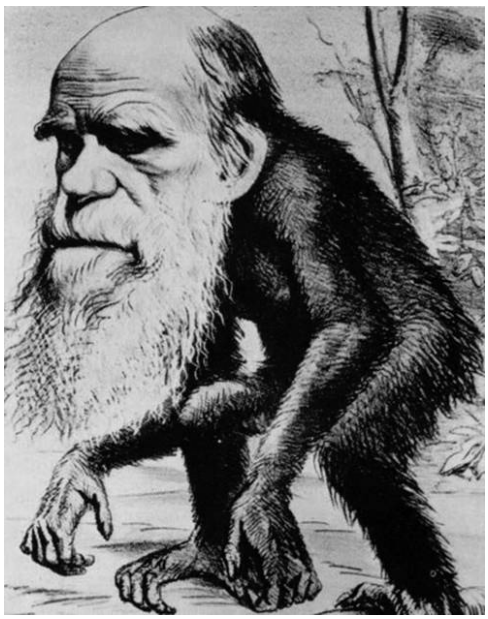
REVIEWS OF NEW BOOKS ON EVOLUTION

This issue of The Quarterly Review of Biology *presents a unique collection of essays on the relationships between science and philosophy, focusing in particular on evolutionary biology and related disciplines.*

Therefore, the editors thought it appropriate to highlight some book reviews, collected below, that deal not only with evolutionary biology in general, but often with conceptual or philosophical issues surrounding evolutionary research.



EVOLUTION: A *SCIENTIFIC AMERICAN* READER. *Scientific American Readers (SCIAMR).*

Edited by Scientific American. *Chicago (Illinois): University of Chicago Press.* $65.00 (hardcover); $22.00 (paper). vii + 355 p; ill.; no index. ISBN: 0-226-74268-7 (hc); 0-226-74269-5 (pb). 2006.

Some of us grew up reading *Scientific American* by flashlight under the covers. A few of my college courses included required reading from sets of reprints or a volume of articles from the venerable magazine. The style of the chapters in this collection will be familiar. They are well written, clever, authoritative, and easily accessible to the scientifically literate. However, the title of this book may be somewhat misleading. *Evolution* generally implies biological evolution. This volume tries to cover the evolution of too many things. Consequently, it lacks focus and contains major voids among its contents. It comprises four sections: The Evolution of the Universe (eight chapters); Cellular Evolution (seven chapters); Dinosaurs and Other Monsters

The Quarterly Review of Biology, March 2008, Vol. 83, No. 1

(seven chapters); and Human Evolution (11 chapters). Although the first two sections connect fairly seamlessly, taking us from the origin of the universe to eukaryote cells, the third section is a grab bag on the evolution of terrestrial vertebrates, omitting such evolutionary marvels as the trilobites, ammonites, fishes, insects, and several other phyla of invertebrates, not to mention plants. Many chapters on human evolution are fascinating, but this is a lot of space for a single small family of mammals. Moreover, the triumphs of the evolutionary synthesis are nowhere to be found.

The original publication dates of the constituent chapters range from 1993 to 2005. Each chapter concludes with a short list of Further Reading. The artwork has suffered in the transition from magazine to book. For example, one whale skeleton falls in a crack between pages, and elsewhere a caption refers to a *Triceratops* pelvis in an inset that apparently ended up on the cutting room floor. More generally, black-and-white reproductions of illustrations that most likely started out in living color are a disappointment.

So, who is this book good for? If you have broad interests that are described by the four section titles or wish to incorporate some detail from the narrow scope of an individual chapter to illustrate a lecture, this may be the volume for you.

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

EVOLUTION AND THE LEVELS OF SELECTION.

By Samir Okasha. Oxford and New York: Oxford University Press. $45.00. xi + 263 p; ill.; index. ISBN: 0-19-926797-9. 2006.

The question of the level at which Darwin's mechanism of natural selection functions is one that has engaged biologists since the publication of *On the Origin of Species*. Indeed, Darwin addressed the evolution of the social insects and the problem of altruism in Chapters VI and VII of the first edition. The levels of selection question has also motivated much of the philosophy of biology for the last quarter century. One might be tempted to think that there really cannot be much more to be said on this question; philosopher of biology Samir Okasha's excellent new book demonstrates that the dialogue continues and that it is becoming more fruitful, and perhaps even more important, as biological theory enters the 21st century.

The current volume provides an exceptionally lucid and analytically rigorous review of the main conceptual challenges facing biologists and philosophers who have engaged in this work. The first three chapters focus on formal treatments of the levels of selection question. Okasha carefully walks readers through the development of the varied concepts and methods created to approach this complex problem. His treatment of the varied applications of the Price equation and his careful presentation of the distinction between the two types of multilevel selection theory (MLS1 and MLS2) following Damuth and Heisler's 1988 paper (*Biology and Philosophy* 3(4):407–430) are particularly useful for any interested biologist or philosopher. Having established the conceptual framework, Okasha provides a comparative analysis of a variety of approaches that demonstrates the effectiveness of each under particular circumstances. The second half of the book presents some specific examples (i.e., genic selection, group selection, and species selection) of the kinds of collectives selection can operate on.

In the introduction, the author gives two reasons for writing this volume. First was to help bridge the gap between the biological and philosophical literatures. I am not so sure how well he succeeds here. The text contains an abundance of biological theory, but not much biology. It would have been more compelling to have included a bit more of the empirical work that generated some of the theoretical discussions that are so carefully analyzed. Second, he claims recent developments in evolutionary biology have reoriented the traditional levels of selection debate, but not the philosophical discussion. Here I think he is exactly right. His final chapter on the connection of the levels of selection question to the recent work on major transitions in evolution is very exciting. The suggestion that moving from a synchronic approach to the levels question (taking the existing higher levels as granted) to a diachronic approach (providing an evolutionary account of the existence of the higher levels) has, indeed, transformed the question and presents an opportunity for significant progress.

MARK E BORRELLO, *Ecology, Evolution & Behavior, University of Minnesota, St. Paul, Minnesota*

BIOLOGICAL EMERGENCES: EVOLUTION BY NATURAL EXPERIMENT. *The Vienna Series in Theoretical Biology.*

By Robert G B Reid. A Bradford Book. Cambridge (Massachusetts): MIT Press. $38.00. xvii + 517 p; ill.; index. ISBN: 0-262-18257-2. 2007.

From its beginnings, the theory of evolution has been dogged by the question of how complex life (and the even more complex manifestations of life such as animals and plants) arose. Evolutionary orthodoxy has tended to emphasize selection—natural, sexual, and processes of sorting among cohesive groups—over other mechanisms of evolution, but advances on many scientific fronts from genetics and development to paleontology and ecology have led many biologists, including me, to

consider selection as an incomplete explanation for the evolutionary unfolding of life. For example, it has become clear that living things not only respond to the environment through direct effects as well as through genetically based adaptation, but that they also modify their surroundings. Interactions among parts at every level of life's hierarchical organization produce entities with properties—emergent properties—that the interacting parties do not themselves possess. Once these more complex entities have emerged, selection operates in the context of competition for locally scarce resources to favor some entities over others.

In *Biological Emergences*, Robert Reid not only embraces the view that the "causes of emergence are the causes of evolution" (p 322), but argues that the goal of "emergentism" is to understand progressive evolution, by which he means an increase in complexity and "improved physiological and behavioral attributes" (p 406). In the author's view, "[p]henotype sorting, differential survival and reproduction, and 'agents' such as competition, predation, and sexual selection are . . . *consequences* of emergent evolution" (p 368). For Reid, selection leads to adaptive rigidity and more often prevents evolution than providing a mechanism of change. Only when selection is reduced (for example, on islands and in many physiologically marginal environments) can evolutionary experiments and explorations that lead to new emergent forms take place.

