctuaries in which great apes are held captive, where no better option is possible.

Several other chapters in this final section provide valuable perspectives. To single out only three: Richard Wrangham discusses, in the context of Uganda's Kibale Forest National Park, the dilemma that occurs when the moral claims of individual apes clash with conservation questions affecting the park as a whole. Steven Wise provides a brief statement of the thesis from his controversial book, *Rattling the Cage: Toward Legal Rights for Animals* (2000. Cambridge (MA): Perseus Books), arguing that the law should recognize legal rights for great apes. Paul Waldau presents the case for the ethic behind the Great Ape Project. But there is much more in this rich book. Although its breadth means that some discussions are necessarily superficial, the lengthy reference lists provide a valuable source for anyone who wants to delve more deeply into the fascinating questions of the current fraught and unhappy situation of our closest relatives, and what we ought to do about it.

PETER SINGER, *Center for Human Values, Princeton University, Princeton, New Jersey*

**EVOLUTION AND THE CAPACITY FOR COMMITMENT.** *Based on a symposium held in Ann Arbor, Michigan, 9–10 April 1999. Russell Sage Foundation Series on Trust, Volume III.*

*Edited by Randolph M Nesse. New York: Russell Sage Foundation. \$42.50. xviii + 334 p; ill.; index. ISBN: 0-87154-622-1. 2001.*

Some aspects of social life are so fundamental that we take them for granted until alerted to their complexity. The capacity for commitment is a case in



point. We make promises and we make threats, both of which are pledges of contingent future action. Audiences discount some such pledges and take others seriously, when the person and circumstances make the promise credible. But whence credibility?

This book is the result of a project organized by Randolph Nesse, a psychiatrist and professor of psychology, who is committed to exploring how natural and sexual selection have designed the mind. The contributors to this project include experts from economics, animal behavior, anthropology, psychology, philosophy, and law. Together, their papers make a convincing case that the complexity and duration of social commitments in *Homo sapiens* warrant close study, for herein may lie adaptive machinery enabling the maintenance of prosocial cooperative enterprises.

The volume begins with outstanding chapters by Nesse, Thomas Schelling, Robert Frank, and Jack Hirshleifer, outlining the nature of commitments, the game theoretic conditions for their evolution and persistence, and the functional value in coordinating social interactions among unrelated persons. "Theory of mind" (the capacity for intuitive modeling of another's perspective) facilitates coordinated social interactions, but will not suffice to explain long-term social commitments that are vulnerable to distractions, interventions, and defections.

Guarantees of commitment can be explicit, as in contract law, or unspecified, as in reputational consequences, and failing to fulfill commitments can be very costly if the outcome is social exclusion by others. It is not external enforcement that is the primary subject of this edited volume, but rather the subjective enforcers of commitments and the display of credible signals that warrant reliance on promises and threats. Candidate adaptations for achieving commitment and credibility include moral sentiments and emotions. A parent's love for a child is an obvious example of how emotion can maintain commitment, in which the direct fitness benefits of investing in its own offspring best account for the design of parental psychology. Avian courtship provides subtler examples of how attachment processes may subserve mutual commitment to the rearing of joint offspring to the exclusion of alternative reproductive opportunities; as with parental investment, the fitness benefits accrue from their commitment to their joint offspring. But the big challenge posed is to account for credible social commitments to unrelated parties.

Three chapters discuss whether displays are honest signals of intent in nonhuman social interactions, but the relatively short-term interactions discussed here may be of little relevance to long-term

social commitments of humans. Other authors discuss the notion of commitment and the standards of evidence for commitment's role in facilitating implicitly contractual agreements in paired and multiplayer interactions of unrelated persons in different social contexts. Cohen and Vandello's chapter on the "culture of honor" in the southern United States is an especially fascinating account of how responding to minor insults with violent anger is an honest deterrent signal to potential trespassers and thieves in particular ecological contexts. William Irons makes a very credible argument about how religious belief and ritual displays might maintain the cohesiveness of like-minded groups and communities.

The 14 chapters together make a strong case for considering the capacity for commitment as an essential process, enabling mutual benefits in social interactions with a long future. The burgeoning interest of economists in moral sentiments such as fairness and equity, plus a revival of interest in the adaptive significance of the emotions, make the publication of this volume timely, and I predict that it will have a major impact on the way people think about social commitment.

MARGO WILSON, *Psychology, McMaster University, Hamilton, Ontario, Canada*

#### SECOND NATURE: ECONOMIC ORIGINS OF HUMAN EVOLUTION.

*By Haim Ofek. Cambridge and New York: Cambridge University Press. \$74.95 (hardcover); \$27.95 (paper). ix + 254 p; ill.; index. ISBN: 0-521-62399-5 (hc); 0-521-62534-3 (pb). 2001.*

Why do human beings have such large brains? The author offers an original hypothesis: the challenges of trading. He suggests that this accounts for "what seems to be a premature and excessive advance in cognitive skills relative to prehistoric needs for survival" (p 2). This slim book includes frequent asides in text boxes. It is separated into two parts: seven chapters on bioeconomics (e.g., Exchange in human and nonhuman societies) and six chapters on paleoeconomics (e.g., The origins of market exchange).

The thesis about trade appears early. But too often the book reads like a set of small and independent thoughts. Every few paragraphs could stand alone, such as the topic of diet on sailing ships, or the division of labor in mole-rat mining, but the pieces did not fit together in a smooth and logical way. Sentences sometimes left me gasping for air: "Very few humans take the bulk of their diet from animal matter except, perhaps, in high arctic latitudes where the scanty vegetation has left the local (Inuit) people with little choice but to acquire

special adaptations to diets high in fat and protein derived from animals—sea mammals and, to a lesser extent, fish and caribou—the only food sources that, historically, were available to them” (p 66).

