

THE QUATERNARY ICE AGE.<sup>1</sup>

THIS handsome volume is a notable contribution to the voluminous literature relating to glacial geology. Its scope is comprehensive, for it describes in a crisp and lucid form the succession of Glacial and post-Glacial deposits in Europe and North America, the living and extinct Quaternary mammals, the successive stages of culture of Palæolithic and Neolithic man, the various theories of the cause of the Ice age, and the isostatic theory of the Quaternary oscillations of sea-level. Much controversial ground is traversed in this wide field. Throughout the volume the author maintains a critical attitude and expresses his opinions freely. His chief aim has been to set forth what he regards as the solid basis of fact which throws light on the history of this fascinating epoch. Hence he discards classifications which, in his opinion, are not supported by conclusive evidence.

At the outset the potency of glacial action in modifying the surface features of a country is recognised. In proof of this contention reference is made to the over-deepening of valleys, the formation of mountain corries, the recession of corrie cliffs by sapping, and the excavation of rock basins due to differential erosion in harder and softer rocks. In the preliminary account of the Glacial drifts the opinion is expressed that many erroneous conclusions regarding the retreat and re-advance of the ice and the occurrence of inter-Glacial periods have been based on intercalations of sand, gravel, and clay between sheets of Boulder Clay. The so-called "Upper Boulder Clay," in many instances, may be merely an-glacial moraine, which settled down on sub-glacially-formed sediments on the disappearance of the ice. On the other hand, it is admitted that, where these intercalated deposits preserve their horizontality over wide areas, they probably point to retreat and re-advance of the ice. Their inter-Glacial value must be determined by local circumstances.

The author's attitude towards the inter-Glacial question is clearly defined. He is of opinion that the elaborate systems of the older inter-Glacialists may all be set aside as unproved, and that we ought to accept the mono-Glacial hypothesis until we can prove one inter-Glacial period. Nevertheless instances are adduced which prove oscillations of climate of more or less magnitude. The recent researches of Victor Madsen, Nordmann, and Harz on the Cyprina Clays of Denmark, North Germany, and Holland, furnish

satisfactory evidence. These fossiliferous deposits occur as transported masses in the Boulder Clay in the east of Denmark and north of Germany, while to the west and south of these areas they are to be found in their original position, resting on Boulder Clay and fluvio-Glacial gravels. Therefore they cannot be pre-Glacial. They must have been laid down during a period of recession of the ice. In view of the width of the belt containing transported masses of these Eemian deposits in the Boulder Clay of the Baltic ice sheet, the extent of the recession cannot be less than fifty miles. But the presence of well-marked southern species in the marine fauna may indicate a greater recession, and probably the complete disappearance of the ice. These investigations confirm the opinion of Prof. James Geikie and others who assigned these deposits to an inter-Glacial period.

The series of Glacial and inter-Glacial periods

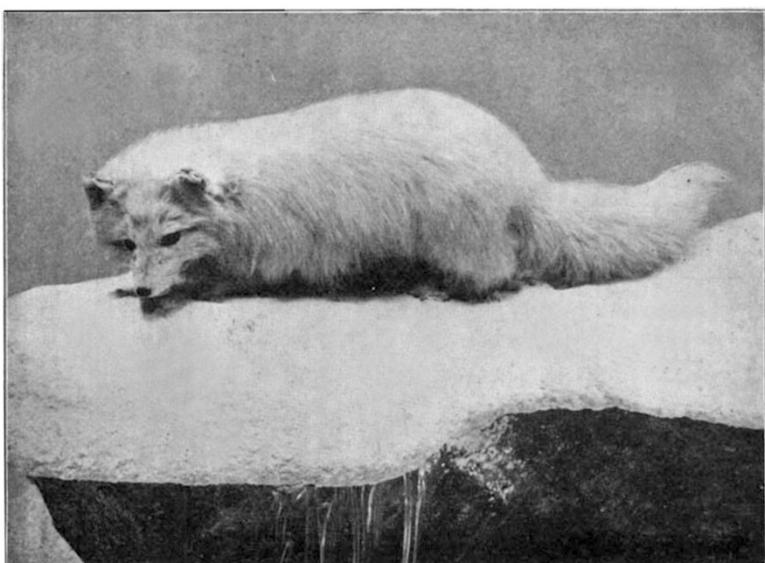


FIG. 1.—The Arctic Fox (*Vulpes lagopus*) in winter coat. From a specimen in the British Museum. From "The Quaternary Ice Age."

worked out by Penck and Brückner in the Alps is adopted. Special allusion is made to certain inter-Glacial deposits proving oscillations of climate, such as the "Höttinger Breccia," the "Schieferkohlen" of Dürnten, the plant-bearing beds of Re and Pianico, all of which are doubtfully referred to the Riss-Würm inter-Glacial period. It is further shown how the evidence from plant remains is confirmed by the Quaternary fauna occurring in Alpine lands; the twofold repetition of the arctic fauna comprising the mammoth, woolly rhinoceros, and reindeer, being separated by the inter-Glacial fauna with *Elephas antiquus*, Merck's rhinoceros, and the red deer.

