

A description of the skull in the British Museum (Natural History), accompanied by figures, will be published shortly, when I shall more fully discuss its relations with the fossils described by the French, the American, and the German palæontologists.

The generic name *Leptodon* has to give place to *Pliohyrax*, the former being preoccupied by Sundevall's genus of Falconidæ (1835).

#### NOTICES OF MEMOIRS.

##### I.—NOTE ON THE SURFACE OF THE MOUNT SORREL GRANITE. By Professor W. W. WATTS, M.A., F.G.S.<sup>1</sup>

IT has long been known that, when first exposed in the quarries, the granite of Mount Sorrel exhibits a smoothed, grooved, and slightly terraced aspect. As the surface, when first discovered, was covered with boulder-clay, it has been concluded that it was produced by glaciation. The writer has long had doubts with regard to this interpretation, and recent excavations near Mount Sorrel have thrown a new light on the phenomenon. At Hawkley Wood and Nunckley Hill a similar but smaller surface has recently been exposed which is covered by undisturbed Keuper Marl, while a second surface, exposed at Nunckley Hill, has boulder-clay abutting on it. Thus the grooving, terracing, and smoothing, like so much of the scenery in Charnwood Forest, was originated in Triassic times, though locally it may have been somewhat modified by glaciation. The writer wishes to thank Mr. R. F. Martin for calling his attention to these newly exposed surfaces.

##### II.—NOTE ON BARIUM SULPHATE IN THE BUNTER SANDSTONE OF NORTH STAFFORDSHIRE. By C. B. WEDD, B.A., F.G.S.<sup>1</sup>

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SPECIAL attention has been directed by Professor F. Clowes to the deposition of barium sulphate as a cementing material of Triassic Sandstone near Nottingham, and he has mentioned numerous places, on the authority of Mr. J. Lomas, where the same mineral has been observed in Triassic rocks.<sup>2</sup>

It may be interesting to record another locality. In a cutting of the North Staffordshire Railway (Audley Branch), three-quarters of a mile south of Alsager Road (Talke) Station, a section of Bunter Sandstone in Merelake Hill shows the cross-like marks common in the Keuper Sandstone of Cheshire and Staffordshire, and due to barium sulphate crystals. A partial analysis, made by my friend Mr. R. Hornby, of the Red Bunter Sandstone of Merelake Hill, showed a considerable quantity of barium sulphate. Occasional veins filling joints consist of barytocelestite, which may also be seen in other sections of the Bunter of Merelake Hill.

<sup>1</sup> Abstract of a paper read before Section C (Geology), British Association, Dover Meeting, September, 1899.

<sup>2</sup> Proc. Roy. Soc., vol. lxiv, p. 374. References to previous papers are given in this article.

III.—THE METEOROLOGICAL CONDITIONS OF NORTH-WESTERN EUROPE DURING THE PLIOCENE AND GLACIAL PERIODS.<sup>1</sup> By F. W. HARMER, F.G.S.

NO satisfactory explanation has yet been offered as to the conditions under which originated the great sheets of shelly sand known to geologists as the Upper Crag, the littoral deposits of the North Sea in Pliocene times, which contain everywhere (over an area in East Anglia more than sixty miles in length) the dead shells of mollusca in the most extraordinary profusion. No such accumulations are now taking place on the shores of Norfolk and Suffolk, although molluscan life is more or less abundant in the adjoining seas. On the coast of Holland, on the contrary, dead shells are exceedingly common.

The occurrence of such *débris* is local rather than general, and seems to be due, sometimes to currents, but more frequently to the action of stormy winds, which agitate the sea bottom to a greater or less depth. An examination of the daily weather charts issued by the Meteorological Office shows that movement of dead shells towards the shore at any place is for the most part in the direction of the gales which may be prevalent. At present the cyclonic disturbances, to which East Anglian storms are due, pass as a rule with their centres to the north-west of that district; and hence south-westerly and westerly gales are there common, and shelly *débris* is driven on to the shores of Holland, and not on to those of the east of England. It would seem, therefore, that during the Pliocene epoch strong winds from the east must have prevailed in the Crag area. At an early stage of the Red Crag period, mollusca now confined to the Arctic Circle had begun to establish themselves in the Crag basin, so that the glaciation of Scandinavia, attended with anticyclonic conditions over that country, had probably then commenced. At present, when Scandinavia is anticyclonic, storm centres may be diverted from their usual course towards the south, as was the case, for example, in October, 1898, causing south-easterly and easterly gales, with rough sea on the eastern coasts of England. It is suggested that such conditions may have frequently prevailed there during the Crag period.

The meteorological conditions of the Northern Hemisphere during the Glacial epoch must have been widely different from those of our own time. At present the accumulation of ice-sheets in the Arctic regions is local rather than general; Greenland, for example, being glaciated, while the north of Scandinavia enjoys a milder climate. The latter is due, partly to the Gulf Stream, but partly also to the prevalence of south-westerly winds, caused by the relative positions occupied by areas of high and low pressure. Nansen states that a constant area of high-pressure now exists over Greenland, and that the winds blow outwards from that country in all directions. Similar conditions probably obtained during the Glacial Period over the great ice-sheet of Northern Europe, producing

<sup>1</sup> Read in Section C (Geology), British Association, Dover Meeting, Sept. 1899.

the most far-reaching changes on the climate of different parts of the Northern Hemisphere; and this may, to some extent, explain the local character of the accumulation of great masses of snow and ice during that epoch.

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R E V I E W S.

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I.—THE SURVEY MEMOIR ON THE SCOTTISH UPLANDS.<sup>1</sup>

(Concluded from p. 479.)

THE volume opens with a preface by the Director-General giving in outline the *raison d'être* of the work, the mode of its preparation, and the names of the Survey officers concerned in working out the geological facts and phenomena described. In Chapter I a very short description is given of the physical characteristics of the Upland region; and then in Chapter II, a "History of Previous Researches among the Silurian Rocks of the South of Scotland," the writers enter upon the subject-matter of their work in earnest. In this second chapter the whole history of research in the Uplands is passed in review, from the days when Hutton and Hall laid here the foundations of stratigraphical and tectonical geology, down to the present time. The work of all the chief stratigraphical investigators—Moore, Nicol, Harkness, Sedgwick, Murchison, and others—is first noticed in outline. There are abundant references to those palæontologists who have studied the fossils of these rocks—Salter, McCoy, Carruthers, Hopkinson, Davidson, Henderson, Etheridge, Nicholson, Hinde, etc. An account is given of the earlier *formational* mapping by the Survey officers, and its results summarized, explained, and discussed. Next the work of the *zonal* geologists is taken up, and treated in some detail. And, finally, we have a summary of the progress and results of the Survey revision as carried out in the years 1888 to 1898; from which it would appear that well before the close of 1888 the Survey officers had convinced themselves of the accuracy and availability of the zonal methods, and that since that time they have employed them continuously and successfully in developing the stratigraphy and tectonics of the whole of the Upland region.

It is hardly possible to praise the tone of this chapter too highly. It is evident that an attempt has been made to treat all contributions to the literature of the subject as historical documents, with perfect impartiality. The main conclusions of all observers, official and non-official, are given in brief, and discussed openly and frankly in the light of present geological knowledge and opinion.

In Chapter III we are presented with a summary of the whole geological story of the Uplands, from a stratigraphical point of view. Each of the great Upland formations—Arenig, Llandilo, Caradoc, Llandoverly, Tarannon, Wenlock-Ludlow, and Downtonian—is

<sup>1</sup> Memoirs of the Geological Survey of the United Kingdom: "The Silurian Rocks of Britain," vol. i, Scotland, 1899.