Alternative hypotheses, as well as caveats, are given scant consideration. The remarkable descriptions of the human psyche in *The Golden Bough: A Study in Magic and Religion* (J G Frazer. 1890. London: Macmillan) or *The Tibetan Book of the Dead: The Great Liberation through Hearing in the Bardo* (F Freemantle and C Trungpa. 1987. Boston (MA): Shambhala) still demand an evolutionary explanation. Ofek does not consider any of this literature, which might at first seem defensible, since his thesis is economic causation. But if we accept his hypothesis, then this voluminous spiritual imagery remains unexplained. Is it a mere unexpected consequence (or even pathology?) of a brain expanded to handle trading? I do not buy it. Nor has Ofek attempted to reconcile the two. This absence of competing hypotheses became increasingly irritating as the book progressed.

The treatment of biology, ecology, and anthropology was often dismissive. Leakey's books are not referenced (although two technical papers are cited). Jared Diamond's *Guns, Germs and Steel: The Fates of Human Societies* (1997. New York: W. W. Norton and Company) is referenced, but none of his papers on the collapse of human societies from overexploitation of resources (e.g., 1994. *Proceedings of the American Philosophical Society* 138(3):363–370) are discussed. There is no mention of a common asymmetrical alternative to trade, pillage—see *Competition* (P Keddy. Second Edition. 2001. Dordrecht: Kluwer). The treatment of defense in plant tissues is weak given its vast literature, including such volumes as *The Inadequate Environment: Nitrogen and the Abundance of Animals* (T C R White. 1993. Berlin: Springer-Verlag). There is minimal consideration of evolutionary game theory (see G J Mailath. 1998. *Journal of Economic Literature* 36(3):1347–1374). A little more effort might have strengthened some of the arguments, clarified other points, and kindled a more responsible exploration of competing hypotheses.

The final issue takes us back to the opening pages. Trying to account for increased brain size is daunting enough, but Ofek greatly expands and muddies the question by inserting the words “premature and excessive.” Both words beg the question, relative to what? Is there even a question to be answered? Was the angiosperm flower “premature”? Is a turtle's shell “excessive”? The use of such language makes me uneasy about Ofek's grasp of evolutionary biology.

Trade may well be part of the story of human

evolution, and Ofek has done a service by reminding us. But someone else, it seems, will have to weave this story into a proper web of competing hypotheses and evidence.

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#### INDO-EUROPEAN ORIGINS: THE ANTHROPOLOGICAL EVIDENCE.

By John V Day. Washington (DC): *The Institute for the Study of Man*. \$68.00 (paper). xxiv + 546 p; ill.; no index. ISBN: 0-941694-75-5. 2001.

This is an ambitious and unusual book. The author has set himself the task of collecting and summarizing 200 years worth of research on the Indo-European (IE) problem by scholars from diverse disciplines. Comparative linguistics leaves us in little doubt that in prehistoric times there existed a population that spoke a Proto-Indo-European (PIE) language ancestral to nearly 150 living languages dominating Europe, and widely distributed throughout West and South Asia. Who were these ancient PIE speakers, when and where did they live, and by what processes did their descendant languages arrive at their present locations?

In successive chapters the author lists and discusses evidence from linguistics, textual and artistic sources, and biological anthropology (dermatoglyphics, cranioskeletal studies, and genetics). Some of the biological findings are quite up to date, although the intensive current research in this area will rapidly outdate them.

One difficulty of studying IE origins is the complexity of the concept. The author points out the noncongruence of several aspects of ancient populations in Europe. These would include archeological, biological, cultural, and linguistic criteria. These criteria yield only partially overlapping classifications of their constituent populations. One statement or investigation about Indo-Europeans may refer to linguistic characters, yet incautious readers may transfer the inference to biological characteristics of the populations. Although the author is well aware of these complexities, it is not always easy to recognize which aspect of the IE puzzle he refers to in his accounts.

The discussion focuses on four population-dynamic processes, all of which can lead to language change: in situ divergence; demic diffusion; elite dominance and folk migration, the two being opposite ends of a continuous spectrum of population movements; and contact-induced language shift. The author postulates expectations for each type of evidence under each of the above models and draws conclusions from the results of numerous cognate studies.

The structure and scope of this book raise an important question for researchers who want to test hypotheses by summarizing numerous experiments and other results. In fields such as clinical trials, where the hypotheses are more narrowly defined, meta-analysis has become established as the procedure of choice. Some new type of meta-analysis has yet to be developed for data, such as the ones in this book, ranging from descriptions in ancient works of variable reliability to conclusions reached from sophisticated statistical analyses of carefully designed studies. Absent such procedures, it is difficult to interpret the often contradictory evidence from several disciplines.

An added problem arises from the possibility of misinterpreting the results of the reported findings. I am unable to evaluate this in disciplines in which I have no expertise, but as an example of the dangers inherent in such a multifarious study, I can cite the treatment of synthetic surfaces in Chapter 9. The author references my work on synthetic surfaces (on page 240) without reporting the gist of my findings that the interpolation of unbalanced data matrices invalidates the maps based on them, because even random patterns when treated in this manner yield trends that invite interpretation. He not only goes ahead and uses the synthetic maps of the first three principal component maps as evidence, but also discusses the evidence from the next four components that even their authors do not consider seriously. Since the author cites the impressive total of over 2,600 references, one wonders how many others might be misinterpreted.

Day's tentative conclusions are that the PIE speakers came from small, sparse populations that established themselves by migration and elite dominance in various regions of Eurasia. They were characterized by light pigmentation of skin and hair and originated on the Eurasian steppes. Because of the many references cited in the text, the book in places makes for wearisome reading. It suffers also from the lack of an index. Nevertheless, this volume is an invaluable compendium for anyone interested in or researching the IE problem and I, for one, will certainly consult it in the future.

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

#### CREATING MENTAL ILLNESS.

By Allan V Horwitz. *Chicago (Illinois): University of Chicago Press.* \$32.50. xi + 289 p; ill.; index. ISBN: 0-226-35381-8. 2002.

This book critiques both modern biological psychiatry and the social scientists and philosophers who argue that mental illness is nothing more than

a social construction. Horwitz makes at least two major contributions to our understanding of mental disorders. First, he eloquently draws on evidence from the biological and social sciences to create a balanced, integrative approach to the study of mental disorders. Second, in accomplishing the first contribution, he provides a fascinating history of the study and treatment of mental disorders in Western society, from early asylum work to the rise of modern biological psychiatry. Along the way, he discusses the economics as well as the science of this evolution.

