Tetrapod tracking

David Weishampel

In the Shadow of the Dinosaurs. Edited by Nicholas C. Fraser and Hans-Dieter Sues. *Cambridge University Press: 1995. Pp. 435. £50, $89.95.*

DURING the Mesozoic era, dinosaurs cast a long shadow — much as they do in today's media — but the terrestrial world throughout that time was not overly encumbered by these behemoths. We now know that there was a vibrant community of small Mesozoic tetrapods and that in fact it was in the context of this amalgam of diminutive competitors and ancestors that dinosaurs had their origin roughly 230 million years ago during the Late Triassic period. But terrestrial life burgeoned in other ways during the Late Triassic and into the Early Jurassic. Many extant groups of tetrapods — birds, crocodiles, squamates, turtles — trace their common ancestry to this time interval. Because it was also a time marked by the appearance of the first flying vertebrates (pterosaurs) as well as important mammal progenitors, the transition from the Triassic to the Jurassic is rightly considered to be a pivotal time of biological experimentation in the terrestrial world.

In May 1991, an international group of researchers met at Front Royal, Virginia, to consider this transformation of the terrestrial biota; the results are presented in this important book containing 25 chapters by 35 specialists on the fossil record, palaeoecology and evolutionary dynamics of the tetrapods from the Late Triassic and Early Jurassic.

The book rightly begins by emphasizing the fossil record and phylogenetic context of the radiation of tetrapods during the Triassic–Jurassic transition. These studies — on Amphibia (Milner), Lepidosauromorpha (Rieppel), Sphenodontia (by Wu and by Carroll and Wild), Crocodyliformes (Clark) and mammalian progenitors (Luo) — are fundamental in establishing the pattern of descent among these new terrestrial inhabitants and in discerning the features of the basal members of respective clades. Several of these studies are more than descriptive anatomy, taxonomy and presentations of phylogenies; they represent explicit phylogenetic analyses (Wu, Clark, Luo), a healthy trend in any kind of phylogenetic work.

Although focusing first on phylogeny, the book is dominated by chapters on faunal assemblages. Ranging widely from the Middle Triassic of Britain (Benton *et al.*) to the Middle Jurassic of Mexico (Clark *et al.*), these studies emphasize assemblage diversity (often with faunal lists), local and regional stratigraphy and often palaeoecology and palaeobiogeography. All of these aspects of Triassic–Jurassic faunistics rely heavily on the considerable research on the exceptional fossil record of the eastern seaboard of North America. Most of it originally done (and presented) by contributors to this volume, this work is rightly seen as the driving force behind much of the new interest in the Triassic–Jurassic transition.

The final section of the book tackles a wide variety of issues, including stratigraphic and biogeographic aspects of faunal change, Late Triassic palaeoclimatology, extinction and evolutionary rates. Particularly interesting is the continuing debate about one or more mass-extinction events at the end of the Triassic. Revolving around how many, timing and cause(s), Late Triassic extinction patterns are tackled from the perspective of taxonomic sampling, biostratigraphy and sedimentology. Yet even with these approaches, there seems little resolution of either the tempo or mode of biotic dynamics at the end of the Triassic (compare Simms *et al.*, Benton, Fraser and Sues, and Padian).

In setting out current knowledge of Triassic–Jurassic transition among terrestrial tetrapods, the book reviews and resolves a number of old questions (advances in information on Early and Middle Jurassic faunas from around the world, biostratigraphic and geochronologic refinements across the Triassic–Jurassic transition and others). Yet, like any work of significance, it also explores unresolved topics and even raises several new questions. How many extinction events were there by the end of the Triassic? What was their severity and selectivity? How did the integration of phylogeny, faunistics and stratigraphy affect these patterns? And is there any possibility of implicating the driving force behind the dynamism between evolution and extinction?

However these questions are answered (and they are bound to generate important research in the future), the Triassic–Jurassic transition has had a lasting impact on land-dwelling organisms. Although it is common to look to the extinction that swept away non-avian dinosaurs 65 million years ago for the rise of modern terrestrial ecosystems, perhaps it is more appropriate to look back roughly 140 million years earlier. As the editors and many of the authors of this book argue, nearly all modern tetrapod clades owe their existence to events — biological and otherwise — of those ancient times. □

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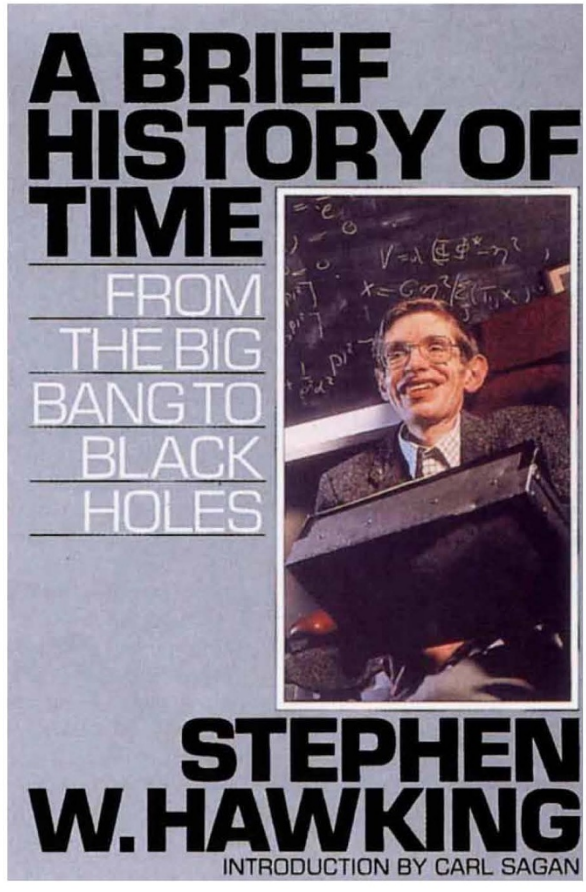

ABOUT time — the UK paperback edition of Stephen Hawking's *A Brief History of Time*, originally published in 1988, has finally seen the light of day (Bantam, £6.99). Reprinted nearly 50 times, the UK hardback edition has sold more than 600,000 copies (worldwide sales exceed 8 million). An interactive CD-ROM that integrates the complete text of the book with graphics, movies and animations is also available (W. H. Freeman, $59.95, £49.95).