age is rendered still more improbable by the fact that they are mainly gneissic. The discussion of their true age does not belong to the present paper.

In the last section, we saw, still more clearly than at Pen y carnisiog, the intimate association of volcanic rocks with the granitoid group. In further illustration of this point, and of the occurrence of hälleflinta in the Dimetian, I will call attention to two more localities.

One mile north of the last section, between Ty newydd and Tyn rhos, quartz-felsite (Note 7, p. 126) is seen at more than one point, and in each case it passes by an imperceptible transition into the ordinary granitoidite (Note 8, p. 126).

Still further to the north, between Gwyndy and Pen y bonc, a thick band of hälleflinta is exposed in a road section. This bed is towards the base of the Dimetian, since, towards Gwyndy, the latter passes down into the dark gneiss.

Summary.

1. The granitoid (Dimetian) rocks of Anglesey pass down into an anticlinal of dark gneiss (above) and grey gneiss (below). The gneiss is also seen in the Menai anticlinal.

2. Low down in the granitoid series are bands of felsite, hälleflinta, and felspathic breccia, which can lay no claim to the rank of a distinct group (Arvonian).

3. The schistose series at Ty Croes is brought into contact with the principal quartz-felsite and hälleflinta band by a fault, and there is, therefore, no proof, from this section, that the schists are of Peibidian age.

VII.—NOTE ON THE MICROSCOPIC STRUCTURE OF SOME PRE-CAMBRIAN ROCKS.

By Prof. T. G. BONNEY, M.A., F.R.S., Sec. G.S.

SOME repetition may be avoided in this note by roughly grouping the specimens, which have been forwarded to me by Dr. Callaway, as (A) Felsitic Rocks, or those resembling felstones; (B) Granitoid and Gneissic Rocks; and (C) Dioritic Rocks. The numbers attached correspond with the reference-numbers in Dr. Callaway's paper. I may mention that in examining the slides I was ignorant of their bearing on the views propounded by the author, and, in some cases, of the exact locality of the specimens.

(A).—FELSITIC ROCKS (4-7).

These are compact generally light-coloured rocks, breaking with a rather sharp fracture, and weathering to a pale, whitish tint. The ground-mass of each consists chiefly of microcrystalline quartz and felspar, of very indefinite outline and arrangement, in which occur some larger grains of the same minerals, with more or less opacite and other microlithic minerals. The ground-mass of (4) exhibits a wavy graphitic or almost arborescent structure not uncommon in felsites.¹ The larger quartz and felspar grains are generally ragged

¹ Described by myself, *GEOL. MAG.* 1877, Dec. II. Vol. IV. p. 508.

at the edges; though the latter are sometimes in part bounded by straight lines. In these, and occasionally in the ground-mass, are minute scales of a clear mica. The quartz is very clear. Magnetite (with some hæmatite) may be recognized. Part of the slide exhibits a brecciated structure, but after careful examination I am of opinion, that this is due to brecciation *in situ*;¹ and that the rock is a *quartz-felsite*.

(5) Differences only varietal, ground-mass less "arborescent" in structure, less porphyritic, no mica, but a minute granular pale-green (hornblendic?) mineral. Less brecciated; also a *quartz-felsite*. The structure suggests the possibility of its being a contemporaneous lava. (6) Structure of ground-mass yet more minute and granular; parts of the slide show a distinctly clastic structure, which it is very difficult to suppose the result of brecciation *in situ*. In any case, I believe the rock the result of volcanic action; and think it most probably an altered *trachytic tuff*. (7) Ground-mass nearer to that of first two; but more minute in structure. Outlines of quartz and felspar more regular than in (4); former mineral less "clean." Numerous almost colourless microliths in the ground-mass. Rather brecciated, but as the structure much more resembles that in (4), I think the rock a true *quartz-felsite*, possibly once a lava flow.

(B.)—GRANITOID AND GNEISSIC ROCKS (2, 8, 9).

