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Book Review of Serendipity: An Ecologist's Quest to Understand Nature

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Book Review of *Serendipity: An Ecologist's Quest to Understand Nature*

Abstract

A common thought among graduate students is: "how do established scientists get where they are today?" In *Serendipity: An Ecologist's Quest to Understand Nature*, James Estes offers a personal reflection on research experiences spanning his 50-year career, beginning as a Ph.D. student in 1970 and concluding with recognition as a member of the National Academy of Sciences in 2014. Estes chronologically outlines the foundational trophic cascade ecology research that he and colleagues conducted in the Aleutian Islands, examining key relationships among kelp forests, sea otters, sea urchins, and killer whales through anecdotal stories of achievement and challenge. Estes' 3 main goals in writing this book are to: (1) recount what he had learned from 50 years of research; (2) provide a larger story of how predators and prey interact with one another; and (3) explain how science "really happens."

Disciplines

Ecology and Evolutionary Biology | Horticulture | Natural Resources Management and Policy

Comments

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adaptations they demonstrate are described in detail and the energetic, water balance, and metabolic consequences considered. Special sections review adaptations of mammals to living at high altitudes, and those that dive or burrow. The concluding part of the chapter considers specialized locomotion modes such as cursoriality and brachiation. Bats receive considerable attention with respect to their adaptations for flight and its consequences for their metabolism, body temperature regulation, and digestive, respiratory, and circulatory systems. Finally, unusual types of food and adaptations for processing plant material are reviewed with attention to different anatomical and biochemical adaptations for mammal digestion.

The penultimate chapter outlines various approaches and techniques to the study of mammal physiology; this chapter covers a broad range of methods including phylogenetic, metabolic (energetic), circulatory, and molecular approaches. The increasing use of isotopes in free-living mammals enabling studies of water turnover and diet in the field is reviewed. Finally, thermal imaging and radiotelemetry facilitate the study of not only heat loss and body temperature in the field, but also animal movements and habitat use.

The short last chapter on conclusions and future directions emphasizes the importance of physiological studies for conservation biology and for predicting the consequences of ongoing climate change on mammal ranges. Phenotypic plasticity and epigenetics may also be investigated using physiological methods. The last part of this chapter suggests that agriculture and veterinary science may also benefit from physiological studies of mammals that investigate their responses to environmental change.

The book is remarkably free of errors; only a few typos and missing references were noted. This volume seems unsuited for a 1-semester course in physiological ecology; there simply is too much material, and topics are not always presented in a logical order within some chapters. Nevertheless, as a general reference book, this volume contains an enormous amount of recent information that enables the reader to gain a comprehensive understanding of the physiology of mammals, and hence, belongs on your shelf. Physiological ecology has come a long way since Per Scholander, Knut Schmidt-Nielsen, and Max Kleiber!

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Serendipity: An Ecologist's Quest to Understand Nature

Estes, J. A. 2016. *SERENDIPITY: AN ECOLOGIST'S QUEST TO UNDERSTAND NATURE*. University of California Press, Oakland, California. ISBN: 978-0-520-28503-3 (hard cover), 256 pp. \$29.95.

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A common thought among graduate students is: “how do established scientists get where they are today?” In *Serendipity: An Ecologist's Quest to Understand Nature*, James Estes offers a personal reflection on research experiences spanning his 50-year career, beginning as a Ph.D. student in 1970 and concluding with recognition as a member of the National Academy of Sciences in 2014. Estes chronologically outlines the foundational trophic cascade ecology research that he and colleagues conducted in the Aleutian Islands, examining key relationships among kelp forests, sea otters, sea urchins, and killer whales through anecdotal stories of achievement and challenge. Estes' 3 main goals in writing this book are to: (1) recount what he had learned from 50 years of research; (2) provide a larger story of how predators and prey interact with one another; and (3) explain how science “really happens.”

This review of *Serendipity* was part of a graduate seminar course offered at Iowa State University. Seminar participants included Ph.D.- and M.S.-level students studying ecology and natural resource management, as well as research faculty. The diverse background of our reviewer group facilitated discussion that included numerous perspectives. Our discussions primarily focused on 2 broad arenas including scientific questions and design of Estes' research, and parallels between Estes' experiences with those commonly faced by graduate students. For the purpose of this review, we dissected the book into 4 major subsections. The first section consists of chapters 1 through 5, in which Estes introduces the reader to the Aleutian archipelago system. Chapters 6 through 9 and chapter 13 focus on sea otters and trophic cascades as well as “knock-on” effects of sea otters on foxes and birds. In chapters 10 through 12, Estes recounts the development of and subsequent controversy surrounding the megafaunal collapse hypothesis. Finally, chapters 14 through 16 revisit the main “take home messages” paired with insight into the future. Although we discussed a variety of opinions throughout our chapter discussions, we were able to reach consensus about what we thought were both the strengths and weaknesses of the text.

