strata. The red sandstone at Ballochmoyle lies in wedge-shaped masses in the conglomerate (fig. 1), like the same deposits at Belah, Westhouse, and Flookborough (Humphrey Head).

The conglomerate and breccia, whether seen at Flookborough in Furness, Westhouse in Yorkshire, Belah Bridge and other places in Westmoreland, near Dumfries, at the foot of Criffel near the mouth of the Nith, or at Ballochmoyle in Ayrshire, present the same kind of paste or cement, resembling decomposed felspar, but the imbedded rocks vary as the rocks of the respective districts do; thus at Flookborough, Westhouse, Belah, and Brough, we have limestone fragments,—at Craigs and in the Cleuden, slates and Silurian rocks,—near Criffel, granite,—and at Ballochmoyle, trap; clearly showing that such rocks have been derived from the beds of the neighbouring districts, and not brought from a distance.

The circumstance of the large tract of the South-west of Scotland, hitherto coloured as Trias, proving to be Permian, must be of great importance to the ironstone and coal districts lying near it, and will in some instances no doubt allow such deposits to be followed under it. In addition to this economical advantage, the change cannot but prove highly interesting to the palæontologist, as it will enable him to remove all the tracks of animals found in the Corncockle Muir, Locker Bridge, Craigs, and Greenbank quarries from the Trias and place them in the Permian fauna,—a position where they will better fit, when compared with the continental deposits, than in their old place in the Trias.

JANUARY 23, 1856.

Richard S. Roper, Esq., and the Rev. S. Lucas were elected Fellows.

The following Communications were read:—

1. *On the* CRYOLITE *of* EVIGTOK, GREENLAND. By J. W. TAYLER, Esq.

[Communicated by J. Tennant, Esq., F.G.S.]

THE few remarks which I am about to offer relate to the mineral Cryolite*, and the nature of the district in which it occurs; and I propose to lay before the Society some observations which the exploration of a rich lead-vein situated in the Cryolite has afforded me the opportunity of making.

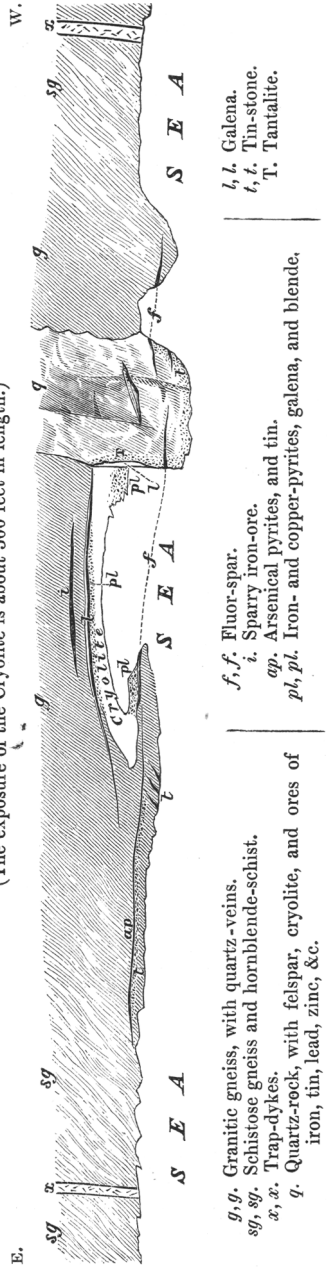
Evigtok (which signifies in the Esquimaux language "a place where there is plenty") is distant about twelve miles from the Danish settlement of Arksut, and forms a small bay in the Fiord of Arksut;

* See Thomson's 'Outlines of Mineralogy,' vol. i. p. 251; and Giesecke's article "Greenland," in the Edinburgh Encyclopædia, 1816.

it is a semicircular space of rather low irregular ground, surrounded by a ridge of mountains, rising abruptly to the height of about 2000 feet; making the enclosed space appear the half of a deep basin about two miles in diameter. Evigtok is noted in Greenland for its abundance of fish in the summer season; shoals of capelins blacken the small bays, whilst thousands of codfish swim close to the shore in pursuit of them, both of which are taken by the natives in large quantities. At the foot of the mountains and on their sides are to be found many grouse, hares, and arctic foxes. In the winter season immense flocks of eider ducks and other water-fowl resort to this part of the Fiord. Vegetation, such as it is in Greenland, also prospers here: a miniature forest of *Salix Arctica*, about 4 feet high, covers about a square mile, and the *Angelica*, *Rumex*, *Taraxacum*, *Potentilla*, and other plants are met with more abundantly than is general in Greenland; the spot appearing like a garden amidst the general barrenness of a land buried deep in snow nine months out of the twelve. But Evigtok is more remarkable as being the only place in the world in which the mineral cryolite has hitherto been found.

