Paleoclimatology

Climates of the Past. An introduction to paleoclimatology. Martin Schwarzbach. Translated from the German second edition by Richard O. Muir. Van Nostrand, Princeton, N.J., 1963. xii + 328 pp. Illus. $10.75.

Since the 17th century, the presence of fossil palms and reef corals, coal beds, evaporites, and glacial tills in areas where these organisms and phenomena do not now occur has intrigued man and has suggested to him that in the past, climatic zones have not always been distributed as they now are. As a result an extensive literature on paleoclimatology has been built up and numerous theories proposed to account for the inferred changes. During the last quarter of a century Martin Schwarzbach has been one of the leaders in paleoclimatology, and the present volume (a translation of the greatly revised second German edition) reflects his broad command of the field, but at the same time it is tempered by his awareness that recent advances have shown that some classical interpretations are debatable.

The contents of the volume are organized in three parts: General Paleoclimatology, a review of kinds of evidence, criteria, and techniques; Historical Paleoclimatology, a review of climates through geologic time, emphasizing the interval since the Precambrian; and Genetic Paleoclimatology, a review of the hypotheses and causes that have been inferred to control climates. Schwarzbach concludes that the primary cause of past climatic variation must be related to variations in solar radiation, but he also feels that a minor amount of continental drift and polar wandering are necessary to explain the observed variations in distribution patterns.

The first section of the work seems particularly disjointed, often with no transition or relationship from one part to another. This same fault occurs to a lesser degree in the other sections, and one suspects that this clumsiness as well as some contradictions are due to translating and editing. Other than this awkwardness, the volume is an up-to-date, conservative presentation of modern ideas on past climates, their variation, and the causes of variation.

Like nearly all modern investigators in the field, Schwarzbach gives no consideration to the fact that the Pacific Basin covers a very large share of the earth's surface and that almost no geologic data of Pre-Pleistocene age is available from within it. As a consequence of this lack of geographic control, many hypotheses cannot be adequately tested.

A second fault, which is also shared with almost all who delve in this field, is the presentation of world-wide paleoclimatic maps on projections using modern geography and then warping climatic belts across them. It is time for the presentation of new and more easily understandable maps.

The bibliography covers 35 pages, and the volume is well worthwhile from this aspect alone.

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Plant Physiology

Meristems, Growth, and Development in Woody Plants. An analytical review of anatomical, physiological, and morphogenic aspects. J. A. Romberger. U.S. Department of Agriculture, Washington, D.C., 1963 (order from GPO, Washington, D.C.). vi + 214 pp. Illus. $1.75.

The author of this book, J. A. Romberger, is a plant physiologist whose interest lies in forest trees. But little is known about certain phases of forest tree behavior, and he illustrates some of his points by referring to experiments conducted with herbaceous plants.

The volume contains slightly more than 200 pages which are arranged in three parts and a brief résumé. Part 1 is concerned with the anatomy of meristems. Here Romberger discusses the organization of shoot apices, both gymnosperm and angiosperm, and, to a lesser extent, the organization of root apices. He displays a great deal of tolerance toward controversial theories —for example, in discussing different interpretations of the pattern of apical zonation in conifers. In this part of the book there are topics on the physiological morphology of shoot meristems, on the origin of leaves, cataphylls, and vascular tissues, on terminal, axillary, and adventitious buds, and on the physiological processes of all of these. Discussion of the physiological anatomy and development of cambium is of particular interest to foresters.

Part 2 (95 pages) is called Episodic Growth and Dormancy of Shoots, and part 3 (11 pages) is on the episodic growth and dormancy of roots. Together these two chapters comprise the major, physiological part of the book, but the author always emphasizes the fact that physiological processes in nature occur in the living cells; concomitant anatomical and cytological changes are always kept in mind. Dormancy, a very important and still not well-known process, is thoroughly reviewed, and the discussion of photoperiodism in trees is illustrated with case histories of seven broadleaf species and one European pine. (But where are our American conifers?) Some space is devoted to the circadian rhythm in trees and its relation to photoperiodism and thermoperiodism.

An especially welcome chapter (32 pages) is devoted to an up-to-date discussion of growth regulators: auxins, gibberellins, kinins, and others like leucoanthocyanins and inositols whose physiological role in plants is not well known. Growth inhibitors are also mentioned, and the interaction of different growth substances is discussed.

This stimulating book will be extremely valuable to those who are engaged in researches on the growth and development of forest trees.

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Paleobotany

The Lower Tertiary Floras of Southern England. vol. 3, *Flora of the Bournemouth Beds; The Boscombe and the Highcliff Sands.* Marjorie Elizabeth Jane Chandler. British Museum (Natural History), London, 1963. xi + 169 pp. Illus. £10 10s.

This monograph is the final volume of a trilogy devoted to the study of the Lower Tertiary (Paleocene and Eocene) floras of southern England. The three volumes together with numerous shorter papers are the culmination of nearly 40 years' work that Miss Chandler has dedicated to the study of British Tertiary paleobotany. The monographs consider, in turn, successively younger floras from the continental and marine sediments. Their publication over a period of several years (1961 to 1963) precluded their review as a unit; they are nevertheless parts of a single story,

since they stress the essential floristic and phytogeographic unity of the Lower Tertiary floras of Britain.

