

XIV.—*On the Syenite Veins which traverse Mica Slate and Chalk at Goodland Cliff and Torr Eskert, to the south of Fair Head, in the County of Antrim.*

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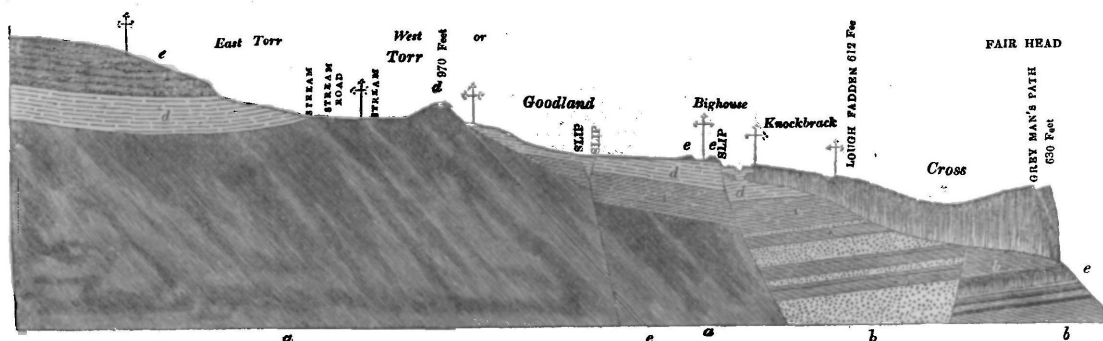
[Read January 6, 1836.]

THE geology of the northern portion of the county of Antrim, has been often treated of; but there are several interesting facts, which have apparently escaped the attention of preceding observers. One of the most important was described by me in the Geological Section at the late meeting of the British Association in Dublin; and I have since revisited the place, accompanied by my friends Professor Sedgwick and Mr. Murchison, at whose request I have prepared the following memoir for the Geological Society*.

The part of Antrim to which this paper refers, is situated between Fair Head, on the north, and Cushleake Mountain, on the south.

The geological structure of the country is exhibited in the accompanying section, No. 1. It will be seen, that mica slate forms the substratum or base

No. 1.



a, Mica slate; b, coal shale; b with dots, coal sandstone; c, new red sandstone; d, chalk; e, trap, or syenite.

of the country; that secondary rocks, belonging to the coal formation, the new red sandstone, and chalk rest upon it unconformably; and that these secondary rocks are surmounted by an overlying mass of rudely columnar

* These veins, together with that at Torr Eskert, were originally observed by Mr. Nicholson, one of the first class of valuers employed on the general valuation of Ireland.

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trap, which at its northern extremity, forms the magnificent promontory, called Fair Head.

The mica slate is distinctly bedded, and passes from a fine-grained, shining, slaty rock, into a coarsely granular gneiss. Its subordinate strata are hornblende slate and schistose limestone; the latter occurring in several places, particularly on the sea shore, close to the south side of Torr Point, and on the shore at West Torr. At Goodland Cliff, near the northern extremity, the dip is north-west, at an angle of 15° from the horizon, and the subordinate beds of schistose limestone and hornblende slate dip conformably with the mica schist, and are consequently contemporaneous portions of it. Other rocks containing hornblende are, however, frequently associated with the mica slate, and though apparently imbedded with that rock, are veins which have been intruded, subsequently to its formation. This is particularly the case at Torr Point and other localities, one of the most remarkable of which is on the sea shore, half a mile to the south of the commencement of the mica slate in Murlough Bay, where are two decidedly intruded veins of syenite, which pass into syenitic greenstone. (See the following cut, No. 2.)

No. 2.



Syenite veins (*e*) passing through mica slate (*a*), in Goodland Cliff, south of Murlough Bay.