I am deeply sympathetic to the importance of emergence, feedbacks, and the direct action of physical forces and chemical gradients on organic structure. The author does a good job of explaining these phenomena and setting them in the context of the history of biology. But, alas, Reid is not content merely to inform his readers of the merits of these ideas. In this relentlessly repetitive, polemical book, the author is bent on slaying the dragons of selection. His distaste for population thinking leads him to purge selection from all significant evolutionary discourse.

It is difficult to diagnose the causes of Reid's dislike for selection, but part of the explanation may lie in some highly questionable propositions. For example, "[a]ny increase in order improves organismal integrity, and so will persist if its energetic requirements are met" (p 69). This statement, besides containing hints of selection, implies that any emergent entity is automatically more integrated than its predecessors; in other words, emergent innovations have an immediate general advantage. The history of life, however, is full of failed innovations—ephemeral, aborted "experiments" that arose in the wrong place at the wrong time. Initially, crude new phenotypes improve in function through regulation and selection, because the entities bearing them are exposed to intense market forces in permissive circumstances. Phenotypes do not succeed by virtue of their innate properties alone; they succeed or fail according to how well they function relative to the phenotypes of other life-forms.

Reid claims that "adaptability, as an emergent property of life, was not produced by natural selection" (pp 13–14). But, adaptability, or an ability to sustain life under a wide variety of conditions, is not simply the happy consequence of an almost instantaneous emergence; it is honed by genetic regulation and selective exploration as internal structures grow and interact. Everyday challenges such as competition and failed predation select some wholes over others, and the phenotypes that survive such events are (in some cases) predisposed to resist exigencies so rare and so intense that lineages can survive the great catastrophes chronicled by the fossil record. Some adaptations, of course, constrain the pathways of subsequent evolutionary change and determine (or place limits on) the range of habitats that organisms occupy, as Reid observes; but this fact does not imply that selection is unimportant or superfluous. Furthermore, adaptability and complexity have by no means increased consistently when evolutionary change occurs. Many lineages have undergone simplification, likely as a consequence of being restricted by competitive superiors with greater power to environments where competitors and predators are less effective.

The root of the problem is the same one that afflicted the attack on adaptations by Stephen Jay Gould and Richard C Lewontin in the late 1970s and 1980s. Neither Reid nor Gould and Lewontin provided or tested criteria by which to accept or reject adaptation and selection. Thus, Reid rather cryptically defines an adaptation as "a genetically fixed and inflexible quality that is appropriate to certain conditions of the external or internal environments" (p 140). Such a weak straw man cannot substitute for far more careful treatments of selection and adaptation given by other authors.

In his preface, the author laments that his previous book on emergence failed to nudge the field of evolutionary biology in the direction of embracing emergence as the primary mechanism of change. It is sadly ironic that this fate resulted not from emergence, but from selection. Reid's obsessive attacks on selection may torpedo the current volume as well. That would be a shame, for despite its obvious flaws—flaws that could easily have been avoided—the book lays out some important and timely arguments about processes that evolutionary biologists have ignored for too long.

Geerat J Vermeij, *Geology, University of California, Davis, California*

PHYLOGENETIC TREES MADE EASY: A HOW-TO MANUAL. *Third Edition.*

By Barry G Hall. Sunderland (Massachusetts): Sinauer Associates. $39.95 (paper). xvi + 233 p; ill.; index to major program discussions and subject index. ISBN: 978-0-87893-310-5. 2008.

Researchers who want to learn how to infer phylogenetic trees from biological sequence data are often left without an obvious place to start. This self-described "phylogenetic cookbook" provides such a starting point, gently guiding novices through the necessary steps to infer a phylogeny using a number of distinct inference methods and software packages. By his own admission, the author does not provide many technical details about the methods, although he does suggest appropriate outside resources. Hall remains largely agnostic about which of the alternative inference methods should be preferred, leaning perhaps toward those that require the least amount of time.

Although the book provides a fine starting point, it would be lacking as the sole source of knowledge of the topic. For example, mention of the statistical methods of model selection typically used with the Maximum Likelihood and Bayesian tree inference methods is conspicuously missing. Proponents of the model-based inference methods will see this as a somewhat odd omission, as the step of model selection is generally considered quite important, but is not overly difficult to grasp.

The third edition sees an almost complete turnover in the phylogenetic inference software covered. Of the software appearing in the second edition, only the popular *MrBayes* (a Bayesian inference program) remains. Significant emphasis is placed on the freely available program *MEGA 4*, which is only for computers running Microsoft Windows. This is an understandable choice, as *MEGA 4* can perform all of the individual steps of phylogenetic inference, from downloading and aligning sequences to inferring and visualizing phylogenetic trees. However, this emphasis on *MEGA 4* means that in order to follow along, the majority of the text users of Macintosh and Unix-based systems will either need to get access to a computer running Windows or use one of several methods of getting access to Windows functionality on their current system. The exact method of doing this depends on their computer's architecture, and may or may not be free. Although getting access to Windows functionality on a non-Windows system is not overly difficult (and the text provides some assistance), this may present a significant barrier to some readers.

DERRICK ZWICKL, *National Evolutionary Synthesis Center, Durham, North Carolina*

DARWINIAN DETECTIVES: REVEALING THE NATURAL HISTORY OF GENES AND GENOMES.

By Norman A Johnson. Oxford and New York: Oxford University Press. $28.00. xix + 220 p; ill.; index. ISBN: 978-0-19-530675-0. 2007.

This small book is an attempt to convey the multiple uses of comparative eugenics and genetic engineering skills to an ever-increasing number of scientific and social problems. The author does succeed in doing so, but the presentation is uneven. Some chapters are at a level for intelligent general readers or undergraduates and some require that readers have a more sophisticated background. Without the coursework, readers will find the neutral theory of molecular evolution rough going.

The book is assembled almost like a collection of essays instead of a consistent theme. Johnson begins with a story from a generation ago that involved a transplanted baboon heart in a child at Loma Linda University and her death soon after as the heart was rejected. I had forgotten the physician's rationalization that size, not genetic distance on an evolutionary scale, mattered most to him because he rejected evolution as a hypothesis. The author follows this with an analysis of why intelligent design is not good science, if it is a science at all. The rest of the chapters deal with molecular evolution applied in numerous ways. He sifts the evidence at a molecular level to tease apart what of our past is due to neutral mutation, positive selection for new traits, and negative selection to maintain the integrity of a product or process. He analyzes human mitochondria and Y-chromosome evolution. Johnson considers the relation of Neanderthals to our species and our species to chimpanzees. In an interesting chapter that brings in new material and raises questions for future research, he attempts to glean what makes us human from our genome (and related organisms). The evolution of languages is also discussed in an interesting chapter, where the author tries to trace the spread of click languages and relate these to human genetic divergence. There is a penultimate chapter on domestic evolution of plants and animals as well as a final chapter on the significance of genome size across the phyla.

Either Johnson or the publisher (or both) must have limited their use of the "spell-check" capabil-

ity on their computer to only glean typographical errors because there are scattered inappropriate words and missing small words that more careful proofreading would have avoided. On page 32, Aquinas is placed in the 4th century instead of the 13th century. These are minor points that should be corrected in a future edition. This volume is a worthwhile update for anyone who wants to see where comparative genomics is taking us.

