Remarkable Creatures: Epic Adventures in the Search for the Origins of Species

Author: DeWoody, J. Andrew

Source: BioScience, 61(2) : 154-155

Published By: American Institute of Biological Sciences

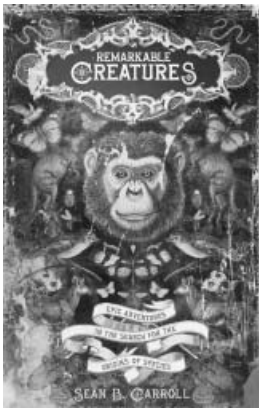
URL: https://doi.org/10.1525/bio.2011.61.2.11

Transformational Discoveries and Paradigm Shifts in Evolutionary Biology

Remarkable Creatures: Epic Adventures in the Search for the Origins of Species. Sean B. Carroll. Houghton Mifflin Harcourt, 2009. 352 pp., illus. $26.00 (ISBN 9780151014859 cloth).

Sean B. Carroll is a professor of molecular biology and genetics and an investigator with the Howard Hughes Medical Institute at the University of Wisconsin. He is also a prolific writer, and has written or coauthored many research papers, textbooks, and popular science books. In *Remarkable Creatures: Epic Adventures in the Search for the Origins of Species,* Carroll sets out to "bring to life the pursuit and the pleasure of scientific discovery, at the same time capturing the significance of each advance for evolutionary science." The book consists of three sections: evolutionary origins of species in general (part I), of particular kinds of animals (part II), and of humans (part III). I found this level of organization unnecessary, as there are only 13 chapters and each is quite short, but in any event, the individual chapters are engaging and lead the reader smoothly from one to the next. Carroll cherry-picks from the rich literature in natural history and evolutionary biology, with a lighthearted approach that I found clever and entertaining (e.g., the section on p. 139 about the Mongolian expedition titled "Snakes on a Plain," a tongue-in-cheek reference to a recent Hollywood movie).

Carroll portrays a number of major scientists and their respective discoveries in evolutionary biology. These include Alexander von Humboldt (natural history), Charles Darwin (natural history and evolution), Alfred Wallace (evolution and biogeography), Henry Bates (the naturalist of mimicry fame), Eugéne Dubois (paleontology), Charles Walcott (geology and paleontology), Roy Andrews (paleontology), Luis and Walter Alvarez (physics/geology), John Ostrom (paleontology), Neil Shubin (paleontology), Louis and Mary Leakey (paleontology), Linus Pauling (molecular biology), Allan Wilson (molecular biology), and Svante Pääbo (molecular biology). In each case, Carroll begins by summarizing the state of evolutionary biology at the time, the entrance of our hero or heroine onto the scene, their evidence and how it overturned the prevailing dogma, and, on a few occasions, a brief view of the aftermath following their respective discoveries. Carroll does all this deftly and concisely; the text flows steadily and never loses momentum.



Like lineages, scientific ideas can be represented by evolutionary trees. Some ideas bloom but sooner or later are pruned by the scientific community. Other ideas persist and spawn many descendants, and these radiation events are the "punctuation" in the punctuated equilibria that represent the progress of science. Carroll picks some of the major coalescent events in the tree of evolutionary ideas and describes the evidence behind these paradigm shifts while characterizing the scientists behind these revolutionary ideas and discoveries. One could quibble with Carroll's choice of nodes in the tree, but overall I think his list of luminaries is as encompassing as can be expected in a book of this size and scope. If some well-known evolutionary exemplars are given short shrift (such as adaptive radiations of cichlids or Hawaiian *Drosophila*), it is in favor of less known or more recent examples (such as the transitional "fishapod" *Tiktaalik*) that are equally compelling in their own right.

A book that simply described the scientific evidence associated with major discoveries in evolutionary biology could turn out to be as dry as a fossil, but Carroll avoids this by presenting the scientific evidence in terms of each case's broader circumstances (financial, logistical, academic, etc.). He does a splendid job of summarizing the human aspects of science as well as the interchange among scientists. One example is the section titled "Priority and Posterity," which describes the correspondence between Wallace and Darwin about natural selection. The grace and deference displayed by Wallace toward Darwin, and the lifelong friendship that developed between the men, is vividly described in just a few pages. Carroll exhibits the pithiness of a good author, which makes his book easy to read.