The author argues that the growing emphasis on genetics and biological psychiatry has served to minimize the influence of culture on individual distress, yet he reviews and acknowledges the real contributions of biological psychiatry to our understanding of psychological disorders. Horwitz presents evidence that there are biological vulnerabilities to these disorders, but only in a very general sense. For example, there is no specific etiology or treatment for most psychological disorders; even effective and popular psychotropic drugs tend to work across a range of disorders; there is much comorbidity of disorders; and the prevalence of disorders varies across cultures and over time. Yet the author rejects the strictly constructionist view that culture merely creates and labels individuals as disordered. Rather, he takes a more complicated approach to argue that underlying biological vulnerability to psychological disorders may be expressed in different ways (e.g., with depression, anxiety, and anorexia, among others) depending on cultural context. For example, cultural forces constrain and reward different behaviors in men and women that lead them to express psychological upset in different ways (e.g., depression is more prevalent among women; alcoholism among men). Although culture can shape the expression of psychological disorders, the underlying disorder is quite "real."

*Creating Mental Illness* provides a thoughtful approach to guide a more balanced understanding and treatment of mental disorders.

DEBRA UMBERSON, *Sociology, University of Texas, Austin, Texas*

#### THE EMERGENCE OF THE SPEECH CAPACITY.

By D Kimbrough Oller. *Mahwah (New Jersey): Lawrence Erlbaum Associates.* \$99.95 (hardcover); \$39.95 (paper). xvii + 428 p; ill.; author and subject indexes. ISBN: 0-8058-2628-9 (hc); 0-8058-2629-7 (pb). 2000.

This original attempt to relate the course of infant vocal development to the evolution of language proposes an "infrastructural" model of communi-

cation systems, which distinguishes purely descriptive operational categories from units based on structural analysis of speech-like features. Each of the four stages Oller posits for infant "protophones" is characterized in such a way as to reveal children's growing mastery of speech production, culminating in the easily recognized "canonical" syllables with their rhythmic open and close jaw movements. The extensive research on the emergence of canonical babbling in normally developing, premature, and deaf infants, infants with Down Syndrome, and those raised in homes of very low socioeconomic status has yielded the important finding that, with the exception of infants unable to hear either adult speech or their own vocalizations—or, perhaps most significantly, to identify the match between the two (M M Vihman and R A DePaolis. 2000. Pages 130–145 in *The Evolutionary Emergence of Language: Social Function and the Origins of Linguistic Form*, edited by C Knight, M Studdert-Kennedy, and J R Hurford. Cambridge: Cambridge University Press)—the timetable for the emergence of this landmark event in the middle of the first year is virtually unaffected.

Oller uses his model to develop a list of critical "design features" of language. He identifies four broad categories of human vocalization: Vegetative sounds (e.g., coughing, sneezing, and "reflexive grunting") and Fixed signals (laughter, crying, and sighing) are limited to small, immutable repertoires that "index" particular bodily functions or are biologically based, but can take on limited "socially significant values." In contrast, both Protophones and Speech are more flexible in form and can function more freely to express social values. Distinguishing between illocutionary force (request, warning, and refusal) and semantic meaning, Oller notes that fixed signals in human and nonhuman primates, like infant protophones, are able to transmit illocutionary force only, whereas words can additionally convey referential meaning.

Turning to phylogeny, Oller first lays down a logical structure for cross-species comparison (Chapter 12), indicating the minimal requirements for a powerful and efficient communicative system as concerns both meaning and form. In a succession of speculative evolutionary scenarios (Chapter 13), he argues for neoteny as a key factor in the evolution of language, noting the presence of relatively freer vocal expression in some nonhuman primates in infancy only (see C Knight. 2000. Pages 99–119 in *The Evolutionary Emergence of Language: Social Function and the Origins of Linguistic Form*, edited by C Knight, M Studdert-Kennedy, and J R Hurford. Cambridge: Cambridge University Press). In nonhuman primates only fixed signals are found, and Oller thus argues for making cross-species compar-

ison between fixed vocal signal systems only (Chapter 14). He concludes that if, following some studies of other primates, human fixed signals are ranged along a series of distinct gradients, it is the pole of low intensity that is most plausible as a "launch point for speech-like vocalizations" (p 355)—this point is occupied by the "quasi-vowel" or grunt, a sound first produced reflexively in the first month of life. As McCune et al. (1996. *Journal of Comparative Psychology* 110(1):27–37) have shown, the grunt later occurs in infants (as in adults) as the involuntary result of attentional effort, and finally—in a notable shift of function—as a voluntary communicative signal, and one that has been found to correlate closely with the first referential use of speech.

MARILYN M VIHMAN, *Psychology, University of Wales, Bangor, United Kingdom*

**DIGIT RATIO: A POINTER TO FERTILITY, BEHAVIOR, AND HEALTH.** *The Rutgers Series in Human Evolution.*

By John T Manning. *New Brunswick (New Jersey): Rutgers University Press.* \$65.00 (hardcover); \$27.00 (paper). xvii + 173 p; ill.; index. ISBN: 0-8135-3029-6 (hc); 0-8135-3030-X (pb). 2002.

In humans, as in many mammals, the digits are not of equal length. The middle finger is longest in almost all individuals, but the relative lengths of the index and ring fingers vary, with systematic sex differences. The latter fact had been noted previously, but no plausible interpretation was available until the advent of Manning's work. The author introduces two major new elements. First, he provides a ratio (index finger length divided by ring finger length, also known as the 2D:4D ratio) that is easily measured, highly reliable, and shows a sexual dimorphism. In the vast majority of samples, the ratio is smaller for males, in a few the ratio shows no sex differences, but no sample shows a smaller ratio for females. The second contribution lies in the proposition that sex differences in digit ratio have a broader significance. This proposition is based on the knowledge that sex hormones influence the *Hoxa* and *Hoxd* genes that play a role in the development of ovaries and testes as well as fingers and toes. Digit ratios, by reflecting the relative influence of androgens and estrogens during development provide an indirect reflection of early effects of sex hormones on brain organization and general physiology. These effects, in turn, are reflected in variables such as behavior, fertility, and the incidence of specific medical conditions. The book provides evidence linking the 2D:4D ratio to variables as diverse as physical aggression, sperm counts, sports performance, myocardial infarct, autism, and sexual orientation. Some of the reported associations are weak

(digit ratio and mental rotation performance) and need confirmation, while others (digit ratio and running speed) are strong.