Elof Axel Carlson, *Biochemistry & Cell Biology, Stony Brook University, Stony Brook, New York*

Gene Sharing and Evolution: The Diversity of Protein Functions.

By Joram Piatigorsky. Cambridge (Massachusetts): Harvard University Press. $60.00. xvi + 320 p; ill.; index. ISBN: 0-674-02341-2. 2007.

The prevailing view among biologists is that each protein has a single primary function. In a style that is both engaging and informative, Piatigorsky explains how inaccurate this widely accepted notion may be. The term "gene sharing" describes the situation where a gene produces a polypeptide or protein that has multiple, equally legitimate functions. By using a number of remarkable examples of protein multifunctionality (such as the classic case of eye lens crystallins), the book effectively illustrates how pervasive gene sharing may be. The author describes how gene sharing can be achieved by modifications to gene expression, which allows the same protein to have a number of different functions and, thus, dynamically participate in a range of different cellular processes. Piatigorsky argues that the widespread nature of gene sharing implies a crucial evolutionary role in protein functional diversification and, as such, organismal complexity.

From an evolutionary perspective, gene sharing is also an important concept as the evolution of functional innovations through gene sharing does not necessarily require the accumulation of mutations in the actual coding sequence, nor does it require gene duplication, two processes generally thought to be prerequisites for the generation of protein functional diversity. Partly due to the widespread nature of gene sharing, the author suggests that we must be cognizant of the fact that proteins seem to have an inherent flexibility, which simultaneously encourages multifunctionality and specialization.

The book is structured in a way that both students and seasoned readers of evolutionary biology can appreciate. With take-home messages neatly summarizing the major points of every chapter and a plethora of apt examples, this volume educates, while continually putting readers in awe of the pragmatic and yet innovative way in which proteins can evolve new functions.

S Ashley Byun McKay, *Biology, Fairfield University, Fairfield, Connecticut*

Sex, Size, and Gender Roles: Evolutionary Studies of Sexual Size Dimorphism. *Based on a workshop held in Ascona, Switzerland, 21–26 August 2006.*

Edited by Daphne J Fairbairn, Wolf U Blanckenhorn, and Tamás Székely. Oxford and New York: Oxford University Press. $110.00. ix + 266 p; ill.; index. ISBN: 978-0-19-920878-4. 2007.

Since Darwin's *Decent of Man* (1874), biologists have been fascinated by the evolutionary processes that produce and maintain sexual size dimorphisms (SSD). This excellent volume is filled with the most current and stimulating research on SSD. It is separated into three sections. The first section contains six chapters that review macroevolutionary patterns of variation across major taxonomic groups (e.g., reptiles, birds, and insects). These chapters assess the role of sexual selection as a contributor to SSD and test Rensch's rule. Section II has eight chapters that explore microevolutionary processes that might be responsible for SSD (e.g., fecundity selection, genetic constraints, and differential equilibrium). In some ways, these chapters are the backbone of the book because they provide a synthesis of the proximate selection patterns that generate SSD and, thus, present an organizational framework to further explore how the wide variation in SSD arises in certain species (Chapters 8 to 11) or populations (Chapters 12 through 15). Section III explores the developmental and genetic mechanisms responsible for SSD. Unlike earlier sections, these five chapters do not address the adaptive value or generation of SSD; rather, the authors explore how growth trajectories and morphologies are generated during gene expression and development. This section was particularly thought-provoking because these issues are fundamentally important, yet have received less attention than other areas of SSD research.

The major unifying themes throughout the book are an assessment of the adaptive significance of SSD and an assessment of how genetic constraint might be responsible for SSD. These themes permit authors to synthesize the recent literature and to use their own data to test novel hypotheses along these themes. I found the efficiency of this format unique and effective. Most chapters are short (10 to 12 pages in length) and the reviews are succinct, yet the data presentation and flow of ideas among chapters

are superb. The editors and contributors are to be commended for the tight organization of the chapters.

The high level of integration among chapters and presentation style works well to expose readers to the enormity of research on SSD. The articles display a wide range of analytical methods. Hence, the volume represents a veritable toolbox for students—molecular techniques, phylogenetic comparative methods, and well-designed field and laboratory experiments are all generously represented. Veteran scholars will find new ideas and approaches in this book because it covers such a wide array of systems (pygophores to horns to calyces), taxa (birds to beetles), and levels of biological organization (alleles to all eukaryotes). Readers will appreciate the introductory remarks on the biology of the study organisms in each chapter; these portions were indispensable for connecting with a wide audience. Also helpful are the "Suggested Reading" sections after each chapter that direct readers to the influential literature cited. The only thing missing from this volume is a thoughtful conclusion or summary chapter at the end. Beyond this minor point, I found this to be an excellent assemblage of contributions that will act as a guiding force in future studies of SSD.

LANCE D MCBRAYER, *Biology, Georgia Southern University, Statesboro, Georgia*

EVOLUTIONARY COGNITIVE NEUROSCIENCE. *Cognitive Neuroscience.*

Edited by Steven M Platek, Julian Paul Keenan, and Todd K Shackelford. Cambridge (Massachusetts): MIT Press. $65.00. xix + 616 p; ill.; index. ISBN: 0-262-16241-5. 2007.

Sixteen years ago, Barkow et al. published *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (Oxford: Oxford University Press), which was a collection of chapters that laid the theoretical foundation for much of the current cognitive research informed by evolutionary considerations. Since then, the techniques and theories from cognitive psychology and neuroscience have been integrated much more thoroughly than before. This cognitive neuroscience approach now dominates brain research, yet like its cognitive psychology ancestor, most cognitive neuroscience is not concerned with evolutionary questions nor guided by evolutionary considerations. *Evolutionary Cognitive Neuroscience* is an edited work that documents cognitive neuroscience research that does take an evolutionary approach. Although this volume does not address theoretical issues with the depth of *The Adapted Mind*, it provides a valuable introduction to the issues, a snapshot of current research, and an encouraging view of the future of this field.

This book contains 21 chapters grouped into six sections: Introduction and Overview (three chapters); Neuroanatomy: Ontogeny and Phylogeny (four chapters); Reproduction and Kin Selection (four chapters); Spatial Cognition and Language (three chapters); Self-Awareness and Social Cognition (five chapters); and Theoretical, Ethical, and Future Implications for Evolutionary Cognitive Neuroscience (two chapters). The introductory chapter provides a nice overview of the concepts, advantages, and issues that an evolutionary perspective provides for cognitive neuroscientists. Each of the empirical sections included valuable chapters, and several stood out. The chapter on sex differences in spatial abilities by Puts et al. offers an example of a topic with well-developed theories at multiple levels of explanation. Santos et al.'s chapter provides a review of human and nonhuman primate mind-reading theory and research with a focus on the recent demonstration that chimps and macaques use gaze information in competitive, but not cooperative, situations. They discuss the implications of this revealing finding and then demonstrate the value of a solid evolutionary and cognitive understanding by making empirical predictions about the neural basis of these abilities.

The volume would have benefited from discussion of how neurocognitive mechanisms evolve, as this is obviously a central question for this enterprise. In addition, greater coverage of recent structural and functional imaging done with nonhuman primates and how these results compare with human imaging findings would have been enlightening. Nevertheless, readers from a variety of disciplines will find the majority of these chapters quite interesting and a good demonstration of the promise of evolutionary cognitive neuroscience.

BRAD DUCHAINE, *Institute of Cognitive Neuroscience, University College London, London, United Kingdom*

EVOLUTION OF MICROBIAL PATHOGENS.

