

and-lake barriers is a continuation of that of the mounds, and not superinduced. In the above district most of the eskers occur at a distance from river-valleys; often where there are no streams of water; and sometimes on the summits of hills. Their magnitude (reaching 150 feet in height) in Shropshire; the breadth of the barriers, and the depth and size of the inclosed lakes (not to mention the frequent total absence of streams of water) clearly show that their forms were left by the agency that piled them up, or denuded them before their emergence from the sea. So far as I am aware, all English and Irish geologists believe that their curvilinear shape is not owing to atmospheric action. [See Mem. of Irish Geol. Survey, 98, 99, 108, 109, 117, 118.]

In answer to Mr. Mellard Reade I have only to say that I do not regard the drifts in the neighbourhood of Liverpool as good representations of the *general* succession one may trace from Carlisle to Church Stretton in Shropshire. Long sea-coast and railway sections between these places (over a distance of about 150 miles) show a persistency in the relative positions of the three drifts, or of two of them where only two are present. The clay left by the sea washing the sand and stones out of the Boulder-clay *would not form a Boulder-clay somewhere else on the same horizon*, but would give rise to such a stoneless clay as we frequently find imbedded in the great middle sand and gravel formation.<sup>1</sup> D. MACKINTOSH.

#### THE TROPICAL FORESTS OF HAMPSHIRE.

SIR,—In Mr. Gardner's lecture "On the 'Tropical Forests of Hampshire,'" in your January Number, he is reported as offering two suggestions in explanation of the occurrence of the remains of a temperate climate flora intermingled with that of a tropical one in the Lower Bagshot of Hampshire. One of these is an oscillation of climate which for a time left survivors of the previous flora lingering beside the new growth introduced by a change of climate, and the other the existence of a mean annual temperature which permitted the growth of either class of vegetation side by side.

As I believe both suggestions to be remote from the truth, and as the first of them is contrary to the general evidence afforded by the animal remains of the Eocene period in England, which appear to me to offer the strongest evidence against the existence of a glacial climate in Europe during any part of that period, perhaps you will allow me to offer what I believe to be the true explanation.

The remains upon which the determinations of this flora have been based are drifted, and not those of a bed *in situ* like the Coal-

<sup>1</sup> For full and accurate information concerning the Post-tertiary deposits of this country I would recommend Mr. H. B. Woodward's *Geology of England and Wales*. It is the only geological work in which an account of these deposits has been thoroughly brought up to the present state of discovery. Having gone over the greater part of the ground described in Mr. Woodward's work, and having previously written a work called "Scenery of England and Wales," I may be pardoned for stating that it exhibits more evident signs of great labour and care than any geological book I have read.—D. M.

seams, and the whole of the Hampshire Eocene is connected with the delta of a great river which persisted throughout the accumulation of the various beds, which aggregate to upwards of 200 feet in thickness. This river evidently flowed from the west, through a district of which the low ground had a tropical climate; but like some tropical rivers of the present day, such as the Brahmaputra, the Megna, the Ganges, etc., it was probably fed by tributaries flowing from a mountain region supporting zones of vegetation of all kinds from the tropical to the Arctic, if during the Eocene period vegetation such as the present Arctic had come into existence, of which we have as yet no evidence. Torrential floods may have swept the remains of vegetation from the temperate zones of this region into tributaries that conveyed it into the main river before it was decayed or water-logged, where it became intermingled with the remains of vegetation which grew in the tropical low ground skirting the main stream, so that both sank together into the same mud and silt.

Assuming, therefore, that the determinations of these extra-tropical forms of vegetation are well founded, we have in the case in question no difficulty in discovering those elevated regions from which, in the way suggested, such forms may have come, for Mr. Judd, in describing (*Quart. Journ. Geol. Soc.*, vol. xxx. p. 220) the ancient volcano of Mull, which lies about 400 miles N.N.W. of Hampshire, has shown that it was in full activity during the Eocene and Miocene periods, and possessed a dimension much exceeding that of Etna at the present day; and that, though from denudation and collapses, the greatest elevation to which any of its remnants now reach is only 3172 feet, yet that in Eocene and Miocene times its elevation must in all probability have greatly exceeded that of Etna, which is nearly 11,000 feet.

Nearer, however, than this, and between 100 and 200 miles only N.W. from Hampshire, we have in Wales a mountain region, the summits and upper zones of which (if we take into consideration the considerable depression which the western side of the British Isles must have undergone coincidently with the upheaval of the Eocene sea-bed in the south-east of them, and make some allowance for the action of subaerial denudation) would have had an elevation sufficient to support a temperate and extra-tropical vegetation during the Eocene period synchronously with the growth of tropical forms in the low ground, and have furnished to the sediment of the principal river the remains of various forms of vegetation, which, according to the elevation of their source, departed more or less from those of tropical character which clothed the banks of the streams flowing through that low ground. SEARLES V. WOOD, JUN.

MEDALS AND FUNDS TO BE AWARDED BY THE COUNCIL OF THE GEOLOGICAL SOCIETY, FEBRUARY 16TH.—Four Medals will be awarded at the ensuing Anniversary Meeting of the Geological Society: the "Wollaston" (Gold Medal), the "Lyell," the "Murchison," and the "Bigsby" Bronze Medals; and £116 18s. 7d. in funds.