

IV.—*A Sketch of the Geology of the Lizard
District.*

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I BEG to offer to the Society an account of the boundaries and position of the serpentine formation, occurring in the vicinity of the Lizard Promontory. I have followed the complete outline of the coast from the Loe Pool to the Helford River, and by crossing the interior of the country in various directions, have, I believe, made out the junctions with as much accuracy as the state of enclosure will permit. There being no map with the elevations distinguished, I have been obliged to content myself with marking out the boundaries on Martyn's Map of Cornwall. The Society is indebted to Capt. Halliday for the drawings of the cliffs and strata.

The slate, which is the general boundary of the district, rests on the granite ridge beyond Helston on the North, at Constantine on the

east, and at Breage on the west: it contains beds of greywacké. Fine sections of these strata, singularly contorted, may be observed near Gunwalloe cove. Slate prevails as far as a small cove a little north of Mullyan, called Bollerium, dipping south-east at an angle of about 40°, and, judging from its inclination, appears to underlie the greenstone, which then succeeds. The latter rock occasionally crops out through the serpentine of Goonhilly downs. It is sometimes slaty, distinctly stratified, and may be seen to lie under the serpentine, on the south side of Mullyan cove, near to which it again forms the barrier to the sea as far as Vellan point: a small quantity of diallage is occasionally intermixed with this greenstone; the predominating ingredient however is common hornblende. Steatite has been raised lately from a distinctly marked vein near Mullyan church-town. The mines of copper have been discontinued. I was informed that at low water, in spring-tides, narrow veins of native copper may be observed in the serpentine where it is covered by the sea. A mass of native copper ore was raised from the mines of the weight of 104 pounds.

Among the beautiful group of rocks forming Kynan's cove, reddish-brown diallage occurs, and dykes of felspar porphyry. The slate of the Lizard promontory commences at Gehilion, and dips south at an angle of about 60°: the serpentine rests on a bed of reddish talc, which

dips north : the intermediate space is filled by greenstone. Veins of fibrous carbonate of lime and of agate occur in the serpentine near the junction. Mica slate then appears, and continues to the west side under the light-house. Under the slate, at the Old Lizard head, are alternating beds of compact felspar and green talc, of considerable thickness. Greenstone continues along the coast from thence to a mile beyond Cadgwith; the inclination of the strata is north, at an angle of about 30°. Near the last village is an extraordinary natural amphitheatre, the area of which is nearly two acres, and the sides about 200 feet in height : the sea enters through an arch near the bottom, where the position of the serpentine on the greenstone is very obvious. The most compact serpentine of this district is found at the Balk Head in Llandewednack ; it is, however, but ill adapted for purposes of ornament, taking a bad polish, as appears from the slab in the museum of the Society, which was cut from a large block raised at this place by my directions : the prevailing colour is green, with red spots near the surface, owing probably to the oxydation of iron, as they do not appear at a greater depth.

Serpentine, containing small masses of emerald-green diallage, or schiller-spar, constitutes the coast from hence round the Black Head to Coverack Cove; a place highly interesting to the mineralogist, as offering a series of rocks intermediate between serpentine

and diallage rock : these consist of green and reddish-brown serpentine, with the jade of Saussure, (the feldspath ténace of Hatty) and diallage of the green and metalloïde varieties : the latter substance shews here very distinctly those characters which distinguish it from hornblende, viz. its inferior hardness, its difficult fusibility into a green enamel, and its peculiar cleavage, which discovers a considerable lustre in one direction that is entirely wanting in the other ; whereas hornblende has natural joints of the same lustre in two directions. Some of the felspar found here is of a violet colour, and is striated like that of Labrador. I broke masses of diallage metalloïde, six inches in length, from beds lying below high-water mark in Coverack Cove. I had an opportunity of shewing some of these to the Abbe Hatty at Paris, and of comparing them with his specimens brought from the hill of Mussinet near Turin. M. Hatty observed, that the specimens from Coverack do not consist of pure diallage, but that fibres of common hornblende interrupt its texture ; that of Mussinet is foliated, and has no such intermixture. The composition of serpentine may be very well seen at Coverack. I conceive that, besides diallage and compact felspar, a portion of talc or steatite is essential, the intimate mixture of the two former substances alone, forming a compound more resembling greenstone.

A very beautiful rock commences at Cove-rack, and continues for three miles along the coast, and in the interior through the greater part of the parish of St. Keverne. It consists of felspar and hornblende, with an occasional intermixture of diallage, and contains imbedded masses and crystals of felspar: from its great beauty and hardness, it seems eminently adapted for purposes of architectural ornament: columns and blocks of any required size may be obtained near the coast, from whence they might be easily shipped. Greenstone, similar in appearance, and in the direction of the strata, to that of Cadgwith, occurs at Porthoustock; and serpentine on the south-west side of Port-hallo, resting on reddish talc, which lies, as before, on clay slate. No further variety is observable from hence to the Helford river, except a conglomerate near the Dennis creek, in which Capt. Halliday noticed veins of quartz traversing the large rounded pebbles of which the rock consists. In the interior of the country, the surface of Goonhilly downs consists principally of serpentine, as may be traced by the growth of the *erica vagans*, which seems to find something congenial in a magnesian soil. In a quarry of limestone on the downs, I noticed chalcedony, and a granitic porphyry near Mawgan, the position of which I could not ascertain.

The result of these observations seems to be, that if the slate which is deposited on the

side of the central granite ridge, is to be considered as primitive slate, of which it bears the external characters, the serpentine and diallage rock (gabbro) occur here in the same geological position which they have been found to occupy in the various parts of Europe where they have been noticed.

In the diallage rock, at a small village near the coast, called Gwendra, and also in the rock of St. Keverne, I observed some small metallic specks, which on chemical examination I found to consist of iron, with a portion of titanium, as was shewn by the precipitate thrown down by tincture of galls: it appears most probable that these particles, carried down by streams to Menacchan, near to which place the St. Keverne rock has been traced, constitute the peculiar sand in which the metal titanium was first discovered by Mr. Gregor. I sent some of this substance immediately on having noticed it to Mr. Gregor, who informed me, by letter, that the result of his experiments proved it to be an assemblage of several ingredients, viz. silica, alumina, and the oxides of titanium and iron, with a little potash: some of these ingredients might be derived from the gangue with which the metallic substance is intimately mixed. I lament, that the subsequent illness of Mr. Gregor prevented him from completing the experiments he had commenced.



A GEOLOGICAL MAP of the LIZARD DISTRICT.

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