BOOK REVIEWS

Life in West Gondwana

Biological Relationships Between Africa and South America. PETER GOLDBLATT, Ed. Yale University Press, New Haven, CT, 1994. x, 630 pp., illus. $85 or £65. From a symposium, St. Louis, MO, Oct. 1990.

Thirty years ago geologists and biologists were galvanized by the discovery that we live on a dynamic Earth with mobile continents and a youthful Atlantic Ocean. A new generation of graduate students dusted off dubious old tomes about Gondwanaland and began tinkering with tectonic tracks by which diverse groups of organisms might have been distributed. Such concepts as Noah's Arks and conveyor belts fueled a lively debate between biogeographers who still thought many organisms had actively dispersed and those who argued that plate movement (vicariance) was sufficient.

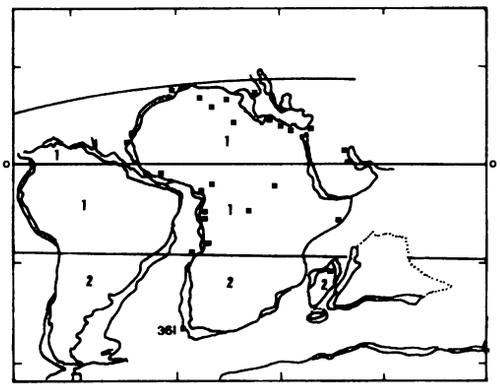
This volume samples the brew that began fermenting a generation ago. It examines in substantial detail the history of freshwater and terrestrial species that now inhabit South America and Africa. It asks how these two continental biota have diverged since the time, about 100 million years ago, when their prior union as West Gondwana was severed. Without doubt, this volume provides the most comprehensive modern account of the historical biogeography of these two continents. It also implicitly demonstrates how the practice of biogeography has matured during these three decades.

In an animated foundation chapter, Pitman and colleagues provide a plate-tectonic review replete with numerous detailed diagrams. Major treatments of key plant and animal groups then follow. Two paleobotanists relate the predominantly pollen records from the late Mesozoic to the late Cenozoic, Coetzee for Africa and Romero for South America. Then Schatz and Le Thomas review the systematics of an ancient family (the magnolia-related Annonaceae), and Bremer analyzes a more modern family (Asteraceae). Featured animal groups are wasps, ants, and five classes of vertebrates.

Most of these systematic studies utilize computer-assisted algorithms to overlay modern distributions on phylogenetic diagrams (cladograms) derived from comparison and analysis of extensive morphological and molecular data. These more rigorous analyses have pared away many of the African–South American disjunctions accepted by an earlier, more enthusiastic generation. For example, Vuilleumier and Andors show that living genera and even families of birds are too young geologically to retain any West Gondwana roots; even the much-touted affiliations between rhea and ostrich and between New World and Old World cuckoo have had to be abandoned in light of their later dispersals via northern continents. The reputations of West Gondwanan reptiles, amphibians, and freshwater fishes fare slightly better. Even so, of the ten widely cited Gondwanan fish groups, Lundberg finds several, including the "leaf fishes," to be geologically too young and thus more likely to have wafted over the Atlantic to their current bicontinental distributions. A similar cautionary conclusion emerges from comprehensive analysis of Asteraceae, for they turn out to be too young and too cosmopolitan to be truly Gondwanan. An exemplary study by Carpenter demonstrates that pollen wasps in these two continents were separated by Atlantic rifting but that a closely related (but geologically younger) group, the paper wasps, went around by a northern route.

The later chapters detail how these two continents moved into different latitudinal and climatic belts during the later Cenozoic, producing extensive divergence between their biotas. Even so, as is emphasized by Gentry, individual lowland forest communities retain a surprising degree of resemblance between the two continents. More generally, however, he suggests that the more extensive humid areas and highland extensions in the Neotropical Realm have provided greater opportunities for ancient plant groups to undergo evolutionary specialization. Some of the later chapters do not seem to address the topic of relationships or comparisons between South America and Africa. In the longest chapter Marshall and Sempere present a standard account of South American land-mammal paleontology; yet their elaborate scenario to explain distribution of South American rodents does not make adequate reference to the excellent chapter by Pitman *et al.*, is contradicted by new records of early rodents from Chile, and begs the question of possible African ties for rodents or primates.

There is grandeur in this book, not only in its absolute size, but also in its broad and synthetic vision of life during the last 100 million years. It must be read by anyone interested in biogeography, terrestrial paleontology, or evolutionary biology.



"Mid-Cretaceous (Albian-Cenomanian) microfloral provinces of Africa and South America (after Herngreen and Duenas Jimenez 1990)." 1, Northern Gondwana province; 2, Southern Gondwana province. [From J. A. Coetzee's paper in *Biological Relationships Between Africa and South America*]

"Some elephant-dispersed fruits from Makokou, Gabon. Left to right, top row: *Picralima* (Apocynaceae), *Massularia* (Rubiaceae), *Omphalocarpum* (Sapotaceae); bottom row: *Strychnos* (Loganiaceae), *Kleinedoxa* (Irvingiaceae). Plant shears are 21 cm long." [From A. Gentry's paper in *Biological Relationships Between Africa and South America*]

S. David Webb
Florida Museum of Natural History, Gainesville, FL 32611, USA

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