Not the end of the dinosaurs

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The Great Extinction: What Killed the Dinosaurs and Devastated the Earth?
By Michael Allaby and James Lovelock.
Doubleday/Secker and Warburg: 1983. Pp.189. $13.95, £10.95.

THE MAIN title of this semi-popular book is misleading, for the organic extinctions at the end of the Cretaceous are no more than a secondary theme. Its primary purpose, no doubt, is to demonstrate that approximately 65 million years ago the Earth was struck by a "planetesimal" with a diameter of 10 or 11 kilometres, a mass of 10^{11} or 10^{12} tons and a velocity of 20 kilometres per second; in other words, a meteorite "much larger and heavier than Mount Everest, made from solid rock and metal, approaching the Earth at about 20 times the speed of a high-velocity bullet from a modern army rifle". It came in at a steep angle, fell in the North Atlantic and disintegrated on impact, releasing as much energy as the detonation of 10^{14} tons of TNT and producing a huge crater. Its several effects were the causes of the end-of-Cretaceous extinctions.

Allaby and Lovelock's scenario differs from the well-known ideas of Alvarez *et al.* (*Science* **208**, 1095; 1980) in three important particulars. First, it is more specific in postulating quite definitely that the planetesimal fell in the ocean rather than on land (Alvarez was indifferent on that point); conversely, it is less specific in suggesting that the green plants could have been killed not only by a temporary obliteration of sunlight but also by the complete masking of the leaves by dust. Thirdly, it proposes that a major cause — if not *the* major cause — of organic extinction was "air pollution on the heroic scale"; the causal agents produced by the planetesimal impact included "acid rain" (leading to an intolerably low *p*H of the soil water), the eutrophication of coastal waters and estuaries, and high concentrations of chlorine, of hydrogen cyanide and of compounds of certain toxic elements which are relatively abundant in extraterrestrial matter, such as osmium. In pursuing their thesis the authors touch upon a battery of scientific disciplines, both physical and biological, man's anthropomorphic attitude towards animals and his attitude towards future catastrophes.

Occasionally the style is lively and informative, couched at just the right level for a semi-popular book; sometimes, however, it is so dramatic as to verge on the sensational, and elsewhere the short staccato sentences are reminiscent of the front pages of the tabloid press. The chapter headings too have a journalistic flavour, likewise the totally irrelevant and inconsequential paragraph concerning (*inter alia*) the scandalous relationships of Lord Byron. Altogether the result is much too diffuse for a book on science, even for a popular book. It is difficult to distinguish fact from speculation or important conclusions from the less important; indeed I am still uncertain as to what the authors regard as the principal immediate cause of the organic extinctions.

Several recent articles, alas, have expressed grave doubts on various aspects of the impact theories. Those aspects include the contemporaneity of the iridium anomalies at different places, their correlation with an extraterrestrial event, the suddenness and contemporaneity of the K–T extinctions, and likewise *their* correlation with a single catastrophe. Meanwhile my original interest in Allaby and Lovelock's book and my confidence in their reliability have been extinguished altogether by a careful reading of those parts which fall within my own field of specialization.

The authors' knowledge of dinosaurs and of fossil reptiles in general is pathetically inadequate, obviously derived from textbooks at least twenty years out of date, and their arguments are often fallacious and based on misconceptions. Elementary howlers abound. For example, clay is *not* a "soil"; fossil reptiles *have* been found in Antarctica, from 1968 onwards; archosaurs were *not* primitively bipedal; ichthyosaurs, mosasaurs and pterosaurs are *not* dinosaurs; and leathery and green turtles are *not* confined to the Southern Hemisphere, being commoner in the Northern.

Their grasp of ecology too is sadly deficient, especially where it concerns the relationship between size, energy expenditure, reproduction and survival, and also the ability of the fauna to survive indefinitely without the input of photosynthetic producers into the food web (apparently they fed on waste material and on each other!). Worst of all, betraying the authors' ignorance of the basics of systematics, was the absurd question (p.163): "Is not a homoiothermic, viviparous reptile, adapted to life in a seasonal climate, but a mammal by another name?". That, for me, was the last straw.

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Odd conformation

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Protein Folding.
By Charis Ghélis and Jeannine Yon.
Academic: 1982. Pp.562. $74.50, £49.20.

THE complexity of the problem of how proteins acquire their folded conformations can be illustrated most graphically by calculating the average time required for a random polypeptide chain to sample all of its possible conformations. Even conservative estimates for relatively short polypeptide chains are many orders of magnitude longer than the age of the Universe. Yet proteins can fold within seconds or minutes, so the process must be non-random and directed in some way. It has been the subject of extensive theoretical and experimental studies, but there is still little consensus as to even its broad, general features.

A brave attempt to summarize the topic is made in this volume. A fresh, objective and critical approach might have been expected, since the authors are relatively new to the field (most of their own work appears to be unpublished), but the subject has proved too intractable for them. The treatment is quite comprehensive — often uncomfortably so for those in the field, for many of their past errors are repeated here, with remarkable naivety and with no qualification or correction. For example, the discussion of folding kinetics is introduced with a lengthy account (pp.329–350) of the purportedly classic theoretical analysis, even though it was shown eight years ago to be inapplicable because it mistakenly assumed the unfolded state to be kinetically homogeneous. The disproved conclusions of that analysis (pp.362, 363, 366) and others (pp.350–355) are given with no qualification.

The material presented is often of dubious choice. The discussion of stabilizing interactions in proteins makes no mention of the classic experimental measurements on hydrogen bond stability by Klotz and co-workers, and those on hydrophobicity by Nozaki and Tanford are described in a mere seven lines. Instead, the discussion is based almost entirely on some questionable theoretical calculations. Much of the experimental data presented on protein structure and stability is twenty years old and has been superseded; in particular, the landmark calorimetric measurements by Privalov are virtually ignored. Finally, the number of grammatical and typographical errors is inexcusable in a book selling at this price.

This volume may be a useful compendium of references but most potential readers would be better served by the eleven extensive reviews and one symposium volume on the subject that have appeared in the past eight years. Collectively they do not give a coherent picture of protein folding; but at least they are internally consistent, perpetuate fewer errors and present different points of view. □

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