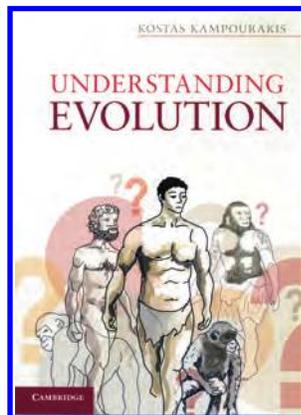


EVOLUTION



Understanding Evolution. By Kostas Kampourakis. 2014. Cambridge University Press. (ISBN 978-1-107-61020-0). 270 pp. \$34.99.

Understanding evolution is hard. In this book, Kostas Kampourakis aims to help the reader not only to understand evolution but also to understand why understanding evolution is so hard. The presentation is informed by up-to-date biology as well as by state-of-the-art historical, philosophical, and psychological scholarship relevant to the teaching of evolution, which Kampourakis masterfully summarizes and even, on occasion, extends. Helpfully, the book teems in examples, diagrams, tables, and illustrations, and is fully supplied with end-of-chapter summaries, lists of further reading, and a glossary. Ambitiously planned and carefully argued, *Understanding Evolution* is a tour de force.

Unsurprisingly, evolution itself is the focus of chapter 1. Kampourakis begins inauspiciously with a definition of evolution as “the natural process by which new species emerge as the modified descendants of pre-existing ones” (p. 1): evolution can occur without speciation resulting. But the

remainder of the chapter provides a generally unproblematic sketch of how evolutionary biology proceeds and what questions it seeks to answer; the acknowledgment of the fact that evolutionary biologists have diverse explanatory aims was especially welcome. The chapter concludes with a display of the practical importance of understanding evolution, in the form of case studies of domestication and epidemic infectious disease.

Chapter 2 is devoted to the phenomenon of religious resistance to accepting evolution. Contemporary manifestations are dismissed briskly, but William Paley’s argument for design, which influenced Darwin, is accorded a detailed analysis. Kampourakis diagnoses the appeal of anti-evolutionary religious views that, in effect, regard organisms as divine artifacts in terms of the intuitive tendency to regard organisms as artifacts, which is extensively discussed in the following chapter. The chapter ends with a comparison of the views on science and religion of Richard Dawkins, Simon Conway Morris, and Stephen Jay Gould, concluding, plausibly, that they all involve extrascientific assumptions.

The heart of the book is chapter 3, where Kampourakis identifies two conceptual obstacles to understanding evolution, which he calls “design teleology” and “psychological essentialism.” Together, these produce what he calls artifact thinking: “thinking about the parts of organisms as if they had specific intended uses” (p. 91). Reviewing the relevant psychological literature, Kampourakis argues that artifact thinking is a powerful obstacle to understanding evolution and discusses the sort of conceptual change required to overcome it. Chapter 4 provides a case study with a careful analysis of the conceptual changes in Darwin’s thinking before the publication of the *Origin*.

Throughout the book, Kampourakis emphasizes the ability of evolutionary theory to explain both the unity and the diversity of life. Chapter 5 addresses the unity of life, with detailed discussions of the evidence for the unity of life, homology and homoplasy, and evolutionary developmental biology. Chapter 6 addresses the diversity of life, discussing evolutionary change under two rubrics, natural selection and stochastic processes like genetic drift, before turning to macroevolution. In a concluding section, Kampourakis describes the virtues of evolution as a scientific theory and articulates the philosophical questions that it cannot answer, ending with a profession of his personal views.

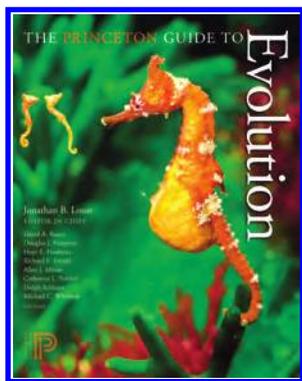
In general, *Understanding Evolution* offers a thorough and thoughtful treatment of its topics. In such a book with so ambitious a goal and so comprehensive a range of topics, however, it would be surprising if any reader could not find occasion for quibbling. I found the suggestion, in chapter 2, that squabbles over the religious implications of evolution would be defused if the partisans distinguished between what they know and what they believe to be unhelpful. The partisans understand the distinction, after all, but they disagree with Kampourakis about which of their views qualify as knowledge and which constitute only belief.

