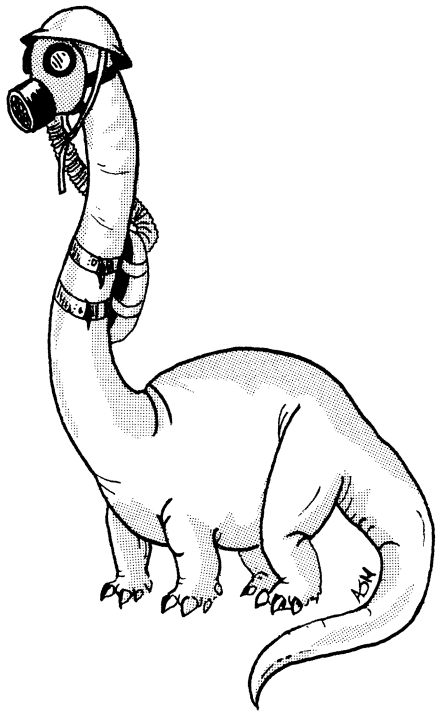
Books

THIS IS THE WAY THE WORLD ENDS . . . OR IS IT?

Catastrophes and Earth History: The New Uniformitarianism. W. A. Berggren and John A. Van Couvering, eds. Princeton University Press, Princeton, NJ, 1984. 464 pp., illus. $65.00 (cloth), $19.50 (paper).



Geology is no longer the same. The "new uniformitarianism," as the book's subtitle proclaims, is upon us. What this all means exactly is not always clear, for the concept of uniformitarianism is used in so many ways. Stephen J. Gould tries to sort out these meanings in an introduction to this highly stimulating collection of essays. As he notes, methodological uniformitarianism is surely acceptable to all: We must apply explanatory laws that are invariant across space and time and not invent new causes for past events when those of the present are sufficient. (Claiming that the speed of light has changed, à la the creationists, comes to mind.) Far more important than methodological assertions, however, is the question of uniformity in real-world processes. Lyellian uniformitarianism and Darwinian gradualism have held sway in geology and biology for more than a century, and their pervasive conceptual influence can neither be denied nor underestimated. "Catastrophic" events—those produced by processes of high rate—have always been recognized as real-world phenomena, yet our perceptions, descriptions, and explanations of change have usually been cast in a uniformitarian and gradualistic framework. Only recently has a "catastrophic" pattern of change become a viable alternative descriptor for the transformational history of evolutionary systems. Take, for example, the increasing influence of "punctuated equilibrium" in paleontology; Thom's catastrophe theory in developmental biology and other disciplines; and cyclical, large-scale extinction events within geology and paleobiology.

The papers of this book derive from two different symposia held in 1977, one at the Woods Hole Oceanographic Institution, the other at the North American Paleontological Convention. Collected together here, they address the theme of catastrophic change during the histories of the earth and its biota. The 18 chapters range widely, from philosophical and historical essays about the uniformitarianism/catastrophism duality to mass extinctions, Phanerozoic supercycles, and marine mineral resources.

The core of the book is unquestionably the section on the Late Cretaceous mass extinction event. Since 1979 a rapidly expanding literature has examined the possible relationship between a large body (asteroid or comet) colliding with the earth at the end of the Cretaceous and the widespread extinctions observed within the marine and terrestrial biotas of that time. Recently, this relationship has been postulated to be so tight that apparent periodicities in mass extinctions over vast amounts of geological time have been causally related to cycles of asteroid impacts brought about by a (cyclical) gravitational pull of an as yet unknown "death star" companion to our own sun. Any causal relationship, cyclical or not, between an asteroid impact and mass extinction makes a major prediction: Extinction events will have a narrow distribution in geological time (indeed, they appear to be geologically synchronous), and both the impact and extinction events will be coextensive. Five chapters of this book examine this prediction using the marine and terrestrial biotas of the Late Cretaceous-Tertiary (K-T) boundary.

In this tour de force volume, Erle G. Kauffman critically examines the geolog-

CORRECTION

In the book review "Biogeography Then and Now," by Arthur M. Shapiro (March 1985 *BioScience* 35: 188), a misprint replaced the word *topology* with *topography* in the third line of the seventh paragraph. The correct sentence should read: "The author's simple proposal reminds me of a problem in an introductory topology course, and unless I misremember my undergraduate anthropology, primitive agriculturalists around the world have repeatedly invented something very like it."

ical and paleontological evidence for an abrupt mass extinction within the marine realm at the end of the Cretaceous. He notes that many faunal replacements across the boundary are artifacts of woefully incomplete stratigraphic records; sedimentation and fossilization are simply too coarse-grained to claim simultaneous extinctions of the component lineages. More importantly, however, when continuous assemblages are preserved in the rock record, the putative "abrupt" extinction of the terminal Cretaceous is observed to have extended from 1 to 5 million years in most groups of organisms.

