

The Great Extinctions: What Causes Them and How They Shape Life

By Norman MacLeod

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Population sizes of vertebrate species -- mammals, birds, reptiles, amphibians, and fish -- have declined by 52 percent over the last 40 years. In other words, those populations around the globe have dropped by more than half in fewer than two human generations. -- World Wildlife Fund Living Planet report 2014

This book straddles an awkward boundary between being a colorful popular work and a scientific literature review.... Profusely and beautifully illustrated with figures, maps, charts, and period reconstructions. Recommended. -- Choice

A good introduction to the great puzzle that is extinction study. -- Publishers Weekly


Selected by the Scientific American Book Club and now a more affordable paperback for a far-wider audience.

For more than a century scientists have tried to identify and understand the precise processes responsible for species extinction. Solving the species extinction puzzle has become even more important, even urgent, as human populations and technologies rival sea-level change, volcanic eruptions and asteroid impacts as an extinction mechanism.

The Great Extinctions explores the search for an understanding of Earth's five great extinction events and whether the sixth is upon us already. Leading paleontologist Norman MacLeod examines the controversies and conclusions and what they mean to the efforts to preserve Earth's biodiversity.

He also reveals how, contrary to popular conception, species extinction is as natural a process as species evolution. Examining extinction over geological time, he compares ancient extinction events and uses them to predict future extinctions.

Featuring the latest scientific evidence on the subject and informative illustrations and diagrams, *The Great Extinctions* is an easy-to-understand presentation of a complex and controversial subject.

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Editorial Review

Review

[Review of hardcover edition] MacLeod takes readers on an interesting 500 million year excursion through the history of life and death on Earth. The first five chapters provide definitions, context, and historical perspective for the current understanding of stratigraphy, the fossil record, and the classification of life within an evolutionary framework. The book concisely offers insight into the limits of knowledge within these fields, and these insights give non-experts some basis to evaluate competing opinions. Macleod also provides a window into the to-and-fro of the scientific process where theories can migrate from the lunatic fringe to scientific orthodoxy as new observations come to light. MacLeod analyses eight extinction events beginning in the Precambrian Eon and working towards the near past. Each chapter follows a format that allows readers to compare key elements from each event. Scientific terminology from the geological timescale and biological classification can be

daunting but excellent graphs, pictures, and diagrams help to clarify and enliven difficult subject matter.

Overall, it is a good introduction to the great puzzle that is extinction study, impressive in its presentation of the scope of work already done and tantalizing to the curious with countless mysteries still unsolved.

(Publishers Weekly Web Exclusive 2013-03-13)

About the Author

Norman MacLeod is Keeper of Palaeontology at the Natural History Museum, London. He studies the origin and maintenance of form in fossil and modern organisms using mathematical models of shape variation. He also creates new mathematical tools for studying plant and animal form and develops systems for automating the identification of species.

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Introduction

For the past 30 years a significant proportion of the scientific community has been obsessed with the idea of extinctions, especially the extinction of the 'dinosaurs' at or close to the boundary between the Cretaceous and Palaeogene intervals of Earth history. This interest pre-dates the current concern with the 'sixth' extinction, a hypothetical event that may occur in the future and which takes its name from the 'Big Five' ancient (mass) extinction events of the fossil record. The reasons for this and the sustained level of interest in extinction related topics are many and varied. But they share a common source. The concept of extinction elicits a deep emotional reaction in most people today, in no small way because we all share an intuitive concern about transformations being wrought in our increasingly unnatural environment. When we see declines taking place in landscapes, animals and plants at the local, regional and even global scales we cannot help experience the sense of foreboding that comes from drawing obvious parallels between the status of our own species and the fates of other, far more ancient, species that 'ruled the Earth' in the distant past.

Much has been written about extinction. Many treatments of this topic end up claiming that the problem of understanding extinctions in general or particular extinction events has been solved (e.g. Raup 1991, Ward 1995, Alvarez 1997). In reality, the scientific community is far from having a detailed understanding of the enigma that is extinction, as attested to by the simple fact that 'extinction debates' constitute one of the longest-running scientific controversies in living memory. If a consensus regarding what 'killed' the

dinosaurs, the ammonites, and their kin has been achieved (see Alvarez et al., 1980, Schulte et al., 2010), why do so many professional palaeontologists -- especially those who know the extinction record best -- stand outside it (e.g. see Archibald et al., 2010)? Given the current state of knowledge about extinction as a phenomenon, what inferences for the contemporary and future management of our planet can, or should, we draw? What type of cataclysm does it take to extinguish 50, or 60, or 75, or 90 percent of all species on the land and in the sea, as has happened repeatedly in the Earth's distant past? What causes the sort of changes in the environment that drive extinction rates to these astonishing levels and over what timescales? Perhaps most importantly, how does a planet recover from devastations of such magnitude?

I have undertaken and published extinction research using the fossil record as my primary source of data for most of my professional career. I and my colleagues have grown up (literally) with this research programme, this scientific debate, this public controversy. Like all participants in any human activity, I have a particular point of view that I believe conforms to the most reasonable interpretation of the greatest proportion of evidence currently to hand. I disagree with explanations offered by some of my colleagues and some of them disagree with me. Such is the character of healthy scientific debate. But my goal in this book is not to simply present the case for my own point-of-view by citing the evidence in its favour and ignoring contrary observations. Rather, it is to present the data extinction researchers of all persuasions work with as fairly as I can, mentioning all the nuances, caveats and assumptions that often get left out of presentations for a popular audience. Once this evidence has been presented it will be up to you, the reader, to come to your own conclusions about extinctions, what has happened in the past, and what might occur in the future. No doubt my own biases will creep in from time to time. This is inevitable. I pledge here to make a diligent effort to identify instances in which I am offering a personal opinion or interpretation. More than this though, I hope to convey some inkling of the excitement, the novelty, the frustration and the sense of grandeur that accompanies the study of one of nature's most common processes, but also one of its deepest mysteries.

It has been said that the secret to a long life is to have a chronic incurable disease and to keep treating it. By the same token, the secret to a productive life in science is to have a chronic insoluble problem and to keep working on it. By this measure I and my extinction-studies colleagues on all sides of the interpretational fence have been very fortunate indeed.

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Robert Hyde:

Here thing why this particular The Great Extinctions: What Causes Them and How They Shape Life are different and trusted to be yours. First of all reading a book is good nevertheless it depends in the content from it which is the content is as scrumptious as food or not. The Great Extinctions: What Causes Them and How They Shape Life giving you information deeper and different ways, you can find any reserve out there but there is no guide that similar with The Great Extinctions: What Causes Them and How They Shape Life. It gives you thrill studying journey, its open up your current eyes about the thing this happened in the world which is possibly can be happened around you. You can actually bring everywhere like in park, café, or even in your means home by train. If you are having difficulties in bringing the paper book maybe the form of The Great Extinctions: What Causes Them and How They Shape Life in e-book can be your option.

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