In chapters 1 through 5, Estes explains his motivations for publishing this book and describes his intended audience of students and young scientists. These chapters provide a glimpse into the beginnings of Estes' lifelong research in the Aleutian Islands. He describes the trials and tribulations he faced in designing his initial research question, as well as the evolution of scientific plans and research questions over time. Additionally, Estes notes the importance of collaboration and working through adversity in

field research. Within this section, he identifies biotic and abiotic factors that make the Aleutians an ideal study system, coupled with an emphasis on challenges associated with studies of complex ecological systems as it pertains to contrasts between the concepts of bottom-up versus top-down trophic dynamics.

Chapters 6 through 9 and chapter 13 focus on Estes' foundational top-down trophic cascade research on sea otters, kelp forests, and sea urchins, and other species through "knock-on" effects (e.g., seagulls, fish, foxes, other sea birds, and bald eagles). Throughout these chapters, Estes recounts his methods for data collection and analysis, coupled with discussions about dealing with uncertainty and criticism. Bold yet insightful take-away messages from this section with respect to careers in science include: "the greatest danger in science is falling in love with one's own ideas" (p. 60), and "take advantage of that which you will never anticipate in the beginning" (p. 82).

In chapters 10 through 12, Estes discusses his controversial investigation into the decline of sea otters in the Aleutians from predation by killer whales in the mid-1990s. Using the same systematic approach described in earlier sections, Estes uses the weight of evidence to pare down multiple alternative hypotheses, ultimately giving rise to the controversial megafaunal collapse hypothesis. Estes noted intense backlash from the marine mammal scientific community to this idea. However, by recounting this experience, he highlights some of the challenges associated with defending one's own scientific reputation along with providing insight as to how political and economic influences can cause scientists to redirect their research program.

The final section consists of the last 3 chapters, in which Estes revisits the 3 broad purposes of the book, which are to: (1) recount what he had learned from 50 years of research, (2) provide a larger story of how predators and prey interact with one another, and (3) explain how science "really happens." This section provides a vision for the future direction of trophic cascade research and its implications for ecosystem management.

Over the course of numerous discussions, our group of reviewers noted several strengths of the book. A strong personal voice and ability to connect with the reader enable Estes to make his research accessible to a broad audience. The inclusion of a glossary and visual displays of major research findings through figures and flow charts address a breadth of potential learning styles among readers. Estes' ability to logically and simply explain his scientific methods and reasoning gives readers a clear understanding of his scientific approach. Lastly, his frequent acknowledgment of the roles of graduate students and collaborators, explicit emphasis on potential biases, and his efforts to describe issues from multiple perspectives allow Estes to share credit for the outcomes of this work.

On the other hand, weaknesses of the book include the perceived message that many of Estes' research questions had to be linked in some way to sea otters. In chapter 13, the relationship between sea otters, foxes, and seagulls seemed to be weak, and the chapter itself was less well integrated into the overall flow of the book. A minor weakness is that the axes of Figure 7.2 were inconsistent with each other. Another possible weakness may be the casual tone used in Estes' references to making major scientific discoveries and publishing them in prestigious journals such

as *Nature*, as well as his glib references to submitting ideas to the National Science Foundation and the apparent ease in receiving funding to pursue them. The somewhat cavalier descriptions of these events could even be discouraging to graduate students who are struggling to establish themselves as scientists.

Serendipity has numerous lessons directly applicable to graduate students. Throughout the book, Estes described his winding career path with the message that graduate students should avoid preplanning their entire careers and that flexibility in career goals, fieldwork, finding collaborators, and choices of research questions are essential to scientific advancement. Estes' frank description of the backlash from the marine mammal research community highlights the importance of continuing one's work despite adversity and being open to redirecting research interests. His logical explanations of the reasoning applied to a variety of scientific inquiries provide graduate students with a clear view of the thought processes of an established scientist.

Serendipity: An Ecologist's Quest to Understand Nature is a good choice as a "primer" for graduate and undergraduate students, established scientists, or anyone interested in the natural sciences. From the perspective of graduate students and established scientists, *Serendipity* provides clearly understandable accounts of both triumphs and adversity faced by another professional. For undergraduate students, this book provides insight into the trials and tribulations faced by a scientist, from the potential perils of fieldwork to the inner workings of scientific inquiry. *Serendipity* provides many insightful accounts of foundational trophic cascade research that took place in the Aleutian archipelago.

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A Primate Scientist's Ethical Journey

Gluck, J. P. 2016. *VORACIOUS SCIENCE & VULNERABLE ANIMALS: A PRIMATE SCIENTIST'S ETHICAL JOURNEY*. University of Chicago Press, Chicago, Illinois, 313 pp. ISBN-13: 978-0-226-37565-6 (hard cover), \$27.50.

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We are scientists, citizens, students, teachers, and mentors. We go through graduate school, face social issues such as war and