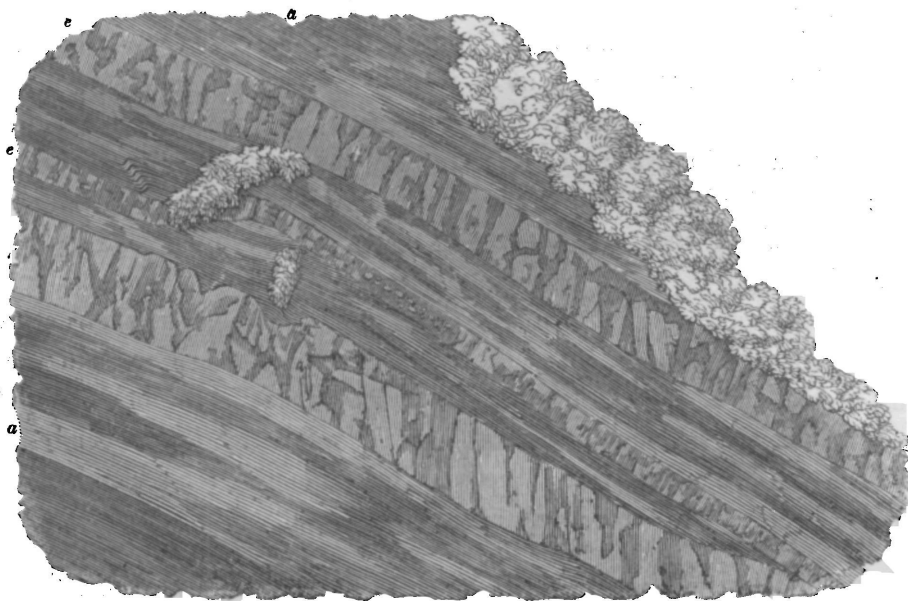
These veins pass obliquely through the mica slate, in the face of the stupendous cliff of Goodland, which is upwards of 500 feet high, and for the greater part nearly perpendicular. They are clearly visible along the face of the cliff for more than half a mile. At the sea shore, the veins appear to range so regularly and conformably with the strata of mica slate, both in strike and dip, that if not closely examined they might be considered subordinate beds; but on minute inspection, it will be found that the edges

are frequently rough and saw-like ; and that the projections are filled by syenite, continuous with the mass ; and the indentations in the veins with mica slate, having a tortuous structure.

On tracing these veins as they gradually ascend the cliff to the south-east, their true nature is at once discernible. There, they may be seen pursuing undulating courses, neither parallel to each other nor to the laminæ of the mica slate ; in some places approaching to within four feet, but in others, being more than twenty feet apart. (See cut, No. 2.)

About 150 yards to the south of the point, where the veins meet the surface of the ocean, and where the lowest has reached the height of about 120 feet, the cliff is fractured by a great fault, or downthrow of the strata to the north ; and by means of which the cliff is accessible. To the south of the fault, the veins are at about 100 feet higher level than to the north, and it is remarkable that to the south of this point *three* veins are observable, instead of two, by the introduction of a small vein, which, when first observed, is in contact with the upper surface of the lower vein, but gradually diverging from it, approaches the upper vein, and afterwards descends a second time towards the lower vein. The accompanying sectional view, No. 3, was taken a short distance to the south of the fault. At this place the upper vein is about five feet thick ; the middle is fourteen inches, and the lower about seven feet ; and the distance between the upper and lower veins is fourteen feet, including the middle vein.

No. 3.



Syenite veins (e) traversing mica slate (a) in Goodland Cliff, south of Murlough Bay.

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The mass of the upper and lower veins is composed of dark green, crystallized hornblende, brownish red felspar, and occasionally quartz. The rock may be said to be finely grained. The hornblende is crystallized in long six-sided prisms; and the felspar exhibits its usual rhomboidal structure, but no distinct crystals. It is to be observed, that the hornblende is more abundant near the upper and lower parts of the vein than in the centre, and a regular transition between syenite and greenstone, is observable in the mass of the vein. This variation is most remarkable in the thin centre vein, which contains much black hornblende, and some black quartz. This vein is also peculiar from its presenting oval-shaped masses, from two to ten inches in diameter, and about one third as thick, composed of crystalline greenstone, enveloped in a congeries of plates of pinchbeck brown mica. In one or two places, I observed a tendency to similar structure in the upper vein.

When seen at a distance, the upper and lower veins present a rudely columnar structure, the prisms being at right angles to the inclination of the veins.

Syenite, similar in every respect to the upper and lower veins, occurs near to the summit of Torr Eskert Hill, about half a mile to the south of Goodland Cliff. (See wood-cut, No. 1. p. 179.)

Owing to the covering of diluvial matter, the surface soil, and herbage, it is impossible to trace the syenite veins of the coast to this point; but in laying down the line of the veins of Goodland Cliff on the Ordnance Map, and making due allowance for their average inclination, and the elevation of the hill, I entertain no doubt that the syenite of Torr Eskert, is a prolongation of one of the veins of the cliff.

