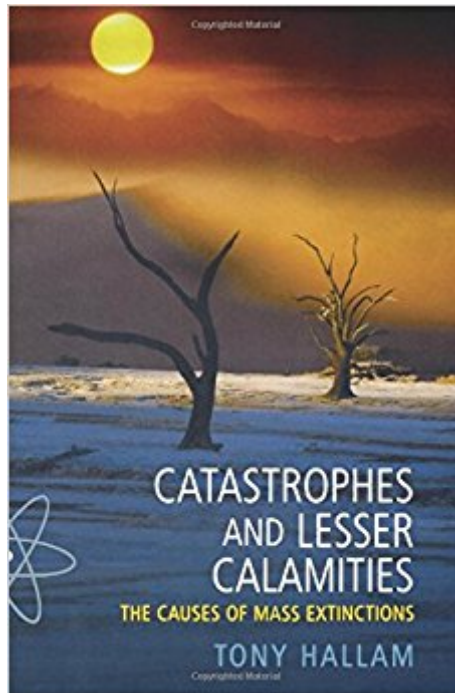




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# **Catastrophes And Lesser Calamities: The Causes Of Mass Extinctions**



## Synopsis

In *Catastrophes and Lesser Calamities*, renowned geologist Tony Hallam takes us on a tour of the Earth's history, and of the cataclysmic events, as well as the more gradual extinctions, that have punctuated life on Earth throughout the past 500 million years. While comparable books in this field of study tend to promote only one likely cause of mass extinctions, such as extraterrestrial impact, volcanism, and or climatic cooling, *Catastrophes and Lesser Calamities* breaks new ground, as the first book to attempt an objective coverage of all likely causes, including sea-level and climatic changes, oxygen deficiency in the oceans, volcanic activity, and extraterrestrial impact. Hallam focuses on the so-called 'big five' mass extinctions, at the end of the Ordovician, Permian, Triassic, and Cretaceous periods, and the later Devonian, and he also includes less well-known examples where relevant. He devotes attention especially to the attempts by geologists to distinguish true catastrophes from more gradual extinction events, and he concludes with a discussion of the evolutionary significance of mass extinctions, and on the influence of *Homo sapiens* in causing extinctions within the last few thousand years, both on land and in the seas.

## Book Information

Paperback: 240 pages

Publisher: Oxford University Press (September 1, 2005)

Language: English

ISBN-10: 0192806688

ISBN-13: 978-0192806680

Product Dimensions: 7.6 x 0.6 x 5 inches

Shipping Weight: 11.2 ounces (View shipping rates and policies)

Average Customer Review: 3.9 out of 5 stars 16 customer reviews

Best Sellers Rank: #552,409 in Books (See Top 100 in Books) #118 in Books > Science & Math > Nature & Ecology > Field Guides > Rocks & Minerals #230 in Books > Science & Math > Biological Sciences > Paleontology #2964 in Books > Science & Math > Evolution

## Customer Reviews

"an excellent concise account of the evidence for both major and minor mass extinctions" Tony Hallam, Chemistry and Industry

Tony Hallam is Emeritus Professor of Geology at the University of Birmingham and the author of a range of scientific books and papers including *Great Geological Controversies* (1992) and *Mass*

Extinctions and their Aftermath (with Paul Wignall, 1997).

