

about all things evolutionary, and is separated into thematic chapters. Chapter 1, Evolution and Natural Selection, discusses Darwin's idea of natural selection and the evidence supporting it. Chapter 2, Evolution and Adaptation, addresses adaptation, the origin of new traits, the effects of climate, mimicry, and more. The next chapter, Evolution and Genetics, starts with Mendel's laws of inheritance, and explores genetic and nongenetic inheritance. Chapter 4, Evolution of Life, looks at the origin of life, the evolution of bacteria and viruses, and the appearance of multicellular organisms. The fifth chapter, Evolution of Species, begins with the question "What is a species?" and then turns to speciation, extinction, and genetic diversity within species. Chapter 6, Evolution of Complexity, examines food webs, ecosystems, and sexual reproduction.

The second half of the volume turns to evolutionary topics more in line with the author's specialization in human evolution. Chapter 7, Evolution of Humans, starts with the ancestors of humans, and turns to Neanderthals, racial differences, language, and ongoing human evolution. The following chapter, Evolution of Behavior, examines altruism, cooperation, and mating systems. Chapter 9, Evolution of Sociality, discusses group living and group size, social life and brain size, group bonding, and deception. The last chapter, Evolution of Culture, addresses the evolution of culture, differences in human cultures, the possibility of nonhuman cultures, music, and religion.

This is an enjoyable, well-written book packed with interesting facts and theories about evolutionary processes and history. Unsurprisingly, given Dunbar's expertise, the last half of the volume on human evolution is the most satisfying. As a whole, the book is best suited for well-educated nonexperts. There are no citations here, so one could not follow up on the information presented for more detail. Rather, at the end of the volume there is a short list of "further reading" for each chapter. And often these reading lists do not contain what might be regarded as the most important and relevant sources. For instance, in the chapter on species, the author discusses the nature of species in ways that indicate little familiarity with the recent species debate, and lists only Ernst Mayr's out-of-date *The Growth of Biological Thought: Diversity, Evolution, and Inheritance* (1982. Cambridge (MA): Belknap Press) as further reading. Historians will likely quibble with this book in other places as well. For instance, Dunbar claims there is an implicit theory of evolution in the idea of the "Great Chain of Being" (p. 11). And he uses the term "genetically inherited" to describe Darwin's views on inheritance, even though Darwin could not possibly have used that terminology. One might also be dissatisfied with the discussion of group selection that ignores the recent debates about group and multilevel selection. Even with these quibbles,

this volume is worth a read for a comprehensive introduction to evolution and human nature.

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URBAN EVOLUTIONARY BIOLOGY.

Edited by Marta Szulkin, Jason Munshi-South, and Anne Charmantier. Oxford and New York: Oxford University Press. \$100.00 (hardcover); \$49.95 (paper). xiv + 303 p.; ill.; index. ISBN: 978-0-19-883684-1 (hc); 978-0-19-883685-8 (pb). 2020.

The study of urban evolutionary biology has rapidly expanded in recent years, with the vast majority of publications appearing in the last decade. To our knowledge, this edited volume is the first on this topic and it examines the current evidence that the evolution of genes and traits of organisms has been influenced by urban environments. The book includes 16 chapters that explore broad concepts in evolutionary biology (e.g., gene flow, genomics, parallel evolution, coevolution, sexual selection, metacommunity evolution), trait evolution (e.g., physiology, locomotion, cognition, life history), or unique habitat features (e.g., urban heat islands, aquatic environments) in urban environments. Each chapter is an independent, stand-alone article summarizing potential predictions for how evolutionary processes might be affected by urbanization, reviewing relevant existing empirical data, and making recommendations for further research.

A major theme across the chapters is the early stage of the field, and the limited number of studies addressing any specific topic to date. Current empirical results often conflict with one another or do not fit simplistic predictions about the effects of urbanization on evolution. We felt that chapters on gene flow, sexual selection, and cognition offer particularly substantive recommendations for refining the field. Nearly every chapter calls for more careful examination of how urban settings present unique environments, and one chapter is devoted specifically to this issue. These discussions are valuable for anyone considering future research in the field.

The absence of some topics is also notable. No chapter addresses urban microbial evolution specifically, and microbiota are discussed only briefly in two chapters. Microbes and microbial communities are important study systems in evolutionary biology, and increasingly recognized as critical to the functioning of other species and entire ecosystems. Another aspect of urbanization that merits more attention is the role of direct human interaction in shaping the urban selective environment. Human presence and population density are both everywhere and nowhere in the book, influencing many aspects of urban evolution without being discussed directly. The volume does end with a provocative

chapter focused on how urbanization has affected human evolution (i.e., how humans have altered selection on themselves), and notably this chapter does not discuss important issues regarding the use of polygenic scores and the biases that these methods can propagate.

