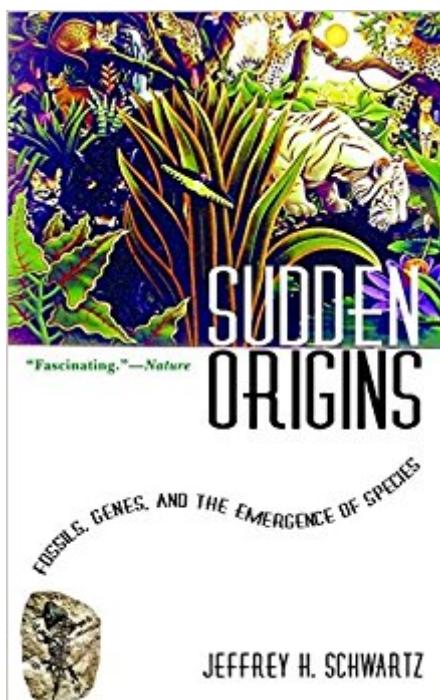


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Sudden Origins: Fossils, Genes, And The Emergence Of Species



Synopsis

"Fascinating."-Nature Finally a compelling answer to the question that has plagued scientists for centuries . . . "A detailed and informative historical account."-Nature "This is an intriguing and significant work."-Library Journal "A provocative new theory to explain how species arise."-Scientific American "A worthwhile attempt at bridging the new developments in how species may change and the evidence for the patterns of those changes."-American Scientist Darwin may have argued that new species emerge through a slow, gradual accumulation of tiny mutations, but the fossil record reveals a very different scenario-the sudden emergence of whole new species, with no apparent immediate ancestors. In this provocative and timely book, Jeffrey Schwartz presents a groundbreaking and radical new theory that explains exactly how evolution works. Turning to the marvels of genetics, paleontology, embryology, and anatomy, and introducing the recent discovery of an extraordinary type of gene, known as homeobox genes, Schwartz provides an evocative answer to the long-standing question: How do species emerge? Writing with the expert knowledge only an insider can bring, Schwartz tells the intriguing history of the study of evolution, from the initial breakthrough discoveries to the famous Piltdown controversy up through the genetics revolution. Sudden Origins is a monumental book that ties together all the threads of evolutionary theory while providing a compelling answer to one of life's most enduring conundrums. This book is crucial reading for anyone who has ever pondered the mysteries of our evolutionary heritage.

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Customer Reviews

Despite the title, Darwin's Origin of Species doesn't really explain how new species are born.

Scientists have been struggling with that thorny problem ever since its publication, and the recent revolution in molecular biology has turned up great piles of new evidence. Anthropologist Jeffrey H. Schwartz takes a close look at this evidence, as well as the more traditional paleontological material, in *Sudden Origins: Fossils, Genes, and the Emergence of Species*. He claims that the tide is turning in favor of "punctuated equilibrium"--the theory that species typically remain static for great lengths of time and then experience brief spurts of accelerated change--thanks in no small part to the discovery of homeobox genes. These remarkable structures are the genetic equivalent of the proverbial butterfly wings that cause hurricanes halfway around the world--small changes can produce enormous effects. Homeobox genes regulate development and are remarkable similar between species and even between phyla--you share some with fruit flies, for example. By turning our attention toward embryology and development, Schwartz shows us that fossils can't tell the whole story, since much of it lies within the womb. He covers a lot of ground and stretches the reader's intellectual muscles; the scope of *Sudden Origins* and the greater understanding of Darwin's problem make the challenge well worth it. --Rob Lightner --This text refers to an out of print or unavailable edition of this title.

Anthropology professor (Univ. of Pittsburgh) Schwartz's latest tome (after *The Red Ape*) is best viewed as a combination of three books that are only loosely tied together. The first blends changing ideas about human ancestors, a brief summary of their fossil evidence and a look at some of the dominant figures in archeology to provide a historical overview of human evolution. The second reviews theories about the origins of species while providing a somewhat idiosyncratic history of evolutionary biology from Charles Darwin to the present. The third, and briefest, offers Schwartz's ideas on how new species arise. Like many scientists before him, Schwartz argues that regulatory genes called homeobox genes, which were discovered in the 1980s, control developmental processes in such a way that small alterations to their structure can lead to major shifts in organisms, possibly even creating new species. Stressing the importance of an integrated approach to the study of evolution, Schwartz contends that "there is a very real need to return the study of comparative morphology, and especially development, to the fore of evolutionary biology." Perhaps. But his dense book is neither sufficiently innovative to gain the attention of most experts nor sufficiently eloquent to hold the interest of the general science reader. Copyright 1999 Reed Business Information, Inc. --This text refers to an out of print or unavailable edition of this title.