Catastrophes and Lesser Calamities by Tony Hallam is a well written book on the topic of biological extinction through time . The volume is essentially a rewrite of the book he and Dr. Wignall wrote together in 1997 (Mass Extinctions and their Aftermath). While the latter is far more technical and probably more than the average person with an interest in paleontology and extinction events is willing to undertake, the present volume is written very much with the a vocational reader in mind. The book has a very readable style, revealing the author's erudition in its sentence style, vocabulary choices (my favorite is "depauperate" with respect to a description of the diversity of a particular fauna), and thorough knowledge of the recent pertinent literature. He keeps his use of professional terms within reach of the basic reader and provides a glossary of terms at the end of the book. While he has some "attitude" with respect to certain issues, he addresses everything in a thoroughly gentlemanly manner, giving credit to the work of others, and when he disagrees with findings makes his point graciously and with evidential support. Students writing papers would do well to study his style and approach to argument. The earlier book with Wignall addressed extinction as a series of specific events. It looks at each event, discussing the date, type specimens, and facies locales throughout the world that support the likely diagnosis of mass extinction and reviews the scientific data that suggests how they might have come about. The present book looks at extinction as a process that effects life and evolution through time. While specific events are discussed in an organized way, the author focuses more on the nature of proposed extinction processes. The most commonly and widely known of these causes are the bolide impact, anoxic aquatic or atmospheric conditions, volcanism, and climate change, each of which is examined in depth using specific extinction events to discuss the data. The section I found most interesting was "Pulling the Strands Together." This was because it reminded me of other authors I've read on other subjects, the topics of which seem to have implications for extinction as a process. One is Stuart Kaufmann's work on self organized criticality which discussed, among other things, a topography of fitness within a set of parameters. He introduced a diagram illustrating, through the rise of peaks from a baseline terrain, that life tends to organize itself in such a way as to make optimal use of the fitness terrain. He notes that, when conditions are altered especially when rapid, those at the peak are not able to hop from one peak to a better one. Their failure to adapt brings about extinction, and others along the lower slopes make a transition to a new peak fitness profile. As Hallam notes, catastrophes may occur too quickly for many taxa to adapt in a Darwinian manner, which leads to disappearance. However, where change is slow enough some taxa that seem to have disappeared

may in fact simply have evolved into a descendant species. They sort of back down the old fitness slope and head off in a new direction. Another author that is brought to mind is the theorist Per Bak, who studies self organized criticality and event probability. The discussion of periodicity/episodicity of extinction in Dr. Hallam's work reminded me of Dr. Bak's discussion of earthquakes, landslides, and similar events. In this case, the author notes that the frequency of occurrence of any possible event will lie along a curve that measures the probability of a given magnitude. In this instance, extinction might be seen as ranging from extinction of a single species to the end of all life on earth. In short, Bak believes that all events that can occur will do so, but that they have a different probability of doing so. As with the disaster in New Orleans during Hurricane Katrina, it isn't a matter of "if" but of "when" the event will occur. The events as they occur through time, however, form an irregular curve with many small peaks punctuated with the random introduction of a few very big ones. The issue for disaster planners and others is that of prediction and preparation, so an effort is made to find a "periodicity" in the data that isn't necessarily there to find. This sounds very much like Dr. Hallam's discussion of the attempts to pin down a periodicity in the data of extinction events. Humans are very good at seeing patterns in random data, but ultimately all that can be said is that "if it has happened, it can happen." I'd recommend the book to anyone with an interest in paleontology, paleoecology, and extinction events. It would make a lovely book for an introductory course on earth history, or in paleontology, and an excellent syllabus entry for a course in earth science for teachers. A wonderful book, full of information, and well written.

Hallam does a nice job outlining the potential causes of these events and pointing out that there's no single common cause, although changes in sea level and its oxygen content are often involved. A good read for those interested in the contingent nature of life on Earth.

A very interesting read. Most of the content was well explained. Could have been a little more decisive in his final opinions.

Very interesting description of periodic catastrophies. Just a little dry.

VERY COOL.

This book presents a great deal of information on mass extinctions, and it provides an excellent overview of how geologists and paleontologists gather evidence of the causes of mass extinctions.

What they can garner from the geologic record is amazing. He also discusses the theories of other geologists in a very respectful manner. Dr. Hallam pokes holes in the asteroid theory for the mass extinction 65 million years ago--wiping out the dinosaurs--although he says that the asteroid may have delivered the final blow to the already dwindling species of dinosaurs. My only quibble is that the author includes some little anecdotes about his research trips and the local people who helped him. He notes that he doesn't want to sound patronizing, but he does--VERY patronizing to the point of being offensive. However, this book does an excellent job of explaining what we can learn--and what has been learned--from the geologic record.

Nice updated listing of main extinction events in earth history and disertation on the main still accepted theories explaining way these happened. No big novelties or radical theories but some points were new for me like the frozen methane gases accumulated in huge quantities in the bottom of cold seas and the possible climatic changes that could be caused by them if they are released to the atmosphere by higher ocean water temperatures.

This brief expose of how large numbers of species kick the bucket at the same time is genuinely uplifting after the 2008 and 2012 elections.

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