Manning's book pioneers a rich new field of research with applied and theoretical dimensions. In addition to the ground covered in the book, population differences in ratios are of potential interest: the ratios could be useful in detecting population-level effects of substances in the environment that mimic estrogens.

MICHAEL PETERS, *Psychology, University of Guelph, Guelph, Ontario, Canada*



### BIOMEDICAL SCIENCES

#### THE TERRIBLE GIFT: THE BRAVE NEW WORLD OF GENETIC MEDICINE.

By Rick J Carlson and Gary Stimeling. New York: PublicAffairs. \$26.00. xiii + 305 p; index. ISBN: 1-891620-65-7. 2002.

In this work of popular polemic, the authors paint a gloomy picture of what the consequences may be for our health care system and for us as a species when the scientific breakthroughs associated with modern genetics are coupled with an increasingly commercialized biotechnology industry. Although they foresee how advances in genetics could produce great benefits for humanity, they worry that the for-profit environment that is funding much of this research may put us on an ethical slippery slope. For example, in their discussion of cloning they warn that "[t]he inexorable power of money will push back the ethical boundaries that today constrain the technology of cloning, bringing medical benefits but also unsettling social phenomena" (p 175).

The ethical qualms voiced by Carlson and Stimeling are being widely discussed by policymakers, ethicists, and the public at large; for this reason, their book is certainly timely. But they sometimes paint with too broad a brush and their arguments lack historical sophistication. For example, in discussing the changes associated with the coming of managed care, the authors observe that "the conversion of Western medicine into a for-profit industry has forced it to work against itself. It now has two primary aims: to make money for its owners and to reduce the number and needs of its customers" (p 81). Although this is a correct diagnosis of some of the problems with the current health care industry, the implication is that, in earlier times, the provision of health care services was not an

"industry" and financial incentives were not present. This clearly was not the case; medicine has always been a way to earn a living, which means that physicians have always responded to financial incentives. In discussing some of the problems with genetics, the authors often invoke a doomsday scenario based on a hypothesized "what if" argument. For example, the authors ask: "What if outrage over drunk driving combines with religious fundamentalism to bring back prohibition of alcohol? The scary truth is that this time it could be enforced: A vaccine spliced into the wheat in your pasta could make you throw up if you so much as have a glass of wine with your date" (p 218). Clearly, this scenario *might* be possible, but that is not the same thing as saying that it is very likely.

At the end of the book, the authors put forward a series of recommendations that appear eminently reasonable—such as rescinding the patentability of genes and living organisms and making access to therapeutic medicine "*a right, not a privilege*" (p 276). Their earlier rhetorical excesses may undermine their overall credibility, which may cause readers not to take their warnings as seriously as they might. This is unfortunate; the potential (and the problems) of the new genetics is far too important.

J ROSSER MATTHEWS, *Washington DC*

#### BECOMING IMMORTAL: COMBINING CLONING AND STEM-CELL THERAPY.

By Stanley Shostak. Albany (New York): State University of New York Press. \$73.50 (hardcover); \$24.95 (paper). xii + 309 p; ill.; index. ISBN: 0-7914-5401-0 (hc); 0-7914-5402-9 (pb). 2002.

I must admit that I read this book backwards. This approach appealed to me because of the very provocative and somewhat bizarre statements I found in the epilogue. Since the premise of the book is that immortality in humans can be attained biologically, Shostak uses his epilogue to examine some ethical, social, and moral aspects of such a development. Although many of his statements may, at first read, seem bizarre, most of them are really about issues that have been debated or raised in the context of genomics, genetic testing, new reproductive technologies, gene therapy, stem cell research, and cloning. For example, issues about the commercial aspects of immortality are couched in the same terms as in vitro fertilization (IVF) commercial issues. Ethical issues—concerning the obvious problems that making human immortals would pose—are discussed in the context of the two most widely cited current objections—use of humans in experimentation and objectification of humans (using humans as a means to an end). By examining genomics, repro-

ductive technology, stem cell research, and other modern technological advances in the context of the spectacular premise of human immortality, Shostak creates a provocative summary of the ethical, social, and policy issues that we already face. It is this spectacular context of immortality that will certainly keep the attention of readers and provide a lesson on ethics and policy.

As in his epilogue, Shostak uses the first five chapters of the book to teach us what we should know. In the first and fifth chapters (*Quo Vadis?* and *Making Immortals: From Blastocyst to Generator*) he discusses the current state of cloning and stem cell research. In the second chapter (*Why Immortality Cannot Evolve*) he teaches us about evolution in general, and evolving longevity and senescence in particular. Chapter 3 (*Why Immortality Cannot Develop*) is a detailed, basic lesson in developmental biology. The next chapter (*Life's Fundamental Feature: Devolution*) is a discussion of the constraints of development and a description of life on our planet from the perspective of a developmental biologist.

Although Shostak is teaching evolution, development, constraints, and modern stem cell technology, he is also boldly true to his task with respect to immortality. Through these five chapters he concludes that because human immortality cannot evolve or develop, it will become reality through cloning and stem cell technology. Specifically, human immortals will be perpetual adolescents with stem cell generators engineered into their bodies.

I have to admit that while reading this book I kept asking myself, does Shostak really think immortality will be engineered in this way? I concluded that it does not really matter. Nor does it matter if readers feel the scenarios described in developing immortality are plausible or not. Acceptance of the reality of engineering immortality is not a prerequisite to enjoy, admire, and learn from this interesting treatment of a broad range of things biological and ethical.

