ORIGINAL ARTICLES.

Beerbachite at the Lizard.

By Professor T. G. BONNEY, Sc.D., F.R.S.

IN my paper on the Lizard this rock is mentioned, but without a specific name, for I had not then seen the figure given in 1898 by Rosenbusch (*Elemente der Gesteinslehre*, 1898, p. 51). He calls it Beerbachite, and describes it on p. 219 as one of his *Ganggesteine*, among those *von malchitischem Habitus*, quoting an analysis. The name appears to have been given by Chelius to a rock from Frankenstein in the northern Odenwald, where it forms small veins in a gabbro, and has the following analysis: $\text{SiO}_2 = 47.21$, $\text{Al}_2\text{O}_3 = 20.52$, $\text{Fe}_2\text{O}_3 = 7.48$, $\text{FeO} = 5.32$, $\text{MgO} = 4.16$, $\text{CaO} = 8.63$, $\text{Na}_2\text{O} = 5.17$, $\text{K}_2\text{O} = 0.33$, $\text{H}_2\text{O} = 0.34$, $\text{P}_2\text{O}_5 = 0.46$, with 0.19 FeS_2 and 0.10 hygroscopic water. He states that the rock is fine-grained to compact, not lustrous, grey to pale grey in colour, consisting of a panidiomorphic mixture of labradorite and diallage, with a variable amount of hypersthene and magnetite, and that olivine-bearing varieties occur. In these commonly a brown hornblende replaces the diallage, in which the above-named constituents are pœcilitic. He states that beerbachite also occurs in gabbro near Harzburg and in the Isle of Mull.

At the Lizard the best outcrops of the rock are near Luggar Cove, to the south of Porthoustock, and I call it in my diary for July 6, 1894, when I particularly studied that part of the coast, "the brown-speckled rock," but it occurs, sometimes in considerable force, from near St. Keverne to the neighbourhood of Porthallow,¹ and I observed and collected it, a few years earlier, from the crags north of the Balk, where, however, it is less well exposed and rather more weathered. The following shortened extract from my diary for 1894 (which is illustrated by sketches) may serve to show the curious mixture of rocks near the shore to the north of Crousa Down. In certain places the gabbro itself varies much, a coarse variety, with diallage crystals sometimes a couple of inches in diameter, occasionally appearing in irregular patches and even in little tongues in the finer gabbro. The "brown-speckled" rock breaks into the gabbro, including fragments, patches, and streaks of it, a few inches or even more in length and perhaps one to three in diameter, which often assume a foliated structure. The speckled rock also not seldom appears to be "porphyritic". The crystals, which may run to about

¹ I studied the coast north of Crousa Down, from St. Keverne, in 1890, with my friends General McMahon and Canon Hill, and again in 1894 with the latter. I revisited it in 1908, when staying with Dr. Flett at Kennack Cove, to discuss sundry points on which we were not agreed, but do not remember that we used then the word beerbachite; and have since seen a little of the neighbourhood in 1909 and 1912.

half an inch in length, are "dead white", like those in the gabbro, and often occur in scattered "coveys". Occasionally they are joined, and include a small crystal of diallage, so they become difficult to distinguish from the smaller gabbro fragments. In fact, it looks as if the "brown-speckled" rock had occasionally partly melted down bits of the gabbro, destroying the augite rather than the felspar, and had softened and drawn out other patches, so that "a process analogous to what Professor Sollas has described in the Carlingford granites has happened here". Dykes of a compact "greenstone" cut both these rocks, but are neither abundant nor thick; seldom, I think, more than 4 or 5 feet.¹ All along the coast to north of Porthoustock we find (1) gabbro (the dominant rock), (2) next to it the "brown-speckled", then (3) the greenstone, much less abundant. So there is no justification for colouring all this part greenstone, as in the Survey Map. But I think the beerbachite at the Lizard must occur in rather thicker masses than it seems to do in Germany. Under the microscope my best slices of beerbachite (I have about seven in all) contain a rather strongly pleochroic hornblende, pale to rich brown, in hypidiomorphic grains, and of rather stumpy form, together with a granular augite more irregular in outline. The felspar (labradorite), also granular in outline, is in good preservation, and so is the iron-oxide, which occurs in rather small but irregular, rather numerous grains. I cannot certainly identify hypersthene or ægirine. Occasionally the felspar of the beerbachite becomes rather elongated, and the hornblende less granular close to a junction with the gabbro. One slice distinctly shows the partial melting together of the two rocks. Though it does not appear to have any marked chemical difference from several other "greenstones"² it seems to be so persistent in its structure and to exhibit such mineral peculiarities, that we must, I think, add beerbachite to the crystalline rocks of the Lizard, as has been already done by Dr. Flett in *The Geology of the Lizard and Meneage* (1912), where it is described briefly on p. 110 and a figure given at p. 101.

¹ These, as a rule, are not welded to the gabbro, beerbachite, or serpentine, as the troktoite is to the last-named, so I regard the beerbachite as the forerunner of the "greenstone" (basaltic) dykes so common on the eastern coast of the Lizard.

² See the analysis quoted in Rosenbusch's *Gesteinslehre* and Flett & Hill's *Geology of the Lizard*, etc.