Fig. 1.—*Horizontal Section or Ground-plan of the Cryolite at Evigtok.*

(The exposure of the Cryolite is about 300 feet in length.)



g, *g*. Granitic gneiss, with quartz-veins.
sg, *sg*. Schistose gneiss and hornblende-schist.
x, *x*. Trap-dykes.
q. Quartz-rock, with felspar, cryolite, and ores of iron, tin, lead, zinc, &c.
f, *f*. Fluor-spar.
i. Sparry iron-ore.
ap. Arsenical pyrites, and tin.
pl, *pl*. Iron- and copper-pyrites, galena, and blende.
l, *l*. Galena.
t, *t*. Tin-stone.
T. Tantalite.

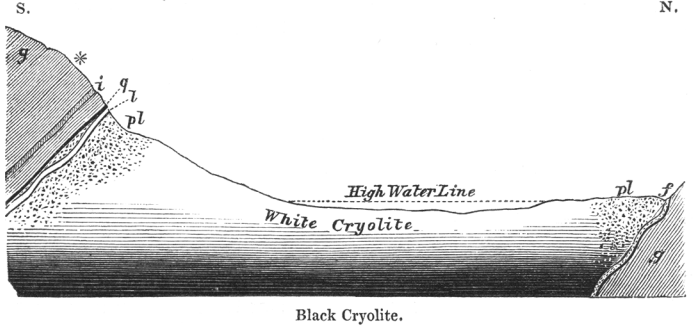
By reference to the horizontal section (fig. 1), two trap-veins will be seen bounding a space containing the cryolite and the minerals accompanying it. To this

space I shall confine my remarks. The section is not drawn accurately to a scale, but it is about $\frac{1}{24}$ inch to the fathom.

Starting from the western trap-vein, which is situated in schistose gneiss and hornblende-schist, we find the gneiss gradually losing its slaty structure, until in the neighbourhood of the cryolite it becomes granitic, and now contains numerous metallic traces; before arriving at the cryolite, we find a wide vein of white quartz and felspar, running about S.W.; the quartz and felspar are in very large masses and crystals, some crystals of quartz measuring a foot in thickness. This rock is traversed in several directions by small veins and masses of cryolite, isolated from the larger body of that mineral, in which, as well as in the rock, are to be found numerous crystals of a variety of tantalite, oxide of tin, blende, molybdenum, much galena, copper-pyrites, arsenical and iron-pyrites, and sparry iron-ore. In this rock are many small caverns, arising from the decomposition of the felspar, and probably also from the decomposition of the cryolite, which is here porphyritic, containing crystals of felspar and quartz. The floors of these caverns are covered with loose crystals and fragments of felspar, and in some places kaolin, crystals of tinstone, and carbonate of iron. In one of these cavities is a large vein of arsenical pyrites and purple fluor-spar; also a large vein of black cryolite, containing copper- and iron-pyrites, and red felspar. Smaller cavities are found when blasting, the sides of which are completely covered with crystals of the tantalite, resembling on a large scale

Fig. 2.—*Transverse Section of the Cryolite at Evigtok.*

(The width of the Cryolite is about 80 feet.)



g, *g*. Gneiss.
i. Sparry iron-ore.
q. Quartz-vein.
l. Argentiferous galena.
f. Purple fluor-spar.
pl, *pl*. Galena, copper-pyrites, blende, iron-pyrites, and carbonate of iron scattered in cryolite.
* Fragment of cryolite was found imbedded at this spot.

the crystalline cavities in amygdaloidal traps. In this quartz- and felspar-rock there is a remarkable vein, containing soft ferruginous clay and rolled pebbles, sparry iron-ore, and copper-pyrites. The copper lies over the sparry iron, and runs in fine threads between the

folia of the partly decomposed iron-ore, appearing as if it had run into it in a state of solution. To this quartz- and felspar-rock succeeds more granitic gneiss, in which the cryolite occurs; this gneiss gradually loses its granitic character as it approaches the eastern trap-vein, where it again takes on the same slaty appearance as at the western trap-vein.