Edited by H Steven Seifert and Victor J DiRita. Washington (DC): ASM Press. $119.95. xiii + 355 p; ill.; index. ISBN: 1-55581-300-3. 2006.

This volume provides exemplary insight into the driving forces that shape microbial pathogen evolution. Much information has been wrought by analyzing bacterial genomes, and has been stimulated by the discovery of myriad novel pathogens over the past several decades (such as that *Helicobacter pylori* infections cause ulcers and gastrointestinal carcinoma/lymphoma). In just 17 chapters (including overviews by lead investigators), the book encompasses both general principles and specific examples. Each chapter concludes with a helpful summary of salient points.

Einstein said "imagination is more important than knowledge" and this volume delivers on both. Several chapters are devoted to general themes relevant to evolution and selective forces with a primary focus on bacterial pathogens. Rather than a pitched battle for survival in a hostile host, pathogen evolution is discussed in light of selective pressures in the environment (harsh conditions, limiting nutrients), in heterologous hosts (ameobae, nematodes, insects, plants), and in symbiotic, commensal, and pathogenic relationships with eukaryotes. In this regard, Chapter 8 (by Muir and Tan) on microbe evolution in soil, Chapter 9 (by McFall-Ngai and Gordon) on symbiosis (*V. fischeri* induced development of the squid, and the bacteria microbiota of the mammalian gastrointestinal tract), and Chapter 17 (by Steenbergen and Casadevall) on human fungal pathogen evolution (the sole chapter on fungi) are commendably lucid and farsighted.

Several general principles emerge. First, in both the bacterial and fungal kingdoms, pathogens developed independently on multiple occasions, and are evolutionarily interspersed with nonpathogenic species. Second, some bacterial pathogens exhibit rampant genomic diversity driven by horizontal gene transfer (HGT)—some *E. coli* isolate genomes differ by 60%—whereas other pathogens have clonally descended from recent bottlenecks (such as *Mycobacterium tuberculosis*) by accumulating point mutations with little or no evidence for HGT. Third, genes clustered in pathogenicity islands play prominent roles in bacterial pathogenesis, akin to mating-type loci and toxin/secondary metabolite producing gene clusters in fungi. Fourth, dramatic genome reduction has occurred in some pathogens of both kingdoms (Microsporidia spp. and *Mycobacterium leprae*), as well as examples in which benign organisms acquired virulence plasmids and then adapted further to virulence niches via specific loss of "antivirulence" determinants. Fifth, virulence and facultative intracellular survival has evolved in response to selective pressures in amoeba for both bacterial (*L. pneumophila*) and possibly also fungal (*C. neoformans*) pathogens. A central driving force in the evolution of microbial pathogens involves DNA exchange. Although the mechanisms differ between bacteria (conjugation, transduction, transformation) and the fungi (sexual reproduction), in both kingdoms, genetic exchange is followed by the emergence of isolates that clonally expand, leading to populations that are both clonal and recombining.

This volume admirably captures the excitement of new information gleaned over the past three decades fostered by the discovery of novel human pathogens, the application of evolutionary principles to pathogens, and the impact of genomics. If there is any failing, it is that the title could have been *The Evolution of Bacterial Pathogens*, as only one chapter considered fungi and none discussed parasites, viruses, or prions. This caveat aside, the authors and editors are to be commended for crafting a book that captures current excitement in the field and sets the stage for much work to follow.

Joseph Heitman, *Molecular Genetics & Microbiology, Duke University Medical Center, Durham, North Carolina*

Microbial Phylogeny and Evolution: Concepts and Controversies. *Based on a conference held in Montreal, Canada, October 2002.*

Edited by Jan Sapp. Oxford and New York: Oxford University Press. $64.50. xxi + 326 p; ill.; index. ISBN: 0-19-516877-1. 2005.

This book will leave readers in no doubt that there has never been a more breathless and exciting time to be an evolutionary biologist, and that microbes have rightfully taken center stage. Rather than attempt to be comprehensive in scope, this volume focuses on three intersecting themes: the origin of the eukaryotic cell, symbiosis and the evolution of organelles, and the significance of lateral gene transfer to the reconstruction of the tree of life. At their very heart, these themes debate the essential interconnectedness of life, the relative merits and plausibility of fusion (genetic or whole cell) versus the more orthodox picture of evolutionary isolation of species. Natural prejudices frequently surface throughout, and so often directly clash from chapter to chapter that reading the book straight through is rather like watching a hugely entertaining game of tennis. As Kurland asserts of the Doolittian view of rampant LGT in Chapter 10 (an extreme position that is frequently referred to by different authors), "this is ideology." This is equally true, of course, of his own opposing view that LGT is little more than a "nuisance" and that a robust tree of life is both tangible and obtainable. Most of all, these clashes betray the inadequacies of our methods and the vagaries of parasexual processes of prokaryotes.

Two chapters stand out as particularly elegant and essential reading. The first is by Carl Woese (Chapter 4) on the emergence of cellular evolution from the "annealing" process of a freely recombining community of precellular forms. The second is Sapp's own introductory chapter, which provides a fascinating historical context for the debate. This chapter is highly recommended for any student laboring under the impression that considerations of bacterial evolution began with the publication of the first bacterial genome sequence in 1995. After reading the other chapters, it also becomes clear that the debates surround

not only the place of bacteria in nature, but our own place as well.

EDWARD FEIL, *Biology & Biochemistry, University of Bath, Bath, United Kingdom*

EVOLUTIONARY ECOLOGY OF PARASITES. *Second Edition.*

By Robert Poulin. Princeton (New Jersey): Princeton University Press. $99.50 (hardcover); $39.50 (paper). x + 332 p; ill.; index. ISBN: 0-691-12084-6 (hc); 0-691-12085-4 (pb). 2007.

Parasitology courses and textbooks, like other "-ology" courses (mammology, ichthyology, and so on) are often focused on cataloguing features of their major taxonomic groups. Although this serves an important function in research and education, this focus sometimes feels regrettable. Parasites offer perhaps the most compelling examples of adaptation anywhere in the natural world; they are brilliantly poised to be a tour-de-force lesson in evolutionary biology. Robert Poulin lays out related sentiments in the introduction to his book, *Evolutionary Ecology of Parasites*, highlighting how parasitology is a fantastically rich world for testing advances in evolutionary theory, but that many such advances have passed the parasitological world by until recently. Similarly, parasites have exceptionally intimate relationships with their environment (the host), and ought to be at the center of the field of ecology (the study of the interactions among organisms and their biotic and abiotic environments). And yet, the tools of ecology have not yet deeply permeated the world of parasitology, just as parasites have often fallen off ecologists' radar screens.

The arrival of the second edition of Poulin's book is well timed, as the lack of crosstalk among fields may be abating, as the author notes in his preface. Yes, parasites are out of the dusty closets and becoming mainstream, and I am pleased to see this new edition keep the momentum going. This is not a radical departure from the organization of the previous edition, but it is thoroughly updated, substantially longer, and worth the purchase price. This book will be particularly valuable for starting graduate students because it points out a great diversity of hypotheses that are testable with knowledge of evolutionary histories, and it is strong on highlighting the pitfalls associated with data interpretation (e.g., are congruent phylogenies really the product of cospeciation? Are body size distributions meaningful regarding broad-scale evolutionary trends?). On a related note, this volume convincingly debunks a number of so-called rules that simply do not accord with current data. One would have to try hard not to be inspired by this book, and anyone contemplating a career in parasitology, or looking for ideal models for the study of ecology and evolution generally, should benefit from reading it.

