covered. For example, the authors omitted discussion of what is known about the role of hormones in mate choice and species recognition. In future editions, it would be useful to include an additional coauthor (or reviewer) who has a stronger behavioral ecology research background.

Some relatively minor but worth noting shortcomings follow. First, I was disappointed to see the authors use the term "phylogenetic scale" and the description of species as lower or higher organisms instead of a reference to the phylogenetic relationships of the organisms being discussed and, hence, the evolutionary history of groups of organisms. Along these lines, I think this text would be improved by discussing findings across species with a solid evolutionary perspective. Specifically, one improvement would be the inclusion of studies that use the comparative method to examine the evolution of the role of certain hormones in behaviors across species. With that said, the authors do propose considering evolutionary links in the Questions for Discussion section at the end of the chapters. From a taxonomic diversity perspective, I also want to note that the authors rarely discuss results from research on fish and amphibians. A large body of literature exists on the endocrinological effects of steroid sex pheromones on mating behavior in goldfish but this was not discussed in the relevant chapter(s). Finally, but not unimportantly, I enjoyed learning about the pioneering scientists in this field, but found that the authors' choice of photographs of scientists was not indicative of the diversity seen in behavioral endocrinology researchers. The power of this textbook for encouraging young scientists would be heightened by inclusion of photographs of female scientists and/or scientists from other underrepresented groups in the field. Despite the above outlined shortcomings, I do think that this volume is a good jumping-off point for both undergraduate and graduate students interested in behavioral endocrinology, and I am excited to continue using the textbook in my courses.

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ANATOMY, PHYSIOLOGY, AND DEVELOPMENT

Deep Homology?: Uncanny Similarities of Humans and Flies Uncovered by Evo-Devo.

By Lewis I. Held, Jr. Cambridge and New York: Cambridge University Press. $74.99 (hardcover); $39.99 (paper). xviii + 272 p.; ill.; index. ISBN: 978-1-107-14718-8 (hc); 978-1-316-60121-1 (pb). 2017.

The subject of this volume is the genetic regulatory networks whose elements have been found to participate in structuring corresponding aspects of the body plans of both fruit flies and humans (or other chordate avatars) during development. The implication is that the reason "uncanny similarities" are observed among networks of such distantly related organisms is that they were inherited relatively unchanged from the common Urbilaterian ancestor, where they had similar functions in development over half a billion years ago. The possibility of convergence, or parallel co-option, or even "cherry-picking" of the elements of networks compared and found similar, is acknowledged in the preface and implicit in the perspicacious question mark of the title. But the proof of evolutionary continuity is left as an exercise for readers. Definition and discussion of the central concept, homology; specification of the criteria for recognizing it; and sorting out alternative evolutionary stories and functional roles for genetic components are delegated to other authors (several are cited)—or to readers.

The book provides abundant material for the task. A bibliography of approximately 2500 references fills half of its pages, the rest of which are apportioned into chapters on groups of sensory organ systems, nervous system, heart, limbs, and body axes. Like the flies that are the author's own empirical focus, the volume performs multiple functions within a compact and carefully organized format. Information is configured in four ways. First, the narrative text is engaging and lively, with often playful prose (along with classical scholars occur allusions to Tolkien or the classic horror film *The Fly*; among the many bracketed numbers citing recent publications some modern scientists are made human by mention of both first and last name). Second, figures use da Vinci's Vitruvian Man and the author's reconstruction of a "Vitruvian Fly" as icons for, respectively, the human (or mammalian or chordate) and fruit-fly conditions; tracing intricacies of genetic pathways and mapping them onto the body parts and regions they affect, charting chromosomal posi-

tions and phylogenetic distributions, these diagrams are tours de force of information design that Edward Tufte could admire (although their figure legends can fill a page). Next, "puzzle boxes" pose yet-unanswered questions (e.g., "How do flies revamp their olfactory system during metamorphosis?"; p. 110) emerging from the circuits explained in nearby text. Finally, tables summarize correspondences between flies and humans, suggesting that shared features have "conserved" mechanisms (rendered tentative with a question mark in column headers), and treating differences between vertebrates and *Drosophila* as "quirks." The rationale for using fruit flies in medical research emerges clearly.