ROB DESALLE, *Molecular Laboratories, American Museum of Natural History, New York, New York*

FORMATION OF THE HEART AND ITS REGULATION. *Cardiovascular Molecular Morphogenesis.*

*Edited by Robert J Tomanek and Raymond B Runyan; Foreword by Edward B Clark. Boston (Massachusetts): Birkhäuser. DM 320. xv + 276 p + 8 pl; ill.; index. ISBN: 0-8176-4216-1. 2001.*

Despite the fact that there have been a few textbooks related to cardiogenesis published recently, the topics that recount heart development are critically in demand. The multifaceted and complex

process of cardiac morphogenesis is diversified, and yet, still a challenge to developmental biologists. This book provides a comprehensive review of the crux of heart development. Each chapter is well written, and the authors are unique in their respective expertise, thus providing significant insight and contributions. The chapters detail the organization and process of the gene expression and gene product associated in the myofibrillogenesis, epicardium, cardiac looping, neural crest, conduction system, regulation of the extracellular matrix, growth factors, homocysteine, and mechanical factors. This is an important reference in understanding the mechanism of the underlying events in heart formation.

NORMAN HU, *Pediatrics, University of Utah, Salt Lake City, Utah*

MYOFIBRILLOGENESIS. *Cardiovascular Molecular Morphogenesis.*

*Edited by Dipak K Dube; Foreword by Roger R Markwald. Boston (Massachusetts): Birkhäuser. DM 390. xvi + 270 p + 9 pl; ill.; index. ISBN: 0-8176-4226-9. 2002.*

This book focuses on cardiac fibrillogenesis and represents a collection of contributions that are separated into five parts that discuss assembly; maintenance and manipulation; regulation of expression; development; and cardiomyopathy. The articles vary in length as well as in quantity and quality. Overall, most of the chapters are very well written and referenced, but some authors tend to cite their own work rather than provide an overview of the field.

In the first section, on assembly of myofibrillar proteins in striated muscle, the articles focus primarily on cardiac myofibrillogenesis, with only the chapter by Shimada et al. adding data on skeletal muscle. The contribution by Ehler and Perriard is especially well done, providing readers with a good introduction to the problem, methodological approach, and significance of the observations. The next part, on maintenance and manipulation, has only two chapters, which is perhaps a bit low of the importance of this aspect of myofibrillogenesis in areas such as hypertrophy and dilatation of the heart. Part III, on regulation of myofibrillar proteins, contains four well-written articles. These range from molecular control of protein expression to signal transduction. The next part, on development and organization, contains only two contributions and these papers, although well written, do not particularly flow with the overall topic. In the final part, topics of disease are dealt with in a clear and forthright manner.

Overall, this collection of papers represents a valuable synthesis and summary of the state of the

field of myofibrillogenesis. This volume will be valuable to anyone working in various aspects of this area.

THOMAS K BORG, *Developmental Biology & Anatomy, School of Medicine, University of South Carolina, Columbia, South Carolina*

DRUG DELIVERY: ENGINEERING PRINCIPLES FOR DRUG THERAPY. *Topics in Chemical Engineering.*

By W Mark Saltzman. Oxford and New York: Oxford University Press. \$85.00. xi + 372 p; ill.; index. ISBN: 0-19-508589-2. 2001.

This book will be an excellent addition to the library of any scientist interested in drug delivery systems. Unlike others in the area, this volume is focused on quantitative understanding of the principles that govern rates of drug transport, reaction, and disappearance in physiological conditions. The author succeeds in providing a working foundation for all of these principles in a very clear and lucid way, such that even a scientist who may lack a background in mathematics could benefit from this unique discussion of engineering concepts. His presentation is further emphasized by specific examples that will make the physical concepts clear and vivid to readers. The book is organized in a friendly way, and includes an appendix that covers basic concepts in polymers for all readers who are not familiar with specific polymers and their chemical structure. It provides an introduction to the field and then describes the fundamentals of diffusion of drugs within biological systems and across biological membranes, and also addresses transport by fluid motions. Most of these topics are rarely discussed in other books. He describes pharmacokinetics and presents issues related to scaling up of animal models that are critical to the field. The last section deals with drug modification, types of controlled drug delivery systems, and concludes with three case studies: systemic therapy, local drug delivery, and topical devices for controlled release.

In summary, what makes this book outstanding is the ability of the author to discuss mathematical equations grounded in real examples. It could be a source of important knowledge for scientists entering the field of drug delivery. Thus, although the book may be primarily intended for bioengineers, mathematicians, and chemists, it is written in such a way that even biologists and medical students could benefit from it. The book is highly recommended as a textbook in the field of drug delivery, and it is the only one written with this target in mind.

EDITH MATHIOWITZ, *Molecular Pharmacology & Biotechnology, Brown University, Providence, Rhode Island*

MATHEMATICAL MODELLING IN MEDICINE. *Based on a conference held in Roskilde, Denmark, 1997. Studies in Health Technology and Informatics, Volume 71.*

Edited by J T Ottesen and M Danielsen. Amsterdam (The Netherlands): IOS Press. \$80.00. viii + 235 p; ill.; index and author index. ISBN: 1-58603-026-4. 2000.

The title of this compact book implies a global approach to mathematical modeling in medicine. But the major focus of the mathematical modeling presented is in its application to the cardiovascular system. The volume is separated into four parts. The first part focuses on the heart's function as a pump, including the isovolumetric contraction and ejection phases, and blood flow in the left side of the heart. Part II concerns the interaction of the pumping heart with the systemic circulation, using mostly the impedance approach of lumped parameters and Windkessel characterization of the compliance and resistance of the arterial tree. These two parts present a traditional approach of analytical modeling based on partial differential equations and electrical analog circuits, rather than the more contemporary approach of numerical modeling, using finite elements or a similar methodology. Although the insights provided by these somewhat outdated approaches are of limited value (two- as compared to three-dimensional models, numerous simplifying assumptions), correlations of global parameters to some experimental results are presented, offering an alternative approach of computationally low-cost modeling to cardiovascular dynamics. The main utility could be as an educational tool for undergraduate and graduate students interested in understanding basic mathematical aspects of modeling in the cardiovascular system, and for researchers in the field who are interested in analytical rather than numerical approaches for modeling.