To integrate evolution, ecology, and the biology of parasites, this volume covers transitions to parasitism, origins of complexity and specialization, and the evolution of life histories and host exploitation strategies. The second half of the book is devoted to distributions, dynamics, and community ecology. The evolutionary integration is largely achieved through a phylogenetic approach. This occasionally leads to statements that seem odd for those of us wholly concerned with the microevolutionary perspective or the study of fitness. For example, the notion that the way to "assess whether more complex life cycles actually lead to improved fitness would be to compare the fitness of pairs of related species that differ only in the complexity of their life cycle" (p 19) seems an untenable proposition because an individual's fitness can only be measured relative to those it shares a gene pool with, and different species do not share. Even when comparisons among groups are reasonable, measuring fitness is a mammoth challenge, requiring an understanding of density dependence and genotype-by-environment interactions, to make but a short list. This is not to say that the microevolutionary perspective is ignored. Indeed, the author often deals with it well, as his excellent discussion of host exploitation strategies is a case in point.

In general, I share with Poulin the desire to see further integration of the macro- and microevolutionary perspectives within parasitology-related fields. Indeed, he concludes his book explicitly requesting deeper links between studies of natural selection and those of local ecological processes. For example, one area where this will bear fruit is in the study of specialization. Although specialization is traditionally considered the range of host species a parasite infects (this view is prominent in *Evolutionary Ecology of Parasites*), adaptation to common local genotypes of a single species is also a form of specialization, embodied, for example, by the Red Queen hypothesis or the local adaptation and geographic mosaic perspectives. Greater understanding of specialization at this level will foster insight into coevolution or how local adaptation contributes to parasite aggregation, among other topics.

So, it is my hope that the future of parasitology is further integration. *Evolutionary Ecology of Parasites* already does a great service to biology through its broad integrative approach, but I anticipate that many will see merit in its message, leading,

eventually, to the third edition that will have the opportunity to synthesize an even greater of array multidisciplinary approaches to the study of parasitic interactions.

Tom J Little, *Biological Sciences, University of Edinburgh, Edinburgh, United Kingdom*

The Ecology and Evolution of Ant-Plant Interactions. *Interspecific Interactions.*

By Victor Rico-Gray and Paulo S Oliveira. Chicago (Illinois): University of Chicago Press. $70.00 (hardcover); $28.00 (paper). xiii + 331 p; ill.; index. ISBN: 978-0-226-71347-2 (hc); 978-0-226-71348-9 (pb). 2007.

Attracting the attention of naturalists for over a century, ant-plant interactions were often considered interesting, perhaps odd, examples of limited importance in ecological communities. Not so today. As this book emphasizes, because they embrace two of the most dominant groups of organisms, with a 100-million-year shared history, ant-plant interactions (APIs) play key roles in structuring food webs in many far-flung temperate and tropical communities, particularly abiotically stressed environments, such as rainforest canopies, edges, and deserts. Documented within the volume are Janzen's elegant studies, the first to record the negative consequences to plants for the loss of ant defenders, which were seminal in stimulating work on coevolution and the formulation of a dynamic, geographic, and temporal mosaic coevolutionary theory that now drives much empiricism. APIs now serve as tractable model systems for studying a variety of questions in ecology and evolutionary biology.

I joyously sped through this book because of three things: lucid organization, precise language, and incontestably fascinating biology. I was starved for more. The authors effectively used three grounding organizational principles: interspecific interactions structured by selfish cost/benefit outcomes; the graded continuum from a few, older antagonistic (one-sided consumer/resource) to more recent and numerous variations on mutualistic (wherein both participants divvy-up benefits) interactions; and the dynamic heterogeneous space-time Thompsonian mosaic idea. I was struck by the fact that many APIs are actually very fluid and multitrophic, with cheater components, which vary in species-specificity (obligate to opportunistic), in fitness consequences and in evolutionary outcomes, depending on who is checked in at the local host plant motel. Thompsonian mosaic theory über alles, I think. Future research will need to appraise more than two-way interactions. For example, there is an instability in evolutionary tensions between extrafloral nectaries, the ant-tended bug exudates that mimic them, and their combined effectiveness in eliciting ants to do the heavy defense lifting favorable to plant fitness, not to mention noisy complications from the vectored pathogens and nectar robbers that skew outcomes away from expected optima.

With a historical perspective beneath, eight of 12 chapters flow neatly from antagonisms in the earliest interactions, to more recent mutualisms between more specialized partners. However, as the authors well point out, we simply lack good fossil records with which to date transitions within particular lineages. The huge ecological flux of facultative and obligate participants has further obscured the detection of clear patterns within lineages. This uncertainty exemplifies the rich vortex of interactions that shape our enjoyed world, one at risk of losing such pluralistic options that maintain diversity. It is my hope that better phylogenies and fieldwork will clarify the evolutionary trends in these marvelous interactions. The other chapters are devoted to ant gardens that feed plants, the issue of mosaic variation in APIs, and APIs in agriculture. There is a very persuasive summary chapter, which illuminates many avenues of much needed research. I fear time is running out on investigations that have noninvasive participants.

As an example of a potentially "hot" topic ripe for further research, inducible antiherbivore defenses (i.e., those that are displayed facultatively, "on the sleeve," like arm candy, as opposed to endogenous, standing secondary chemistry) are fascinating and novel. For instance, the Cecropia-Azteca system (studied by Agrawal and others) is a complex of herbivore-elicited physical and chemical cues that increase ant defense activity, the mechanisms of which we lack precise understanding. Plants evidently are not totally passive in APIs. In addition to the well-known production of nutrient laden inducements, such as Beltian bodies (leaf rewards) and elaisomes (seed rewards) that serve to encourage ant antiherbivore activity and seed dispersal, recent evidence shows that some plants manipulate extrafloral nectary visitation to favor nonsugar-loving obligate mutualists over cheaters, by the production of enzymatic invertases, which eliminate the sugars that attract most visitors, but here would be evolutionary baggage.

For anyone who wants a more than a glancing familiarity with APIs, the extensive index and nearly 1100 citations make this book an indispensable compendium and research primer. My prediction is that this volume will remain important to undergraduate and graduate students, as well as coevolution and agroapplied researchers for years to come.

Fredric V Vencl, *Ecology & Evolution, Stony Brook University, Stony Brook, New York*

THE EVOLUTION OF SOCIAL WASPS.

By James H Hunt. Oxford and New York: Oxford University Press. $99.50 (hardcover); $44.50 (paper). xxi + 259 p; ill.; author and subject indexes. ISBN: 978-0-19-530785-6 (hc); 978-0-19-530797-9 (pb). 2007.

In social insects, one or more females reproduce while the rest are sterile workers. How worker sterility could have evolved is a puzzle. W D Hamilton made the brilliant suggestion that in the haplodiploid Hymenoptera (ants, bees, and wasps), kin selection increases a worker's fitness when she helps rear sisters who are more closely related than her daughters would be. However, the data on the role of kin selection in the evolution of eusociality are equivocal. Hunt's book is based on an alternative hypothesis, that sociality is the result of modifications of ancestral biology that lead to differences in the behavior of queens and workers in modern eusocial species. In a careful, thorough, and compelling account, he traces the development, physiology, and life history through the entire phylogeny of the wasps, from solitary to truly social. The strength of the book is the author's command of the details of taxonomy, foraging behavior, and life history, which enables him to weave a coherent narrative of the evolution of this huge and diverse group. Building on the reproductive ground plan hypothesis introduced by West-Eberhard, Hunt emphasizes the importance of evolutionary modification in how larvae are fed and in the timing in the life cycle of diapause. A lifetime of research, hard thinking, and devotion to detail shine through Hunt's conversational style. The book is clear about many questions that remain unanswered, and will inspire both controversy and new synthetic research on the evolution of social behavior.

