

miles, it varies much in texture, is generally not conspicuously rich in quartz, and often contains hornblende as well as mica. It exhibits in places a curious streaked or banded structure due to local crushing. This is fully described. The lava flows (with ashes) are porphyrite; this is generally compact, sometimes glassy in structure, with scattered crystals of plagioclase, biotite, hornblende (sometimes augite), a little free quartz, and occasional olivine and apatite. Some peculiarities in these rocks are described. The intrusive dykes (3) consist of (a) coarse red porphyrite, (b) quartz porphyry, (c) felsite, (d) granite. The author considers that the porphyrite and granite (which are alternately intrusive one in another) belong approximately to the same geological epoch. This is the Lower Old Red Sandstone; and as pebbles of the granite as well as of the porphyrite occur in the Lower Carboniferous measures of the region, great denudation must have taken place prior to the latter epoch. The author also describes some basalt dykes which he considers to be of Miocene age.

CORRESPONDENCE.

DR. ROBERTS ON THE TWT HILL SERIES.

SIR,—I fear that in controversy Dr. Roberts occasionally allows too much freedom to his imagination. His reply to my criticisms on his communication relating to the conglomerates of the Twt Hill district and of Anglesey is in many respects far from accurate. For instance, he draws a plan of the Twt Hill Pit, places a line *A B* thereon, and states: "Prof. Bonney's section was taken along the line *A B*." There is nothing in our article (*Q. J. G. S.* vol. xxxv. p. 321) to warrant this assertion. My section was intended to be drawn roughly in the same line as Prof. Hughes's—but did not include so much, as I wished to call particular attention to the bands of conglomerate associated with the arkose (because at the time I considered this important as relating to the age of the rock). One of the bands rather high in the conglomerate did seem to me there to bear a resemblance to the bottom rock, but from subsequent visits I came to the conclusion that I had overestimated the resemblance. The diagram exhibited at the Society was a sketch of the pit (I have the original before me) exhibited to illustrate the same point. From where I stood Twt Hill was seen in the position indicated, but I never said the beds dipped under it, and there is nothing in the drawing to make this essential. The outcrop there shown is compatible with their passing on either side. I said the strike seemed E.N.E. Dr. Roberts's diagram makes it the same: how then could my diagram be drawn along *A B*? Sections are usually drawn approximately at right angles to the strike of the beds. I did not, however, regard this strike as perfectly accurate, for there were no exposures very well suited for measurement—and with a dozen pupils about one (among whom I believe was Dr. Roberts) asking all kinds of questions, it is difficult to avoid an error of a few degrees. The Cefn Cynryg grits mentioned in my paper of

the present volume (p. 20) are not the same as the Careg Goch grits; that is to say, I am not speaking of the same localities. Possibly I may have fallen into some error in designating the places. In a thinly populated country, with names, and often a language, that to an English ear are as unintelligible as if they were Patagonian, and with a map that (from lapse of time) needs revision, it is difficult to avoid error. I still maintain that the materials of the Anglesey conglomerates are no valid proof in the case of the Twt Hill beds. I never intended to imply that every Cambrian conglomerate must contain felsite pebbles. The language of my article does not warrant the absurd "major premiss" which Dr. Roberts attributes to me. I was obviously speaking (I appeal to any unprejudiced reader to confirm this) of the conglomerates of the Bangor-Carnarvon region, which are full of felsite pebbles, and argued that it was very strange if this one conglomerate of that region, which did not contain felsite pebbles, should be Cambrian—and I pointed out that the absence of these in a distant region could not be adduced in explanation of their absence here. Put concisely this was my argument—"In the Bangor-Carnarvon district is a mass of felstone. This has largely supplied materials to the Cambrian and latest Pre-Cambrian conglomerates. In the same district, and near the felstone, are grits and conglomerates in which I do not find felstone fragments. Therefore I think they are not of the same age as the others. As I do not believe they can be later, I suppose they are earlier. The absence of felstone from conglomerates several miles from the mass of this rock does not seem to me to have much bearing on the subject."

As regards the last paragraph of Dr. Roberts's article, where he thinks he has made me contradict myself, I beg leave to request him to read my article (pp. 114–117) again, and he will see that I have never admitted the Twt Hill series as Cambrian. He forgets that I maintain that there is a considerable series (larger than that admitted by Prof. Hughes) beneath the Cambrian conglomerate of the Bangor area—Pebidian I suppose we may call it—and I think it more probable that the Twt Hill series belongs to this. The amount of alteration shown by the microscope is considerably greater than is usual in the Cambrian rocks. But really, to criticize fully this last paragraph, I should have to print it with a running commentary, so full is it of assumptions which I should dispute, or inferences which I maintain do not follow from my words. After the above example of his mode of conducting a controversy, Dr. Roberts must excuse me if I take no notice of any further communication which he may make on this subject.

T. G. BONNEY.

THE HEADON HILL SECTION.

SIR,—As I hope very shortly to have an opportunity of defending the views which I hold (in common with many foreign geologists) concerning the classification of the Isle of Wight Tertiaries, I should not have intervened in the controversy at the present moment, had I not felt myself compelled to protest against certain remarks made