Part III discusses baroreceptor control models of the peripheral resistance, based on linear and nonlinear compartmental analysis, incorporating transient interaction between the cardiovascular and the nervous systems. These compartmental models include studying the effects of physiologic parameters such as blood pressure and respiration, and are unique in drawing attention to a modeling approach that is often overlooked in cardiovascular modeling. The fourth and concluding part of the book, Applications for Simulators, illustrates two examples of the applications of models, one an anesthesia simulator and the other a cardiovascular disease decision-making simulator. Those are only remotely related to the models presented in the previous three parts, and appear more as an afterthought rather than support for the applicability

of the modeling approaches given before in the clinical arena. It only serves to show that modeling of the cardiovascular system can be applied to the clinical arena, albeit casting potential doubt on the clinical applicability of the modeling approaches presented earlier in the book.

DANNY BLUESTEIN, *Biomedical Engineering, State University of New York, Stony Brook, New York*

#### CYTOKINES AND AUTOIMMUNE DISEASES.

*Edited by Vijay K Kuchroo, Nora Sarvetnick, David A Hasler, and Lindsay B Nicholson. Totowa (New Jersey): Humana Press. \$135.00. xi + 422 p; ill.; index. ISBN: 0-89603-856-4. 2002.*

This multiauthored book is comprised of 16 chapters that describes basic aspects of cytokine biology and immunoregulation (seven chapters) and then attempt to apply this knowledge to individual diseases (nine chapters). References are included (just) into 2000.

The underlying theme of the first few chapters is the problem of what controls the development of T cells into Th1 (pathogenic?) or alternative (protective?) phenotypes. Several mechanisms, not necessarily conflicting, are proposed—control of STAT-4 and STAT-6 through IL-2, IL-4 or IFN- $\gamma$ , through chromatin remodeling (a fine synthesis by Shannon and Holloway) or through second signals (CTLA-4 and their ilk). There are outstanding articles on the role of CD1d-restricted NK T cells (Exley and Wilson), the effect on Th differentiation of signaling by variant class II ligands (Itoh and Germain), and T-cell death and autoimmunity (Van Parijs and Abbas).

The information in the second part might have been less easy to find. Chapters deal with autoimmune uveitis, experimental allergic encephalomyelitis, multiple sclerosis, type 1 diabetes, rheumatoid arthritis, systemic lupus erythematosus, and myasthenia gravis. Most of these chapters describe their subject competently (although I searched in vain for information on cytokines in lupus). I was particularly impressed by Wahren-Herlenius et al.'s article on rheumatoid arthritis and its balanced account of the various murine models. My own interest, the class I associated autoimmune diseases, is almost completely neglected.

When computers can easily track down obscure references and reviews, does an expensive, special publication add anything useful to the literature? It has to justify itself by synthesis and explanation. So was it worth writing? Many of the chapters are excellent; but I am not sure they justify the cost of buying the book. A more comprehensive index would have been useful. Neverthe-

less, I learned much and frequently enjoyed reading it—a book to borrow and dip into.

J R ARCHER, *Immunology, Bart's & The London School of Medicine & Dentistry, London, United Kingdom*

#### BIG SHOT: PASSION, POLITICS, AND THE STRUGGLE FOR AN AIDS VACCINE.

*By Patricia Thomas. New York: Public Affairs. \$27.50. xi + 515 p; index. ISBN: 1-891620-88-6. 2001.*

#### SEXUAL CHEMISTRY: A HISTORY OF THE CONTRACEPTIVE PILL.

*By Lara V Marks. New Haven (Connecticut): Yale University Press. \$29.95. xi + 372 p + 17 pl; ill.; index. ISBN: 0-300-08943-0. 2001.*

This book examines the checkered history of one of the 20th century's most controversial technological innovations: the contraceptive pill. At its inception, both feminists and scientists celebrated the pill as a scientific triumph that would put an end to western women's reproductive dilemmas, as well as eliminate the threat of overpopulation in the Third World. More recently, some critics of modern biomedicine have used the pill as the exemplar of western big science and cultural imperialism run amok. Some feminist scholars allege that rather than providing women with more control over their bodies, the pill simply expanded the authority of the male-dominated medical profession. Civil rights leaders and representatives from nonwestern countries decry the pill as a tool of western imperialism and genocide designed to reduce or eliminate entirely the nonwhite peoples of the planet.

Marks's book attempts to provide some balance to both historical and contemporary analyses of the pill by teasing out the complex historical circumstances under which the pill was developed and disseminated. Skillfully combining scientific and social history, the book captures the point of view of a variety of historical agents, including scientists, physicians, religious leaders and, most importantly, women themselves. One of the most insightful sections of the volume is the chapter, *Human Guinea Pigs?*, in which Marks restores historical agency to the women who participated in the clinical trials of the pill. According to Marks, "the original developers of the pill have been unfairly accused of experimenting on women as though they were guinea pigs," since the trials "could not have worked without the full cooperation of women" (p 114). Marks displays a similar degree of historical sensitivity in discussing the political controversies associated with the pill. In



the chapter, Panacea or Poisoned Chalice?, Marks agrees that it has not turned out to be the miracle drug envisioned by Margaret Sanger and other feminist champions of the pill, since health hazards, cost, and lack of access to adequate medical care have closed off this contraceptive option to a significant number of women. Yet she avoids the polemics of some feminist histories of the pill, which allege that insensitive male scientists and physicians forced a dangerous, poorly tested drug upon unwitting women.

In summary, *Sexual Chemistry* is the most balanced and complete history of the contraceptive pill currently in print. It is the only book to take the story of the pill outside of North America and place it in a fully international context. The book is very well written and highly readable. It would be very suitable for graduate and undergraduate courses in the history of biology, history of medicine, and women's studies.

HEATHER MUNRO PRESCOTT, *History, Central Connecticut State University, New Britain, Connecticut*

COMPARATIVE CELLULAR AND MOLECULAR BIOLOGY OF OVARY IN MAMMALS: FUNDAMENTAL AND APPLIED ASPECTS.

By Sardul S Guraya. *Enfield (New Hampshire): Science Publishers*. \$137.50. xxi + 327 p; ill.; index. ISBN: 1-57808-127-0. 2000.

