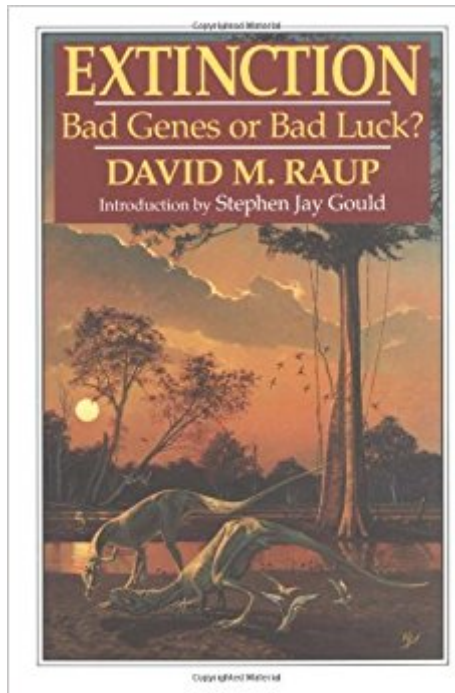


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Extinction: Bad Genes Or Bad Luck?



Synopsis

This is the first major book to present a comprehensive overview of the current state of extinction studies. At the end of the journey, Raup has put forward the best science of the day to answer the question posed by the title: Bad genes or bad luck? In the geological record, there are five major mass extinctions—the "Big Five." The most famous happened at the end of the Cretaceous Period, when the dinosaurs and two-thirds of all marine animal species were wiped out, opening the door for the age of mammals and the rise of Homo Sapiens. Using this example as a springboard, David M. Raup leaps into an engaging discussion of the theories, assumptions, and difficulties associated with the science of species extinction. Woven in along the way are stories of the trilobite eye, tropical reefs, flying reptiles, and the fate of the heath hen on Martha's Vineyard, a very modern extinction.

Book Information

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Customer Reviews

Raup takes up a cocktail-party science topic--Why do entire branches of life "suddenly" (in geologic time) disappear?--and gives it weight and validity. Despite the catchy title, Raup's presentation is plenty rigorous, drawing in just enough geology, anthropology, biostatistics and yes, even the Alvarez meteor/earth cataclysm, to send readers looking for additional reading on current evolutionary theory. Fans of Stephen Jay Gould will find a similarly fluent and friendly lecture style here. University of Chicago professor Raup is coauthor of several standard graduate-level texts on paleontology and evolution. Illustrations not seen by PW. Copyright 1991 Reed Business Information, Inc. --This text refers to an out of print or unavailable edition of this title.

Scientists have directed a good deal of attention to the topic of extinction in recent years. In this book, Raup, a mathematically oriented paleontologist, discusses the role of extinction in evolution, attempting to differentiate the effects of natural selection ("bad genes") and extraterrestrial causes ("bad luck"). It is a nicely done work written for the layperson, much in the vein of his previous book, *The Nemesis Affair* (LJ 8/86), which covers some of the same territory and which also favors extraterrestrial causes. This book should serve as a complement to the relatively few other recent works on extinction for the nonspecialist, notably Steven M. Stanley's *Extinction* (Scientific American Lib., 1987), which offers an alternative viewpoint.-Joseph Hannibal, Cleveland Museum of Natural History
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This is a delightfully well written book on the phenomenon of extinction, from the background rates of species death to the massive die-offs of the KT and other major extinction events. The author approaches the subject from a statistical/probabilities standpoint, looking at extinction as a continuum which is characterised, as he notes, by "long periods of boredom interrupted occasionally by panic." He introduces the concept of Gambler's Ruin, which makes his thesis understandable even to the statistically challenged like myself. The sense of humor with which he injects his work makes a complex subject entirely enjoyable.

Came in great condition. This book is entertaining and informative. Definitely a great read.

Very happy!

Excellent:)

David M. Raup is a University of Chicago paleontologist, who has also written *The Nemesis Affair: A Story of the Death of Dinosaurs and the Ways of Science* and *Principles of Palaeontology*. He wrote in the Preface to this 1991 book, "This is a book about the history of life on earth: the myriad twistings and turnings that have led, somehow, to us. It is written in the conviction that our biological origins are at least as important---and as interesting---as the physical origins of our universe... The main question, to be visited again and again, is whether the billions of species that died in the geologic past died because they were less fit (bad genes) or merely because they