Torr Eskert Hill is about 970 feet above the level of the sea. At a distance, it presents a bold escarpment to the north, and in this respect exhibits a character quite distinct from the comparatively tame outline and green acclivities of the neighbouring chalk hills. Its summit is composed of strata of compact chalk, dipping east, at an angle of 5° from the horizon; and is divided into three perpendicular escarpments, having sloping terraces between them. The vertical portion of the two upper escarpments, may each be about ten feet in height; and that of the lowest is also ten feet, but its upper half is composed of indurated chalk, and the lower of syenite, a part of which is rudely columnar.

This syenite cannot, either in external aspect, or in internal structure, be distinguished from that of the cliff, and the same transition into syenitic greenstone is observable. Having made an excavation and cleared away part of the surface soil and grass, both above and beneath the syenite, I obtained the following section. Commencing from the top; compact chalk, five feet*; syenite, five feet; an irregular bed of chalk, from nine inches to one

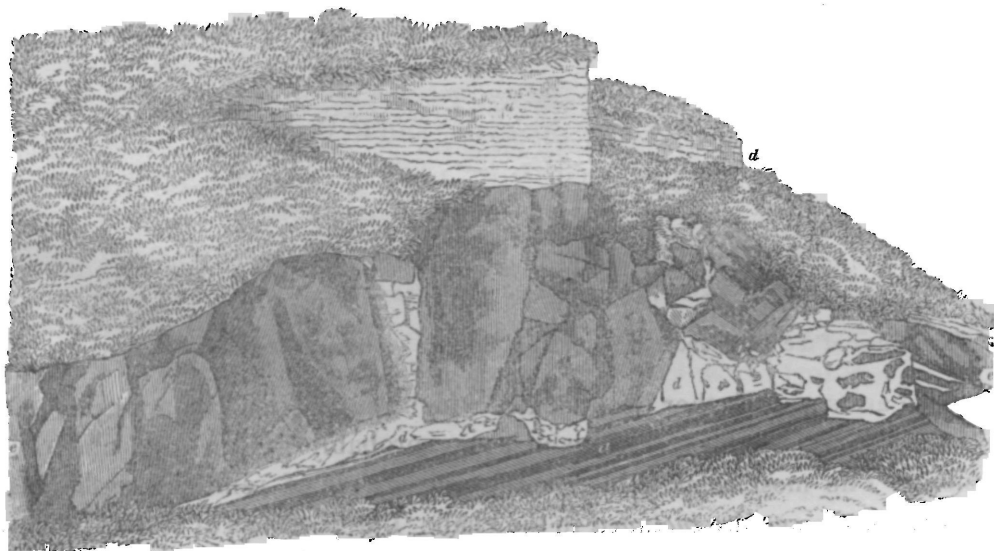
* The grain of this chalk is closer and more compact than that of the chalk forming the summit of Torr Eskert.

foot; containing quartz pebbles, green sand, and numerous, red, siliceous grains, some of which resemble garnets, and others carnelians. This stratum rests on soft, leafy, mica slate, regularly stratified, and dipping north-west at an angle of 10° from the horizon.

The syenite is divided into large masses, which in several places are separated by intervening chalk, containing quartz pebbles and green sand, also numerous fragments of the fossils, usually met with in the green sand of the north of Ireland. The views, Nos. 4 and 5, represent the connexion of the chalk and syenite at Torr Eskert.

It is to be observed that in the vertical masses of chalk (see wood-cut, No. 4.) the numerous fragments of belemnites, shells, and other fossils, are also nearly vertical; and consequently are not in the position in which they were deposited. In examining closely the line of contact between the syenite and the chalk, it will be seen that the elevations and depressions of the outline, are accurately filled with the syenite. It is also to be observed that the chalk, in immediate contact with the syenite, is unusually compact, and that the colour is changed from yellowish white to reddish white.

No. 4.



Connexion of chalk and syenite at Torr Eskert. *a*, mica slate; *d*, chalk; *e*, syenite.

One of the specimens (No. 10.) presented to the Society's Museum* contains a wedge of chalk, included in the syenite, and the lower part is so compact as to assume the appearance of marble,

* The specimens alluded to in the Memoir are in the Museum of the Geological Society.