Many recent developments in reproductive medicine and much current research at the frontiers of reproductive health are founded on an ability to manipulate ovarian function. Eggs in vivo (ovulation induction) and in vitro (IVF)—produced in supranormal numbers—are the stuff of fertility treatment in our own species and the enhanced productivity of other mammalian species upon which our agrifood economy depends. This compact volume brings together one eminent reproductive physiologist's vast knowledge on the structure and function of the mammalian ovary in a way that will enlighten anyone with an academic interest in this complex and fundamentally important subject.

The chapters deal sequentially with follicle formation and maturation, ovulation, luteinization, follicular atresia and—uncomfortably—ovarian stromal interstitial cellular interaction. Emphasis is on comparative aspects, including human and nonhuman primates, and few laboratory or domestic animal species are off limits. Although generally of a high academic standard, the treatise is flawed by its presentation. The disproportionately long (135 page) chapter on follicular maturation is dense and impenetrable to all but the truly dedicated, being deficient in subheadings and replete

with paragraphs up to two pages long. Exclusive use of black-and-white figures and photomicrographs, some of which are unclear with muddled legends, do not aid the cause.

Guraya's most important contribution here is his comprehensive survey and compilation of the "old" ovarian endocrinology and morphology that must now inform "new," postgenomic research strategy in reproductive medicine. A generation of molecular biologists and medical practitioners have grown up with the tools of gene cloning and knockouts at their fingertips, but with diminished awareness of the depth and breadth of the physiological and microanatomical complexities that underpin the functioning of the ovaries. This book provides a glimpse into these complexities, for both students and professors.

STEPHEN G HILLIER, *Reproductive & Developmental Sciences, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom*

ANNUAL REVIEW OF NUTRITION. *Volume 22: 2002.*

*Edited by Donald B McCormick, Dennis M Bier, and Robert J Cousins. Palo Alto (California): Annual Reviews*. \$67.00. xii + 584 p + 5 pl; ill.; subject index and cumulative indexes (contributing authors and chapter titles, Volumes 18–22). ISBN: 0-8243-2822-1. 2002.

THE MOLECULAR BASIS OF HUMAN CANCER.

*Edited by William B Coleman and Gregory J Tsongalis. Totowa (New Jersey): Humana Press*. \$145.00. xii + 588 p; ill.; index. ISBN: 0-89603-634-0. 2002.

This book consists of 24 chapters that are separated into seven parts. Following an introductory chapter that presents current cancer statistics, four chapters are concerned with basic aspects of molecular genetics and molecular biology oriented toward neoplasia. Although there is significant overlap between Chapters 3 and 4 in the discussion of genes involved in the neoplastic transformation, these chapters afford readers an excellent basis for the remainder of the volume. Part IV presents microsatellite and chromosomal instability in human neoplasia, and Chapter 8, on hereditary cancer, deals largely with breast and colon cancer as models in the human. The chapters in Part V discuss chemical, physical, and viral carcinogenesis, initially laying some basic foundations in relating these to the human condition. The chapter on physical carcinogenesis deals almost entirely with asbestos and related chemicals, while radiation carcinogenesis is not discussed, although ultraviolet carcinogenesis is considered in the chapter on cancer-causing agents

of the skin. Part VI consists of eight chapters, each describing a different, specific type of neoplasm, which emphasizes molecular changes in the development of the neoplasm itself. Although all of these presentations are excellent, the discussion of primary hepatocellular neoplasms is outstanding. The final part deals with genetic counseling, diagnosis of inherited cancer predisposition, cancer drug discovery, and gene therapy of human cancer.

This is an excellent volume both for investigators in the field of oncology as well as practicing oncologists. Although there are areas of overlap among

the chapters, this in no way detracts from the presentations and can be an aid to students or those unfamiliar with some of the technologies discussed. The absence of some discussion of ionizing radiation as a cause of human cancer and the molecular characteristics of neoplasms induced by this physical carcinogen does not significantly take away from the excellence of the presentations and the areas covered.

HENRY C PITOT, *McArdle Laboratory for Cancer Research, School of Medicine, University of Wisconsin, Madison, Wisconsin*

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Birkhäuser Verlag, P O Box 133, CH-4010 Basel, Switzerland; +41 61 2050707; [www.birkhauser.ch](http://www.birkhauser.ch).

Blackwell Science, Commerce Place, 350 Main Street, Malden MA 02148-5018; 781-388-8250; 800-759-6102; [www.blacksci.co.uk](http://www.blacksci.co.uk).

CABI Publishing, 10 East 40th Street, Suite 3203, New York NY 10016; 212-481-7018; 800-528-4841; [www.cabi.org](http://www.cabi.org).

Cambridge University Press, 40 West 20th Street, New York NY 10011; 212-924-3900; 800-221-4512; [www.cup.org](http://www.cup.org).

Columbia University Press, 562 West 113th Street, New York NY 10025; 212-666-1000; 800-944-8648; [www.columbia.edu/cu/cup](http://www.columbia.edu/cu/cup).

Comstock Publishing Associates (Cornell University Press), 512 East State Street, P O Box 250, Ithaca NY 14851; 607-277-2338; 800-666-2211; [www.cornellpress.cornell.edu](http://www.cornellpress.cornell.edu).

CRC Press, 2000 Corporate Boulevard NW, Boca Raton FL 33431; 561-994-0555; 800-272-7737; [www.crcpress.com](http://www.crcpress.com).

CSIRO Publishing, 150 Oxford Street, P O Box 1139, Collingwood, 3066 Victoria, Australia; +61 3 96627666; [www.publish.csiro.au](http://www.publish.csiro.au).

Firefly Books, 3680 Victoria Park Avenue, Toronto, Ontario M2H 3K1, Canada; 416-499-8412; 800-387-6192; [www.fireflybooks.com](http://www.fireflybooks.com).

Free Press (Simon & Schuster), 1230 Avenue of the Americas, New York NY 10020; 212-632-4991; 800-323-7445; [www.simonsays.com/thefreepress](http://www.simonsays.com/thefreepress).

