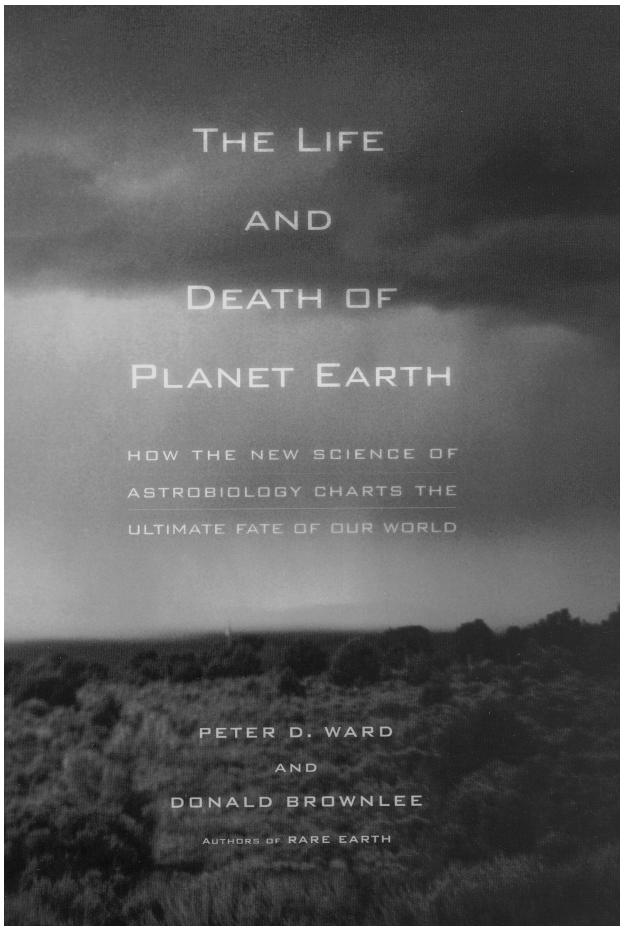
Meteoritics & Planetary Science 38, Nr 7, 1131–1132 (2003)
Abstracts available online at http://meteoritics.org

Book Review

The life and death of planet Earth: How the new science of astrobiology charts the ultimate fate of our world. by Peter D. Ward and Donald Brownlee. Henry Holt, 2003, 240 p., $25, hardback, (ISBN 0–8050–6781–7).



Writing popular books to invite the general public into the fascinations and joys of our research life is one of the most important, and most difficult, tasks a modern scientist faces. In their previous book, "Rare Earth," Ward and Brownlee showed themselves able to present new and intriguing ideas in a way that challenged the assumptions of the scientific field while engaging the general public. The reader got to share in the intellectual excitement of the debate while learning a lot of interesting details about the science that formed the basis of their arguments that life in the universe may well be rare. Alas, "The life and death of planet Earth" is a less successful book.

First of all, there is a certain clarity of focus lacking in this book. The authors explicitly state that they reject the Lovelockian idea of Earth as "Gaia," itself alive; well and good, their argument has validity. But then, what do they really mean by Earth's "life and death?" Is a planet "alive" only if it has organic life? Or intelligent life? Or fin-de-siecle 20th century human life? Their showy apocalysms, referring to futures as "grim" and "chilling," only make sense in terms of human history; yet elsewhere, they seem to want to write a biography of a planet that for virtually all of its history, past, and future—including some of the most interesting parts—is free of human civilization. Which book are they trying to write?

When they concentrate on the future of the planet, they neglect the effect of the future human beings. Nature has produced intelligent creatures, us, who have already made a remarkable change to the surface and ecology of this planet. The human ability to continue such change, for better or worse, is a wild card in the system that the authors never even speculate about (beyond the oft-told discussion of present day global warming).

Secondly, when they talk about past attempts to outline such a history of Earth, too often they fall into the trap of sneering at anything not modern. "At the beginning of the nineteenth century, there was no true understanding of geology, evolution, atomic theory, astronomical time or distance, relativity, or quantum mechanics." And they probably didn't know how to program a VCR, either. A statement so broad can't help but be inaccurate, misleading, and pointless. The advances of 1802 were based on the wisdom of 1801, and thus was it ever.

In referring to the geological system of epochs and eras, the authors comment, "no other field of science has found it necessary to codify its own time scale of quaint and romantic Victorian origin." Those Victorians were neither quaint nor romantic; they were solid scientists. By naming eras for the places where the fossils were found, they made sure that the classification scheme was independent of implied interpretations, and as a result, they were able to come up with a time scale that has remained useful and important through several revolutions in the way we date, and understand, changes in the geological record. The nomenclature of meteorites should be so clear!

By contrast, Ward and Brownlee themselves will surely look "quaint and romantic" in a hundred and fifty years. A fundamental flaw in the way they present their material is that they do not differentiate between ideas that are well established "textbook" science, like plate tectonics, and concepts that are cutting-edge and so, while exciting, also run

the risk of ultimately being shown to be false, like the future carbon cycle. This confusion does a disservice both to the scientists trying to understand the state of the field and to the casual reader who may well dismiss the entire book when any one piece of it is subsequently found to be in error.

Errors indeed are a danger in any book so wide-ranging. I know nothing of the biology they describe; their descriptions are clear and exciting enough that they make me wish to learn more, which is a tribute to their excellent writing skills. I hope they got it right. But, in other areas where I do have knowledge, I find some troubling oversimplifications and outright mistakes.

The Wilson cycle of super-continent formation and breakup is hardly as regular as they would imply. Likewise, they say that "continents can be split, fragmented, and shuffled about, but their basic volume can never be decreased," which they interpret to mean that continental surface area "will continue to grow slowly into the future." It's not so simple. Recent work by Hahn, Holt, Silver, and Kreemer suggest that continental area is roughly in steady state; sedimentation at the margins of continents may increase their area, but this is balanced by plate collisions which compress and shrink continental surface area. (The continents may thicken in such collisions, until their bottoms delaminate and get reintroduced into the mantle.)

Such nit-picks aside, the science in the book is clearly its strongest point, and when the authors stick to the science, it is a fascinating read. Their philosophizing, on the other hand, is simply irritating and distracts both from their story and their credibility. The end of the earth is "more than a little disquieting: for philosophy, for religion, and for hope" only if you have a very naive philosophy, religion, or sense of hope that sees no farther than the material world. As they themselves acknowledge elsewhere, most religions, eastern and western, have been dealing with "end of the world" scenarios for millennia.

The fundamental weakness in any attempt to predict the cosmological future is that, unlike the cosmological past, we have no data to fit. Any theory of the Big Bang or of planetary evolution has the present state as a boundary value to deal with. And, in addition, within the present state, there are any number of markers to the past, from meteorite isotopes to telescopic observations gigalightyears distant in space (and thus, in time). By contrast, we have no meteorites from the future. Our inability to match the data in hand should give us pause before we make any strong claims to be able to predict the physical future of the earth.

We can use analogies with processes observed at present to make predictions for what the future may hold, and we can develop elaborate computer models to take known forces and see how they will alter present conditions. It's a worthwhile exercise, if only to see what variables turn out to be the most interesting or important. And, it is great fun. But, all such models should be taken with a grain of salt. They should never be mistaken for, or presented as, an incontrovertible picture of the truth.

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