The chapters are written for a scientific audience with an existing foundation in evolutionary biology. We read the book with a group of early-stage graduate students, and our readers found some material challenging but could follow the general arguments throughout. Many chapters also assume some background in the more established field of urban ecology, which provides context for how urban environments might be unique. In summary, we find the volume to be a valuable resource for summarizing the current state of urban evolutionary biology and helping future researchers to develop new questions that will expand this growing field, particularly given that all ecosystems are increasingly altered human activities.

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GREAT ADAPTATIONS: STAR-NOSED MOLES, ELECTRIC EELS, AND OTHER TALES OF EVOLUTION'S MYSTERIES SOLVED.

By Kenneth Catania. Princeton (New Jersey): Princeton University Press. \$27.95. vii + 199 p. + 11 pl.; ill.; index. ISBN: 978-0-691-19525-4 (hc); 978-0-691-20955-5 (eb). 2020.

In this volume, MacArthur and Guggenheim fellow Kenneth Catania reveals how curious creatures outsmart and outpace their prey. Electric eels jolt small fish into revealing their hiding locations with an electrically forced body twitch. Tentacled snakes trick their small prey fish into swimming into open jaws by exploiting the prey's hardwired escape reflex. Star-nosed moles use their funny nose appendages to feel and snuffle down invertebrate prey faster than any animal in the world. Water shrews smell prey underwater and in stereo by blowing air bubbles and sniffing them back in before they break loose (I have to try this). Water shrews also have the fastest feeding reflexes of any vertebrate: the author explains how tiny simple brains can respond faster than big, complex ones, a property more familiar to designers of smart machines. He concludes with a detailed account of how the jewel wasp turns cockroaches into zombies.

Catania also explains the extraordinary behavior of ordinary creatures. Naturalists and fishermen know that nightcrawlers rocket to the surface when bait collectors vibrate a wooden stake pounded into the soil, but the author figured out why: earthworms

panic when they sense the digging vibrations of the common eastern mole. His latest interest is how the humble cockroach manages to fight back against zombie-making parasitoids, succeeding 60% of the time through innate mastery of cockroach kung fu.

Throughout the chapters, QR codes instantly link the reader's smartphone to Catania's excellent high-speed videos. Many of these will be familiar to readers of his papers in *Nature*, but to those new to his work surprise and delight awaits in each one.

A lagniappe is the author's fondness for historical archives. For each of these animals he provides the fascinating background story of partial discovery, often with a mystery lying unsolved, waiting for the right, curious naturalist to follow up with the right questions asked in the right way. Catania has proven both the interest and the knack for picking up a cold trail. He successfully followed up on Alexander von Humboldt's famous but apocryphal account of electric eels leaping out of the water to attack horses. To my retrospective horror, the author shows that von Humboldt got it right. I have been zapped by more than my fair share of electric eels but thankfully missed out on the leaping frontal attack.

Explaining the needed scientific background at the right level for all likely readers is a particularly hard task, and here Catania does better than some of my favorite scientists and science writers. By focusing on what he, as an experienced instructor of undergraduates, assumes will confuse novice readers, the author covers the necessary background with just enough detail and without being pedantic. My architect wife and I alternated reading chapters aloud on a road trip; she enjoyed the stories as much as I did, and often with much surprise since she was hearing them for the first time.

Catania has worked to balance the self-congratulatory joy of his many successes with accounts of the inevitable dead ends and rejected hypotheses, as well as the recognition that enthusiastic scientists inevitably appear eccentric to the rest of the planet. Here he mostly succeeds, although that task is easier for a circumspect biographer than any autobiographer.

Great Adaptations joins my two other favorite accounts of scientific discovery, Vincent G. Dethier's classic *To Know a Fly* (1962. San Francisco (CA): Holden-Day) and Jonathan Weiner's *Time, Love, Memory: A Great Biologist and His Quest for the Origins of Behavior* (1999. New York: Knopf). Although the current volume holds together, it differs from these others in that the sections on each creature can also stand alone, a structure that makes this book particularly well suited for supplemental reading in classes on animal behavior, sensory biology, or neurobiology. I think individual sections would be superb for generating excitement in the process of scientific discovery among introductory biology students, especially those who are