DEBORAH M GORDON, *Biological Sciences, Stanford University, Stanford, California*

FINS INTO LIMBS: EVOLUTION, DEVELOPMENT, AND TRANSFORMATION.

Edited by Brian K Hall. Chicago (Illinois): University of Chicago Press. $110.00 (hardcover); $45.00 (paper). vi + 433 p + 20 pl; ill.; index. ISBN: 0-226-31336-0 (hc); 0-226-31337-9 (pb). 2007.

Reversing the century-old separation of embryology from evolutionary biology, standard developmental textbooks now have at least one chapter on "Evo-Devo" that focuses on how evolutionary transformations might be explained by developmental processes. One of the cases frequently cited is the evolution of the limb viewed from a developmental perspective. *Fins into Limbs* is the subject of the present collection of papers edited by Brian Hall, a long-time student of this field. His theoretical engagement with evolutionary-developmental biology together with his rich practical experience of experimental analysis of skeletogenesis make him the ideal person to select the authors and topics for this volume. Limb evolution, which the editor pithily summarizes as "fins minus fin rays plus digits equal limbs" (p 1), is the subject of Part I, comprising four papers. Coates and Ruta's beautifully illustrated account is outstanding, with its focus on the paleontological evidence, both old and new. Accounts of this transition, fin to limb and fish to amphibian, now generally place the shallow-water *Panderichthys* and the polydactylous *Acanthostega* center stage, and edge out those old war horses of older zoological textbooks, *Eusthenopteron* and *Ichthyostega*. Central to the transformation is retention of the proximal branching of the lobefin elements, plus a more distal reconstruction, appearance of digits, and elimination of fishrays.

Part II (eight papers) deals with fin and limb development, where their explanation becomes ever more complex. Only 20 years ago, limb bud development was seen in terms of induction of mesenchymal outgrowth by the ectodermal ridge and control of digit patterning along the anterior-posterior axis through a gradient of morphogen, soon confidently identified as retinoic acid, released by the "zone of polarizing activity" (ZPA) localized in the posterior border and celebrated by the famous "We have a Morphogen!" title of a *Nature* paper (J M W Slack. 1987. *Nature* 327:553–554). Now, neither induction nor retinoic acid feature in the index and we have a plethora of morphogens and a complex gene network. The limb bud ZPA is the site of expression of SHH (sonic hedgehog), bud outgrowth is controlled by a number of FGFs (fibroblast growth factors), and Wnt7a plays a control role in dorsoventral patterning. Hox d10-d13 gene expression correlates with digit development, an aspect of limb bud development not seen in teleost finbuds and consistent with the idea that digits are novel structures in early tetrapods. Tanaka and Tickle's paper is an excellent guide to these gene networks, integrating new molecular insight with older "cut and paste" experimental embryology. There is, of course, a problem bringing the molecular biology of teleost finbuds and amniote (mouse and chick) limb buds into focus on the evolutionarily distant fin to limb nodal point. Nonetheless, it is clear that there are critical similarities in the molecular mechanisms of finbuds and limb buds (for example, SHH expression) that underpin limb evolution.

Finally, Part III (seven papers) deals with limb transformation, with the focus being less "fin to limb" and more the radiation of the tetrapod

limb within the major vertebrate classes, especially amphibians and mammals. Although the limb structure of early tetrapods has proved remarkably durable in subsequent evolution, adaptation to flight, swimming, or digging are later transformations, all effectively analyzed in Part III. Here, Carroll and Holmes's paper on amphibia is a substantial contribution that grapples with issues of stability and malleability of form in the limb skeleton.

Overall, this handsome and elegantly illustrated book integrates much new information, ranging from molecular to paleontological, into a modern, broad perspective. Thus, it makes a substantial contribution to our ongoing evolution-development debate.

Richard Hinchliffe, *Biological Sciences, University of Wales, Aberystwyth, United Kingdom*

Rodent Societies: An Ecological and Evolutionary Perspective.

Edited by Jerry O Wolff and Paul W Sherman. Chicago (Illinois): University of Chicago Press. $125.00 (hardcover); $49.00 (paper). xv + 610 p; ill.; subject and species indexes. ISBN: 978-0-226-90536-5 (hc); 978-0-226-90537-2 (pb). 2007.

There is no question that this volume contains a wealth of information that is presented by acknowledged experts in animal ecology and evolution. The book is massive: it contains 42 chapters that are separated into nine sections. The stated goal of this work is to synthesize and integrate the current state of knowledge on social behavior in rodents from both an ecological and evolutionary perspective, and to provide guidance on conservation and management of this large and diverse group of animals. The work is heavy on social behavior and socioecology, but extremely light on conservation and management. Some chapters did, indeed, present a synthesis (e.g., rodent mating strategies, parental care, ecology of sociality), whereas other chapters focused on specific species or species groups. Although the editors did attempt to provide an overview of the chapter contents in their introductory chapter, this volume lacks any attempt to integrate chapters or provide a summary and synthesis for each of the major sections. Individual chapters usually included a brief summary, but most did not provide specific guidance on how to address the unresolved questions that abound in rodent ecology and evolution. I was disappointed that habitat selection was only mentioned in passing in most chapters. For example, Karen J Nutt (Chapter 35) addressed sociality and habitat selection for rock-dwelling rodents. A more useful approach for such a summary book, however, would have been to select major topics—such as habitat selection or population regulation—and incorporate various rodent groups into the discussion. Another useful approach would have been to clearly integrate what we know about animal ecology and evolution in other vertebrate groups, including other mammals. Krebs et al. (Chapter 15) did a nice job of relating population regulation in birds to rodents, but regulation in other vertebrate groups was largely missing.

In summary, *Rodent Societies* contains information that will be valuable as a reference for students of rodents. There is nothing wrong per se with what is presented. Rather, I would have preferred a volume that contained fewer, larger, and more in-depth chapters or, at a minimum, a summary for each major section that integrated what was presented in the individual chapters.

Michael L Morrison, *Wildlife & Fisheries Sciences, Texas A&M University, College Station, Texas*

The Last Human: A Guide to Twenty-Two Species of Extinct Humans.

By G J Sawyer and Viktor Deak; text by Esteban Sarmiento, G J Sawyer, and Richard Milner; contributions by Donald C Johanson, Meave Leakey, and Ian Tattersall. A Peter N. Nèvraumont Book. New Haven (Connecticut): Yale University Press. $45.00. 256 p; ill.; index. ISBN: 978-0-300-10047-1. 2007.

This glossy volume has no counterpart. It is a compendium of about 30 photographs of three-dimensional artist reconstructions, based on fossil hominid remains spanning the last six million years. Donald Johanson's foreword conjures up memories of himself staring into a fossil's face. Ian Tattersall provides a wandering introduction that he terms "the sketchiest of accounts" (p 23). Unfortunately, that description applies to most of the book.

Meave Leakey's afterword asserts: "This book vividly brings to life twenty-two extinct species of our ancestors, branches of a once diverse human family tree" (p 230). She does not explain how they can be both ancestors and extinct. Nevermind, this is all part of hominid "diversity systematics" run amok. Many of the putative species are chronotaxa; others are not even valid species in that sense. No one really thinks that available hominid fossils represent 22 separate species lineages in the last six million years.

