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THE RISE OF MARINE MAMMALS: 50 Million Years of Evolution by Annalisa Berta. Baltimore, MD: Johns Hopkins University Press, 2017. 212 pages, including contents, preface, acknowledgments, and index. Hardcover; \$75.00. ISBN: 9781421423258.

Evolutionary transitions between terrestrial and aquatic environments have long fascinated evolutionary theorists. Going back to Darwin, biologists have recognized that evolution by common descent implies that all aquatic mammals—including modern whales, seals, manatees, and otters—must have descended from mammalian ancestors that were terrestrial. Such a situation poses a challenge for evolutionary theory, due to the fact that creatures living on land are under very different constraints and pressures than creatures living in the water. Thus, any proposed evolutionary transition between terrestrial and aquatic environments would necessitate a virtual overhaul in anatomy to accommodate such a profound shift in ecology.

For many years, these large-scale evolutionary transitions were poorly understood. However, in recent decades, the fossil record has allowed us to achieve a much greater understanding of how various groups of mammals have taken to life at sea. The evolution of cetaceans—including whales, dolphins, and porpoises—from terrestrial hooved mammals has become a sort of poster child for this type of evolutionary change, and rightly so. The fossil record documenting the origins of these creatures has exploded since the late 1970s, allowing paleontologists to reconstruct at high levels of detail how the earliest four-legged cetaceans adapted in various ways for life in water. But as much as this fascinating case study deserves the attention it has received, it is also important to recognize that cetaceans are only one of at least seven different groups of mammals who have returned to the sea from whence their ancient tetrapod ancestors came.

In *The Rise of Marine Mammals: 50 Million Years of Evolution*, paleontologist Annalisa Berta details the wide variety of mammals that have made a living in the world's oceans. Berta, who is emerita professor of biology at San Diego State University and former president of the Society of Vertebrate Paleontology, has spent her career studying the evolution of marine mammals, particularly pinnipeds—including seals, sea lions, and walruses—and cetaceans. She has written or cowritten multiple books about marine mammal history and biology. First and foremost, she is coauthor of the popular *Marine Mammals:*

Evolutionary Biology textbook, now in its third edition, which is aimed at upper-level undergraduate students, graduate students, and professionals studying marine mammals. She has also written *Whales, Dolphins, and Porpoises: A Natural History and Species Guide*, which provides a comprehensive overview of the most diverse marine mammals in our oceans today. In 2012, she published *Return to the Sea: The Life and Evolutionary Times of Marine Mammals*, a book aimed at nonscientists that serves as a primer on many aspects of marine mammal evolution and ecology. *Return to the Sea* is full of wonderful grayscale photos and illustrations that nicely supplement the well-written prose. However, given the intended audience for this book, citations and references to primary literature are conspicuously absent, and the list of resources for further reading is very short. With *The Rise of Marine Mammals*, Berta takes a different approach, filling in the gap between her exhaustive academic textbook and her nontechnical treatise with an easy-to-read, lavishly illustrated book that provides ample details and resources for further exploration about the fossil record of marine mammals.

What the reader immediately notices when flipping through the book for the first time is all of the beautiful, full-color photos and illustrations. Many of these illustrations are life reconstructions of key fossils from noted artists, while others are figures from the primary scientific literature. There are also many photos of researchers excavating fossils in the field and working with them in museums. In a sense, given the quality and abundance of images on virtually every glossy page, this could be considered a coffee table book.

However, this assessment would sell the book short, as there is also so much valuable scientific information that is summarized clearly and concisely in the text. In the opening chapter, Berta sets the stage for the rest of the book, discussing how she aimed to present the fossil record of marine mammals in the context of major events in Earth history, while highlighting how advances in scientific research capabilities have enhanced the study of marine mammal evolution. She covers some of the basics of naming, classifying, and describing species; how fossils are discovered, collected, and prepared; and some basic geological principles that are necessary for providing important context for fossils, using helpful examples to clarify each of these concepts along the way.