A second fine paper, by paleobotanist Leo J. Hickey, examines evidence for an abrupt Late Cretaceous extinction in the angiosperm flora. He concludes that extinction was generally minor across the K-T boundary. These findings are especially significant since they contradict some impact-extinction scenarios that envision months of near total darkness and, consequently, a rather substantial disruption of the terrestrial flora. Hickey's results and conclusions are augmented by the work of another contributor, Robert H. Tschudy, who reports on the palynological evidence. It, too, points against any abrupt extinction event in land plants.

Two additional papers, one by J. David Archibald and William Clemens on mammals and another by Dale Russell on dinosaurs, also examine the Late Cretaceous extinction. The first two authors find no evidence for catastrophic extinction in the mammal fauna, but Russell champions his own idea that an exploding supernova was a possible cause for the abrupt extinction of the dinosaurs. As Archibald and Clemens point out, on the other hand, the data are inadequate to postulate that dinosaurs actually went extinct simultaneously over their entire distribution.

The above papers on extinction make up about one-half of this book and will probably be of greatest interest to biologists. They alone make this book worth having, especially for those hooked on the recent debates about mass extinctions. With the exception of Russell, all these researchers reject extraterrestrial events as important in shaping the major patterns of biotic evolution during the K-T transition, and, in effect, they lay down a stiff challenge to those riding the impact-extinction bandwagon.

Other papers in this volume also pique interest for showing how the history of the earth and the history of its biota are interrelated. Alfred G. Fisher, for example, posits two 300-million-year supercycles of mantle convection, which are causally related, in turn, to cycles of eustacy, volcanism, and climate. Likewise, Nils-Axel Morner discusses causal interconnections between plate tectonic activity, glaciation, eustacy, and climate. These long-term alterations of climate, as is well-known, can bring about major changes in evolutionary patterns of biotas.

In summary, I enthusiastically recommend this book, which has something for everyone interested in the history of life. I might add that the paperback edition is a real bargain.

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INSECT NEUROHORMONES

Insect Neurochemistry and Neurophysiology. Alexej B. Borkovec and Thomas J. Kelly, eds. Plenum Press, New York, 1984. 523 pp. illus. $69.50 (cloth).

The title is completely inappropriate for this collection of papers from a 1983 symposium, but for a modern look at insect neurohormones, with some comparisons to vertebrates, this volume is hard to beat. Apparently, the conference's organizing committee did not distinguish between neuropeptides and neurochemistry. This book will disappoint neurochemists and neurophysiologists, but anyone interested in insect neurohormones or neuropeptides will be pleasantly surprised.

Contrary to the conference's stated purpose, no mention is made of possible ways to apply this knowledge to insect control; the book unfortunately omits discussion sessions, where such information might be covered. In fact, the 9 review chapters, 6 techniques chapters, and 46 abstracts appear to have been published exactly as received—in that order. There are no section title pages, no connecting comments, and the chapters are not even numbered. Moreover, there are 43 blank pages, mostly between the abstracts.

Despite these features, the review chapters are gems, all written by outstanding authorities. The book's value lies in the review and techniques chapters; the abstracts are a bonus.

J. de Wilde's chapter, which appears eighth, should have started the volume. The author writes of intrinsic and extrinsic factors affecting the homeostatic balance and alerts the reader that insect neurosecretory systems "control a large number of elements" (p. 151). This excellent overview, includes subjects not covered elsewhere in the volume.

Finlayson presents the difficulties inherent in studies on neuroendocrinology with the statement: "Relatively little is known about the mechanisms that regulate the activities of [neurosecretory] neurons" and goes on to detail much of his recent work on peripheral neurosecretory neuron (link nerve) activity during dark-light phases in *Carausius morosus*.

A particularly good feature of Davey's article on hormonal control of reproduction is the description of equivocal results or observations and suggestion of a possible interpretation. He concludes that six hormones are thought to be involved in egg production in various insects and reinforces Finlayson's message that much more work needs to be done.

The Mordue/Morgan chapter on isolating neurohormones in locusts keeps strictly to locusts. Although crustacean neuropeptides are mentioned (e.g., red pigment-concentrating hormone), the authors miss the chance to present these comparative structures in a table.

Orchard points out the close association between aminergic and peptidergic neurosecretory processes in insects and vertebrates. Nathanson describes the second messenger system in insects as cellular responses to amines and neurohormones but, unfortunately, does not refer to Berridge's work on inositol phospholipids in salivary glands.

Duve and Thorpe review identification of vertebrate peptides in insects with immunoreactivity methods. In a chapter on techniques they also describe the use of radioimmunoassay and immunohistochemistry plus the normal pitfalls one may encounter in these contemporary methods. This, together with Eiden's techniques chapter on cloned cDNA probe and peptide radioimmunoassay applied to the vertebrate enkephalins, is an extremely useful treatment of the latest neuropeptide techniques.

The final two reviews by Pichon and Sattelle are informative but do not mesh with the bulk of the other contributions. The Pichon article omitted cotransmitters and gave a largely traditional treatment of electrogenesis. Although Sat-