

distributing the debris throughout the Quaternary and the Recent deposits. The thin integument of soil that covers the surface even in those localities where denudation has been the most severe, masks from view the rocks beneath; and this, combined with the fact that but few clean cut sections of the Lower Coralline Limestone are exposed inland, affords an explanation for the obscurity of these thin veins of black limestone, and for the doubt with which their occurrence in the Malta rocks has hitherto been regarded.

#### VI.—THE DISCOVERY OF *TEREBRATULINA SUBSTRIATA*, SCHLOTHEIM, IN YORKSHIRE.

By JOHN FRANCIS WALKER, M.A., F.G.S., etc.

SEVERAL years ago Mr. W. H. Hudleston, Prof. J. F. Blake and myself obtained large quantities of *Waldheimia* (*Zeilleria*) *Hudlestoni*, Walker, from the quarry on the Suffield Heights near Scarborough. I had separated several specimens which appeared to differ from the typical form; on rearranging my collection, I carefully examined them, and found that they were covered with fine striæ and also had the characteristic form of the genus *Terebratulina*.

The bed in which they occur is described by Hudleston and Blake, Q.J.G.S. vol. xxxiii. p. 331. This quarry has been long noted for the quantity of small sponges, *Spongia floriceps*, *Spongia corallina*, etc., which it contains. It is to be noticed that Quenstedt "die Brachiopoden," p. 224, states that this brachiopod appears to prefer exclusively a spongy layer as its dwelling place. Quenstedt, *op. cit.* gives the following varieties of *Terebratulina substriata*, var. *alba*, from Weiss Jura,  $\gamma$ , and var. *silicea*, var. *marmorea* from Weiss Jura,  $\delta$ .

The Yorkshire specimens appear to be most like the variety *Terebratulina substriata*, var. *alba*, but are generally less convex and have the striæ finer and more numerous. If this shell should require a varietal name it might be called var. *Suffieldensis*.

As Mr. S. S. Buckman and myself are preparing a paper on the species of Jurassic Brachiopoda which have been discovered since Davidson's work was completed, I will not further discuss this species. I have presented to the British Museum a specimen of this Brachiopod.

#### VII.—RECENT OBSERVATIONS ON THE GEOLOGY OF THE LIZARD DISTRICT, CORNWALL.

By ALEXANDER SOMERVAIL, Esq.

DURING a stay of nearly six weeks, made last July and August, at the Lizard, Cornwall, I had ample opportunity of correcting former, and making some fresh observations.

With regard to the first of these, and to some of the strictures recently passed on them, I found that I had little or nothing to regret as to what I had already written on the subject, with the exception of the "felsitic-like-rock" at Housel Cove,<sup>1</sup> which I should now rather regard as a mass segregated, or separated out of the

<sup>1</sup> GEOL. MAG. Vol. VI. 1889, p. 114.

common magma, than as an altered portion of the hornblende-schist as I then described it—my object at the time being to show that it was not a dyke; a view I am still convinced of. I now pass on to recent observations.

These latter observations were made over the whole area, that is, from Polurrian on the west to Porthallow on the east, both of these localities marking the boundary between the killas or slates on the north, and the igneous rocks of the Lizard district to the south.

I shall briefly localize these observations, beginning with:—

*Porthallow.*—In the killas or slates here, at a few feet from their junction with the hornblende and serpentine series, there is a quartzose-like-rock at the base of the cliff, immediately below the iron-lode described by Mr. J. H. Collins, F.G.S.<sup>1</sup> The relations of the quartzose-like-rock to the surrounding slates is exactly like that of an intruded igneous mass, which also in its upper portion contains included fragments of the slate. On breaking well into this intrusive like rock, its interior is found to present a very different aspect from its exterior; the former is chloritic-like, resembling a diabase that has undergone much alteration. It contains a large amount of iron-pyrites, and recalled to my mind the chloritic rocks of the Start area in Devonshire, especially those near, or at the junction with, the slates in the Bickerton Valley.

Following the cliff towards the Inn, at about 36 paces from which (near a building with outside stair and thatched roof) a gabbro (much decomposed) most unexpectedly occurs, where only the ordinary slates were hitherto supposed to exist. This gabbro has all the appearance of cutting through the slates and the arenaceous beds associated therewith; but on this point I could not arrive at absolute certainty. In the cliff behind the Inn there is also diorite of the greenstone type, but much decomposed. Higher up the road, behind and forming the foundations of the cottages, there is more gabbro and diorite, the former rock cropping out on the roadway and continuing southwards in the direction of the road.

The occurrence of these rocks, where only slates were supposed to exist, is of considerable importance, especially as they seem to rise through the slates, as does also the adjoining serpentine at Pengarroek, which, if the case, when connected with the gabbro and serpentine, and perhaps even the greenstone occurring at Nare Head, Gerran Bay, would clearly prove these Lizard eruptive rocks to be subsequent to the killas. However this may be, the occurrence of the gabbro and diorite or greenstone, forming the cliff described, will necessitate a very considerable alteration of the boundary on the present map.

Returning again to the junction on the coast between the eruptives and slates, I examined the hornblende-schist which immediately succeeds the serpentine, tracing it along the entire length of the top of the cliff where it has been quarried. It certainly is a very variable rock, in some portions schistose, in others quite massive; in one portion a diorite, in another passing into a variety of green-

<sup>1</sup> Quart. Journ. Geol. Soc. vol. 40, 1884, p. 463.

stone, and other portions with a well-defined porphyritic structure resembling the variety at Porthoustock. In a sentence, there is every grade between a diorite and a greenstone, schistose and massive, non-porphyritic and porphyritic.

