

Isles of sub-aerial glaciers. Dr. Buckland published in 1842 his reasons for believing that the Snowdonian mountains in Caernarvonshire were formerly covered with glaciers, which radiated from the central heights through the seven principal valleys of that chain, where striæ and flutings are seen on the polished rocks directed towards as many different points of the compass. He also described the "moraines" of the ancient glaciers, and the rounded "bosses" or small flattened domes of polished rock, such as the action of moving glaciers is known to produce in Switzerland, when gravel, sand, and boulders, underlying the ice, are forced along over a foundation of hard stone. Mr. Darwin, and subsequently Prof. Ramsay, have confirmed Dr. Buckland's views in regard to these Welsh glaciers. Nor indeed was it to be expected that geologists should discover proofs of icebergs having abounded in the area now occupied by the British Isles in the Pleistocene period without sometimes meeting with the signs of contemporaneous glaciers which covered hills even of moderate elevation between the 50th and 60th degrees of latitude.

In Ireland the "drift" exhibits the same general characters and fossil remains as in Scotland and England; but in the southern part of that island, Prof. E. Forbes and Capt. James found in it some shells which show that the glacial sea communicated with one inhabited by a more southern fauna. Among other species in the south, they mention at Wexford and elsewhere the occurrence of *Nucula Cobboldiæ* (see fig. 125, p. 155) and *Turritella incrassata* (a crag fossil); also a southern form of *Fusus*, and a *Mitra* allied to a Spanish species.*

CHAPTER XII.

Difficulty of interpreting the phenomena of drift before the glacial hypothesis was adopted—Effects of intense cold in augmenting the quantity of alluvium—Analogy of erratics and scored rocks in North America and Europe—Bayfield on shells in drift of Canada—Great subsidence and re-elevation of land from the sea, required to account for glacial appearances—Why organic remains so rare in northern drift—Mastodon giganteus in United States—Many shells and some quadrupeds survived the glacial cold—Alps an independent centre of dispersion of erratics—Alpine blocks on the Jura—Whether transported by glaciers or floating ice—Recent transportation of erratics from the Andes to Chiloe—Meteorite in Asiatic drift.

It will appear from what was said in the last chapter of the marine shells characterizing the boulder formation, that nine-tenths or more of them belong to species still living. The superficial position of "the drift" is in perfect accord with its imbedded organic remains, leading us to refer its origin to a modern period. If, then, we encounter so much difficulty in the interpretation of monuments relating to times so near our own—if in spite of their recent date they are involved in so much obscurity—the student may ask, not without reasonable alarm, how we can hope to decipher the records of remoter ages.

* Forbes, Memoirs of Geol. Survey of Great Britain, vol. i. p. 377.