

serpentine in the fashion figured by Tschermak¹ and others. The felspar of this rock seems by its extinction-angles to be near anorthite. The most numerous generation is in elongated crystals with fine lamellation. There are also later felspars in shapeless crystals with wide twin-lamellæ and strongly-marked zonary banding in polarised light. The magnetite is later than the dominant felspar and earlier than the augite; it sometimes shows rod-like aggregations of octahedra. The pale-brown augite, in plates with an ophitic tendency, has here again a marked hour-glass structure, although the dividing lines have often an irregular disposition, and even run parallel to the outlines of projecting felspar crystals. It may be remarked that the hour-glass augites of the Welsh rocks rarely exhibit the regularity of structure figured by Werveke, etc.²

Several rocks from Holyhead stand on the border-land between the diabases and dolerites, as those families are here defined. The present specimen seems best referred to the latter category, the *porphyrische structur* (Rosenbusch) being well marked: the absence of ilmenite and hornblende is also to be noted in this connection.

Other dykes in Holyhead Island are marked on the Survey Map and mentioned by Sir A. Ramsay. They all strike in a general N.W.—S.E. direction, "which is also that of the fault which crosses Holyhead Mountain between Gogarth and Porth-y-corwgl, and all coincide more or less with the run of many of the larger joints." We have seen that the dykes of the Menai Straits and the Coal-field have about the same bearing, but they show lithologically little resemblance with those last described; and as the rocks cut by the Holyhead dykes are themselves of dubious age, speculation on the date of the dykes must necessarily be reserved.

NOTICES OF MEMOIRS.

I.—A COMPARATIVE STUDY OF THE TILL OR LOWER BOULDER-CLAY IN SEVERAL OF THE GLACIATED COUNTRIES OF EUROPE—BRITAIN, SCANDINAVIA, GERMANY, SWITZERLAND, AND THE PYRENEES. By HUGH MILLER, F.R.S.E., F.G.S., Assoc.R.S.M.³

THE sections of foreign Till examined by the author occur chiefly in the neighbourhood of the Trondhjem Fjord in Norway, at Berlin and Leipzig in Germany, near the Lake of Geneva in Switzerland, and in the valleys of the Pyrenees directly south from Pau in Southern France. In these countries and in Britain the Till bears an identical character. It is not more variable throughout Europe than the author has found it to be in Scotland and Northern England. On the basement-gneiss at Christiansund in South-western Norway it is the same as on the basement-gneiss of Sutherlandshire; in the great limestone valley of Eaux Chauds in the Pyrenees it is scarcely

¹ Sitzungsber. d. k. Akad. d. Wien. vol. lvi. p. 283, and plate, 1867.

² Neues Jahrbuch, 1879, p. 823. Hussak, *Anleitung zum bestimmen der gesteinsbildenden Mineralien*, p. 72; 1885.

³ Read at the British Association, Manchester, 1887.

to be distinguished from the Till of the limestone valleys of Yorkshire. In all the places mentioned it bears the unmistakable character of a ground-moraine accreted under the direct weight of glacier-ice. The familiar features of the Till need not be recapitulated here, but the author insists that its essential character is that of a rude pavement of glaciated débris, ground from the rocks over which the glaciers have passed, with its larger boulders firmly glaciated *in situ* on their upper sides in the direction of ice-movement, and with a tendency to the production of fluxion structure here and there in the matrix, due to the onward drag of the superincumbent ice. In mere indiscriminateness of composition (which is the character often most emphasised) the Till is not to be distinguished from Boulder-clays formed under berg- or raft-ice, such as the highest marine clays of the Norwegian coasts, which are stuck promiscuously through with boulders derived from the glaciers of the interior. But the glaciation of boulders *in situ* the author finds to be a really crucial distinction; he readily detected this “*striated-pavement*” character in the Tills of all the districts above mentioned except Leipzig and Berlin, where the Boulder-clays resemble the Upper Boulder-clay (Hessle Clay) of the eastern seaboard of England and Scotland, and in the sections examined by him contained no blocks large enough to take the striæ.

REVIEWS.

I.—THE GEOLOGICAL SURVEY OF ENGLAND AND WALES.

SOME time has elapsed since we last noticed a series of the Geological Survey Memoirs (GEOL. MAG. for 1886, p. 65), and in the mean time a number of additional Memoirs have been published, attention having been drawn to only one of these (GEOL. MAG. 1888, p. 31). Much more detail is inserted in these Explanations of the Survey Maps than was the custom in the earlier publications; but if on this account they afford somewhat heavier reading, they are also much more valuable for reference on questions both of scientific interest and of practical concern. Indeed the precise record of facts and a statement of the localities where particular information has been obtained, are always of great value to subsequent investigators, as well as to engineers and well-sinkers. We note also that the prices of these Memoirs are very moderate.

In addition to a number of General Memoirs on particular districts or rocks, no less than 66 Memoirs explanatory of the Survey Maps have now been published. Nevertheless much remains to be done ere the whole country is described in such detail. Portions of Hampshire and Dorsetshire have not yet been ‘explained’ in Survey publications; the Isle of Man and the Channel Islands have not at present been officially surveyed; while Cornwall and much of Devonshire, the South Wales Coal-field and the Old Red Sandstone area of Brecknock-Hereford- and Monmouth-shires offer tempting fields for future detailed surveys. Moreover, the Drift-deposits over