The arrangement of the text in volume 3 is the same as that in the previous volumes of the series. A brief introduction (29 pages) includes important information relative to the occurrence and composition of the flora to supplement the general introduction provided in volume 1. This is followed by a section (129 pages) of detailed descriptions and comments on the species of the 80 named genera representing some 51 families of plants recovered primarily from the Eocene Bournemouth Freshwater Beds and the Highcliff Sands. The prime objects of study are again, as in the earlier volumes, angiosperm fruits and seeds and fern and gymnosperm leaf and cuticular remains. The Bournemouth Freshwater Beds also yield abundant angiosperm leaves not yet comprehensively studied. The systematic descriptions are accompanied by 25 excellent plates (including about 800 figures), which are the work of Chandler, and by 33 text-figures, most of which are based on Chandler's sketches.

The three volumes of the present series are largely descriptive. But we have to look forward to a statement that Chandler indicates she will prepare, which will survey all of the floras described by her from the Thanet Beds (Paleocene) of Kent to the Oligocene of the Isle of Wight and the Bovey Tracey Lake Basin and will provide the main floristic and phytogeographic conclusions that arise out of her extensive and painstaking work.

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Biogeography

North Atlantic Biota and Their History. A symposium held at Reykjavik in July 1962, under the auspices of the University of Iceland and the Museum of Natural History. Áskell Löve and Doris Löve, Eds. Pergamon, London; Macmillan, New York, 1963. xii +430 pp. Illus. $15.

In July 1962 a symposium on the biogeography of North Atlantic land areas was held at the University of Iceland in Reykjavik; the symposium was sponsored by the NATO Advanced Study Institutes Program. The 26 papers in this volume were presented at the symposium. Six of the papers are geological; three are paleobotanical. The remaining deal primarily with the distribution and ecology of modern species and with their bearing on historical problems—13 on plants, 3 on animals, and 1 on plant dispersal, in which animal agents are considered in some detail. The authors come from seven North Atlantic countries plus Czechoslovakia and Italy, the countries most strongly represented being Sweden (8 papers), Iceland (5), and Norway (4).

Iceland was an area of appropriate focus for the symposium—first, because it is a "stepping stone" in dispersal paths between America and Europe; second, because its unusually varied and dramatic geology offers such rich clues to the past; and third, because for Iceland there is an impressive knowledge of floras, both present and past, and of Tertiary geology, all of which are highly relevant to broad problems of floristic and faunistic relationships across the North Atlantic. The central question to which the papers directly or ultimately are addressed is, as Áskell Löve states in his introduction, "whether certain flora and fauna elements on both sides of the Ocean reached their present areas by dispersal over existing lands . . . or, whether these continents in a not too remote past were in direct contact . . . united by land bridges. . . ." The contributions vary in both taxonomic and geographic scopes. Some papers are confined to specific areas (for example, the papers on Svalbard and the Faroes) or to specific groups (for example, lichens and oligochaetes), but most are more wide-ranging one or both ways, and all partake of the broad perspective indicated by the book's title. Angiosperms get the most attention. The two papers hitting the central question mentioned above most directly are the one in which Dahl cites plant evidence and the one in which Lindroth cites animal evidence. Both authors argue in favor of a land connection across the North Atlantic, existing in the late Pliocene or perhaps even into the Pleistocene.

This well-edited volume is clearly one of wide interest on both sides of the Atlantic, not only to biogeographers, but also to ecologists, taxonomists, and historical geologists. Those biogeographers with especially keen interests in North Atlantic land areas should know that the symposium discussions are recorded in a mimeographed volume, presumably accessible through any of the participants. This book may well stand as a model for the sort of intensive and collaborative regional attack on problems of historical biogeography now needed for various parts of the world.

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Ecology and Plant Geography

Vegetation and Flora of the Sonoran Desert. vols. 1 and 2. Forrest Shreve and Ira L. Wiggins. Stanford University Press, Stanford, Calif., 1964. 1740 pp. Illus. $22.50.

Publication of this work on the vegetation and flora of the Sonoran Desert, described from both the ecological and taxonomic points of view, has been awaited for some time—about 35 years. For a book like this one a long preparation period is necessary because the taxonomic problems involved are intricate—just the mechanical work of writing the descriptions is enormous. Wiggins is to be congratulated on his outstanding contribution to the knowledge of the taxonomy of vascular plants that appear in a highly important vegetation type which covers an enormous area, and especially since access to that area is difficult. One hardly expects such a project to be completed during the life-span of one man, for this is no mere compilation of the work of others, but original research.

In volume 1, along with the monumental work by Wiggins on the taxonomic side of the flora of the Sonoran Desert is the equally outstanding work by the late Forrest Shreve on natural vegetation. This was first published in 1951 by the Carnegie Institution of Washington, and it is reprinted here without material change. This also represents a lifetime of work, although it is more briefly summarized. Shreve's interpretation of the desert flora of Mexico and the United States has been the standard of many authors, and its excellence stands beyond question.

The entire treatise makes a valuable two-volume coverage of a vast subject, and Stanford University Press is to be congratulated upon its excellent work. The total bulk, 1740 pages, is considerable. The text could have been pub-