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IX.—*Preliminary Notice of Substances which may prove to be New Minerals.* By Professor Heddle.

Part Second.

Balvraidite.

I give this name to a substance which may be regarded as of the nature of a hydrated magnesian felspar.

It was found by Mr. Dudgeon and myself in granular limestone, about one third of a mile above and north-east of the hamlet of Balvraid; this hamlet is situated six miles up the Glen Beg of Glen Elg, Inverness-shire.

Only a single large mass containing the mineral was found. In this mass it was associated with blue *necronite* (orthoclase of limestones), Biotite, and a hydrated labradorite.

Its colour is purplish brown of a pale cast; its structure is crystalline granular, it may be called saccharoid; its hardness is 6·; its specific gravity from 2·905 to 2·908

It varied somewhat in depth of colour, but not at all in tint. It had altogether a striking resemblance to *Bytownite*.

A darker and a paler variety were analysed, and gave

	DARK	PALE 1.	2.
Silica	46·041	46·165	
Alumina	20·112	20·953	22·282
Ferric Oxide	2·524	1·861	1·951
Manganous Oxide	·784	·843	·66
Lime	13·472	13·254	13·925
Magnesia	8·301	7·361	8·2
Potash	1·363	1·555	
Soda	2·723	3·252	
Water	4·705	4·897	4·8
	100·025	100·141	

The last was an incomplete analysis, the silica having been lost.

B. B. it fuses with intumescence and frothing into a vesicular and somewhat pale blue glass.

Examined with the microscope, a specimen taken from the general mass showed no mixture of any other substance, and exhibited no marked structure; having merely a mottled appearance, with a slight evidence of minute interpenetrating crystals.

The generally close accordance of three separate portions of this substance shows the uniformity of its composition.

Putting together the alumina and ferric oxide, and the potash and soda, the average composition of the three analyses becomes:—

		ATOMS.		GIVING.
Silica	46·103	15·37	15·	45·32
Alumina	23·261	4·51	4·5	23·33
Lime	13·55	4·84	5·	14·09
Magnesia	7·941	3·97	4·	8·05
Soda	4·446	1·5	1·5	4·68
Water	4·802	5·33	5·	4·53

These numbers, calculated from the atoms, agree fairly with the analytical results; the atoms of silica also balance those of the bases, without the water. No formula can be deduced from these numbers, however, without a strained grouping of the alkalies with the sesquioxides: though this indeed is little more strained than the present method of grouping them with the protoxides, and the leaving of the water to stand excluded, as if it were always mere water of hydration.

HYDRATED LABRADORITE.

Substances of such a nature are far from uncommon: they are generally set down as resulting from partial alteration.

That presently noticed, which was associated with the *balvraidite*, had anything but an altered or weathered appearance, being remarkably fresh, and even characteristic in appearance.

In colour and lustre it is like bleached wax, its structure is flat-fibrous, resembling thus radiated *Cleavelandite*. Rarely some parts were granular. No cleavage angle could be measured, as the surfaces of cleavage were all curved. Its specific gravity is 2·708.

It yielded—

Silica	49·33
Alumina	26·698
Ferric Oxide	·25
Lime	11·02
Magnesia	·072
Potash	2·59
Soda	5·254
Water	4·845
	100·059

B.B. it frothed like a zeolite, and fused moderately easily to a transparent blebby glass.

When heated in chips in a crucible by the more gentle action of a Bunsen burner, the chips assumed the lustre of white mica throughout; the lustrous planes were small, and lay in every direction, but chiefly in planes which accorded with the direction of the fibres.

After more intense heating the mineral exfoliated much before finally fusing. Ordinary labradorite does not behave in this manner, and it also fuses with more ease than this.

This mineral is noticed here in order to consider searchingly the question whither *balvraidite* can be a result of a simple combination or fusion of *Biotite by* and *in* this hydrated labradorite.

The facts, as relates to the mode of occurrence, are that plates of *Biotite* are imbedded in *both* minerals.

If any combination could take place between them why did it not take place between the *Biotite* and its labradorite matrix? And again, if *balvraidite* is the result of such union how comes it that there are clear lustrous plates of Biotite still imbedded in it?