The text is largely by Esteban Sarmiento, who begins each "species" account with what he calls an "imaged narrative" (p 26). These short, adventure-in-the-life-of fictional vignettes are followed by a textbook-lite, highly idiosyncratic rendering of each taxon's attributes. He includes: skull, teeth, and diet; skeleton, gait, and posture; sites and geography; antiquity; tools; paleoenvironments; classification; and often bizarre historical notes.

The most valuable part of the volume is the 14-page illustrated appendix (by Richard Milner) on the history of fossil hominid artistic rendering.

The book is full of inaccuracies and entertaining reconstructions, such as the *Au. afarensis* "temporarily" submerged up to its shoulders, "relaxing" in an Ethiopian lake. Aquatic ape aficionados who are willing to ignore crocodile biology will love this fantasy. For more entertainment, assign your introductory students to go through the volume critically and carefully. Arm them with plenty of sticky notes.

TIM D WHITE, *Human Evolution Research Center and Integrative Biology, University of California, Berkeley, California*

EVOLUTION OF THE HUMAN DIET: THE KNOWN, THE UNKNOWN, AND THE UNKNOWABLE. *Based on a workshop held in Fayetteville, Arkansas, August 2003. Human Evolution Series.*

Edited by Peter S Ungar. Oxford and New York: Oxford University Press. $99.50 (hardcover); $49.50 (paper). xiv + 413 p; ill.; index. ISBN: 0-19-518346-0 (hc); 0-19-518347-9 (pb). 2007.

"Meat Made Us Human." This toothy epigram, also the name of Bunn's Chapter 11, is an apt alternate subtitle. The given subtitle draws from a Sloane Foundation program by that name, which supported Ungar's workshop in 2003 that, in turn, begat this book and its well-organized 21 essays. Some 30 distinguished authors represent a broad range of technologies and perspectives on how hominin diets evolved from the predominantly plant foods of the great apes to the meat-rich human preference. Generally following the canon of the subtitle, we are led to many confrontations with the unknowable. Two examples intrigue. Although bone radioisotopes may indicate ingestion of plant types that use different pathways of photosynthesis (^{13}C:^{12}C ratios discriminate trees versus grasses), we can not know if the isotopes were derived directly from an individual's own lifetime diet or indirectly from tissues from another animal in the food chain (Sponheimer et al.; Chapter 7). Again, Walker (Chapter 1) noted that the seasonal gorging of grizzly bears on moths would be unknowable (e.g., by bone isotopes or tooth wear patterns) without direct observations.

Speaking as a molecular biologist, it is refreshing to see this candor. Although progress in understanding the existing biological machinery is truly amazing, the genomic triumphalism often expressed in molecular circles is challenged by slim pickings in the scattered archeological record in the numbers of fossils. There is no fossil in the chimpanzee lineage older than 550,000 years ago to inform on the shared ancestor. Henry and Wood (Chapter 2) critically summarize the fossil evidence, emphasizing how taxonomy is inescapably hypothetical.

Given these uncertainties, much is being learned about ancient hominin diets, as described by: a critical reevaluation of known fossils; patterns of tooth wear; foods eaten by *Pan* or available to hominins, prehistoric *H. sapiens*, and modern hunter-gatherers; and by geological approaches to paleoecology. The emerging comparative genomics of *Homo* and *Pan* will increasingly engage the themes of this book—e.g., apoE variants evolving in *Homo* may have mediated meat ingestion and neuronal complexity (see C E Finch and C B Stanford. 2004. *QRB* 79(1):3–50). Gene pleiotropies are likely, because brain and dental tissues both stem from neural crest cells. We may expect ever the more illuminating hypotheses from the multidisciplinary efforts represented at work in anthropology and its widening allied fields, even if these working hypotheses never reach Euclidian certainty.

CALEB E FINCH, *Biological Sciences and Davis School of Gerontology, University of Southern California, Los Angeles, California*

THE EVOLUTION OF HUMAN LIFE HISTORY. *Based on a seminar held in Santa Fe, New Mexico, 2–8 November 2002. School of American Research Advanced Seminar Series.*

Edited by Kristen Hawkes and Richard R Paine. Santa Fe (New Mexico): School of American Research Press and Oxford: James Currey. $34.95 (paper). xiii + 505 p; ill.; index. ISBN: 1-930618-72-7 (School of American Research Press); 0-85255-170-3 (James Currey). 2006.

This is a collection of articles written by biological anthropologists on human life histories, based on a conference held in 2002. Although it suffers from some of the usual problems with conference proceedings, including a lack of high consistency, it is nevertheless of great interest both generally, for evolutionists today recognize just how important life histories are and, specifically, for the light that it throws on our own species. Of course, Charles Darwin realized just how significant life history is—the forces of selection can be very different for a young organism than for an older one, especially an older one that has reproduced and is now protecting his or her investment, rather than starting from scratch. He was also interested in this problem in the case of humans, seeing that older members of the group might act differently than the younger members.

Now we are starting to get some systematic findings and explanations. Very helpful in this

regard is the paper by Utah anthropologist (and volume coeditor) Kristen Hawkes, who offers a very detailed treatment of what we know about human life histories and the putative theories behind them. It is well known in the guppy world that the age at which predation falls most heavily strongly influences earlier development—if the predation comes early, then the best bet might be to try to beat it with very early development, and later predation allows for more leisurely maturing. Hawkes suggests that this might apply to humans also. This would surely make sense of our own Western societies, where there is time for development without threat—although one expects different patterns within our societies, with inner city denizens experiencing different selection pressures from those in safer environments.

Also covered in this volume are the history of human evolution and the pertinent fossil findings, comparative studies over hunter gatherer societies still in existence, and problems of taxonomy, among other issues. All in all, this is a useful collection that will introduce readers to the issues and problems of human life history.

Michael Ruse, *Philosophy, Florida State University, Tallahassee, Florida*

The Biology of Human Longevity: Inflammation, Nutrition, and Aging in the Evolution of Lifespans.

By Caleb E Finch. Academic Press. Burlington (Massachusetts): Elsevier. $69.95. xiii + 626 p; ill.; name and subject indexes. ISBN: 978-0-12-373657-4. 2007.

This is a monumental book that reviews and discusses over 3000 scientific publications on mechanisms of aging and longevity, with special emphasis on the role of inflammation in senescence and age-related degenerative diseases. The author is an internationally recognized leader in the field of biogerontology. His volume could serve as a useful reference for a wide readership, including biomedical scientists, biogerontologists, and clinicians in the areas of vascular disease, diabetes, obesity, Alzheimer's disease and other neurodegenerative diseases, genetics of aging and longevity, animal models of aging, anthropology and primatology, evolutionary biology, demography, and epidemiology.

This volume is not a particularly easy reading, because of the complexity of the study topic (with mixed and sometimes even controversial research findings), making it difficult to reach general conclusions. Fortunately, the book is well illustrated with numerous tables and pictures (136 images), which makes it much easier to follow.

Finch begins with a discussion of the role of inflammation and oxidation in aging and chronic diseases (Chapter 1), including an overview of experimental models for aging studies, description of inflammation process, as well as four types of damage (free radical damage, glycoxidation, chronic proliferation, and mechanical bystander effects). This chapter also examines arterial aging and atherosclerosis, Alzheimer's disease and vascular-related dementias, inflammation in obesity, and the processes of normal aging in the absence of specific diseases. The author concludes that in most chronic diseases of aging, oxidative stress and inflammation are prominent; moreover, inflammatory changes are observed in many aging tissues even without specific pathology.

