

XIX. *Description of FERGUSONITE, a New Mineral Species.*

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FEW cabinets of minerals contain so many of the rare substances, which were discovered in Greenland, by Sir CHARLES GIESÈCKE', and perhaps none in equally interesting varieties, as that of Mr ALLAN. The most prominent of them have been examined both in a mineralogical and chemical point of view, and some described as particular species. Mineralogy is already indebted for Allanite, Sodalite, Eudialyte, and Gieseckite, to the zeal of the indefatigable explorer of Greenland, and the subsequent labours of Dr THOMSON and Professor STROMEYER ; and it is probable that the number of new species from this source will yet be increased upon farther examination.

Allanite had first been noticed by Mr ALLAN, who described it as crystallised Gadolinite *,—a variety of which it had been considered by Count BOURNON, resting, in part, upon some partial chemical experiments. Dr THOMSON† afterwards analysed it, found it to be a species of its own, and gave to it the name of Allanite, under which it has been since received in most of the treatises on mineralogy. The description of the crystals, given by this author, and the second figure which accompanies his paper, are perfectly correct, and refer to that variety of the mineral which he has analysed. It is well known at present, that the first figure represents a crystal of Zircon of a very dark colour. This

* *Transactions of the Royal Society of Edinburgh*, Vol. VI. p. 345.

† *Ibid.*, p. 371.

species occurs along with the Allanite, and sometimes imbedded in it, in small but very distinct crystals, generally of the form of a four-sided prism, terminated by a four-sided pyramid, in parallel position, and having occasionally its lateral edges replaced. HAÜY, and most of the other mineralogists, in the description of Allanite, have quoted the measurement of the prism 117° , as indicated by Dr THOMSON. Messrs PHILLIPS * and BROOKE † ascribe to it a rectangular four-sided prism, which is incompatible with the real form of the mineral. That substance, the form of which Mr PHILLIPS has described, and which he calls Crystallised Allanite, does not belong to this species: it is a species of its own, but, like the Allanite, it belongs to the order Ore, of the system of Professor MOHS.

The more particular object of the present paper, is to describe this new species, for which, at the suggestion of Mr ALLAN, I propose the name of *Fergusonite*, in honour of a gentleman too well known to the mineralogical world at large, and to the members of this Society in particular, to require, in the present place, a more detailed acknowledgment. In order to produce a more distinct idea of the differences existing between the two species, I shall begin with giving a short description of the Allanite, and then add the description of *Fergusonite*, as derived from the specimens observed in the cabinet of Mr ALLAN.

I. ALLANITE.

Its form is tetarto-prismatic. Plate XII. Fig. 1. shews the elevation of a crystal. Fig. 2. the projection of the same, upon a plane perpendicular to the sides of the prism. It is the same crystal which has been mentioned by Dr THOMSON, and presents

* *Elementary Introduction to Mineralogy*, p. 264.

† *Familiar Introduction to Crystallography*, p. 458.

a greater number of planes than any of those which have been described by Count BOURNON. I have noted the faces, with the letters received for Axinite by HAÜY, and in the Treatise on Mineralogy by Professor MOHS, for the sake of an easier comparison of the analogies among the crystalline forms of the two species. I obtained the following measurements of the angles:

r on $M = 129^\circ$	y on $r = 109^\circ$
r on $P = 116$	s on $x = 156\frac{3}{4}$
M on $P = 115$	x on $t = 164\frac{1}{2}$
s on $r = 135\frac{1}{2}$	x on $y = 151$
d on $r = 124\frac{1}{2}$	t on $y = 166\frac{1}{2}$

These angles are given merely as rude approximations to the true angles of the crystal, as, besides the use of the common goniometer, I was obliged to take impressions from them in sealing-wax, to make them at all fit to be measured with the assistance of the reflective goniometer. The surface is far from presenting a good polish, or high degree of lustre; the inclined faces s , x , t , and y , are more perfect in this respect than those which are parallel to the axis. The face M in particular is very rough and uneven. The inclination of r on P is more easily ascertained. The edge between P and M is also sometimes replaced by a rough face.

Faint traces of cleavage are observable parallel to P and r ; but they are very indistinct and interrupted. Fracture is imperfect conchoidal.

The lustre is imperfect metallic, if any thing inclining to resinous; the colour black, verging upon green or brown: the colour of the powder or streak is greenish-grey, also a little brownish. It is opaque, only the edges of very thin splinters are somewhat translucent, and of a dark yellowish-brown colour.

The substance of Allanite is brittle; the hardness = 6.0; some varieties a little higher, others a little lower, but the difference is scarcely perceptible. The specific gravity is differently stated; but the highest obtained by Count BOURNON, which seems to be that of the pure mineral, is = 4.001. It does not act upon the magnetic needle.

This description does not differ in any material point from that which has been given by Mr ALLAN, except in respect to the regular forms, which were obtained from specimens discovered after the publication of his paper.

