

REVIEWS

S. K. RUNCORN, *ed.* *Continental drift*. New York and London, Academic Press, 1962. xii, 338 p. (International Geophysics Series, Vol. 3.) £4 6s.

CONTINENTAL drift is of great importance to glaciologists as it affords the only credible explanation of the Permo-Carboniferous glaciation of the now widely separated Southern Hemisphere continents. Wegener's theory was shelved on geophysical grounds and the appearance of this stimulating book is ample proof that the geophysicists have repented. It consists of easily readable contributions by a dozen experts from quite widely different geophysical fields. In all of them, however, movements in the crust and mantle, only slightly less spectacular than those involved in continental drift, are somewhere postulated.

Recent interest in continental drift has been revived by palaeomagnetic studies which are reviewed in the first chapter by the editor who is himself a vigorous worker in this field. The palaeomagnetic data are reconciled with the palaeoclimatic data in the second chapter. The next three chapters discuss large horizontal movements in the Earth's crust as revealed by earthquake and magnetic studies. That the search for a mechanism usually involves a consideration of thermal convection in the Earth's mantle is largely due to the work of Vening Meinesz who has contributed a most illuminating chapter, which is followed by one in which the theory of convection in spherical shells is developed and applied to the Earth's mantle. Convection is also involved in some of the mountain-building hypotheses which are fully discussed (and all found wanting) by Chadwick. The two-thirds of the Earth under water are not ignored. The longest chapter deals with the deep sea-floor in which Heezen discusses the drift hypotheses. Dietz is given the succeeding chapter to present his "sea-floor spreading" mechanism. Gaskell, in the final chapter, concludes that the differences between the Pacific and Atlantic Ocean floors may well be due to drift. The book concludes with a chapter devoted to Wegener.

No specific pronouncements about continental drift are made in this book, the aim of which the editor says has been to stimulate. By taking us to the frontier in so many fields, one feels it will be stimulating for some years to come.

M. AFTAB KHAN

J. TRICART and A. CAILLEUX. *Traité de géomorphologie. Tom. 3. Le modèle glaciaire et nival*. Paris, Société d'Édition d'Enseignement Supérieur, 1962. 508 p., illus.

THIS book is one of a series devoted to various aspects of geomorphology, written by two of the leading French workers in this field. Snow and ice produce very distinctive modifications of the landscape, which are discussed in detail in the book. The first section deals with glaciological data, beginning with the nature of snow and its distribution, and going on to discuss different types of glaciers. Throughout the book the emphasis is on the geomorphological significance of ice and snow. The study of present-day ice cover is followed by a discussion of past ice ages and a short section on Pleistocene chronology and stratigraphy. The second part deals with the dynamics of ice movement and stresses the paucity of data concerning the flow of ice at depth. Most of the recent views on glacier flow are mentioned, and a fair assessment of the present state of knowledge in this field is given, although it is not always related to the morphological forms that glacier flow produces and which are described in the rest of the work. The discussion of glacier flow is followed by an account of the theories of glacial erosion. In the third section the processes operating to erode typical glacial landforms, such as cirques and glacial troughs, are considered in detail, following a valuable section on the geomorphological significance of avalanches. The section ends with a discussion of the processes operating on the margin of the ice, in which deposition plays a significant part and melt water becomes one of the dominant forces in operation. The morphological effect of a sequence of glacial stages is discussed in the last section; the features

due to advance are differentiated from those formed during retreat and stagnation. The book ends with an account of the indirect effects of glaciation, including changes of sea-level resulting from eustatic and isostatic movements of sea and land, and biogeographical influences.

Both authors are familiar with present ice masses and have travelled widely in previously glaciated areas, so that they describe many of the features at first hand. They have not only relied on their own work, as the very long and detailed bibliographies show. These are arranged at the end of each chapter or section, subdivided according to the subject matter to which they refer. The book is a well documented and scholarly work, which stresses the processes operating, or which have operated in the past, to form the very distinctive glaciated landscapes. The illustrations, however, are not as satisfactory as the text; the drawings rarely reveal so clearly the features they portray as good photographs would have done, and some of the figures lack units and maps occasionally have no scale. One figure is missing and another repeated.

The geomorphological effects of ice sheets and local glaciers are differentiated from each other and from the influence of snow. These differences are important in that, although local glaciers are now generally studied more intensively, ice sheets have in the past been much more widespread in their influence on the landscape. The book can be strongly recommended to anyone who wishes to read a full account of the various theories that have been put forward to explain glacial phenomena in terms of the processes which operate in a region covered by snow and ice.

C. A. M. KING

A. HOEL and J. NORVIK. Glaciological bibliography of Norway. *Norsk Polarinstitut. Skrifter*, Nr. 126, 1962, 242 p. N. kr. 30.

A. HOEL and W. WERENSKIOLD. Glaciers and snowfields in Norway. *Norsk Polarinstitut. Skrifter*, Nr. 114, 1962, 291 p., maps, + 8 maps in separate folder. N. kr. 40.

THE description of the glaciers and snowfields of Norway by Hoel and Werenskiold is based on all available sources of information, which include early accounts as well as more modern scientific observations, although the authors' own contribution to this knowledge forms the major part of the work. The material that was used for these studies has been assembled and printed separately as "Glaciological bibliography of Norway" by Hoel and Norvik. This bibliography begins with a saga of A.D. 1202, but then there is little more until the seventeenth century, when early travellers' accounts and local descriptions, some related to boundary delineation, were becoming more common. The material is arranged chronologically, and extends to 1958, with a few addenda to 1961. It includes all references to work relating to glaciers, snow and ice in all Norwegian territories, so that Jan Mayen and Svalbard are covered as well as Norway itself. The detailed chronological list is followed by a regional arrangement of the material and an index of authors. There is a short appendix giving references to ice-dammed lakes.

In the main list, which includes articles written in several languages, Norwegian titles are also translated into English. It is very valuable for anyone planning glaciological work in any part of Norwegian territory, as it provides a comprehensive bibliography of relevant material already published. The articles are drawn from a wide range of sources and in some a short comment in the bibliography mentions the scope of the article, and some facts are given. The chronological bibliography is of interest as it shows the development of ideas and feelings towards glaciers; from being objects of awe and menace, they have become increasingly appreciated for their scenic beauty and scientific interest and as the goal of many parties of young people exploring the remote and little-known glacier regions. Towards the end of the period covered, there is increasing evidence of the more detailed scientific work, such as the studies initiated by W. V. Lewis in Jotunheimen and on Austerdalsbreen.