BOOK REVIEWS

Biotic Reshufflings

The Paleobiogeography of China. YIN HONGFU, Ed. Oxford University Press, New York, 1994. xiv, 370 pp., illus. $120 or £80. Oxford Biogeography Series, 8. Translated from the Chinese edition (1988).

Grappling with the tectonic history of California seemed a formidable task during my graduate school years, given its mélange of suspect terranes and abrupt transitions between geologic units. The incorporation of fossils to reconstruct paleobiogeographic history added several levels of complexity, for not only were plants and animals shuffled around by the shifting tectonic bits and pieces that now make up California, they also respond to differing climatic, environmental, and ecological requirements on a single tectonic plate, producing often intricate distributional patterns. Although California has a level of tectonic and biogeographic complexity similar to that of China, it has but 4 percent of the area. Imagine, then, the difficulties facing Yin Hongfu and his colleagues at the China University of Geosciences in Wuhan and Beijing as they undertook the first synthesis of Chinese paleobiogeography in a tectonic framework. Paleobiogeographic treatments are also prone to conflicting goals, whatever the complexity of the region studied. Is their purpose to reconstruct plate history? to aid in reconstructing paleoenvironments, paleoclimate, and geologic history? Or is the evolutionary history of lineages or communities of primary interest? and if the latter, is biotic dispersal or physical disruption of the region (that is, vicariance) of greater importance?

China comprises at least four major tectonic units, each of which includes a host of smaller tectonic units. Buried in this complicated package is the history of the ancient seaway of Tethys, which lay between the supercontinents of Gondwana and Laurasia during the late Paleozoic and Mesozoic, the earlier history of the Paleozoic continents, and the later formation of Asia. This volume, through a system-by-system description of the major biogeographic realms, regions, and provinces in China, provides a concise documentation of the changing patterns of floral and faunal distributions and their paleoenvironmental implications. Discussion of the tectonic processes that underlie the patterns and of their paleoclimatic implications is largely limited to the final two chapters, and evolutionary considerations are of minor importance in the work. Proper documentation of distributional patterns is the foundation for other studies, however, and 12 of the 15 chapters are primarily concerned with characterizing biogeographic units through cluster analyses of a database of some 217,000 records on the distribution of 12,468 Phanerozoic fossil species. (Some systems are far better characterized than others, with the Cambrian, Carboniferous, Triassic, and Tertiary data sets far larger than those for other systems.) That results of the cluster analyses are occasionally at odds with the recognized designation of provinces, discrepancies that are not always explained, and that there are relatively few attempts to use the paleontologic data to challenge previous plate reconstructions simply illustrate the amount of work that remains to be done on the biotic history of this pivotal region.

In their chapter on the Permian, Xu Guirong and Yang Weiping provide some perspective on the complexity that emerges from the analyses. Globally, the Permian is divided into three biogeographic realms, the Boreal realm of Siberia, Mongolia, Kazakhstan, northern Europe, and North America, the Paleo-Tethyan realm along the equator, and the Gondwanan realm encompassing much of modern South America, Africa, India, Australia, Antarctica, and a few bits of Asia. Elements of each of these realms are present in China, and the realms are divided into seven distinct biotic provinces, probably about one-third of the global total. Within a single biotic province, distinct faunas (or floras, not to be too zoocentric) occupy different sedimentary environments and can usually be identified as discrete biomes. Xu and Yang recognize a total of 16 such biomes within the seven Permian provinces. This careful attention to distinguishing geographically based provinces from environmentally based biomes is an important feature of good paleobiogeographic studies and a hallmark of this pioneering synthesis of 600 million years of biotic history in China.

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A Displaced Cosmology

The Milky Way Galaxy and Statistical Cosmology, 1890–1924. ERICH ROBERT PAUL. Cambridge University Press, New York, 1993. xiv, 262 pp., illus. $44.95 or £30.

What today is called by some galactic astronomy, or the study of the structure of our galaxy, has had a history, Robert Paul persuasively argues in this book, that was both revolutionary and continuously in flux. The period he has chosen to study was, conceptually and methodologically, dominated by a revolution.

At the turn of the century and for almost two decades thereafter, the visible universe was most frequently described as a static Sun-centered ellipsoidal system of stars some 10,000 to 18,000 parsecs in diameter and from 1800 to 2400 parsecs in thickness. By 1922, virtually through the efforts of one man, working with the largest telescopes in the world and with techniques far removed from those of his forebears, the stellar universe had become a very different place, some 90,000 parsecs in diameter, with the Sun displaced well toward the periphery.

The seasoned reader of astronomical history might well remark, "I've heard all this before." And indeed the historical reconnaissance of what has been dubbed (not by Paul) "the Galactocentric Revolution" has been both extensive and thorough. What Paul has done is turn the tables to look primarily at what was displaced. In doing so, he has both filled a major gap in the liter-

Jacobus Cornelius Kapteyn, around 1914. [Yerkes Observatory]