The Principles of Evolution: Systems, Species, and the History of Life by Jonathan Bard. London and New York: Garland Science. $ 90.00 (paper). xv + 375 p. ISBN: 9780815345398. 2017.

One of the main goals of evolutionary biology is to explain the origin of complex phenotypes, such as camouflage and antibiotic resistance. The Modern Synthesis during the first half of the 20th century enhanced our understanding of the evolution of complex traits by successfully marrying genetics with evolutionary biology. Nevertheless, recent developments in molecular biology have further complicated the view of evolution handed down by the Modern Synthesis. In particular, the effect of mutations on phenotypes can be highly unpredictable because phenotypes are often the product of a complex system of interacting proteins. As a result, a common theme in evolutionary systems biology is that a proper account of the evolution of life requires a finer understanding of the causal pathways from genes (DNA sequences) to phenotypes.

Jonathan Bard's book aims to introduce the principles of evolutionary biology from a systems biology perspective. The influence of systems biology is particularly evident in the chapters on evo-devo (evolutionary developmental biology) and on the sources of variation between organisms. These chapters focus on how protein networks affect phenotypes. One of the chapters on evo-devo, for instance, describes in detail some classic examples of homologous proteins that perform similar functions in different types of organisms, such as the *Hox* and the *Pax6* transcription factors. The complexity of genotype-phenotype maps is a recurrent theme in the chapters about phenotypic variation, and multiple examples are used to illustrate this theme, such as variation in vertebrate limbs and stripe variations in zebras.

Some parts of the book rely on a broader concept of systems biology. Instead of being construed as a field restricted to analyzing protein networks, systems biology is sometimes framed as a strategy for studying evolution. Bard suggests that, like phenotypes, distinct levels in the biological hierarchy (e.g., higher taxa) could also be modeled as the output of a network of interacting units (Bard's stance on the scope of systems biology is discussed in one of the appendices). These portions of the book might be of special interest to a more theoretically-minded audience, but I felt the ramifications of Bard's broader concept of systems biology were not fully developed (probably because this book is meant to be used as a textbook on evolution rather than a manuscript about the scope of systems biology).

Bard's book covers much more ground than discussed above, however. The bulk of his book falls into two sections. One of these sections describes the many types of evidence for evolution, such as the fossil record and DNA sequence analysis. The other section focuses on the different mechanisms that can produce evolutionary changes, including natural selection, mutation, and genetic drift. This book thus manages to cover standard topics in evolutionary biology while also adopting a systems biology perspective.

The target audience includes upper-level undergraduates and beyond. Further, reading this book requires minimal mathematical background despite the significance of mathematical modeling to systems biology. Each chapter is well organized which enables the reader to quickly grasp the main theme of the chapter. References to the primary literature are also included throughout the text. In conclusion, this is a well-written upper-level textbook on the principles of evolution which, unlike other similar textbooks, successfully incorporates key ideas from systems biology into the study of evolution.

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