A Southern Biota

Ecological Biogeography of Australia. ALLEN KEAST, Ed. Junk, The Hague, 1981 (U.S. distributor, Kluwer Boston, Hingham, Mass.). In three volumes, boxed. xl, 2142 pp., illus., + map. $495. Monographiae Biologicae, vol. 14.

This 2182-page work, in three volumes, is a masterly synthesis of the available knowledge about the ecological biogeography of the Australian continent. In some respects, it is an updating of Crocker and Christian's 1959 volume *Ecology and Biogeography of Australia*, the first of the regional reviews published in Dr. W. Junk's Monographiae Biologicae series; but it far exceeds that book in scope and depth, treating many additional topics and reflecting the enormous quantity of scholarly studies of Australian plants and animals that have been carried out in the intervening two decades. Despite its price, which can only be described as horrendous, this book should find a place in all libraries seriously concerned with ecology, systematic and evolutionary biology, geography, limnology, or anthropology, and it will doubtless remain the standard reference in its field for years to come. It is beautifully produced and richly illustrated with maps, line drawings, and photographs.

The 69 chapters of the book are divided into eight parts, the last of which (169 pp.) is an overall synthesis that has been very capably written by the general editor. Part 1, on the development of the Australian environment (162 pp.), reviews plate-tectonic events in the region and the development of its climate as the Australian plate moved northward during the past 53 million years. Widespread humid forests were fragmented from the Middle Miocene onward by spreading aridity. Part 2, on the flora of Australia, occupies the remaining 643 pages of the first volume, with 19 chapters outlining the major vegetation formations in Australia and the development of the elements that make up its distinctive flora through time.

Especially notable in part 2 is a paper by D. C. Christophel on Tertiary megafossil floras as indicators of floristic associations and paleoclimate in Australia. The widespread and characteristically abundant occurrence of fossil pollen of *Nothofagus*, Proteaceae, and Myrtaceae in Paleogene time in Australia has been traditionally interpreted as indicating a cool-temperate forest dominated by these angiosperms and characteristic austral gymnosperms. None of these genera is represented in the three megafossil floras analyzed by Christophel, a fact that suggests rather that there was a very diverse assemblage of woody plants characterizing the Paleogene Australian closed forest and that the three groups just mentioned may be grossly overrepresented in the pollen record as compared with their actual abundance. In this paper, and in an outstanding analysis of Australian rainforests by L. J. Webb and J. G. Tracey, the picture of a warm-temperate to subtropical forest dominated by many diverse plants, highly varied regionally, begins to emerge for the Eocene of Australia. In another valuable chapter, L. A. S. Johnson and B. G. Briggs discuss the hypothesis that the evolution of the sclerophyllous habit that is characteristic of so many Australian plant families is not associated with recent climatic shifts toward aridity, as it appears to be in the Northern Hemisphere and perhaps in South America also, but rather with evolution on highly infertile soils that existed in forested areas in Australia from the late Cretaceous onward. A similar pattern of evolution is suggested for the even richer and more diverse sclerophyllous flora of southern Africa, particularly that of the Cape Region.

Part 3 (270 pp.) deals with selected groups of terrestrial invertebrates in Australia: spiders, scorpions, Oligochaeta, land snails, Lepidoptera in general, butterflies, Coleoptera, and *Drosophila*. The ecological and biogeographical patterns presented by these different groups are varied. In the chapter on Lepidoptera, for example, N. B. Tindale presents a new analysis of the Upper Triassic fossil *Eoses*, from Queensland, that suggests it is a member of the Lepidoptera and that the order is therefore considerably older than has been generally thought. The extraordinary radiation of the moth superfamily Hepaloidea in Australia certainly reflects the archaic character of the group in Australia. The Odonata, another ancient order of insects, are about evenly represented in Australia by genera ultimately of southern distribution and those of northern (tropical) origin, the ancestors of the former presumably having been in Australia since Eocene or earlier times and the latter having entered mainly from the Miocene onward. These are the two patterns that dominate among Australian biota generally, although in many groups (for example the birds; A. Keast) it is impossible on the basis of present evidence to assign particular taxa to one source or the other with confidence.

The biogeography of inland waters is treated in part 4 (194 pp.). Crustacea, Odonata, Plecoptera, blephariceridid midges, aquatic Hemiptera, and freshwater fishes and mussels are treated at some length. These groups again display varied patterns of origin and diversification. For example, nearly all the freshwater mussels (K. F. Walker) and Plecoptera (P. Zwick) belong to distinctive southern groups with only distant relationships to the members of the same groups that occur on the northern continents, whereas the aquatic Hemiptera and Coleoptera are mainly widespread forms that have clearly been derived from Asia, mainly from the Miocene onward. The much greater powers of dispersion of these latter groups doubtless hold the key to the explanation of this pattern.

Part 5 (158 pp.) deals with the biogeography of reptiles and amphibians and the patterns of evolutionary radiation they display. Nearly all the frogs, the only group of amphibians present, show affinities with those of South America (M. J. Tyler, G. F. Watson, and A. A. Martin); they are an archaic southern group, like the Plecoptera and freshwater mussels. In contrast, only one family of reptiles, the chelid tortoises, exhibits such a pattern of distribution. The remaining approximately 120 genera and 600 species probably have been derived in the Miocene or more recently from Oriental ancestors (H. G. Cogger and H. Heatwole), at least as I would interpret the data presented.

