REVIEWS

GLACIER VARIATIONS AND CLIMATIC FLUCTUATIONS

By H. W:son Ahlmann. *New York: American Geographical Society, 1953. (Bowman Memorial Lectures, Series Three). 9 x 6 inches; v + 51 pages; illustrations, diagrams, and sketch-maps. $2.50.*

When the master of a subject, Hans Ahlmann, speaks or writes upon his favourite topic, glaciology, the profits are great. The third series of Isaiah Bowman Memorial Fund lectures afforded just such an occasion, and the benefits of Ahlmann's words are now made more widely available through publication of this booklet.

Readers familiar with Dr. Ahlmann's former works and aware of his more recent services as Swedish Ambassador to Norway might understandably expect to find herein a summary of earlier accomplishments, but they will be surprised. The present volume is an effective digest of recent glaciological and climatological investigations, organized and interpreted within a framework established largely by the researches of Ahlmann and his colleagues. As a result of his alert and continuing interest in glaciology and related climatic changes and through his widely recognized stature, Ahlmann serves as an effective clearing house for all the latest information in these fields. It is because of this unique position plus his own talents for evaluation and synthesis that the present volume constitutes a notable contribution.

Topics to which consideration is given include: glacier regimens, factors influencing glacier variations, the recent glacier recession and its causes, the present climatic fluctuation and the evidence for it, the position of this fluctuation in the broader sequence of climatic changes, and some aspects of possible future climatic variations. Treatment of these matters is enhanced by inclusion of con siderable unpublished material from the Norwegian–British–Swedish Antarctic expedition of 1949–52 and from recent investigations in Spitsbergen and Swedish Lapland. Newly published glaciological and climatological information, not always readily available or widely known in North America, is also ably integrated into the presentation.

Only a few of the many notable points treated can receive comment here. Among these is the fact that recent seismic soundings in the Antarctic give further support to Cailleux's suggestion that the volume of the Greenland and Antarctic ice sheets is greater than supposed heretofore. Melting of all glaciers would cause a rise in sea level, after isostatic adjustments, conservatively calculated at 60 metres (195 feet) which is notably more than the 20 to 50 metres usually given.

Ahlmann feels that Schytt's temperature and crystallographic studies in the Antarctic lend support to his earlier statement that the continental Pleistocene ice sheets were largely polar, that is at subfreezing temperatures to depths of several hundred feet. However, this interpretation may too greatly discount the influence of meltwater on thermal regimen. Schytt's results pertain to environments in which meltwater forms only in minor amounts or not at all. It seems entirely possible that considerable meltwater may have been developed in summer over large areas along the margins of the Pleistocene ice sheets. The heat given off by this water as it percolated into the firn and refroze prevented these parts of the ice sheets from being deeply chilled even though the mean annual air temperature may have been well below freezing. Thus, a wide peripheral zone of the continental ice sheets could have had a temperate thermal regimen.

Evaluation of the meteorological factors affecting ablation is discussed. In this connection it might be well to point out that some method is sorely needed for measuring ablation of snow and firn with an accuracy and reliability equivalent to that with which the meteorological factors are measured. This is not an easy task, but it is essential to an eventual balancing of the ablation equation.

A sound discussion of the lag between changes in regime and changes in behaviour of glacier snouts is offered. However, in a following section note is made of a synchronous and proportional relation between regimens and recessions of the snouts of the Kårsa and Stor glaciers in Swedish Lapland. Because of the lag factor, these relations cannot be those of direct cause and effect. Rather it seems that variation of some ablation factor or factors has had a simultaneous and corresponding effect upon total regime and upon wastage of ice at the snout. Eventually, perhaps, glaciers and the principles governing their behaviour will be well enough known so that a reasonable estimate or calculation of the lag factor for individual glaciers will be possible.

Mention is made of the fact that some glaciers seem to have a "threshold" response which causes them to undergo pulsational advances and recessions under conditions of essentially uniform nourishment. This is a matter warranting the serious attention of glaciologists and physicists because it involves the fundamental properties and behaviours of ice and the modes of flow in a glacier. Expressed in grossly oversimplified terms, the question is whether glaciers are essentially "plastic" or essentially "viscous" in their behaviour. In this connection it is well to keep in mind the possible differences of polar and temperate glaciers and also to evaluate the relative contributions to total movement provided by basal slip and by deformation within the ice body itself.

The results from the many lines of investigation bearing on recent climatic changes can be confusing unless placed in proper perspective. Dr. Ahlmann skilfully integrates and summarizes this dispersed material to support the conclusion that the so-called recent "climatic improvement" of the North Atlantic region came to an end between 1930 and 1940 with a return to conditions somewhat more favourable for glaciers. The success of Scandinavian researches in tracing the recent "climatic improvement" makes one wish that a more vigorous program of investigation might be launched on the corresponding "climatic deterioration" in the semiarid southwestern United States, another marginal area sensitive to climatic change.

Much of the data reported by Ahlmann is clearly summarized in two illuminating graphs on page 38. These are most useful for showing in relative amounts the great shrinkage of glaciers during the post-Wisconsin xerothermic period, their resurgence during the subsequent "climatic deterioration" culminating about 500 B.C. in a climate which, with fluctuations, has continued to the present day. These fluctuations caused a considerable glacial recession during the Roman period (A.D. 0–400) and also produced in many areas between 1650 and 1750 the greatest glacial advance of the post-Wisconsin period.

Dr. Ahlmann renders us all great service by bringing together in this little booklet a stimulating view of some exciting chapters in the history of recent climatic fluctuations. ROBERT P. SHARP

NORTH: THE NATURE AND DRAMA OF THE POLAR WORLD. By KAARE RODAHL. *New York: Harper and Bros. 1953. 8½ x 5½ inches; diagrams; illustrations, and end-paper map. $3.50.*

Dr. Kaare Rodahl is known on both sides of the Atlantic for his studies of human nutrition in cold climates. A decade ago his paper on "The vitamin A content and toxicity of bear and seal liver" aroused interest because of the clues it provided to the causes of poisoning from eating polar bear liver. Later technical reports by Dr. Rodahl discussed the sources of vitamins available in plant and animal tissues in the arctic regions.