



## EVOLUTION

## BASICS IN HUMAN EVOLUTION.

*Edited by Michael P. Muehlenbein. Academic Press. Amsterdam (The Netherlands) and Boston (Massachusetts): Elsevier. \$120.00. xviii + 557 p. + 32 pl.; ill.; index. ISBN: 978-0-12-802652-6. 2015.*

This is a laudably ambitious project. Although the title of the book indicates a focus on providing basic information about human evolution, in actuality it attempts to provide general reference to an audience interested in human evolution, modern human biology and genetics, human health and development, social organization, and human behavior—all viewed through a distinctly anthropological lens.

The editor succeeded in herding 48 authors to produce 39 chapters organized into seven main parts. The first part includes only two chapters. The first chapter, introducing readers to the basic concepts of evolutionary theory and the facts of evolution, just might be the best chapter in the volume. Part II provides the primate background to human evolution, behavior, and anatomy. The introduction to the basics of primate behavior is particularly succinct and enjoyable. Part III covers the fossil record and phylogenetic hypotheses of early hominin through early to modern human evolution, and also addresses early hominin ecology, the origins of bipedal locomotion, and the evolution of tool use. Unfortunately, the chapters on hominin and human morphology and phylogeny follow a gradistic approach. For example, several authors lump *Kenyanthropus platyops* and *Australopithecus bahrelghazali* with *Australopithecus afarensis* and prefer not to separate *Paranthropus* spp. from *Australopithecus* spp. This approach, which eliminates much of nuance of hominin evolution, is a poor choice for a book looking to provide a solid foundation into the current state of the field of human evolution. By contrast, the chapter on the origins of bipedalism provides a good review of different views about this crucial question in human evolution.

From here on the volume enters its bioanthropological sections, which generally includes topics of more interest to the wider public. Part IV introduces readers to human population genetics, physiology, evolution of brain size and skin color, growth and aging, and reproductive ecology. The next part includes three chapters about modern subsistence modes. Part VI presents anthropological analyses of the relationships between changes in human environments and the rise of chronic

diseases, infectious diseases, and pathogen evolution, human diet, and an introduction to paleopathology (how disease of the past are studied). This part addresses current health topics such as obesity, cardiovascular disease, and the rise of infectious disease. The final part explores the connection of biology and different human behaviors, including stress, love, war and paternal care, mating systems, cognition and language, moral systems and reciprocal behaviors, race and ethnicity, and the evolution of culture. The book ends with a good glossary and some excellent color images and figures.

Although the volume is uneven, its strength is its many parts and broad spectrum of ideas. The book is a collection of idiosyncratic treatises gathered into loosely congruent sections that will allow any reader to pick and choose where and what to focus on. Thus, various chapters can form an excellent introduction to different graduate courses in bioanthropology and the volume would fit on the shelf of any anthropology or general university library.

ARYEH GROSSMAN, *Anatomy, Midwestern University, Glendale, Arizona*

## EVOLUTIONARY DYNAMICS: THE MATHEMATICS OF GENES AND TRAITS.

*By Hugo van den Berg. Bristol (United Kingdom) and Philadelphia (Pennsylvania): IOP Publishing. \$150.00. xviii + 366 p.; ill.; no index. ISBN: 978-0-7503-1095-6 (hc); 978-0-7503-1094-9 (eb). [The book includes five Appendixes (A - E).] 2015.*

EVOLUTION IN FOUR DIMENSIONS: GENETIC, EPIGENETIC, BEHAVIORAL, AND SYMBOLIC VARIATION IN THE HISTORY OF LIFE. *Revised Edition. Life and Mind: Philosophical Issues in Biology and Psychology.*

*By Eva Jablonka and Marion J. Lamb; illustrated by Anna Zeligowski. A Bradford Book. Cambridge (Massachusetts): MIT Press. \$29.95 (paper). xii + 563 p.; ill.; index. ISBN: 978-0-262-52584-8. 2014.*

This volume is a sequel to Jablonka and Lamb's groundbreaking 1995 book *Epigenetic Inheritance and Evolution: The Lamarckian Dimension* (Oxford (UK): Oxford University Press), a work that aroused heated controversy and inspired the growth of a new research field. In the current volume, the authors reimagine evolution as the outcome of four interwoven hereditary processes: genetic, epigenetic, behavioral, and symbolic. This is a radical departure from the straitlaced population genetics of the Modern Synthesis, with its underlying assumption that natural selection on random genetic variation provides a perfectly adequate model of evolution. Jablonka and Lamb believe that their far more complicated view is necessitated by recent discoveries in molecular biology, as well as advances

in the fields of cultural evolution, symbolic communication, and niche construction, and this book may be the most comprehensive attempt thus far to incorporate these insights into a revised concept of evolution.