*Porthoustock.*—Here I examined the greenstone on the extreme south side of the Cove, and found it, as I had done on previous occasions, traceable through many varieties into fine-grained varieties resembling an aphanite, and others into epidiorite, which latter had an apparent passage into the hornblende-schists proper.

Passing over the great alternating succession of gabbro, and greenstone or epidiorite (which I have already described),<sup>1</sup> with the gradual decrease of the latter towards Coverack, there is nothing I have specially to note except a very remarkable and beautiful variety of gabbro occurring as a dyke in the serpentine on the immediate west side of Coverack Pier. The diallage in this gabbro has a brilliant metallic silvery lustre, being quite like a mica at first sight; the only gabbro of the kind that I am acquainted with.

*Black Head area.*—At a little distance N.W. of Chynhal Point, near the base of the cliff, a diorite dyke one foot in thickness cuts through the serpentine; and at the Black Head, also at the base of cliff, there are two dykes of a similar character in the serpentine which have a N.N.W. and S.S.E. strike or trend.

In this area the serpentine shows evidence of much disturbance, and from this cause, or as a result of cooling, is full of structures; among which is a strongly-marked surface foliation which has the usual N.N.W. and S.S.E. strike which is common to this structure in the serpentine of nearly every locality.

On the west side of Beagle Hole there are two more diorite dykes in the serpentine, and near the Point there is one of gabbro; and two or three more of the latter occur (beside those of Downance and Lankidden Coves already known and recorded) on the west side of Lawn Vinoc. Beside these I have no doubt that careful search would discover many more in what are at present regarded as unbroken masses of serpentine. Passing over a large area I have nothing special to record until near—

*Polpeor Cove.*—It is here and to the westward that the great development of mica-schist occurs, the origin of which is a problem yet waiting solution. Many appearances would seem to indicate that it is an advanced stage in the metamorphism of the hornblende-schist, for the reasons already given in my former papers.<sup>2</sup> I have only now to add that on extracting a number of lenticular or nodular decomposed masses from the heart of the mica-schist on the west side of the road leading down into the Cove, and on breaking them up their centres were found to consist of the green porphyritic diorite or diabase-like rock so common in the reefs of the Cove. To this may be added the fact that the mica-schist west of Polpeor Cove, at and near the Lizard Point, contains similar nodules of the ordinary hornblende-schist.

<sup>1</sup> GEOL. MAG. Vol. VI. 1889, p. 425.

<sup>2</sup> GEOL. MAG. 1890, Vol. VII. p. 163.

*Mullion Cove.*—To the south-west of the Cove near to Ladan Ceyn, in the serpentine there is a dyke<sup>1</sup> or vein of nearly pure felspar containing some white mica, biotite, etc., with a nearly north and south strike.

*Henscath to Polurrian Cove.*—The Headland of Henscath is by no means the most northerly termination of the serpentine, as I found it continued in the cliff a little below the level of its top quite continuously among the hornblende-schists as far north as Carrag-luz, and also on each side of the upper portion of the Cove there. There is also an impure or transitional variety on the south-west side of Rocky Pedn-y-ke which now brings the serpentine within a few hundred yards of Polurrian Cove where the junction occurs between the hornblende and the killas.

## REVIEWS.

I.—THE SYSTEM OF MINERALOGY OF JAMES DWIGHT DANA, 1837–1868. DESCRIPTIVE MINERALOGY (Sixth Edition). By EDWARD SALISBURY DANA, Professor of Physics and Curator of the Mineral Collection, Yale University. Entirely Re-written and much Enlarged. Illustrated with over 1400 figures. (London: Kegan Paul, Trench, Trübner & Co., Limited, 1892. Royal 8vo. pp. lxiv. and 1134.)

IN the GEOLOGICAL MAGAZINE, for October, 1868 (Vol. V. pp. 460–463), we had the pleasure to notice the fifth edition of this most valuable work, which has been before the scientific world since 1837, and is likely to continue, for many years to come, the standard treatise on Mineralogy.

In the fifth edition the veteran mineralogist, Prof. J. D. Dana, was assisted in his difficult task by Prof. Geo. J. Brush, and the work was then re-written and enlarged to 827 pages.

The present (sixth) edition, issued after an interval of nearly twenty-four years, has been entirely re-written and much enlarged by Professor E. S. Dana, son of Professor J. D. Dana, and already favourably known to mineralogists as the author of a "Text-book of Mineralogy," published in 1877 (Trübner & Co.), and noticed in the GEOLOGICAL MAGAZINE (Decade II. Vol. IV. 1877, pp. 328–29).

During the past quarter of a century the science of Mineralogy has made very rapid progress, indeed there has probably never been a time of more active mineralogical investigation. A striking indication of this activity is shown by the many new periodicals, recently started, devoted largely, if not exclusively, to Mineralogy. The activity of mineralogical workers is still further evidenced by the fact that within the past twenty-four years nearly one thousand new names have been introduced into the science—unfortunately, not all "new species," although this has been claimed for most of them.

Nor has the important subject of the optical properties of minerals been neglected, new and improved methods and instruments for

<sup>1</sup> As the locality of this dyke or vein is rather difficult to find, the Serpentine worker in the Cove can guide anyone to it.