Homeothermic vertebrates are treated in part 6 (207 pp.). Most families of marsupials were established prior to the close of the Oligocene, and there are no fossils from the periods that would be critical in tracing the much-debated details of their early history in Australia (M. Archer). Conilurine rodents arrived in the middle to late Pliocene, other groups of rodents later (A. K. Lee, P. R. Bavestock, and C. H. S. Watts), bats from the Miocene onward (L. S. Hall), the dingo at least 9000 years ago. The origin of monotremes is enigmatic. Birds

are ancient in Australia (Keast), and some extant groups clearly (ratites, megapodes) or probably (parrots) so; about other groups of birds the evidence of time or direction of arrival in Australia is inconclusive.

The origins and ecology of aboriginal humans are treated in part 7 (147 pp.). Aboriginal occupation of Australia certainly began more than 35,000 years ago (A. G. Thorne), probably much earlier. It seems to have been associated with the extinction of large marsupials and birds, as well as of other animals. Fire clearly became more important in the Australian environment after the arrival of humans (N. B. Tindale). Recent studies of the cultural anthropology of the aborigines, which have provided a rich array of new insights into their hunter-gatherer economy, are reviewed.

This is a landmark volume of the greatest importance in understanding the natural world of the island continent, Australia. It will long repay careful study and will doubtless help to stimulate whole new cycles of investigation of the fields with which it deals.

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Medical Institutions

The Invention of the Modern Hospital. Boston, 1870–1930. MORRIS J. VOGEL. University of Chicago Press, Chicago, 1980. x, 172 pp. $15.50.

Today the general hospital forms the center of America's medical system. Patients expect to go to the hospital when they are ill; physicians insist that modern medicine can be practiced best in these central institutions where laboratories and expensive equipment are located. The visibility of the hospital today, however, should not blind us to the fact that the hospital's position at the pivot of medicine is a relatively new phenomenon. Traditionally physicians practiced in the homes of patients, and only the poor and solitary sought treatment among strangers in hospitals. Morris Vogel's concise analysis of the evolution of the modern hospital in Boston between 1870 and 1930 places the hospital in its rightful historical perspective and provides insight into how and why the institution took its modern form. Vogel rejects an analysis of hospital growth based solely on the advancing techniques and capabilities of medical science. Instead, he emphasizes the social and economic factors that transformed charity hospitals into modern scientific institutions that serve all classes of people.

In 1873, when Vogel's study begins, a survey of the United States identified only 120 hospitals; by the 1920's there were more than 6000. The typical patients in the early hospitals were people with limited resources. The medical procedures these patients received could have been administered at home, were it not that their rooms were unheated or dirty or crowded and they had no one at home to care for them. The physicians who attended these charity institutions, in marked contrast to their patients, formed the medical elite of Boston, socially well-positioned people who sought hospital appointments to develop their skills and reputations and who expected no remuneration for their services. A diverse set of factors gradually made this model of hospitalization obsolete. Vogel analyzes in turn the political influences in a city with a large immigrant population, the impact of new medical and surgical procedures, the developing professionalization and specialization of physicians, the effects of urbanization and industrialization on the family's ability to care for its sick, the clinical needs of medical education, the costs of the new medicine, and the tensions between private nonhospital physicians and their hospital-based colleagues. Vogel argues that the modern hospital developed out of identifiable needs and desires of physicians, lay hospital boards, patients, and public officials. His research is based squarely on hospital records, medical society papers, newspapers, private archives, and interviews.

Vogel's most important contribution is his analysis of middle-class motivations and patterns for moving to the hospital. Unable to make the transition directly into hospitals they regarded as repositories of the socially marginal, yet feeling increasingly unable to take care of sick friends and relatives in cramped urban apartments or alone in lodgings, middle-class urban dwellers first found refuge and medical attention in new private hospitals that appeared at the end of the 19th century. Initially little more than boarding houses for the sick, these institutions catered to the affluent and eased their transition ultimately to the better-equipped general hospital. The book's weakest aspect is its assumption that the new hospital medicine necessitated a view of patients as mere physiological entities. Vogel ignores the humanizing influences of medical social work, which flourished in the new hospitals, and unjustifiably credits traditional medicine with more concern for the whole patient than it frequently exhibited.

Although Vogel concentrates on Boston in his analysis of the evolving American hospital, he is aware, with Oliver Wendell Holmes, whom he quotes, that "to write of 'Medicine in Boston' is not unlike writing of the tides in Boston Harbor. Boston is a fraction of the civilized world, as its harbor is part of the ocean." Vogel's book is the best available historical account of the development of modern hospitals in America. It is also a good reminder that some institutions we take for granted today developed only in the recent past and may in time themselves give way to new forms.

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Biochemistry

Biology of Carbohydrates. Vol. 1. VICTOR GINSBURG and PHILLIPS ROBBINS, Eds. Wiley-Interscience, New York, 1981. 320 pp., illus. $49.50.

Though carbohydrates have been studied extensively for several decades, significant progress has been made in recent years, and thus the series this volume initiates is timely.

In chapter 1, Vincent C. Hascall, whose work over the past decade or so has dramatically clarified the complex organization of proteins, proteoglycans, and glycosaminoglycans in connective tissues, discusses the development of his research as well as the work of others in the field. His chapter provides a clear and concise picture of the current understanding of the biochemistry of mucopolysaccharides and includes sufficient information concerning the experiments to enable the reader to follow the strategy and the development of conclusions. The emphasis is on carbohydrate-containing macromolecules and proteins in cartilage, although those in other connective tissues are also discussed. As Hascall points out, this field has now reached the stage at which important questions concerning the function of connective tissue polymers can be addressed.

In the second chapter, Enrico Cabib and Eleanor M. Shematek discuss the structures of cell wall polysaccharides of selected species of yeast, fungi, and plants as well as the general organization of polymers in the cell matrices. The biosynthetic pathways for several of the