II. FERGUSONITE.

The regular form of this mineral is one of the most interesting of those comprised within the pyramidal system. The fundamental form, as deduced from approximate measurements, is an isosceles four-sided pyramid, having its terminal edges = $100^{\circ} 28'$, and its lateral edges = $128^{\circ} 27'$, Fig. 7. The character of its combinations is hemi-pyramidal, like that of Tungstate of Lime, the pyramidal Scheelium-baryte of MOHS, with which it agrees also very nearly in its angles. The character of its combinations is evident from Fig. 3., where the fundamental pyramid is in combination with an acute four-sided pyramid, with a rectangular four-sided prism, and with the pyramid of infinitely small axis, or $P - \infty$. The angle abc in Fig. 6., which is the horizontal projection of Fig. 3., being about 11° , it follows that the prism r itself consists of the alternating faces of that eight-sided prism, whose transverse section is $112^{\circ} 37' 12''$, and $157^{\circ} 22' 48''$, and whose crystallographic sign, according to the method of Professor MOHS, is $\frac{[(P + \infty)^5]}{2}$. The faces of the pyramid are generally curved, and yield on that account various measures with the common goniometer, giving the inclination at its base from 158°

to 170° . The angle of $159^\circ 2'$ corresponds to the pyramid $(P - 1)^\circ$, exactly the same ratio as we find in the two forms of pyramidal Tin-ore, noted s and z by HÄÜY. The angle of $169^\circ 26'$ belongs to $(P + 1)^\circ$. There is no sharp edge between these faces; but wherever they are most distinctly pronounced, they seem rather to approach to the position of the first of these pyramids. The acute four-sided pyramid z is often in combination only with $P - \infty$, as in Fig. 5.

No crystal has yet been observed terminated on both ends. In the portion of one represented in Fig. 4., the faces of the four-sided pyramid z are disposed in the opposite direction from that in Fig. 3. This may be conceived to be the opposite apex of the crystalline forms.

There are faint traces of a cleavage observable parallel to P , the fundamental pyramid of the species; but they are incoherent, and much interrupted by conchoidal fracture, which is of a high degree of perfection. The surface of all the forms is rather uneven, often irregularly streaked and rough.

Fergusonite possesses an imperfect metallic lustre, inclining to vitreous in the perfect conchoidal fracture. Its colour is dark brownish-black; but, in very thin scales, it appears of a pale liver-brown or yellowish-brown colour, and is translucent; in larger crystals it becomes opaque. Its streak is a pale brown powder, exactly the same as in peritinous Titanium-ore.

It is brittle, the hardness = 5.5...6.0, nearer the latter; it is scarcely different from that of the prismatic Feldspar. The specific gravity, taken with great care by Dr TURNER, was found = 5.800, nearly agreeing with 5.838, the result obtained by Mr ALLAN. It does not act upon the magnetic needle.

Both these species were discovered in Greenland by Sir CHARLES GIESÈCKE. Allanite occurs at Alluk near the south-

ern extremity of East Greenland, and, besides Zircon, it is associated with Mica and Albite, and imbedded in Quartz. The locality of Fergusonite is Kikertaursak, near Cape Farewell, where it is found in imbedded groups and single crystals, in white quartz. The specimens of this species were brought from Greenland by Sir CHARLES himself, and were presented by him, on his arrival in this country, to Mr ALLAN.

Fergusonite, under the name of Allanite, has been examined by Mr CHILDREN before the blowpipe *. The results of his experiments agree pretty well with those given by BERZELIUS of the Black Ytthro-tantalite from Ytterby. Its slow but perfect solubility in salt of phosphorus, leaving a long time some particles undissolved, the property of this glass-globule to become opake by flaming, when saturated to a certain degree, and, on cooling, when still farther saturated, may indicate the presence of tantalum and yttria; and even the rose colour, which it assumes under certain circumstances, accords with the re-action of a small quantity of wolfram, as quoted by BERZELIUS. It will depend upon future examination of its physical properties, whether the black Ytthro-tantalite can be arranged among the varieties of Fergusonite. They agree in some respects, but their differences in others are such, as, if ascertained with sufficient exactness, would alone prove the two substances to be different species; while the circumstance, that we know nothing of the regular forms of the black Ytthro-tantalite, renders every conjecture doubtful.

It is the more necessary to leave the decision of this point to future observations, as there are some crystallised specimens in Mr ALLAN's collection, evidently belonging to a different species

* BERZELIUS *on the Blowpipe*, translated by J. G. CHILDREN, p. 291.

from Fergusonite, and which Mr NORDENSKIÖLD ascertained to be an ytthro-tantalite. This substance is crystallised in regular octahedrons, the largest of them half a line in diameter, presenting no cleavage, but rather perfect conchoidal fracture. Its lustre is resinous, almost imperfect metallic, at least in the fracture; for the surface of the crystals, though very even, possesses but little lustre, the colour is pale yellowish-brown, the streak still lighter, almost of the same colour as that of Fergusonite, and it is translucent on the edges. It is brittle, but the hardness inferior to that of Fergusonite, being only between 4.5 and 5.0.

The locality of this species is Godhavn in Greenland, where it is found imbedded in Albite, with cleavable octahedral Iron-ore and Fluor. It resembles the yellow Ytthro-tantalite of BERZELIUS; but the forms of this substance not being known, it is as impossible to say whether they belong to one species, as it is with other varieties of Ytthro-tantalites and the Fergusonite.

Several of the properties of Fergusonite have been quoted by Mr PHILLIPS among the characters of Ytthro-columbite, and something analogous to its form is represented as a crystal of Allanite. The chief difference of this figure from the real crystals of Fergusonite is, that the faces *s*, which appear on their extremities, are inclined either to the right or to the left of each face of the four-sided prism, while in the figure quoted above, they are replaced by an eight-sided pyramid, appearing with the full number of its faces.

The mineral from Bastnaes, called *Cerite* by HISINGER and BERZELIUS, possesses many properties in common with Allanite. On account of its agreement in regard to chemical composition, it has been supposed by many mineralogists to constitute with it but one and the same species. It would be too precipitate to form at present a decided opinion on this question, as long as the

regular forms of Cerite are unknown, or, at least, as long as they have not been compared with those of Allanite. Professor MITSCHERLICH, however, informed me, that he had a crystal of Cerite in his possession, which the crystal of Allanite, described above, immediately recalled to his memory, when he was looking over that department of Mr ALLAN's collection which contains the minerals belonging to the order Ore.