Other topics discussed in this volume include: the role of infections, inflammogens, and drugs in the aging process (Chapter 2); energy balance, inflammation, and aging (Chapter 3); the role of nutrition and infection in the developmental influences on aging (Chapter 4); genetics of aging and longevity (Chapter 5); and evolution of human life span with forecasts for the future (Chapter 6). In our opinion, the most interesting part of this book is Chapter 4, where Finch provides an excellent overview of the Barker Hypothesis of fetal origins of adult disease, and expands this hypothesis further to consider the role of early-life infections and inflammation in the aging process later in life.

Leonid A Gavrilov and Natalia S Gavrilova, *Center on Aging, National Opinion Research Center, University of Chicago, Chicago, Illinois*

The Evolution of Death: Why We Are Living Longer. *SUNY Series in Philosophy and Biology.*

By Stanley Shostak. Albany (New York): State University of New York Press. $80.50 (hardcover); $26.95 (paper). xiii + 246 p; ill.; index. ISBN: 0-7914-6945-X (hc); 0-7914-6946-8 (pb). 2006.

The author has an innovative, if eccentric, notion about why human longevity has increased so dramatically over the past few centuries. His idea is that humans have become recently juvenilized, in that they preserve juvenile numbers of stem cells into later life. They manage this by somehow diverting cells from the primordial germ cell pool to the pool of stem or progenitor cells devoted to our renewing tissues as we age. This hypothesis is presented on pages 141 to 148 of a book with 160 pages of text (excluding preface and afterward). No shred of evidence is adduced to support the hypothesis, except that human fecundity in technologically advanced countries has been decreasing lately. I am not sure whether this suggests that people emigrating from nontechnological coun-

tries with continuing high fecundity would continue to be short-lived, or whether they would evolve within a few years to be as long-lived as the rest of us. More seriously, the big problem with this scenario is that genetic evolution cannot occur nearly rapidly enough to be compatible with the hypothesis, so some quicker "epigenetic" change must be posited. Exactly how that might work is not obvious to me.

In the first 80% of the book, we learn something of the history of evolutionary thought, the history of aging research, and a bit about developmental biology. More puzzling to those of us in the field, it is asserted that in the future, death (meaning human death) will all but disappear, that family and pedigree studies can tell us nothing about the inheritance of "normal longevity," that genes thought to be involved in aging operate through nothing more than the cumulative effects on cell loss, and that the scientists who have made remarkable progress over the past several decades in unraveling the process of aging really seemed to have missed the whole story. As confusing as I found presentation of ideas in this book and its Delphic metaphors, it is written in graceful prose and touches on an impressive array of topics.

STEVEN N AUSTAD, *Barshop Institute for Longevity & Aging Studies, University of Texas Health Science Center, San Antonio, Texas*

RENDER UNTO DARWIN: PHILOSOPHICAL ASPECTS OF THE CHRISTIAN RIGHT'S CRUSADE AGAINST SCIENCE.

By James H Fetzer. Chicago (Illinois): Open Court Publishing. $24.95 (paper). xx + 201 p; ill.; index. ISBN: 0-8126-9605-0. 2007.

This book is challenging to read, rewarding when the effort is made, difficult to recommend but, if used, bound to set off firestorms of classroom discussion. The author is a philosopher with a reasonable understanding of science (especially evolution), religion (especially its variety, which makes common ground difficult) and, above all, a keen mind to analyze almost any point of view.

The difficulty is that most scientists lack the background or interest in formal philosophic analysis. For most of this analysis, Fetzer will find strong scientific support. He demolishes creation science and shows why it cannot be called a science. He dismantles intelligent design and shows why it requires a redefining of science to include the supernatural to make it legitimate. He shows creation science to be a degenerating paradigm. He accuses the intelligent design movement of substituting mere pretense for temporary ignorance. He analyzes moral approaches and recognizes only one that is worthy of humanity. It is deontological (rights based) in which humans are treated with respect and never as means to an end. The Golden Rule comes close to that interpretation, but he sees its religious origin as coincidental and that its merit is in its logical foundation.

Rather confusing is an almost conspiratorial interpretation of the religious right, fundamentalism, the Republican Party's neofascist policies of manipulating the masses by supporting pro-life, antistem cell research, antiflag burning, and anti-evolution issues to win elections for their rich corporate masters who very much see people as means to an end (especially profits and power). It is this political intrusion that makes it hard to recommend this book and makes it seem like a Michael Moore muckraking documentary. It is not that his points lack merit. Nor is he necessarily wrong in his harsh judgment of the Republican Party and its dismal failures to address inequality in the world and in the United States. It just comes out of nowhere and distracts attention from the evolution-creationism debate. I have no doubt in my mind that creationists would be just as active at the school-board level whether Democrats or Republicans held national office.

I would hate to see college students rejecting the scientific merits of evolution and embracing the nonscientific beliefs in intelligent design because they judged Fetzer's philosophic analysis by his conspiratorial theories and politics.

ELOF AXEL CARLSON, *Biochemistry & Cell Biology, Stony Brook University, Stony Brook, New York*

EVOLUTION AND RELIGIOUS CREATION MYTHS: HOW SCIENTISTS RESPOND.

By Paul F Lurquin and Linda Stone. Oxford and New York: Oxford University Press. $29.95. xiii + 224 p; ill.; index. ISBN: 978-0-19-531538-7. 2007.

This book is a response to creationism and the proponents of intelligent design. It begins badly, but improves. Chapters 5 and 6 are the best, and review evidence for a prebiotic "RNA world," the evolution from it of a "DNA world," and the evolution of the eukaryotic cell. The lessons drawn from the material that pertain to creationist errors are well stated. But more is required for a volume to pass muster on the battlefield of public polemics, where this book purports to be. In this respect, the publication is flawed, and I cannot recommend it.

For starters, the title is false advertising. Only ten pages are devoted to other religious creation myths besides that of the biblical literalists, and they are perfunctory. The writing at its best is colorless lecturehallese. Sometimes it reads like a Hal Roach comic routine, although quite unintentionally, from sentences such as the "Irish look

different from Koreans, and vice versa" (p 99) to their passing off of a joke, which they do not recognize as such, as serious intellectual history (pp 32–33). There are careless errors, such as applying a description appropriate to the biblical Adam to the last male to contribute his Y chromosome to all of today's males, because they describe the latter as "the man who first passed on a distinctive Y chromosome variant to all subsequent human males on Earth" (p 94). The "on Earth" is yet another one of those unintended comic touches. Another careless error is the authors' forgetfulness regarding Darwin's theory of sexual selection, and they say, "[e]volution is also determined by factors other than natural selection, something that Darwin never envisioned" (p 44). The errors, both grammatical and historical, in this sentence are just boggling: "Do neocreationists, who, superficially, emulate some of the bold thinking of Galileo and his demise at the hands of the establishment, merit the title of scientific victims of pervasive Darwinism? The answer must be no" (p 188).

The volume contains a glossary and an appendix of five experiments for teachers to perform, so it is intended for use as a college textbook. But, aside from the flaws already noted, there are no notes, and few citations are included to back up claims. This is a sorry example to set for students. As a polemical volume defending evolutionary sciences against the creationists, it is not a credit to the cause; indeed, it is sometimes quite embarrassing.

Arthur Falk, *Philosophy, Western Michigan University, Kalamazoo, Michigan*

Evolution and Creationism: A Documentary and Reference Guide.

By Christian C Young and Mark A Largent. Greenwood Press. Westport (Connecticut): Greenwood Publishing Group. $85.00. xviii + 298 p; ill.; index. ISBN: 978-0-313-33953-0. 2007.