were in the wrong place at the wrong time (bad luck).... In other words, if the evolution of life a fair game, as the survival-of-the-fittest doctrine so strongly implies?" (Pg. xi) He adds, "somewhere between five and fifty BILLION species have existed at one time or another. Thus, only about one in a thousand species is still alive---a truly lousy survival record: 99.9 percent failure! This book examines two primary questions: Why did so many species die out? How did they die out?" (Pg. 3-4)Of his widely-cited quotation about extinction at the end of the Permian, he explains, "I am slightly embarrassed by the wide use of the figure 96 percent for the Permian because I was responsible for it in a 1979 article presenting the reverse-rarefaction method. Although my article contained ample caveats about the random-killing assumption and although I said that the 96 percent estimate was an upper limit, all too many users of the number have neglected to mention the caveats. In truth, I probably did not exert myself to emphasize them. The whole question of selectivity in extinction is crucial to the extinction problem..." (Pg. 74)He observes, "The most important message of the kill curve is that species are at low risk of extinction most of the time... and this condition of relative safety is punctuated at rare intervals by a vastly higher risk of extinction. Long periods of boredom interrupted occasionally by panic. Any explanation of the causes of extinction to be plausible, must accommodate this pattern." (Pg. 84)He argues, "At this point, I can almost hear some of my colleagues complaining that I am pressing too hard to find a single cause of extinction. Why not accept that most extinction events are complex---and different from each other? ... My response is that this may in fact be the way the world works, but I hope not, because it would be hard to prove, for the following reason. Suppose major regression and mass extinction occurred only once in earth history. If these two unique events coincided in time, we would have a strong case for regression as the cause of the extinction. But regressions and mass extinctions are scattered throughout geological history... There is no way of assessing cause and effect except to look for patterns of coincidence---and this requires multiple examples of each cause-and-effect pair. If all extinction events are different, the deciphering of any one of them will be next to impossible." (Pg. 150)He concludes, "Extinction is evidently a combination of bad genes and bad luck. Some species die out because they cannot cope in their normal habitat or because superior competitors or predators push them out. But, as is surely clear from this book, I feel that most species die out because they are unlucky. They die because they are subjected to biological or physical stresses not anticipated in their prior evolution and because time is not available for Darwinian natural selection to help them adapt... Is extinction through bad luck a challenge to Darwin's natural selection? No... Extinction by bad luck merely adds another element to the evolutionary process, operating at the level species, families, and classes, rather than the level of local breeding

populations of single species. Thus, Darwinism is alive and well, but, I submit, it cannot have operated by itself to produce the diversity of life today." (Pg. 191-192) This is an excellent survey of extinction, in addition to a presentation of Raup's thesis; it will be of great interest to anyone studying this issue.

This book by David M. Raup, a biologist at the University of Chicago, of the Stephen Jay Gould genre, identifies everything about extinction that we thought was true but is not. The author's main thesis is that extinction is a mostly random event; due to catastrophes and bad luck, and not related to the process of evolution that is part and parcel of the Darwinian idea. The author believes that the most likely explanation for the major extinctions that we have had is not competition, nature, or physical causes, but meteorites of colossal energy that fell on the earth regularly some 18 million years ago and still threaten us today. In the process of debunking everything that we have been taught about extinction the author comes to six conclusions that are of great explanatory value for all species, all companies, and all investment styles: Species are temporary. Almost all species die out, and almost all lifetimes are very small relative to the age of the earth. Species with small populations are easy to kill. This is a consequence of gambler's ruin, that if you let random events run for a long enough time you are bound to hit the zero point, unless the probability of success is inordinately high. This is something that all traders with fixed systems, and all companies with specialized technological innovations and unique niches should contemplate. Widely spread species are harder to kill. Geographic diversity, and niche diversity are very important in precluding narrow events from causing a species' extinction. It is much easier to kill a species if you get a substantial number with the first strike. The importance of not losing too much in one fell swoop is paramount in any field. Extinction is most often caused by new stresses that the organism is not accustomed to. Long-lived species have usually developed mechanisms to cope with everything that has occurred to them in the past, so the thing they must fear the most is the meteor ... or the spacemen! Mass extinctions require stresses that cut across all biological boundaries. In the market this would be such a thing as a big war or a global rise in interest rates. There have been five major extinctions in the history of the earth. They are usually classified as Ordovician-Silurian, 440 million years before present, Late Devonian, 365 b.p., Permian-Triassic 250 b.p., End Triassic 200 b.p., and Cretaceous-Tertiary, 65 b.p., and a high percentage of species and genera were killed off in the years surrounding each of these markers. The author has developed some nice graphs to show what the likely number of species that died are, given the number of genera that were killed in each cataclysm. There is an interesting but naive chapter in the book on the relation of extinction to

industries. Raup argues that most of the companies around today were not in existence 50 years ago, and the cause of their disappearance, merger or bankruptcy corresponds to the causes of species disappearance or phyletic transformation. The author draws parallels between such things as that the total number of companies names was lower 50 years ago, just as biodiversity was less, and that certain industries wax and wane just as species do: Above all, stock prices as well as the composition of the entire market, are virtually unpredictable from ... decade to decade. And so it was with biological evolution in ... the most recent 500 million years. There is an excellent chapter in this book on the history of life, some nice methods of graphing durations and the branching of species, and some good anecdotes about all the famous species like the trilobites and the dinosaurs that did disappear with a debunking of the common explanations. The book focuses on an extremely important part of the process of life, and shows some interesting methods for sorting fact from fiction.

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