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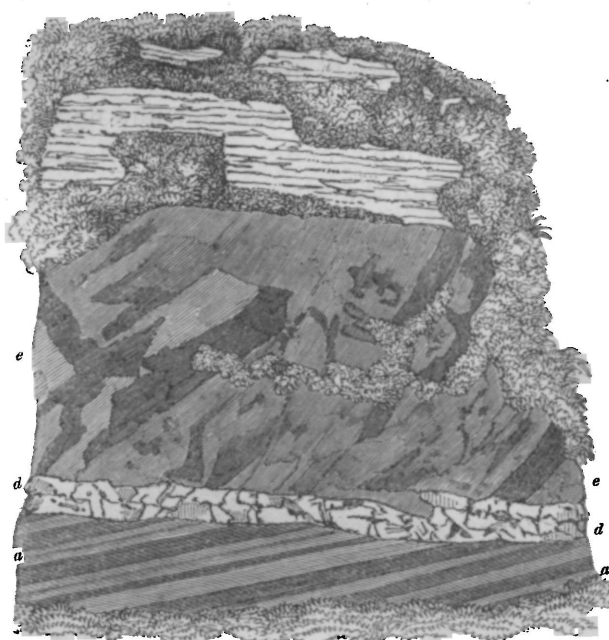
agreeing in this respect with the character which chalk usually presents, when found in contact with common whin dikes.

It is remarkable, that a small reniform mass of syenite, is included in the centre of this wedge of chalk; but is much finer in grain than the usual mass of the syenite. It is evident from its external appearance, that this small mass has not been rounded by attrition.

In another specimen (No. 11.) the chalk is nearly enveloped by syenite; and the minute projections at the point of contact are well developed.

The specimen marked No. 12. exhibits a small portion of the syenite passing through the chalk in the form of a vein; and that numbered 13. contains five small portions of chalk insulated in the syenite, and it is remarkable that the union at the contact is so perfect, that the chalk appears to form an integral part of a compound rock.

No. 5.



Connexion of the chalk and syenite at Torr Eskert. *a*, mica slate; *d*, chalk; *e*, syenite.

There are several other peculiarities which render this contact of syenite and chalk very interesting, and which may probably give rise to much discussion. The most remarkable, is the occurrence of reniform or flattened spheroids of the syenite *included* in the chalk. The positions of several of these masses, are shown to the right of the sectional view No. 4, which was drawn with great care, and accurately represents the facts when the last excavation was made: any fresh excavation will of course cause a change in the detail, but I have no doubt that the principal characters will be continued.

Included in the collection is a specimen (No. 14.) which exhibits two, detached, flattened masses of syenite, resting on chalk. It might be argued from the smooth edges of this specimen, that the

fragments had been rounded by attrition, and consequently that the chalk which surrounds them is newer than the syenite. But it may be observed, that the syenite itself includes pebbles of quartz, similar to those contained in the green sand and chalk. This fact, when coupled with the peculiarly rounded and indented form of the upper surface of the syenite, and the smooth flattened one of the lower, leads to the conclusion, that it was injected in a fused state into the chalk, when the latter was soft or plastic; and that it may be considered similar to the small reniform fragment of syenite included in the chalk, as seen in specimen No. 10. If the chalk were not first formed, how can we account for fragments of that substance being included in the syenite, as exhibited in the drawing No. 4, and in specimens Nos. 10, 11, 12, 13; and above all, how can we account for the irregular stratum of chalk, with green sand, &c., which occurs *below* the syenite, and interposed between that rock and the mica slate, as exhibited in cuts Nos. 4 and 5?

It may also be mentioned, that it is not unusual to find chalk intermixed with trap, and trap entangled in chalk on the Antrim coast. Examples of both occur at Kenbane Head, west of Ballycastle; and in the section No. 1, appended to this paper, the southern extremity of the greenstone of Fair Head, is shown penetrating the chalk, while the chalk itself includes masses of trap.

It is perhaps unnecessary to dwell on this subject, as it is hoped that the drawings, together with the specimens, will sufficiently illustrate the relations of the mica slate, chalk, and syenite: and if it appears, that the views now put forward, have been substantiated, a new and important fact will have been added to those, already described by other observers, which may ultimately lead us to attribute a comparatively recent origin, not only to syenite veins and to greenstones formerly called primary, but also to many other crystalline rocks.

I have long doubted the existence of true beds of the large grained crystalline greenstone or granite, in schistose sedimentary rocks, being of opinion that if carefully examined, they would, like the syenite now described, prove to be intrusive veins, and not beds subordinate to those rocks; but I forbear entering further upon this subject at present.

October, 1835.