Evolution: The Basics

by Sherrie Lyons
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reviewed by Daniel J Fairbanks

Evolution: The Basics, by Sherrie Lyons, is a recent addition to a series of nearly forty books on The Basics published by Routledge on topics as wide-ranging as anthropology, art history, finance, human genetics, law, philosophy, religion, television studies, terrorism, and world music. With only seven chapters and 177 pages of text, Evolution: The Basics is true to its title, offering an abbreviated and basic introduction to evolutionary thought.

Chapter 1, “The Darwinian cosmos,” summarizes the contributions of Darwin’s predecessors from the 17th to early 19th centuries, from Descartes to Lamarck. The chapter concludes with a short discussion on the argument from design, starting in the 17th and 18th centuries with John Ray and William Paley, then contrasting their ideas and motivations to those advocated by promoters of the modern “intelligent design” movement and their non-scientific approach.


Events of the late 19th and early 20th centuries are the topics of chapter 3, “The maturation of a theory,” which takes readers from the advent of genetics through the modern synthesis. It begins with pre-Mendelian ideas of inheritance and a brief review of Gregor Mendel’s experiments. It then transitions to the Mendelian rediscovery and its effect, underscoring William Bateson’s dismissal of Darwinian gradualism, and Hugo DeVries’s ideas on mutation. A discussion on the rise of population genetics follows, emphasizing the work of Karl Pearson and WFR Weldon on early statistical approaches to genetics, Thomas Hunt Morgan on mutations in Drosophila melanogaster, Wilhelm Johannsen, Herman Nilsson-Ehle, and William Castle on polygenic inheritance, and the independent derivation by GH Hardy and Wilhelm Weinberg of what is now known as Hardy-Weinberg equilibrium. The contributions of Ronald Fisher, JBS Haldane, and Sewall Wright toward mathematical and statistical approaches to genetics as an explanation of Darwinian natural selection set the stage for...
the modern synthesis, as developed by Julian Huxley, Ernst Mayr, GG Simpson, G Ledyard Stebbins, and Theodosius Dobzhansky.

Chapter 4, “Expanding the modern synthesis,” begins with a simplistic description of DNA structure and replication, gene expression, the genetic code, exons and introns, and mutation. The remainder of the chapter consists of an assemblage of loosely connected topics. Among them are the neutral theory of selection, molecular clocks, modern studies on evolution in Darwin’s finches, adaptive radiation of cichlid fish in Lake Victoria, macroevolution and microevolution, punctuated equilibrium, transitional fossils, and evolutionary developmental biology (evo-devo).

Chapter 5, “Human evolution,” addresses speculations on human evolution during the late 19th and early 20th centuries, including the Piltdown fraud, ideas (especially those of Wallace and Darwin) regarding the evolution of human morality, and the fossil evidence of hominin evolution. The chapter concludes with a short foray into DNA-based evidence of human-Neanderthal hybridization and worldwide ancient human diasporas as determined through mitochondrial and Y chromosome DNA.

Microbial and pathogen evolution are the topics of chapter 6, “Origins, the expansion of life, and the persistence of disease.” This chapter deals with molecular origin-of-life experiments, such as the Miller-Urey experiments, the so-called RNA world, early microbial evolution, lateral gene transfer, and evolutionary explanations of the persistence of disease. The final chapter, “Humankind’s future: An evolutionary perspective,” is almost entirely devoted to evolutionary explanations for human behavior, including psychology, sexual behavior, language, ethics, kin selection, and empathy.

This book’s greatest strength is its first three chapters: a rapid and simple historical narrative recounting key events in the foundation of evolutionary theory from pre-Darwinian times through the modern synthesis of the 1940s. Readers seeking a brief summary of how evolutionary theory became the central theme of modern biology will find it here. The historical theme continues throughout the remaining chapters; however, the chronological narrative dissipates into a collection of topics, some of them treated in historical context, others with superficial coverage and little or no reference to history.

Unfortunately, this book suffers from an excessive number of scientific errors, ranging from simple oversights to serious misstatements. These errors cluster in chapters 4 through 6, and most, but not all, are misconceptions about molecular evolution. A few illustrative examples include the following: erroneous reversal of phenotypes when discussing Mendel’s experiments (p 60), an incorrect explanation of the mechanism for malarial resistance in hemoglobin A/S heterozygotes (p 71 and 77), inaccurate evolutionary relationships among humans and great apes (p 91, 115, and 161), an oversimplified description of how mutations occur in DNA (p 76), an incorrect recounting of the discovery of exons and introns followed by inadequate definitions of them and their evolutionary roles (p 77), misunderstandings about molecular clocks (p 78–80), and an argument criticizing vaccine development that fails to adequately distinguish between vaccines and antibiotics, or among viral, bacterial, and protist pathogens (p 142). Errors of this sort can be overlooked when minor
and few but their number and pervasiveness are likely to frustrate informed readers, and mislead those who are not well acquainted with molecular and cellular biology.

Given the basic nature of this book, one might expect omission of some topics. However, several fields of evolutionary science that have played extraordinarily important roles, especially in recent years, are either absent or only hastily mentioned. The most serious is the lack of any meaningful discussion of genomics and bioinformatics, which have revolutionized evolutionary science since the 1980s. Missing are genomic chromosomal evolution (including the classic example of the human chromosome 2 fusion, which played a key role in the 2005 *Kitzmiller v Dover* trial), transposable elements and pseudogenes (which constitute nearly half of primate genomes and dramatically influence genome evolution), and differential gene expression among related species, all of which are major areas of current evolutionary research. Comparative genomics is limited to a few isolated and outdated comparisons of genes and proteins, such as a brief and overstated summary of similarities between mammalian Hox clusters and their insect paralogs. A major deficit is the dearth of attention to bioinformatical genome-wide comparisons, responsible for an explosion of evolutionary information, corroborating and enhancing all evolutionary disciplines. Correction of such deficiencies, as well as the scientific errors, in a second edition could make this book a more valuable resource for its intended audience.

**About the Author**

Daniel J Fairbanks is Associate Dean of Science & Health at Utah Valley University. He is the author of *Relics of Eden: The Powerful Evidence of Evolution in Human DNA* (Amherst [NY]: Prometheus, 2007) and *Evolving: The Human Effect and Why It Matters* (Amherst [NY]: Prometheus, forthcoming 2012), and a co-author of *Ending the Mendel-Fisher Controversy* (Pittsburgh [PA]: University of Pittsburgh Press, 2008).

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