The next five chapters focus on the fossil records of every group of marine mammals. Beginning chronologically with the oldest fossils, chapter 2 discusses the origins of cetaceans and sirenians, which include

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modern manatees and dugongs, during the early Eocene epoch around 50 million years ago, mostly focusing on ancient, four-legged cetaceans called archaeocetes. Here, Berta deftly weaves historical narratives and the work of specific researchers into descriptions of key fossils and their characteristics. This pattern, which continues in subsequent chapters, effectively integrates the scientific process of discovery into the encyclopedic knowledge of marine mammal history. Chapter 3, the longest chapter in the book at 56 pages, continues to focus on cetaceans, discussing many of the trends that arose after cetaceans were living full time in the water, and elucidating the details of every group of cetaceans that has existed, including both toothed whales and baleen whales. In chapter 4, Berta moves on to discuss her other main area of expertise: the evolution of pinnipeds. She discusses all major groups of pinnipeds, both living and extinct, in a fair amount of detail, as well as highlighting different hypotheses for how all of these different groups are related to one another. Chapter 5 discusses later sirenians, which were first introduced in chapter 2, along with a completely extinct group of marine mammals called desmostylians, which were plant-eating, hippo-sized mammals that were restricted to the northern Pacific Ocean during the late Oligocene to middle Miocene epochs about 10–30 million years ago. Chapter 6 rounds out the roster of marine mammals, including discussion of polar bears, sea otters, and a radiation of extinct marine sloths from South America.

Berta concludes the book in chapter 7 with a discussion of how climate and human activity have affected the diversity of marine mammals through time. Topics include climate-related shifts in geographic distribution, the effects of habitat loss, and changing food webs. She also discusses the impetus for studying the dynamics of marine mammal evolution through time, as this work provides valuable information for helping us to evaluate the ecological changes we see happening in the world's oceans today. Following this concluding chapter, there are 20 pages that provide an exhaustive list of marine mammal taxa, a three-page glossary, 14 pages of references to the primary literature (sorted by the chapter in which they were cited), and a six-page index.

Throughout the book, Berta's expertise is on display, showing an excellent grasp of both older and newer literature for all groups of marine mammals. There are a few minor errors in figures related to labeling phylogenetic trees, but most of the summaries are accurate, fair, and up-to-date. However, the way this book handles contentious issues among marine mammal paleontologists is a bit uneven. For instance,

her discussions of pinniped relationships do a nice job of describing competing hypotheses and areas of uncertainty, whereas interpretations of swimming behavior in some key early cetaceans are presented uncritically despite the fact that there is some debate in the literature.

But these minor quibbles do little to detract from this book's strengths. *The Rise of Marine Mammals* covers the breadth of marine mammal evolution while highlighting the key details. It discusses what we can learn from the fossils within a context that makes the reader feel as if he or she is part of making these discoveries. In exploring the changing ecologies of marine mammals over the past 50 million years, Berta provides insights into the dynamics of our world's oceans, both past and present. This visually stunning, yet informative, book should serve to inspire its readers—not only to give them a sense of awe and wonder at the marvelous diversity of marine mammals in eons gone by, but also to push them to preserve and steward the remarkable creatures that live in our seas today.

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THE CARBON CODE: How You Can Become a Climate Change Hero by Brett Favaro. Baltimore, MD: Johns Hopkins University Press, 2017. 220 pages. Hardcover; \$22.95. ISBN: 9781421422534.

The Carbon Code is a manual for action. Chapter 1, "The Cost of Carbon," gives a quick overview of the indisputable reality of human-caused climate change and its various effects on planet Earth. The rest of the book focuses on what we, mainly as individuals, can do to solve the problem. Chapter 2, "Solutions Start with You," defends the idea that the cumulative impact of many individuals is significant. The middle section covers personal electricity use (chap. 4), transportation (chap. 5), diet (chap. 6), and long-distance travel (chap. 7), with practical tips for reducing one's carbon footprint. The last section is "Sharing the Carbon Code." In "Winning the Conversation" (chap. 8), Favaro gives tips for communicating with friends, family, coworkers, and community members about climate change and what we can do about it, culminating with a case for running for public office in order to advance the cause. Chapter 9, "Policies for a Pro-climate Future," outlines nine policies that climate change heroes should advocate: (1) a carbon tax or cap and trade price on carbon; (2) tougher regulations and the elimination of coal; (3) making climate change a priority in public policy; (4) eliminate fossil