Be warned that the book is heavy on theory and light on practice. A teacher seeking advice about how to teach evolution effectively will not find it here and would do better to peruse Lee Meadows’s *The Missing Link* or the (unrelated) Understanding Evolution website (<http://evolution.berkeley.edu>). Even a reader not in need of such advice will find that the complicated material is often presented in so compressed a state that it is difficult to understand without the aid of a knowledgeable guide. But for the right

reader, *Understanding Evolution* will be eminently useful. It deserves to become a standard text in biology educators' education.



Glenn Branch
National Center for Science Education
Berkeley, CA 94709
branch@ncse.com



The Princeton Guide to Evolution. Edited by Jonathan B. Losos (editor in chief), D. A. Baum, D. J. Futuyma, H. E. Hoekstra, R. E. Lenski, A. J. Moore, C. L. Peichel, D. Schluter, and M. C. Whitlock. Princeton University Press. ISBN 978-0-691-14977-6. 853 pp. Hardcover. \$99.

Impressive and comprehensive, the term "tome" is a valid and positive descriptor of *The Princeton Guide to Evolution*. The volume's

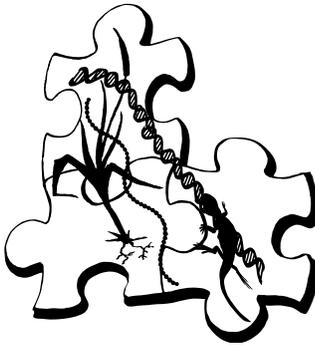
heft, however, should not dissuade interested readers from this comprehensive and fascinating presentation of scientific and social aspects of evolution. Eight major sections present Phylogenetics and the History of Life; Natural Selection and Adaptation; Evolutionary Processes; Genes, Genomes, Phenotypes; Speciation and Macroevolution; Evolution of Behavior, Society, and Humans; and Evolution and Modern Society. Each section is subdivided into several subsections, most of which are familiar to biology teachers as central topics in the study of evolution: major events in the evolution of plants and animals, taxonomy, molecular and genome evolution, epigenetics, phylogeny, speciation, natural selection, macroevolution, microevolution, sexual selection, evolutionary psychology, aging... the list is far more extensive. The "Evolution and Modern Society" section is particularly interesting, covering less conventional or even more "controversial" topics such as Evolutionary Medicine, Evolution and Microbial Forensics, Evolution and Conservation, Creationism and Intelligent Design, and Evolution and the Media. This is far from an exhaustive list, and the table of contents invites the curious and interested reader to spend hours expanding their knowledge of evolution. A particular strength of *The Guide* from the teacher's standpoint is the useful and uniform organization of each chapter: an

outline gives a brief, abstract-like overview of the chapter's topics, followed by a glossary of terms of particular significance in that section and by an extensive, 5- to 10-page discussion of the topic.

Although not perhaps the book for your bedside table, *The Guide* is a must-have for any good science library. Extensive in scope, it offers overviews of practically any topic in evolution that a teacher or student would want to access. Of obvious use as a reference on the shelf, *The Guide* could also be a more active source of fascinating and enlightening material for individual research on the topic of evolution. Particularly interesting topics, such as the evolution of antibiotic resistance and the evolution of linguistics, might form the basis of more extensive student explorations. Although there are illustrations throughout (including a *Doonesbury* cartoon!), and a color illustration section in the middle of the volume, some of the illustrations are beyond the scope of the average student and may not be of use in furthering understanding. However, *The Princeton Guide to Evolution* is without doubt a formidable resource to which any biology teacher would want to have access.



Cate Hibbit
The Lincoln School
Providence, RI 02906
chibbitt@lincolnschool.org



Online MS in Biology

Master of Science (Non-thesis option)

Online Master's Degree in Biological Sciences for K-12 teachers and other science educators

- All courses offered online
- Reduced tuition
- No out-of-state tuition differential
- No residency requirement
- 30 semester hours of graduate credits
- Up to 12 credits of graduate courses may transfer for the degree requirements

For Information:
tjarret@clemson.edu
864-656-2153



The courses offered in the **BIOL ONLINE** Program are fully accredited through Clemson University by the Southern Association of Colleges and Schools (SACS). CU is an equal opportunity employer