This is a valuable compendium of research on genetic networks, targeted to an audience of students, and inviting to professional biologists. The correspondences it identifies beg tantalizing questions that require consideration of alternative roles for genes and sampling of many more taxa to trace evolutionary threads of continuity and transformation. In what sense are these correspondences "deep"? Are they phylogenetically ancient, profoundly fundamental, or just hidden? Homology is a hypothesis and an inference. Rolling readily off the tongue, the term is used widely in the world at large to refer, with unstated assumptions, to different things. In this context there is risk that in speaking of "deep homology" the question mark will be dropped, and interesting similarities will be construed as well understood. A remarkable product of scholarship and a versatile resource, this book's greatest contribution could be as a stimulus, in demanding critical assessment and calling for continuing discovery.

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EMBRYOGENESIS EXPLAINED.

By Natalie K. Gordon and Richard Gordon. Hackensack (New Jersey): World Scientific Publishing Company. $198.00. xxiii + 759 p.; ill.; index. ISBN: 978-981-4350-48-8. 2017.

VERTEBRATE DEVELOPMENT: MATERNAL TO ZYGOTIC CONTROL. *Advances in Experimental Medicine and Biology, Volume 953.*

Edited by Francisco Pelegri, Michael Danilchik, and Ann Sutherland. Cham (Switzerland): Springer. $239.00. x + 549 p.; ill.; index. ISBN: 978-3-319-46093-2 (hc); 978-3-319-46095-6 (eb). 2017.

NEUROBIOLOGY

BIG BRAINS AND THE HUMAN SUPERORGANISM: WHY SPECIAL BRAINS APPEAR IN HOMINIDS AND OTHER SOCIAL ANIMALS.

By Niccolo Leo Caldararo. Lanham (Massachusetts): Rowman & Littlefield. $100.00. xi + 269 p.; ill.; index. ISBN: 9781498540872 (hc); 9781498540889 (eb). 2017.

Brains, especially human brains, are among the most structurally and functionally complex structures ever scientifically studied. A great many unsatisfying attempts to determine basic underlying explanatory rules linking brain size with the evolution of diverse neural functions, from fundamental sensory-motor systems to behavior and cognition, have been made. Most such approaches are based on reductionism. Caldararo's holistic perspective tries to link human behavioral and cultural diversity with his personal thoughts and interpretations of the archeological record and broad swaths of comparative neuroanatomy. His goal *seems to be* to unite brain complexity and group social organization into a synthesis taken from multiple social animals, such as humans and honey bees. However, the author never once clearly states his thesis in the entirety of the book. A number of his ideas on human social behavior come from cultural anthropology, sociology, political science, urban studies, epidemiology, and criminology, fields that I admit I am less familiar with. However, Caldararo's summaries and interpretations of neuroscience are not merely wildly and bizarrely speculative, they are also easily refuted, without exaggeration, by thousands of relevant studies. In just one example, he mistakes and misinterprets functionally analogous systems in the mammal cortex and avian telencephalon, data that are available even in contemporary general science volumes and coffee-table books. He also mischaracterizes (or "straw mans") several authors as those who stated birds are "stupid" based on smaller absolute sized brains, thereby allowing ridicule by citing contemporary studies on problem-solving in corvids and other birds (which he also incorrectly describes). He cites some facts about mammalian brain size and neuron morphology and diversity that, although technically correct, appear irrelevant to his argument. Caldararo's "review" of neuroanatomy and function provides me with no confidence that he actually understands these topics.

Is this book a work of science? I would argue no. Nor can I recommend *Big Brains and the Human Superorganism* to any serious student of brain evolution.