This is a thick and sometimes difficult volume that bristles with bold, contentious ideas. It is an example of that rare sort of scientific writing that can leave readers either fuming or inspired (or both). Of all the hypotheses elaborated, the most controversial may be the suggestion that evolution is driven not just by natural selection but also by inherently adaptive and self-guiding “instructive” processes, in which the epigenetic, behavioral, and symbolic dimensions play key roles. Admittedly, Jablonka and Lamb do not quite pull off the Herculean feat of clarifying how all of these dimensions and processes fit together into a coherent picture of evolution. Yet, this book certainly succeeds in a more modest but still important objective—to compel readers to ponder new evidence and question long-held assumptions.

Not content merely to shatter evolutionary biology’s most cherished certitudes, the authors also do away with the dusty stylistic conventions of scientific writing. Complex molecular, hereditary, and evolutionary processes are illustrated with self-consciously silly cartoons, while every chapter ends with a lengthy dialogue between the authors and a pipe-smoking alter ego named Ipcha Mistabra (“the opposite conjecture” in Aramaic) who elicits clarification by playing straight man, a bit like the imaginary interlocutors in Plato’s *Dialogues*. The discussion ranges over a dizzying diversity of topics and examples (aficionados of Jewish cuisine can look forward to reading about Polish *gefilte fish* and Yemenite *schug* on pages 175–178), but also includes very clear and intuitive explanations of molecular processes.

The new edition incorporates an overview of advances made since the publication of the first edition in 2005. To the elation of some readers and the despair of others, much of this material is presented in an additional 78-page dialogue with old imaginary friend Ipcha Mistabra. This section outlines many new, interesting empirical examples that illustrate Jablonka and Lamb’s four dimensions of heredity and evolution (but, unfortunately, very little space is devoted to discussion of new theory). The new edition certainly provides a valuable update, and ensures that this book will continue to challenge general readers, students, and practicing biologists to reimagine evolution.

RUSSELL BONDURIANSKY, *Evolution & Ecology Research Centre and School of Biological, Earth & Environmental Sciences, University of New South Wales, Sydney, Australia*

EVOLUTION OF VULNERABILITY: IMPLICATIONS FOR SEX DIFFERENCES IN HEALTH AND DEVELOPMENT.

By David C. Geary. Academic Press. Amsterdam (The Netherlands) and Boston (Massachusetts): Elsevier. \$59.95 (paper). x + 411 p. + 22 pl.; ill.; species index for tables, author index, and subject index. ISBN: 978-0-12-801562-9. 2015.

The application of evolutionary biology to the study of health and disease has burgeoned within the past 20 years. This is a book not about evolutionary medicine, but about evolution and a major upstream cause of disease: stressors (such as disease, nutrition, and competition) that impact upon disease vulnerability. The volume begins from the basic premise that condition-dependent traits with a history of strong selection and elaboration will be differentially important in mediating deviations from maximal health and fitness. Most importantly, as such traits commonly differ between the sexes and with age, so also should vulnerability to stress, with strong implications for human health and well-being. How well are the predictions of this hypothesis met?

The book starts with a brief introduction to its main premise, and then launches into a set of chapters that describe condition-dependent traits in birds, fish, arthropods, and mammals, in each case evaluating the idea that a selective history of elaboration, and condition-dependence, determine levels of vulnerability in sex and age specific ways. These sections become rather encyclopedic, with many pages of tables of evidence that is consistent with the theory’s broad predictions, but sometimes in apparently simplistic ways, such as poor diet or more parasites leading to lower-fitness phenotypes. Considered together, the evidence is impressive in scope and depth, although it could more directly and thoroughly address the key ideas and their assumptions.

The next set of chapters turns to human vulnerabilities as functions of sex, age, and evolutionary histories of sexual and social selection, covering physical and behavioral human traits, as well as aspects of cognition and the brain. The same general, although not sharply defined, patterns are reported as for other animals, and implications for health, optimal development, and disease ensue. This section, taken together with the material on other animals, presents many stimulating examples, but becomes rather one dimensional in its pursuit of evidence relevant to differential vulnerabilities; a more nuanced treatment of the subject might also consider selective tradeoffs, variation in the scope for maladaptation due to sex-differential selection, reaction norms, canalization effects, and gene by environment interactions—or genes at all, for that matter, which are curiously lacking in the exposition.