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Book review

Dinosaur extinction revisited

Archibald, J.D. 1996. *Dinosaur Extinction and the End of an Era: What the Fossils Say*, 237 pp. Columbia University Press (Critical Moments in Paleobiology and Earth History Series); New York, Chichester, West Sussex.

The impact theory became the most popular explanation of the demise of dinosaurs, not only gaining excessive media coverage, but also converting the majority of paleontologists. The opposition still persists, however. Among others, J. David Archibald remains on the skeptical side. His recent book is addressed both to his fellow professionals who happened to miss his earlier papers on the matter, and to the interested lay readers. Thus the book contains sections explaining some essential concepts employed by participants of the extinction debate (like the well known Lazarus Effect and Signor-Lipps Effect, and the newly named Zombie Effect and Rarity Effect; the penultimate pertains to reworked specimens), and a basic catalogue of North American terrestrial vertebrates (Who's Who of the Late Cretaceous) plus an introduction to the paleogeography and stratigraphy of the Createcous/Paleogene transition in Western North America.

Archibald both presents his own work, focusing on the fate of vertebrates at and near the K/T boundary, and refers to recent research by colleagues on other groups (including palynomorphs, macroflora, marine invertebrates) and other topics related to the extinctions (lava flows, impacts, sea-level changes), quoting both proponents of the impact scenario and skeptics.

Using this background to compare predictions of different extinction theories, the author refutes the strong, single-cause version of the impact extinction theory, as presented in the popular book by Peter Ward (*The End of Evolution*, 1994), numerous press accounts and public statements and scientific papers by impact theorists. The main objection raised by Archibald against the radical and now fashionable impact scenario is that we actually do not know what happened to the world biota through the end of Cretaceous, and the only available data — those of the North American coastal plains fauna — lack fine enough stratigraphical resolution. Thus it is premature to proclaim that all dinosaurs and other species were alive and well just until the asteroid hit the Yucatán Peninsula. Equally plausible, and not to be rejected with available fossil data, is the possibility that the Maastrichtian ecosystems were declining for tens or hundreds of thousands years prior to to the K/T extinction.

The scenario preferred by Archibald involves a cacophony of causes. The extinctions among different groups were not as abrupt and massive as commonly envisaged. In reality, many groups fared quite well as compared with previous or succeding epoch transitions. Those who suffered most were victims of different corollaries of several phenomena that triggered the wave of extinctions. Archibald hypotesises that the most important factor may have been the relatively fast habitat loss during a marine regression that coincided with intense volcanic activity (in this case leading to formation of the Deccan Traps). Both processes caused substantial environmental stress especially for the large inhabitants of coastal plains. The impact creating the Chicxulub crater was just the final blow that killed off the already weakened populations of dinosaurs and other organisms, especially in the proximity of ground zero (like at the North American sites which yield the only available fossil record for the transition on land). Perhaps local populations farther from the impact, especially living in high latitudes, and thus well adapted to prolonged darkness and cold, survived longer, as some data suggest. An additional factor involved in the extinctions was migration of competitors via land bridges that opened during the regression.

Karol Sabath, Instytut Paleobiologii PAN, al. Żwirki i Wigury 93, PL-02-089 Warszawa, Poland.