Schwartz certainly weaves a good story. He details the history of evolutionary thought from the very

beginning to the present day. Unfortunately, that consumes nearly the entirety of the book. Any mention of a new evolution only gets treatment in the final two chapters of the book and then only briefly. This book can serve very well as an introduction to evolutionary biology or biological anthropology, but as the introduction to a new paradigm, it fails. Schwartz is not out of line by seeking to challenge received wisdom, but his hubris seems to get the better of him. He spends too much time talking about revolutionizing his field and pointing out its problems rather than actually getting about doing it.

A great read. I'd love to use for teaching a class on the history of evolutionary thought. Fun and thought provoking.

Dr. Schwartz has great passion for his profession and this is readily apparent in all his literature. His work will soon bring him to the very forefront of his field.

Schwartz spends most of his book on the history of evolutionary theory, which is fine from the perspective of a historian of science, but then there isn't much of the book left for development of newer ideas. Pages are spent on Linnaeus but next to nothing on cladistics; much detailed attention is given to detailed reports of the first hominid fossils found, even to Piltdown, but more recent findings are hardly mentioned, surprising given that he is even now editing an authoritative volume with Tattersall on hominid fossils. However, credit is due for developing the thesis that the discontinuous fossil record is due to the relatively sudden emergence of species from changes in regulatory molecules such as the homeobox genes. Rudolph Raff, in *The Shape of Life* (an excellent book which Schwartz quotes) previously developed the thesis that macroevolution of body plans was dependent on these genes, but did not emphasize the discontinuous fossil record.

Although we don't get to a discussion of the new ideas until the last 10% of the book, nonetheless, this whole area of evolutionary developmental genetics is of such fundamental importance that the book is worth reading. In the relatively near future, with new fields such as comparative genomics (comparing entire DNA sequences of one organism to another), and computerized analysis of developmental expression of complete sets of cellular proteins analyzed on biochips, the promise of reconstructing, at a molecular level, the evolutionary history of life on earth has begun. I'd also like to take issue with the reviewer who thought Schwartz "savaged" Darwin. He does not, though as part of his detailed review of the early debates on evolution he quotes scientists who do attack Darwin's ideas. And although it's true that actual research details on speciation and changes in

homeobox genes are at an early stage, and that Schwartz is not a researcher himself in this area, again I think he's on the right track. For example, see the article by Ting et al. (Science 1998 282:1501) about a rapidly changing homeobox gene linked to speciation in *Drosophila*. Overall, I think the book is an important one, but could have been much improved as a scientific text by giving a broader picture of newer data and less emphasis on historical personalities, though as written it is designed to appeal more to an educated lay audience than to the professional.

Despite the intellectual pretensions of this book, *Sudden Origins* is poorly reasoned and is based on a naive understanding of much of the science on which it is based. It is filled with irritating errors. Most organisms stop growing when they reach sexual maturity, but many do not. Chert and flint are not volcanic rocks. The fossil record cited by Schwartz is limited almost exclusively to hominid specimens. While this might be expected from a paleoanthropologist, it is rather limiting for someone discussing the evolution of species. Schwartz's understanding of genetics seems to be limited to the high-school version of dominant and recessive traits, a brilliant deduction for Mendel, but a gross oversimplification as we approach the 21st century. The importance of mutations in the genes regulating development, such as the homeobox genes, is an interesting subject of current research, but the effects are far more varied and complex than Schwartz indicates. Such mutations can sometimes cause major developmental changes, but this does not imply that gaps in the fossil record are explained by this type of mutation. Given his own lack of sophistication in modern genetic, developmental, and evolutionary work, Schwartz's savaging of Darwin is in particularly poor taste. Darwin developed the idea of natural selection in spite of having limited understanding of the underlying mechanisms of change. This makes his achievement more intellectually impressive, not less. Darwin mastered the scientific knowledge of his time and built upon it. Unfortunately, the same cannot be said of Schwartz.

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