The second part of the book takes up Major Transitions in the Evolution of the Mind. This is much more heavily scientific, dealing with the mechanics of the brain and how consciousness comes about. Particularly interesting, especially for those of us whom you might call basic evolutionists, is the penultimate chapter on the Cambrian explosion, that sudden flowering of complex forms some five hundred million plus years ago. The key finding by the authors is the development of a central nervous system. This led to biological arms races and the evolution of ever more complex forms, forms in the authors' opinion with the potential for ever more sophisticated ways of thinking—memory, imagination, and so forth. The final chapter takes up some implications, refinements, and objections.

There is a huge amount in this book, and I much suspect that anyone taking seriously the body-mind problem is going to find essential information and ideas, not necessarily always right but always stimulating. At the beginning of their work, the authors admit to having written a "rather fat book" (p. xi). It is this indeed. Sometimes, I felt that this was altogether too much of a good thing and significant pruning might have helped. To talk of my own particular area of expertise, the history of evolutionary biology around Darwin, too often I thought the authors were just skimming to get everything in and not desperately thoughtful. For instance, simply to say that Darwin was a group selectionist is to miss many subtleties in his thinking. Again, at other times, I had trouble seeing the wood for trees. Popular today, particularly by those who do take evolution seriously, is some form of panpsychism, seeing consciousness pervasive through the universe. A kind of updated monism promoted by the 17th-century Dutch philosopher Spinoza. I note that there is no reference to the late 19th-century mathematician-philosopher W. K. Clifford, who made much of the monistic implications of Darwinian theory.

I do not want to end on a critical note. This volume took many years to produce. The time was well spent.

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The Consciousness Instinct: Unraveling the Mystery of How the Brain Makes the Mind.

By Michael S. Gazzaniga. New York: Farrar, Straus and Giroux. $16.00 (paper). ix + 274 p.; index. ISBN: 978-0-374-53815-6. 2018.

In his latest book on brain-mind, the noted neuroscientist Michael Gazzaniga offers readers a new idea. Consciousness is an instinct. By instinct he means "something organisms come with" (p. 5) such as nest building by birds or mouse hunting by cats. Humans cannot help but be conscious—it "comes" as part of us. That said, the author does not believe consciousness is an ordinary instinct. Rather, he writes, "it is a slippery, complex instinct situated in the universe's most impenetrable organ, the brain" (p. 6). Viewing consciousness as instinct is not an easy task. It requires revisiting, reexamining, and reframing centuries of neuroscience and thousands of years of philosophy to escape the "quagmire" that has trapped scholars contemplating how a brain builds a mind. Gazzaniga willingly puts his shoulder to the wheel, taking readers on a wild romp through the history of philosophy, anatomy and neuroscience, evolutionary biology, semiotics, molecular genetics, quantum physics, thermodynamics, and complex systems science. Readers could not have a more erudite and genial travel companion.

In under 250 pages of text (10 chapters organized into three parts) vast amounts of information are adroitly condensed. Yet, the book feels long. More than 100 pages of setup precede the main topic moving to the fore: consciousness is not a what, not a thing, and it is not localized to some identifiable spot in the brain. Coming from a strong proponent of brain functional modularity, this assertion is startling. However, Gazzaniga offers a convincing integration of 20th-century neural modularity with 21st-century network neuroscience. That human consciousness is an emergent property of a complex system of billions of interacting cells is not novel. That consciousness is distributed across functional modules in a way that aspects of consciousness can be lost (such as in spatial neglect following stroke), while other aspects are spared (sense of self) and stitches together seemingly disparate findings from: comparative psychology and clinical neurology. His multilevel model of brain function offers not just a "big" idea—but a testable hypothesis. On reflection, perhaps the leisurely pace of argument offers respite in our tweet-stormed world.

The book chases down fascinating sidetracks that can distract from Gazzaniga's main thesis. Excursions into histogeography (English, French, German, and American studies of mind-brain), evolution, biological codes, and quantum physics could overwhelm readers not as conversant as the author in such a wide range of disciplines. Novice readers will have to rely heavily on Google for backfill while experts will have to push past the frustration of the sometimes high-level summaries of complicated science. Readers who persevere are rewarded and given much to ponder. Mostly, Gazzaniga is adept at knitting together multiple strands of knowledge but there are times when one feels like a stitch or two was dropped.

