

crushings, such as bespeak ice-action, or inclose small masses of Boulder-clay in their lower layers; so that I consider it established, independently of further considerations, that these gravels at all events date back to glacial times. I have other reasons for thinking so, but content myself at present with the above. I would only add that it by no means follows, because these gravels began to be deposited before ice-action had ceased in this area, that their deposition did not continue down to Post-glacial times. In other words, while their lower part is of Glacial, their upper part may be of Post-glacial age.

South of the town is a corresponding cliff, consisting of current bedded sand and gravel, and finely laminated sandy clays (Phillips' Warp Beds). These do not show any undoubted signs of ice-action; they would seem, however, to have once been continuous with the Sewerby gravels, but to have had their continuity interrupted by the denudation of the valley by which the Gypsy Race escapes to sea.

In none of the above-mentioned beds have any shells been found as yet; this, though it proves nothing, is quite in keeping with the idea of their being of Glacial age, and is possibly due to their having been deposited in shallow seas freshened by the melting of the great ice-sheet; the current bedding, dipping now in one direction and now in the opposite, bespeaks tidal currents in shallow water, and the warp-like character of the laminated clays is equally suggestive of a tidal estuary.

I may mention that I have found fragments of marine shells in sand-beds in the interior in localities where they have not been noticed before—viz. in the remarkable series of sand-hills running south from Harpham Moor and at Brigham. These, I suspect, will turn out to belong to the set of beds described by Phillips at pages 61 and 62 of his work on the Yorkshire Coast.

It is right to add that the gravels at Bridlington mentioned above are here and there overlaid or replaced by more recent fresh-water deposits, gravels, and marls. This, of course, is well known.

BRIDLINGTON QUAY.

J. R. DAKYNS.

#### GLACIAL TROUGHS BENEATH THE GLACIER DES BOSSONS.

SIR,—Glacial grooves and furrows are always described in geological works as running in the direction of the ice-flow which formed them. That this should, perhaps generally, be the case, is so obvious that it may seem superfluous to give proofs thereof; nor are such far to seek; they are these: the direction of the grooves is often found to coincide with that of glacial striæ, with that of the transport of erratics, and with the direction of motion indicated by crag and tail, and by the forms of *roches moutonnées*. Yet it is not always so. In many cases grooves and furrows, such at least as are broad and shallow, must have been formed by ice moving not *along* but *across* the direction of the grooves. This would be apt to be the case especially on steep ground, and such I would call troughs. I saw a very good instance of this in the year 1873, in the case of the Glacier des Bossons. From a point in the hill-side beyond the

pavilion of the Pierre Pointue, and on the right-hand side of the Mont Blanc route, as you ascend, I got a capital view of the glacier's rocky floor, partly laid bare; and made a rough diagram of the form of the ground, which it is not necessary to reproduce. The bed of the glacier was seen to be scooped out transversely to the glacier's length. It was evident that the rocky floor beneath the ice consisted of a wave-like series of ridges and hollows running along the hill-side across the line of ice-flow. The reason of this, and the mode of formation of the hollows or troughs, was obvious. The rocks over which the ice is moving consist of a series of crystalline schists, of varying degrees of hardness, dipping into the hill at a high angle. Accordingly, as the ice descends, it will wear away the softer strata more than the harder, and thus scoop out a series of troughs along the strike of the schists. In the case of the Mont Blanc range this strike is across the glacier, and thus the latter's rocky floor gets furrowed across the direction of ice-flow.

In my sketch is represented in one spot a mass of moraine stuff caught in a deep hollow in the rocks below the ice.

Another point interesting to geologists, which I may mention, is that the lateral moraines of the Glacier des Bossons are rudely but distinctly stratified. The layers, as might be expected, dip down the valley, very much with the fall of the ice. J. R. DAKYNS.

BRIDLINGTON QUAY.

#### MIOCENE OR EOCENE? AGE OF THE BOVEY LIGNITES.

SIR,—If it be necessary to remove the Bovey beds from the Miocene to the Eocene, why not carry them back at once to the Cretaceous age?

According to Professor Morris, the Floras of the Tertiary and Cretaceous have been mistaken one for the other.<sup>1</sup> Dr. Duncan<sup>2</sup> says the mean temperature required for the growth of the Corals now found in the Haldon Greensand would be equal to 74° Fahrenheit, which must have been a climate equally favourable to the plants of the Bovey beds. In fact the *Sequoia*, a very characteristic fossil in these beds, also occurs in the Coral bed on Haldon. There would then be no need of going eighty miles for its nearest neighbour.

THE PRIORY, COLLETON CRESCENT, EXETER,  
April 13, 1879.

WILLIAM VICARY.

#### MISCELLANEOUS.

GEOLOGICAL SURVEY OF THE TERRITORIES.—The United States Congress has sanctioned a scheme for the reorganisation of the American Surveys. It is understood that the Geological Survey will be placed under the control of Mr. Clarence King, who has so long had charge of the Geological Exploration of the 40th Parallel; but no details have yet reached us.—*Nature*, April 17th.

#### OBITUARY.

We regret to record the death of James Nicol, F.R.S.E., F.G.S., late Professor of Natural History in the University of Aberdeen. He published a Guide to the Geology of Scotland; a Geological Map of Scotland; and is the author of many original contributions to its Geology.

<sup>1</sup> Prof. Morris, on Cretaceous Flora, vol. xv. p. 47, of Popular Science Review.

<sup>2</sup> Prof. Duncan, Journal Geol. Soc. Feb. 7, 1879, page 96.