These three rocks consist mainly of quartz, felspar, and mica, and are very granitoid in aspect, exhibiting no distinct foliation. Still the outline and arrangement of the component minerals suggest that they are metamorphic rather than true igneous rocks. (2) Quartz rather full of minute cavities. Among the felspar, a considerable amount plagioclastic. Microliths frequent; probably decomposition products; green mica (biotite) and a little white mica. A *granitoidite*. (8) The specimen is not a favourable one for examination, being taken (probably unavoidably) from an old surface. At the first glance it seems indubitably clastic, but closer examination shows that much of this structure has been produced *in situ*; crystals of felspar being broken through and recemented by vein quartz, etc.; so that we cannot cite it as a proof of clastic origin for the rock itself. Still so far as the true structure of this can be ascertained, it is that of a *granitoidite*, rather than a true granite. Some of the felspar is orthoclase; there is also finely banded plagioclase, and perhaps a little microcline—a good amount of opacite and ferrite, and a little of a clear micaceous mineral, similar to that already described in rocks of this kind.²

(C.)—DIORITE.

(3) In this specimen the felspar is a good deal decomposed; the hornblende is green, showing good dichroism and characteristic cleavage, but is more or less irregular in external form. Ferrite, opacite, and larger grains of some iron oxide present. A trace of a

¹ Produced by crushing or strain; not uncommon near faults.

² Quart. Journ. Geol. Soc. 1879, vol. xxxv. p. 322.

plagioclastic felspar is here and there to be recognized; the hornblende very irregular in outline. I believe, however, that we may safely affirm the rock to be a true *Diorite*. There is a fair quantity of a pale yellowish-brown somewhat earthy-looking mineral, with a fairly-marked prismatic cleavage; occasionally in well-defined crystals, which from their outline and optical properties appear to be monoclinic: microlithic crystals, apparently of a similar mineral, are often contained in them. They may be epidote, but are not in that case characteristic examples; they have also some resemblance to sphene.

REVIEWS.

I.—A MANUAL OF THE GEOLOGY OF INDIA, etc. (Second Notice, continued from the GEOL. MAG. for February, 1880, p. 85.)

Strongly contrasting though the several formations are which make up the two great groups of the Peninsular and Extra-Peninsular rocks—they are yet found in a few places to be in actual juxtaposition, individual members of each group occurring outside the geographical limits of the two areas:—for example, in Cutch and Kattywar, certain marine Extra-Peninsular beds are interstratified with typically Peninsular formations. Again, in Sind, a representative of the Deccan trap occurs intercalated between the marine Eocene and Cretaceous rocks.

Two other Extra-Peninsular localities are named by the authors, in which Peninsular rocks are found. "One of these is at the base of the Himalayas, in Sikkim and Bhután, where fossiliferous Damúda (Lower Gondwana) beds occur. The other is in the Assam Hills (Khási and Gáro), where representatives of the metamorphic and Cretaceous (marine) rocks of the peninsula, and in all probability of the transition beds, and of the Rájmahál traps, are found. But in the first instance the relations between such Himalayan rocks as are associated with the Damúdas and those of other parts of the Himalayas are extremely doubtful; and it is not even conclusively settled whether the Himalayan rocks in question are higher or lower in position than the Damúda beds themselves; and in the Assam hills none of the older Himalayan formations have been detected; they appear to be replaced by Peninsular types" (p. xv).

A very interesting and important point of contrast between the two great areas, and one throwing great light upon their geological history, is to be found in the absence of any traces of disturbance in late geological times in the Peninsular area; "a feature which (as Mr. Blanford pointedly remarks) abruptly distinguishes the whole area from the remainder of Asia" (p. vi). He contends that the principal dividing ranges of the Peninsular area "are merely plateaus, or portions of plateaus, that have escaped denudation. There is not throughout the length and breadth of the Peninsula, with the possible exception of the Arvali, a single great range of mountains that coincides with a definite axis of elevation; not one, with the excep-