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LIII. *A Geological Sketch of a Portion of the Granite District near Penryn, referred to in the preceding Paper.* By R. W. Fox, Esq.*

[With a Map: Plate IV.]

Explanation of the Map.

THE unshaded part is intended to show the direction of the range of hard or compact granite near Penryn, which is nearly N.E. and S.W. Its length about 5 or 6 miles, and its breadth 1 to $1\frac{1}{2}$ mile.

The dotted part represents a coarser granite, less compact, and often friable near the surface.

The granitic district extends many miles towards the north-west, and includes, as there is reason to believe, other ranges of compact granite nearly parallel to the above.

The shaded part represents clay-slate, or "killas," resting on the granite.

Some of the quarries in which the cleavage has been examined, are marked thus, +; and it appears that the average direction of the vertical cleavage is nearly N.N.W. and S.S.E. There seems to be a remarkable approximation to uniformity in this respect, although not so decided as in the horizontal, or almost horizontal cleavage.

The Main Rock, and some other very large rocks, which are above the surface, seem to correspond with the lines of cleavage; thus affording strong evidence of their being in their original position.

In reference to the statement in the preceding paper relative to the cleavage of granite near Penryn, it may be proper for me to say, that the horizontal cleavage, or "capping" as it is termed, is by no means confined to the granite in question; but on the contrary, it seems to be a characteristic of that rock in different parts of Cornwall; as I find it has been observed at Kit-hill, and other places near Callington, at Rough-tor near Camelford, and at Carnmarth near Redruth. In these districts likewise, the granite possesses natural joints in a horizontal direction, or nearly so, although they are often almost imperceptible, except where they have been enlarged by the action of the weather. Besides these joints, there are other similar ones at right angles to them; but I am not prepared to state whether, as in the Penryn granite, they have any tendency to uniformity in their bearing. In all the cases alluded to, there appears however to be a correspondence between the "capping," and the nearly horizontal joints; on which account it seems reasonable to infer, that the similar joints which abound in the granite at and near the Land's End,

* Communicated by the Author.

and at the Scilly Islands, indicate a cleavage, or tendency to split in the same direction.

I apprehend that granitic ranges occur in various parts of Europe possessing identical characters, as far at least as the joints are concerned, respecting which it seems desirable to obtain specific information bearing on the points in question; for I think it must be evident, that wherever a conformity in the cleavage, or indeed in the joints of different ranges of granite can be established, especially where such ranges are found in contact, there is good reason to consider them contemporaneous, however differently they appear to be circumstanced in other respects.

R. W. Fox.

LIV. *Particulars of the Measurement, by various Methods, of the Instrumental Error of the Horizon-Sector described in Phil. Mag. vol. lix. By Mr. JOHN NIXON.*

[Concluded from the Lond. & Edin. Phil. Mag. and Journ. vol. i. p. 108: with Figures; Plate IV.]

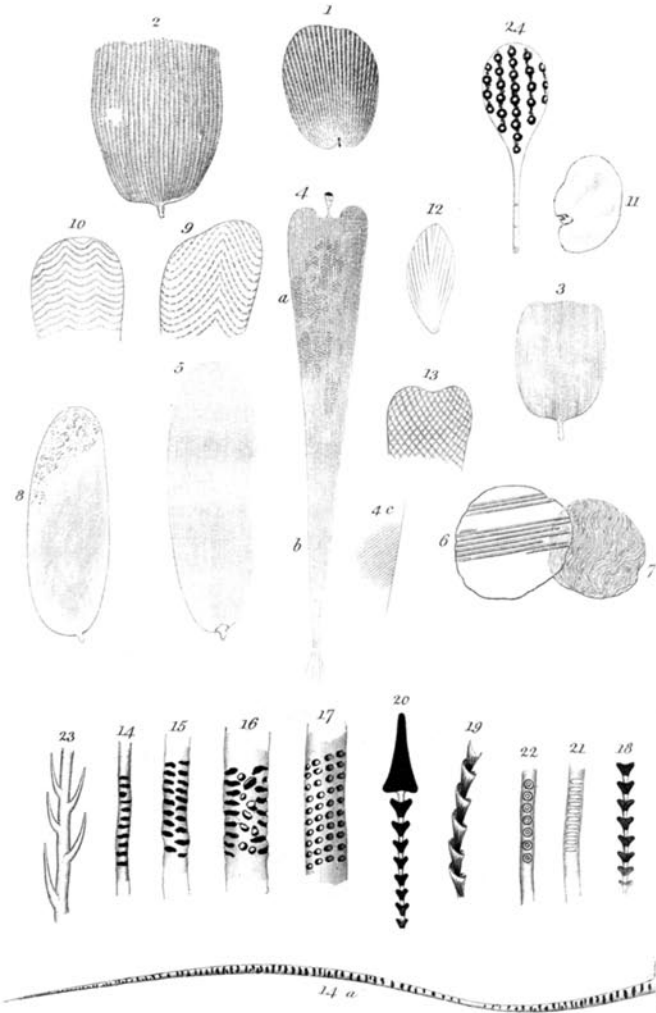
By the Second Method.

Theory.—A RAY of light falling, at any angle of *depression*, on the surface of a fluid at rest, is reflected from it at the same angle of *elevation*. Hence parallel rays are reflected from a level surface at their previous *equal* inclination to the horizon. The elevation of any direct ray (A. fig. 1.) at any point (R) of a horizontal surface (HH') will be the same as that of the reflected ray (C). Another ray B, parallel to A, intersecting C at any point* of it P, will be seen from that point at an elevation equal to that of A at R, and equal to the depression (at P) of the reflected ray C in the direction of R. PL being parallel to HH', the angle ARH will be equal to BPL, and also to LPR, and the sum of the two latter angles equal to BPR. The rays A, B, although sensibly parallel, might have diverged from one point situated at a considerable distance. Rays from a (fixed) star would be of this description.

At P, a star observed in the direction of B, would also be seen by reflection from a level surface below, as HH', in the direction of R. As the elevation of the star should equal the depression of its reflected image, an instrument having a *constant* error would not give the two angles equal. However, as the one would be exactly as much in excess as the other was in defect, half their sum would be the correct quantity; and half their difference the constant error, additive to, or

* The horizontal distance of P to R should not exceed a few feet, or the direction of gravity at the two points will not be sensibly parallel.

Pritchard's Microscopic Cabinet



Drawn by A. Pritchard.

W. Fellsall sc.