Harvard University Press, 79 Garden Street, Cambridge MA 02138; 617-495-2600; 800-448-2242; [www.hup.harvard.edu](http://www.hup.harvard.edu).

Humana Press, 999 Riverview Drive, Suite 208, Totowa NJ 07512; 973-256-1699; [www.humanapress.com](http://www.humanapress.com).

Hyperion Books, 77 West 66th Street, 11th Floor, New York NY 10023; 212-456-0100; 800-934-5252; [www.hyperionbooks.com](http://www.hyperionbooks.com).

Institute for the Study of Man, 1133 13th Street NW, Suite C2, Washington DC 20005; 202-371-2700; [www.jies.org](http://www.jies.org).

IOS Press, Nieuwe Hemweg 6B, 1013 BG Amsterdam, The Netherlands; +31 20 688 3355; [www.iospress.nl](http://www.iospress.nl).

Johns Hopkins University Press, 2715 North Charles Street, Baltimore MD 21218-4363; 410-516-6900; 800-537-5487; [www.jhuupress.jhu.edu](http://www.jhuupress.jhu.edu).

Jones and Barlett, 40 Tall Pine Drive, Sudbury MA 01776; 978-443-5000; 800-832-0034; [www.jbpub.com](http://www.jbpub.com).

Kluwer Academic Publishers, P O Box 17, 3300 AA Dordrecht, The Netherlands; +31 78 6392392; 781-871-6600; [www.wkap.nl](http://www.wkap.nl).

Krieger Publishing, P O Box 9542, Melbourne FL 32902-9542; 407-724-9542; [www.web4u.com/krieger-publishing](http://www.web4u.com/krieger-publishing).

Lawrence Erlbaum Associates, 10 Industrial Avenue, Mahwah NJ 07430-2262; 201-236-9500; 800-926-6579; [www.erlbaum.com](http://www.erlbaum.com).

- Marcel Dekker, 270 Madison Avenue, New York NY 10016-0602; 212-696-9000; 800-228-1160; [www.dekker.com](http://www.dekker.com).
- McGraw-Hill, 1221 Avenue of the Americas, New York NY 10020; 212-512-2000; 800-262-4729; [www.mcgraw-hill.com](http://www.mcgraw-hill.com).
- MIT Press, Five Cambridge Center, Cambridge MA 02142-1493; 617-625-8569; 800-356-0343; [www.mitpress.mit.edu](http://www.mitpress.mit.edu).
- Natural History Museum, Cromwell Road, London SW7 5BR, United Kingdom; +44 20 7942 5000; +44 1752 202 301; [www.nhm.ac.uk](http://www.nhm.ac.uk).
- New York Academy of Sciences, 2 East 63rd Street, New York NY 10021; 212-838-0320; 800-843-6927; [www.nyas.org](http://www.nyas.org).
- Oregon Sea Grant, 322 Kerr Administration Building, Oregon State University, Corvallis OR 97331-2131; 541-737-2716; <http://seagrant.orst.edu>.
- Oxford University Press, 198 Madison Avenue, New York NY 10016; 212-726-6000; 800-451-7556; [www.oup-usa.org](http://www.oup-usa.org).
- Perseus Publishing, 1 Jacob Way, Reading MA 01867; 781-944-3700; 800-449-3356; [www.perseusbooks.com](http://www.perseusbooks.com).
- Princeton University Press, 41 William Street, Princeton NJ 08540-5237; 609-883-1759; 800-777-4726; [www.pup.princeton.edu](http://www.pup.princeton.edu).
- Public Affairs, 250 West 57th Street, New York NY 10107; 212-397-6666; [www.publicaffairsbooks.com](http://www.publicaffairsbooks.com).
- Russell Sage Foundation, 112 East 64th Street, New York NY 10021; 212-750-6000; 800-524-6401; [www.russellsage.org](http://www.russellsage.org).
- Rutgers University Press, 100 Joyce Kilmer Avenue, Piscataway NJ 08854-8099; 732-445-7762; 800-446-9323; [www.rutgerspress.rutgers.edu](http://www.rutgerspress.rutgers.edu).
- Science Publishers, P O Box 699, May Street, Enfield NH 03748; 603-632-7377; [www.scipub.net](http://www.scipub.net).
- Smithsonian Institution Press, 750 Ninth Street NW, Suite 4300, Washington DC 20560-0950; 202-275-2300; 800-782-4612; [www.si.edu/organiza/offices/sipress](http://www.si.edu/organiza/offices/sipress).
- Springer, 175 Fifth Avenue, New York NY 10010; 212-460-1500; 800-777-4643; [www.springer-ny.com](http://www.springer-ny.com).
- State University of New York Press, State University Plaza, Albany NY 12246; 518-472-5000; 800-666-2211; [www.sunypress.edu](http://www.sunypress.edu).
- 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).
- Transaction Publishers, 390 Campus Drive, Somerset NJ 07830; 732-748-0085; 888-999-6778; [www.transactionpub.com](http://www.transactionpub.com).
- 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 Texas Press, P O Box 7819, Austin TX 78713-7819; 512-471-7233; 800-252-3206; [www.utexas.edu/utpress](http://www.utexas.edu/utpress).
- University of Wisconsin Press, 2537 Daniels Street, Madison WI 53718-6772; 608-224-3900; 800-621-2736; [www.wisc.edu/wisconsinpress](http://www.wisc.edu/wisconsinpress).
- 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 Mississippi, 3825 Ridgewood Road, Jackson MS 39211-6492; 601-432-6205; 800-737-7788; [www.upress.state.ms.us](http://www.upress.state.ms.us).
- 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).
- Westview Press, 5500 Central Avenue, Boulder CO 80301-2877; 303-444-3541; 800-386-5656; [www.hcademic.com](http://www.hcademic.com).
- Wiley, 605 Third Avenue, New York NY 10158-0012; 212-850-6000; 800-225-5945; [www.wiley.com](http://www.wiley.com).
- Yale University Press, 302 Temple Street, New Haven CT 06511; 203-432-0960; 800-987-7323; [www.yale.edu/yup](http://www.yale.edu/yup).