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In conclusion, my grateful thanks are due to Professor Fleure for much help in initiating and carrying out the survey and for giving me the free use of all his own measurements of men and women.

R. M. FLEMING.

## Europe: Archæology.

Brooks and Marr.

**The Ice-Age and Man: A Note on Man**, 1922, 5. By C. E. P. Brooks, **47**  
with a Note by Prof. J. E. Marr, F.R.S.

I have studied Mr. Peake's classification of the Quaternary deposits with great interest, though I am unable to agree with him in all respects. There are two critical questions which must be solved before details can be worked out—the age of the Chalky Boulder Clay, and the position of the Chellean Industry.

Mr. Peake places the Chalky Boulder Clay in the Würmian and later than the Acheulian of Hoxne. The British Association Report on this subject is, however, quite definite\* The Acheulian gravels lie *above* the Chalky Boulder Clay and separated from them by lignite and clay with temperate plants. The Chalky Boulder Clay must also be older than the 100-foot terrace of the Thames Valley. But the fauna of the latter, especially *Corbicula fluminalis* and *Paludina diluviana*, is characteristic of the first (Mindel-Riss) interglacial of the whole of northern Europe. We therefore have Chalky Boulder Clay-Mindel. Similar conclusions were reached by F. Leverett† from a study of the weathering and erosion of the European deposits.

I am not an archæologist, but Penck's argument with regard to the position of the Chellean seems to me very clear, that as at Taubach and in the Grimaldi Grotto the Mousterian industry is contemporaneous with a temperate fauna, it must be in part interglacial. That being so, the Acheulean must correspond to the Rissian glaciation, and the Chellean must be Mindel-Riss. This statement is not inconsistent with the Mousterian occupying the whole of the Würm proper also. The close association of Chellean man with *Elephas antiquus* and the only really warm fauna of the Glacial Period is also in favour of its earlier position, for in the Riss-Würm interglacial Northern Europe does not appear to have reached its present temperature.

The great majority of British geologists fail to find any evidence of more than an oscillation of the ice-edge between the period of the Cromer Drifts and the Chalky Boulder Clay. A recession of the Scandinavian ice was followed after a pause by an advance of the British ice, but both are considered to belong to one period of glaciation.

I am glad to see that Mr. Peake throws doubt on the validity of the Gunz-Mindel interglacial. I should like to go further and divide the whole Ice Age into two glaciations only, the Gunz-Mindel and the Riss-Würm, both composed of several oscillations and re-advances. Recent work by Scandinavian geologists‡ suggests that over the greater part of Norway and Sweden the ice only completely melted away once during the whole glacial period, but then for a very long interval. After the Rissian readvance there is no return of a really temperate fauna until the close of the Ice Age. Examine, for instance, the fauna of the "interglacial" mammal beds of Rixdorf, near Berlin. In spite of the large number of bones examined, the warm element is represented solely by one tooth of *Elephas antiquus* and one tooth of *Rhinoceros Merckii*, both possibly derived.

\* B.A. Report, 1896, pp. 400-415, or W. B. Wright, "The Quaternary Ice Age." London (Macmillan), 1914, p. 273.

† Leverett, F., "Comparison of North American and European Glacial Deposits," *Zs. Gletscherk*, Berlin, 4, 1910.

‡ Ahlmann, H. W.: Son, "Geomorphological Studies in Norway." Stockholm, *Geogr. Ann.*, 1, 1919, pp. 1-187, 193-252.

An analysis of the probable meteorological conditions associated with the development of an ice-sheet over Scandinavia gives the following stages:—

1. Ice-sheet forming first over Norway. Northerly winds over Central Europe causing the first glaciation of the Alps (Gunz).

2. Centre of Scandinavian ice-sheet spreads to northern Baltic. Winds over Central Europe become more easterly—drier and somewhat warmer. Recession of Alpine glaciers (Gunz-Mindel).

3. Ice occupies Baltic and spreads out over North Sea, impinging on British coast. Centre of glacial anticyclone again moves westward, causing return of very cold northerly winds over Central Europe. Beginning of Mindelian glaciation of Alps.

4. The cooling brought about by the ice on the North Sea plain causes increased snowfall in British Isles. Hence the British glaciers develop at the expense of the Scandinavian and push the latter away from the coast (Chalky Boulder Clay). This process is probably helped by subsidence in Scandinavia under the weight of the ice-sheet.

5. Final recession of the first ice-sheet.

During the second glacial period the sequence of events was roughly similar, but the Scandinavian ice never actually reached England, while the British glaciers were smaller, and their disappearance was followed by a long series of oscillations in North-West Europe and the Alps. After the disappearance of the British ice there was one comparatively long and mild interval, which we know as the Mindel-Riss interglacial, during which cold-temperate steppe conditions prevailed over Central Europe, but the ice-sheet maintained its existence in Scandinavia, and the commonest animals were the horse, the bison and various species of deer.

I have not been able to see a copy of Macalister's book referred to, so I have not been able to discuss his arguments. C. E. P. BROOKS.

The views as to the relationship of the different stages of palæolithic times are so varied and conflicting that nothing short of a full discussion of the problem is of much use. Even at present, some hold that palæolithic man dwelt in this country in pre-glacial times, others that he is entirely post-glacial, others, again, that some of the palæolithic stages belong to an inter-glacial period. There is a tendency for the upholders of the different views to pay scant attention to the arguments of their opponents. The ideas of those who adopt the third position above mentioned seem to be gaining ground, but the writer feels that much more information must be obtained before the question can be considered as being finally settled.

The Hoxne evidence is most important, but the assumption that the boulder clay below the beds containing Acheulean implements is chalky boulder clay (using the term in a stratigraphical sense) is unproved. It has been suggested that it represents an earlier glaciation during which the Cromer glacial accumulations were formed, and that the Hoxne beds containing a cold flora indicate the oncoming of a second cold period of post-Acheulean date, during which the true chalky boulder clay was formed. J. E. MARR.

America, North: Art.

Ritchie.

**Note on Carving on a North-West American Birch Bark Canoe Model.** By John Ritchie.

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In the literature regarding the artistic element among the peoples of the Far West of Canada I have, so far, been unable to discover any reference to a habit of telling their stories by means of cutting pictures on tree barks, such as that revealed by a specimen in the Perth (Scotland) Museum collection. This specimen, a model