Carroll has also recognized that many other fine writers have already made some of his points for him, and the book is sprinkled with quotations from scientists (Darwin, Galileo, Newton), poets (Emerson), and philosophers (Aristotle, Franklin, Voltaire). Carroll shows a knack for choosing wonderful quotations, such as the one about explorers by Mark Twain at the beginning of the book, or the one by Bates (p. 71): "It may be said, therefore, that on these expanded membranes nature writes, as on a tablet, the story of the modifications of a species." I have never read Bates's original writings, and I find it fascinating to read such snippets by pioneers in our field.

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Some readers may find it slightly surprising that this book about remarkable creatures and their natural history was written by a molecular biologist. The divide between organismal and molecular biologists has fractured a number of prominent academic departments over the last two decades, and I find it reassuring that a prominent molecular biologist such as Carroll recognizes the role that natural history has played in the development of modern biology. This illustrates an implicit point of Carroll's—evolution is a unifying theme throughout biology, whether one speaks of remarkable creatures themselves or their molecular underpinnings.

Before reading this book, I was a bit skeptical that a molecular biologist could effectively capture the essence of early naturalist expeditions such as those by Humbolt, Darwin, Wallace, Bates, and others. I had little doubt that Carroll would do justice to the more recent (molecular) work of Linus Pauling, Allan Wilson, and Svante Pääbo, but how could a bench scientist such as Carroll appreciate African expeditions, seasickness, tropical diseases, and the other trials and tribulations of field work? In fact, Carroll does so masterfully. Furthermore, I think it is the very juxtaposition of fieldwork (by naturalists and paleontologists) with laboratory work (by geophysicists and molecular biologists) that makes this book so persuasive. The evidence for evolution comes from many scientific disciplines, and Carroll covers each of them—and spins a good yarn while doing so.

Remarkable Creatures is relatively small, with an attractive layout and a pleasant font. I love the beautifully designed and illustrated dust jacket, which depicts a diverse mural of plants and animals on tattered parchment. The book contains a captivating diversity of figures (photographs, portraits, drawings, maps, etc.); unfortunately, the publisher's rendering of many is subpar. Some figures (e.g., 9.4) appear as though they were printed on an old dot matrix printer; perhaps the quality can be improved in subsequent printings.

In summary, this book is a genuine pleasure to read. I think this is evidenced by its popularity with the general public and the various accolades it has garnered (e.g., a finalist for the National Book Award). I highly recommend *Remarkable Creatures* to anyone interested in science.

J. ANDREW DEWOODY
J. Andrew DeWoody (dewoody@purdue.edu) is a professor and University Faculty Scholar in the Departments of Forestry and Natural Resources and in Biological Sciences at Purdue University in West Lafayette, Indiana.

SMALL, WARM, AND FUZZY

The Biology of Small Mammals. Joseph F. Merritt. Johns Hopkins University Press, 2010, 336 pp., illus. $60.00 (ISBN 9780801879500 cloth).

At least 90 percent of the 5416 known species of living mammals are "small." They are cosmopolitan in distribution and the subjects of extensive research, most notably as model organisms in medical research. Because they are often common members of their communities, they frequently play major roles in the structure and function of community systems. Furthermore, they can invade agricultural crops and carry diseases transmitted to humans.

The Biology of Small Mammals provides an overview of the diversity of life histories exhibited among small mammals, and thereby promotes increased interest, appreciation, and understanding of these creatures that impinge so much on human life. Author Joseph F. Merritt, a senior mammalogist with the Illinois Natural History Survey (University of Illinois, Urbana), is a respected scientist with many years of experience researching these interesting and important organisms. His book aims for a "broad readership" ranging from amateur naturalists and students to wildlife professionals (p. xi, xiii). He makes no pretense to be comprehensive but writes engagingly about the species he simply finds particularly unusual or informative. He defines "small mammal" as those species weighing 5 kilograms (11 pounds) or less; however, most appropriately, he ignores this arbitrary boundary whenever it seems sensible to do so.

After an introductory chapter that lays out the scope and context of the book, Merritt divides 12 additional chapters into three parts: "Modes of Feeding," "Environmental

Adaptations," and "Reproduction." These chapters are followed by a one-page list of useful Web sites, a 10-page glossary, literature cited, and an index (17 pages). Some organizational anomalies occur, but this is not surprising since life histories resist being compartmentalized according to just one or a few of their attributes.

The Biology of Small Mammals has many important strengths: (a) In most cases, chapters begin with a brief overview of the taxonomic context of the chapter's subject matter; (b) Merritt often provides a welcome historical context for the topic being discussed; (c) the information is up to date, an example being the discussion of the white-nose syndrome currently devastating bats in

doi:10.1525/bio.2011.61.2.12