The author began with his own fascinating studies of consciousness by studying split-brain patients (severing the corpus callosum as a treatment for intractable epilepsy). First initiated in the 1960s, these studies laid the groundwork for a 60-year career

ranging far and wide in neuroscience and studies of cognition. He has a breadth and depth of vision not typical of a single scientist. Although I was not completely convinced that Gazzaniga had fully unraveled the mystery of consciousness, the book does offers a rare opportunity to experience how a pioneer in mind-brain thinks through the most perplexing question that can be asked: how the brain creates the mind. It does not disappoint.

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COGNITIVE EVOLUTION.

By David B. Boles. London (United Kingdom) and New York: Routledge (Taylor & Francis Group). $140.00 (hardcover); $54.95 (paper). xiv + 352 p.; ill.; index. ISBN: 978-0-367-02854-1 (hc); 978-0-367-02855-8 (pb); 978-0-429-02803-8 (eb). 2019.

This is an ambitious, yet concise book aimed at upper-level undergraduate and postgraduate students of evolutionary human psychology. It is presented as an *all-in-one* resource to accompany a degree course when read in its entirety, but is structured so that parts of the volume can be used in broader evolutionary/psychology courses. It is organized into three sections: Introduction to Evolution; Sensation and Movement; and Perception and Cognition. Throughout the book, human cognitive traits are discussed in an evolutionary context—a framework rarely used in psychology courses.

A wealth of topics is packed into fewer than 300 pages of text: from an outline of theories of how life began on Earth in Chapter 1 to an exploration of human consciousness in Chapter 16. In between, Boles covers single-celled to multicellular organisms, human evolution, the cellular mechanisms underpinning sensation, the evolutionary trajectory of motion and a range of cognition topics, such as tool use, memory, and language. Each chapter begins with a general introduction, followed by specific theories often accompanied by simple visual aids and empirical support in the form of tables or figures. The inclusion of strong images complements the wealth of information and helps to break up sometimes complex sections of text. The result is a book that is an enjoyable and digestible read.

The author reminds readers to avoid common misconceptions in evolutionary theory, such as thinking of evolution as "intentional" or "directional" and also warns against overinterpreting findings. These are useful tips for budding scientists.

This volume has been well researched and is clearly the product of many years of shaping. But with its staggering diversity of topics, it is no surprise that some areas are more detailed than others and that a few errors have slipped in. When discussing the divergence of hominins from other primates, for instance, humans are described as *hairless* in comparison to their primate relatives. This is a fallacy: there is no significant difference among primates (including humans) in hair follicle density. However, this publication should still serve students as the "go-to" book in their studies.

I was slightly disappointed to read early on that the volume was "unabashedly anthropocentric" and that studies on nonprimate taxa would not be featured. It is the comparison with more distantly related taxa that provides insights into not only the primitive state but also the ecological drivers of particular cognitive abilities. But, to my delight, a few studies on nonvertebrate and nonprimate vertebrate cognition appear in the final section, making this a well-rounded volume.

The evolution of human cognitive traits is a vast subject and I commend Boles on the recency of the literature cited and for the overall flow between the different sections. *Cognitive Evolution* will be a useful and important resource for students of evolutionary psychology. I think back to my days as an undergraduate student when the opportunity to buy a single textbook that encapsulates the main themes of the course, as this volume does, would have been very welcome.

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CELL AND MOLECULAR BIOLOGY

MOLECULAR AND CELLULAR BIOLOGY OF VIRUSES.

By Phoebe Lostroh. A Garland Science Book. Boca Raton (Florida): CRC Press (Taylor & Francis Group). $128.00 (hardcover); $63.96 (paper). xxi + 501 p.; ill.; index. ISBN: 978-0-3670-7632-0 (hc); 978-0-8153–4523-7 (pb). 2019.

This textbook is geared toward undergraduate students interested in virology. Teaching virology to undergraduates is a challenge as it requires both a broad knowledge base and depth of information about each system. Moreover, students must have a reasonable understanding of molecular biology and cell biology. The author uses her experience in teaching to an undergraduate audience in mind to tackle teaching virology. She emphasizes the important takeaways without getting bogged down in a lot of detail that invariably troubles most students. This is accomplished by combining straightforward, easy-to-read text with simple, yet informative diagrams. I particularly appreciate the numerous diagrams in each chapter. Unlike textbooks that are for more advanced readers, these illustrations only contain the necessary information. For example, while describing a signaling pathway, not all of the