In the description of the American drifts the classification presented is not so comprehensive as that of Prof. Chamberlin. It begins with the Kansan Till sheet and ends with the later Wisconsin Boulder Clay. The cautious attitude of the author in dealing with the classic Don valley

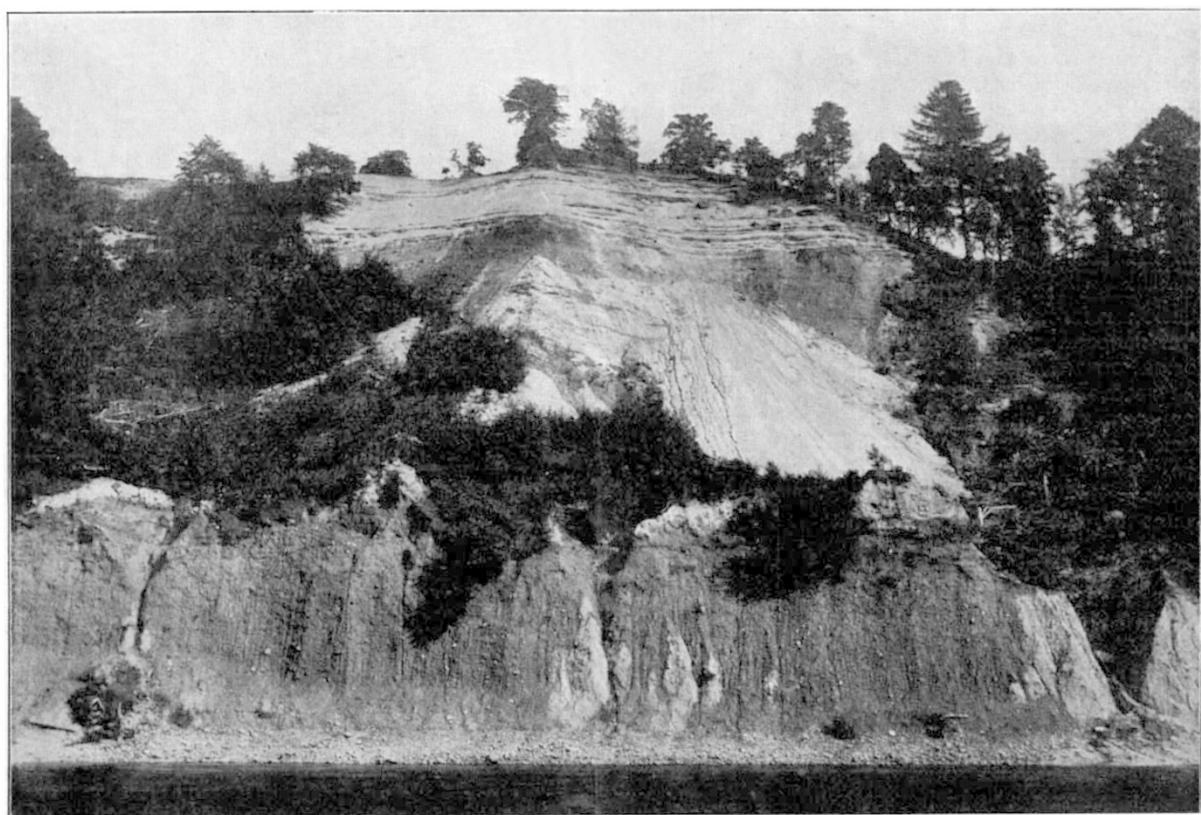
<sup>1</sup> "The Quaternary Ice Age." By W. B. Wright. Pp. xxiv+464. (London : Macmillan and Co., Ltd., 1914.) Price 17s. net.

section near Toronto scarcely does justice to the evidence indicating great climatic changes so well described by Prof. Coleman.

In England, only one out of many so-called inter-Glacial deposits is considered to have stood the test of critical examination, viz., the shell-bearing clay of Kirmington, which is overlain and underlain by Boulder Clay. It indicates a recession of the ice-margin between the periods of deposition of the purple and Hessle Clays, when the sea stood at a higher level in the estuary of the Humber than it does at present. The sequence of the drifts, the oscillations of the ice, the westward shifting of the centres of glaciation, and the

theory was first advanced by Dr. Jamieson to account for marine sediments of late Glacial age in Scotland. He believed that the earth's crust sank under the weight of ice and rose again when the ice disappeared. The author argues with much ingenuity that the late-Glacial and post-Glacial changes of level in Scandinavia may be accounted for by isostatic recovery from the effects of ice-load combined with a single oscillation of the sea-level.

This volume will be useful to students as a synopsis from a particular viewpoint of modern research in Quaternary geology. The illustrations deserve special mention. In selection and



*Photo.]* FIG. 2.—Section of glacial sand and gravel resting on Boulder Clay on the river Spey, opposite Rothes, Banffshire, Scotland. From "The Quaternary Ice Age."

Glacial drainage as worked out by Mr. Lamplugh, Prof. Kendall and others is clearly set forth.

The classification of the culture stages of Palæolithic man is based on that of G. de Mortillet, and of Neolithic man on that of Montelius. Special emphasis is laid on the great break between the Palæolithic and Neolithic industries of Europe. The transition phases (Campignien, Tardenoisien, and Asylien), which are supposed by archæologists to bridge this gap, fail to demonstrate a passage between the two.

One of the most interesting chapters in the volume is that dealing with the isostatic theory of the Quaternary oscillations of sea-level. This

execution they are excellent. Two of them (Figs. 1 and 2) are here reproduced. JOHN HORNE.

#### WIRELESS TELEPHONY.

THE system of wireless telephony upon which Capt. Colin and Lieut. Jeance, of the French Navy, have been at work for some years has recently been considerably improved, and some very successful experiments were carried out last June, when, during some tests in which long-distance communication was established in France by means of an aerial only 164 ft. high, speech was incidentally overheard on a small amateur installation in Lincolnshire. The continuous