We will now refer to the transverse section of the cryolite (fig. 2). The cryolite forms a bed or vein parallel to the strata, and is about 80 feet thick and 300 feet long; it dips to the south, at an angle of nearly 45°, and runs nearly E. and W. In the upper wall of gneiss, about 2 feet above its junction with the cryolite, runs a vein of sparry iron, with the same dip as the cryolite; and a layer of opake quartz-crystals lines the under side of the gneiss, between the iron-ore and the cryolite: sometimes sinking several feet into the cryolite, but never rising into the gneiss, is a vein of argentiferous galena, containing 83½ per cent. of lead, and 45 ounces of silver in the ton of ore; this was worked during the year 1854–5, and some good ore was extracted. The cryolite below this vein is impregnated for a few feet with galena, copper-pyrites, and sparry iron-ore; but beyond, until within a few feet from the under wall of gneiss, it is quite pure and white; within 10 feet, however, of this under-gneiss, it again contains the same minerals disseminated, but is here separated from the gneiss by a vein of dark purple fluor-spar. The gneiss on both sides of the cryolite contains much fluor-spar disseminated.

The upper part of the cryolite at its junction with the gneiss is much decomposed, leaving many cavities, which contain loose crystals of sparry iron. At a depth of about 10 feet from the surface, the cryolite, although free from foreign matter, assumes a darker colour; and at 15 feet it is nearly black, and more translucent and compact; and, as the deeper we sunk we found the cryolite become darker, there is reason to believe that below this depth the mineral will be found to be wholly black. As the white cryolite is only found at the surface, and bears evidence of partial disintegration by having lost some of its compactness and translucency, it is reasonable to suppose that the cryolite was originally wholly dark-coloured or black.

When the black cryolite is heated to redness, it loses about 1 per cent. (moisture and acid), the whole of its colour, and part of its translucency, becoming perfectly white, like the cryolite at the surface. And from this fact we may conclude that the white colour of the cryolite at the surface has been produced by a similar cause. I consider it probable that the trap now found at each end of the cryolite has formerly overlain it, heating it superficially, and rendering it white; there are at present no remains of overlying trap between these two veins, but in this country the trap and allied rocks disintegrate most rapidly from the effects of frost. The cryolite itself has considerably decreased, from this and other causes; for I found a piece of it imbedded in the upper gneiss, more than 8 feet above the highest part of the cryolite, proving that it formerly stood at that height.

In working the lead-vein, we sunk about 30 feet on the dip of the

cryolite; it probably extends to a great depth, and exists in great quantity.

The fact of its solitary occurrence in this spot induces speculation in regard to its origin. The number of minerals, mostly crystallized, which accompany it, indicate some powerful and long-continued agency to have operated in a limited space. The few facts I have stated may suggest some opinions which may elucidate the as yet ill-understood subject of mineral veins. The cryolite has been hitherto applied to few purposes. The Greenlanders were the first to turn it to account, which they did in a curious manner, viz. the manufacture of snuff. They grind the tobacco-leaf between two pieces of cryolite, and the snuff so prepared contains about half its weight of cryolite powder. This snuff they prefer to any other. In Europe cryolite has been employed to a limited extent; but the recent discovery of the mode of preparing aluminium will probably render it a valuable ore of that metal.

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2. *Description of Remarkable* Mineral Veins.

By Prof. D. T. Ansted, M.A., F.R.S., F.G.S.

[This Memoir was preceded by an introduction, in which the author, after certain definitions, stated the class of facts which he considered it desirable should be recorded by mining engineers in investigating mineral veins, in order that their observations might be available for scientific purposes.]

1. *The Cobre (Copper) Lode of Santiago de Cuba.*

As being a very exceptional and remarkable vein, and one which possesses a remarkable geological interest, I have selected for this memoir the great Cobre lode, and I propose to describe and, as far as possible, explain the conditions of this vast deposit of mineral wealth. I select it with the greater readiness, as it has not hitherto, I believe, been the subject of scientific investigation, although known for twenty years as the richest copper lode which has within that period been the object of continuous mining operations in any part of the world.

Position of the Lode.—This deposit of copper ore, opened in a hill near the small town of El Cobre, is about eight miles W.N.W. of the town and magnificent harbour of Santiago de Cuba, the mines being directly connected with the harbour by a railway, which takes advantage of the valley of the Cobre River to reach the mining district. There is a fall of about 300 feet from the plateau on which the town is built to the sea, and the hill on which the principal crop of the lode takes place is about 300 feet above the level of the railway. The line of railway running nearly parallel to the principal direction of the sierras, both along the coast and in the interior, gives some little insight into the structure of the country, and to the facts observed in the cuttings I shall have occasion to allude presently.