

Book Review

Francisco J. Ayala and John C. Avise (eds.)
Essential Readings in Evolutionary Biology
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This book is Ayala and Avise's attempt to address a serious oversight in the scientific literature – no volume of essential readings in evolutionary biology exists, despite the fact that evolution remains central to and is the unifying principle of the biological sciences. To remedy this, they have put together an impressive collection of classical papers, encompassing virtually all aspects of evolutionary biology and including all of key figures in the development of this field.

After a brief introduction, the book begins with a broad timeline of evolutionary thought and then presents 48 classic papers in evolutionary biology. Each paper is reprinted directly from the primary literature, presented in chronological order, and introduced with a brief commentary by Ayala and Avise. These introductions are particularly valuable in that they set up the significance and broader context of each paper, explain why the paper was included, and provide a short list of related readings.

Perhaps the greatest strength of this book is that it contains the seminal works (or excerpts of such works) from so many key scientists involved in the history and development of evolutionary biology. Virtually everyone of importance, starting with Charles Darwin, is represented here, including Hardy, Morgan, Wright, Dobzhansky, Simpson, Watson & Crick, Hamilton, Lewontin, Kimura, Gould, Maynard Smith, Stebbins, Trivers, Woese, Mayr, Margulis, and Carroll – to name a few. Indeed, there are very few names in the book that will not be immediately recognizable by an-

yone with even a basic knowledge of evolution. Ayala and Avise have done very well to include the landmark publications from so many individuals, thereby tracing almost 150 years of evolutionary biology, from the field's origins, through the tenuous and uncertain early years, to modern discoveries, syntheses, and re-interpretations.

Another strength is the sheer breadth of subject matter that the book covers. The classic papers cover a wide range of topics, including natural selection, adaptation, phylogeny, complexity, the role and importance of mutation, sexual selection, the relationship between behavior, ecology, and evolution, evolution and developmental biology (evo-devo), and coevolution – among many others. Many of the papers explore different aspects of the relationship between evolution and genetics, something which is not only appropriate, but critical, since the two disciplines have been inseparable from the Modern Synthesis in 1940's right up to today, and because the vast majority of modern work in evolution involves the application of genetics principles and techniques. I was particularly pleased to see Watson & Crick's seminal paper on the structure of DNA included; though the paper does not involve evolutionary biology per se, its importance to the field going forward cannot be underestimated.

The book begins its journey through evolutionary biology with two excerpts from Charles Darwin, the first from *On the Origin of Species* and the second from *Descent of Man and Selection in Relation to*

Sex. The excerpt from *Origin* is from Chapters III and IV, and while it is certainly appropriate for a volume such as this, it might have been better to include a section from the Conclusion to *Origin of Species*, since it is here that Darwin summarizes his theory and looks to the future. Nevertheless, both opening selections are very appropriate and get the collection off to a good start.

The book then continues through the very late 1800's into the early 20th century, where it focuses mostly on the genetic side of evolution. By the time the book reaches the 1970's, the reader will have been treated to essays on everything from Mendelian proportions (G.H. Hardy) to the species concept (G.G. Simpson) to the evolution of social behavior (W.D. Hamilton). Many of these essays represent an all-too-often overlooked and underappreciated element of the scientific endeavor – the development of ideas. The early essays in this collection do well to remedy this situation and to remind all of us that ideas and theories develop over time, rather than germinate immediately.

Ayala and Avise include papers from the 1970's that represent some of the most important developments in evolutionary biology. Dobzhansky's classic and often-quoted *Nothing in Biology Makes Sense except in the Light of Evolution* is included here, as is Eldredge and Gould's landmark paper introducing punctuated equilibrium. I was also very pleased to see The Spandrel's of San Marco and the Panglossian Paradigm, Gould and Lewontin's classic work, included in this collection, since the spandrel concept is often used as an easy way to explain sometimes difficult evolutionary concepts to students.

The volume concludes with papers from the 1980's through 2003. This latter section includes Charlesworth's classic on the evolution of sex and recombination, as well as several other highly significant contributions on homeotic genes (S. B. Carroll), biological classification (Mayr), the origin of the nucleus (Margulis, et al), and 30 years of study on Darwin's finches (Grant). Finally, the book ends with a short epilogue by the Ayala and Avise, entitled *Science & the Public*. Here, they address the disconnect between the acceptance of evolution within the scientific community and the lack of acceptance among the general public, especially in the United States, and what may be the causes and consequences of this. While what they present here is good, I wish they would have ex-

panded their thoughts a bit more, as the discussion came across too brief. A detailed index and a few color figures follow.

For all of this book's many strengths, it does suffer from a few minor weaknesses. First, the book has a rather odd look to it, as it appears that all of the papers were simply scanned into the text from their original sources, such that the original typeface, layout, and internal structure are all as they appeared upon first being published. While this may add a nice touch of nostalgia, I found it distracting at times, especially the many different fonts and styles, as well as often large areas of white space. Secondly, although the chronological ordering of the papers is nice and works well, it is hard to find a paper on a specific topic of interest. A second table of contents, ordered by topic, would have been helpful. Nevertheless, these are both cosmetic issues that may not be of concern to all readers.

For a text on essential readings in evolutionary biology, I was surprised to see that the book begins only in 1859 with Charles Darwin. Although Darwin may seem like a logical place to start, and his importance to the field is paramount, evolutionary biology and evolutionary thinking in general extend as far back as the Ancient Greeks; indeed, Ayala and Avise's timeline at the beginning of the book make this very clear. I am not suggesting that the book should have started with writings from this far back, since this might be too cumbersome, but I think some precursors to Darwin should have been included. In particular, excerpts from Linnaeus, Buffon, Lamarck, Erasmus Darwin, and perhaps Robert Chambers' *Vestiges of the Natural History Creation* would have been appropriate and given the reader a more thorough picture of the development of evolutionary biology. It also would have helped counter the notion in much of the general public that evolution begins with Charles Darwin, when in fact it has a much deeper and richer history that begins well before him.

One final criticism is that the last paper in the book is from 2003, more than ten years ago. Why aren't some more current papers included? Recent advances in phylogenomics, evolutionary-developmental biology, the relationship between the emerging field of epigenetics and evolution (was Lamarck completely wrong?), human ancestry, and the evolutionary role of the human microbiome are but a few of the areas of

current research that would have lent themselves well to this volume. I can only believe that Ayala and Avise were restricted by space and the size of the book, such that more current papers could not be included.

These criticisms aside, on the whole, this book is an excellent collection of classic papers that does a great job of tracing the history of evolutionary biology through the presentation of seminal works from their original sources. It covers a wide range of topics and includes papers from all of the key figures in the development of evolutionary biology. This book would make a great ancillary resource in any evolution course, or seminar courses in evolution, ecology, genetics, or even general

biology. Additionally, the book would be most useful as a reference for both students and those working in this field. Even the layperson is likely to glean much useful and insightful information from this volume. Ayala and Avise conclude by saying that they hope “this collection...has enlightened readers not merely about the history and the current knowledge in evolutionary biology but...also about the vibrant dynamic nature of scientific investigation in the evolutionary sciences.” There is no doubt that this book accomplishes this, as well as finally providing a collection of essential readings in evolutionary biology to academia and the reading public.