
Book Review

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The value and intrigue of eco-evolutionary dynamics

Hendry, Andrew P. 2017. **Eco-evolutionary dynamics**. Princeton University Press, Princeton, New Jersey. xii + 397 p. \$65.00 (hardcover), ISBN: 978-0-691-14543-3; \$45.99 (e-book), ISBN: 978-1-400-88308-0.

Key words: adaptation; contemporary evolution; ecology; ecosystems; selection.

In the Preface (p. x), Hendry describes his book as, “a long advertisement for the value and sheer intrigue of studying eco-evolutionary dynamics in natural populations.” This is an apt description, as this book provides a conceptually broad overview of the major themes in this rapidly emerging field of study. Importantly, it emphasizes field studies of natural populations (while acknowledging the value of laboratory studies) and promotes a return to the study of phenotypes (while describing the importance of understanding the underpinnings of trait change). The purpose of this book is to provide conceptual clarification of major themes in eco-evolutionary dynamics and to describe their interconnections. The style is refreshing in that it poses and attempts to answer major questions within each major thematic area. For some questions, the answers are clear and well-supported by existing evidence. For others, the evidence is mixed. In both cases, Hendry presents clear summaries of the existing evidence and offers his own conclusions, with the appropriate caveats.

Hendry openly worries (pp. x–xi) whether his book is “too technical for non-specialists but not technical and detailed enough for specialists.” This concern is largely unfounded, as the coverage of topics is general enough for graduate students just embarking on the study of eco-evolutionary dynamics but detailed enough to allow specialists to track down more detailed information, if needed. Thus, this book is a useful reference for ecologists and evolutionary biologists at diverse career stages and could profitably serve as a text for graduate courses on the topic.

Hendry defines eco-evolutionary dynamics (p. 1) as “interactions between ecology and evolution that play out on contemporary time scales.” Thus, eco-evolutionary dynamics include ecological processes that influence evolution over several to hundreds of generations and evolutionary changes that influence ecological processes over similar time scales. The book is organized into three conceptual areas: (1) effects of ecology on contemporary evolution; (2) effects of contemporary evolution on

ecology; and (3) mechanistic underpinnings of contemporary trait changes. The first section covers topics that will be familiar to most evolutionary biologists, including selection, adaptation, adaptive divergence, gene flow, and ecological speciation. The second section covers the emerging and rapidly growing literature addressing the effects of contemporary evolution on the ecology of populations, communities, and ecosystems. This section will be the most interesting to many ecologists, as it reviews current studies in this area and places them into a well-organized conceptual framework. But Hendry cannot escape his roots as an evolutionary biologist, and returns to more evolutionary themes in the third section, describing the underpinnings of contemporary trait change in terms of genetics and phenotypic plasticity.

The strengths of this book include a comprehensive review of its main themes and the placement of each theme within a conceptual framework that allows the reader to see connections within and among major topics. Perhaps the most helpful conceptual framing presented in the book involves the graphical representation of both the *eco-to-evo* and the *evo-to-eco* sides of the eco-evolutionary feedback cycle, overviewed in Chapter 1 (“Introduction and conceptual framework,” pp. 14–15) and then revisited and represented as path diagrams in Chapter 9 (“Ecosystem function,” p. 227). Hendry relies heavily on adaptive landscapes as a conceptual framework for describing the effects of ecology on contemporary evolution. He largely relies upon the mathematical framework originally presented by Hairston et al. (2005), in describing the effects of evolution on ecology. Graphs are used strategically to support key points and examples. Graphs and illustrations are clear, printed in high quality, and easily understood based on descriptive legends. For readers with limited time, the reference list alone will serve as a valuable resource. It represents an authoritative and up-to-date bibliography of classic and recent papers on eco-evolutionary dynamics.

Despite its many strengths, the book does have weaknesses. The broad conceptual overview is informative, but some sections fall short of using it to its fullest potential. An example is Hendry’s proposed Española-Isabella Hypothesis (pp. 304–308), which describes his ideas about the effects of ecology on adaptation, gene flow, and speciation. A straightforward extension of this framework could link these evolutionary processes to effects on prey communities through changes in resource use. However, Hendry stops at classic arguments about the evolutionary

effects of resource competition, largely failing to make the connection to recent work (described in Chapter 8 “Community structure”) showing that contemporary trait change in predators can reshape prey communities. Such ecological effects can, in turn, further modify selection and adaptation. Thus, the book largely treats the two sides of the eco-evolutionary feedback cycle (*eco-to-evo* and *evo-to-eco*) as independent. It acknowledges that feedbacks between ecology and evolution likely operate in nature, but it does not tackle this issue in depth. The literature in this area is growing rapidly, and specific coverage of eco-evolutionary *feedbacks* (e.g., as a separate chapter) would have been a beneficial addition.

Hendry proposes that scenarios where environments are changing rapidly will be profitable study systems for investigating eco-evolutionary dynamics. This is undoubtedly true. Many such scenarios involve human influences on ecological and evolutionary processes (e.g., medicine, agriculture, landscape change, harvest, climate change). While the length of the book may have been prohibitive, a section on human influences on eco-evolutionary dynamics would have been welcome. Hendry has specific expertise in this area, and an overview of *applications* of eco-evolutionary dynamics in the realms of human health, agriculture, conservation, and resource management would have been informative and insightful.

Hendry describes various facets of eco-evolutionary dynamics, but unlike the authors of some prior books with eco-evolutionary themes (e.g., Odling-Smee et al. 2003, Thompson 2005), he does not aim to muster evidence for a particular eco-evolutionary theory. This

approach has weaknesses and strengths. The main weakness is that it precludes the clarity offered by a single over-arching framework and set of hypotheses. The main strength is that diverse and sometimes conflicting evidence is presented freely, allowing Hendry to highlight questions needing additional research effort. Indeed, one of the most valuable contributions of *Eco-evolutionary dynamics* is its informed description of unanswered questions and future research directions. We are just beginning to appreciate the value and intrigue of studying eco-evolutionary dynamics. Hendry’s book represents an overview of this rapidly growing area of research. As Hendry describes with enthusiasm, research into eco-evolutionary dynamics will likely yield new insights, and perhaps some surprises, in the years to come.

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LITERATURE CITED

- Hairston Jr., N. G., S. P. Ellner, M. A. Geber, T. Yoshida, and J. A. Fox. 2005. Rapid evolution and the convergence of ecological and evolutionary time. *Ecology Letters* 8: 1114–1127.
- Odling-Smee, F. J., K. N. Laland, and M. W. Feldman. 2003. *Niche construction: The neglected process in evolution*. Princeton University Press, Princeton, New Jersey.
- Thompson, J. N. 2005. *The geographic mosaic of coevolution*. The University of Chicago Press, Chicago, Illinois.