Part 2 of the book is devoted to the history of moas at human hands and is fascinating reading for anyone regardless of field of interest. This section is complete, covering sites, hunting strategies, processing technology, and chronology and extinction. Anderson's conclusions are carefully formulated from evidence, not from hopes and fears. Moa relationships are still in doubt; mass-kill episodes probably did not occur, but individualized hunting may have been wasteful; moa-hunting began about 900 years ago and had ceased by 400 years ago, and it is unlikely that moas survived much longer than that. Anderson brings us his story from the standpoint of an anthropologist, and I would have liked more on the relationships between moas and plants, a topic covered nicely by Atkinson and Greenwood in the *New Zealand Journal of Ecology* volume. But this beautifully produced book will stand as a new landmark in the study of these bizarre New Zealand giants. It will occupy a prominent place on my bookshelves.

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Reptilians Past

Dinosaur Tracks. TONY THULBORN. Chapman and Hall, New York, 1990. xvi, 410 pp., illus. $85.

Dinosaurs, Spitfires, and Sea Dragons. CHRISTOPHER MCGOWAN. Harvard University Press, Cambridge, MA, 1991. xii, 365 pp., illus. $29.95. Revision of *The Successful Dragons: A Natural History of Extinct Reptiles* (1983).

Two prominent and productive vertebrate paleontologists here weigh in with good, readable books about very different aspects of dinosaurs and other extinct beasts. Though both books are curiously lacking in phylogenetic perspective, both are highly competent in scholarship and presentation and (in different ways) deserve the attention they are likely to receive.

Dinosaur tracks have been studied for over two centuries (though their makers were not at first correctly recognized), and over the years a vast literature on them has accumulated, very ably reviewed by Thulborn. Through history, many paleontologists have tended to look down their noses at footprints and other trace fossils, often underestimating what they have to tell us. The traditional work was mostly descriptions of tracks or sites: find 'em, collect 'em, draw 'em, measure 'em, name 'em, file 'em, forget 'em. The most adventurous work was usually in trying to guess the identity of the track-maker, often with (to our eyes) implausible or even hilarious anatomical and functional reconstructions. Few paid much attention to the sedimentary or biological context of trackways until the 1950s and 1960s, when workers such as Donald Baird, Frank Peabody, Georges DeMathieu, and Hartmut Haubold began to look more intently at their meaning. Baird in particular established rigorous methods for analyzing tracks, properly noting that these were not anatomical structures but records of transitory behavior. And, he added, there is no point wasting much time on badly preserved tracks, as so many taxonomizers have done.

Many younger workers, notably Martin Lockley, Paul Olsen, James Farlow, and Thulborn himself, have been instrumental in adopting new approaches to trackways. Many of these have been experimental, involving recent animals and a variety of actual substrates. And a lot of new work has overturned traditional identifications of track-makers and views about their locomotion. In 1986, at the First International Symposium on Dinosaur Tracks and Traces, Wann Langston and Adolf Seilacher led a strong new emphasis on the sedimentological context of tracks, noting the importance of the composition and competence of the substrate in influencing footprint form and warning how easily one can be misled by underprints, or "ghost tracks," in reconstructing the identity of track-makers and their behavior. This emphasis should spur a lot of new work.

Thulborn's emphasis in this book is mainly the basics of fossil footprints: what they are, how they are collected and described, and how their makers have been assigned to them. He is particularly good reviewing the recent literature on dinosaur speeds and gaits. His command of the vast literature is especially impressive, typically strong and unusual in coverage.

Dinosaurs, Spitfires, and Sea Dragons is a great engaging exploration of the functional morphology, physiology, and structural mechanics of extinct reptiles, plus the obligatory chapter on extinction. McGowan nicely covers ground probably familiar to most specialists, but with a strong emphasis on the lessons that living animals can teach us about fossil ones. He is especially effective exploring the analogies between large living herbivores, such as giraffes and elephants, and giants of the past. The question of dinosaurian physiology, often simplified as "warm- vs. cold-bloodedness," is given a thorough going-over: the treatment here will enlighten, but not confuse, even the typical undergraduate. Of course there are minor gripes. I would have been perhaps less conservative in conclusions about dinosaur physiology, and I think that perhaps uniformitarian analogies to recent forms are accepted rather too casually at times. But there is more than just good heuristic discussion here. Students and professionals alike will benefit from this book.

In omitting the phylogenetic perspective these two books surprisingly fail to take advantage of what is the greatest advance in our knowledge about dinosaurs during the past decade: clarification of their evolutionary relationships. It is not simply that new phylogenies of major dinosaur groups have been advanced and (more or less) established; more important, the usefulness of phylogenies in answering more complex evolutionary questions has proven so great that no paleontological study is complete without rooting hypotheses in phylogeny. So it is curious that, for example, Thulborn divides track types into "small ornithopods," "iguanodonts," and "hadrosaurs," when these are really nested sets of the same group, and ponders the question whether fossil tracks belong to theropods or birds, when in fact birds *are* theropods. Discussions of track-makers and of the evolution of locomotory types should be coordinated with this kind of knowledge. McGowan leaves questions of phylogeny and what it can tell us about the evolution of function and physiology almost entirely out of his book. And this is a real tragedy. How can one consider the problems of the great size of brachiosaurs, the evolution of the bizarre skull crests in duckbills, or the elegant flight of *Pteranodon* without exploring the evolutionarily intermediate stages represented by other groups in a phylogeny?

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A Repopulation

After the Ice Age. The Return of Life to Glaciated North America. E. C. PIELOU. University of Chicago Press, Chicago, IL, 1991. x, 366 pp., illus. $24.95.

As the most recent period of geologic history, the Quaternary (Ice Age) is potentially the best known. That is especially true of the most recent deglacial hemicycle that spanned the past 20,000 years. In glaciated North America the ground is littered with fresh (and sometimes frozen) evidence of events just past; and most living things in the region have their histories intimately