Moreover, a chemical consideration will not permit of our drawing the conclusion that *balvraidite* is a compound mineral so formed, inasmuch as such a union of Biotite with the labradorite as would introduce so large an amount of magnesia, would at the same time reduce the lime very markedly; while its quantity in *balvraidite* is, it will be observed, considerably *greater* than what it is in the hydrated labradorite.

TOBERMORITE.

This is a zeolite which I first found totally filling small druses in the cliffs of the shore immediately to the north of the pier of Tobermory in the Island of Mull.

It is massive, or very minutely granular; its colour is a very pale pinkish white; it is translucent; it is frequently surrounded by a thin zone of pale blue massive mesolite. I have never found it in any druse which was not filled to its centre with it, therefore I have seen no trace of crystalline form. It has a hackly fracture, without any trace of cleavage.

It yielded.—

Silica	46·508
Alumina	2·402
Ferric Oxide	1·139
Ferrous Oxide	1·853
Lime	33·404
Magnesia	·474
Potash	1·445
Soda	·356
Water	12·606
	100·187

The specimen analysed appeared quite pure, that is it contained no particle of the dark matrix.

I next found the mineral in the cliffs near the lighthouse, north of Tobermory, and along the shore towards Bloody Bay. In its modes of occurrence and appearance it was in all respects similar to that at Tobermory. There was here no visible mesolite.

The specific gravity of specimens from this spot, which were larger than those first mentioned, though still seldom larger than a damson, was 2·423.

This yielded.—

Silica	46·62
Alumina	3·895
Ferric Oxide	·664
Ferrous Oxide	1·080
Lime	33·978
Potash	·572
Soda	·891
Water	12·109
	99·81

In proceeding to calculate the formula of this, it is evident that (if not an impurity) the alumina can only replace silica,and the ferrous-oxide lime.

The average of the two analyses and the calculation is as follows :—

		ATOMS.		P. C.
SiO_2	46·564	1·552	15·	49·83
Al_2O_3	3·148	·08		
Fe_2O_3	·901			
FeO	1·466	·04		
CaO	33·691	1·203	12·	37·21
K_2O Na_2O	1·632	·03		
H_2O	12·357	1·373	13·	12·96

This gives the formula :—

$$3\,(CaO^4, H_2O), 5\,SiO_2 + 10\,H_2O$$

The mineral thus stands intermediate between *xonaltite* and *okenite.*

It is an interesting fact that *xonaltite* occurs in several Mull localities, some not far distant from the locality of *tobermorite.* This is the first observation of *xonaltite* as a British species.

Before the blowpipe there is no reaction of this mineral which serves to distinguish it from other zeolites.

Last year I obtained it in pieces the size of a small fist, in a quarry out of which the pier at Dunvegan in Skye had been built. It was here also surrounded by a zeolite—which in this case was faröelite.

The specimens here were finer, and had a more distinct pink hue.

Gyrolite was seen in some of the adjacent cavities.

WALKERITE.

Dr. Walker, Professor of Natural History in the University of Edinburgh, published an analysis of a radiated yellowish-white mineral which was found in diabase at Corstorphine hill near Edinburgh. This is the first of the three analyses which stand below.

In a paper upon British *pectolites*, I introduced this analysis as belonging to these.

Several years afterwards I became the purchaser of the collection of minerals amassed by Mr. Jameson Torry,—nephew of Professor Jameson of Edinburgh. In this collection I found a specimen which agreed with the description of Walker's mineral; this had a label attached, which bore in Mr. Torry's hand-writing,—"From the great quarry, north side of Corstorphine Hill."

I took part of this specimen for analysis. The specimen was a vein, about three fourths of an inch in thickness; this vein was formed of radiating and interlacing lustrous cream-coloured fibres. These fibres phosphoresce when heated, and also slightly when broken.

The mineral had a specific gravity of 2·7, and it lost 1·28 per cent. of water when heated in the water-bath.

Its analysis, on 21·426 grains, is given in the second column. A note was appended at the time, "does not agree with pectolite." The analysis was incomplete from my not wishing further to sacrifice the specimen, in the hope of afterwards succeeding in getting more of the mineral.

A year or two after this analysis was published, I obtained a few chips from the western side of the lower top of the Bin Hill, in Burntisland. I had sufficient only to determine the presence of magnesia in quantity.

Next, I myself obtained it as a fine vein, of over an inch in width, in the *east* quarry of Corstorphine Hill.

Here the vein consists of bunches of diverging fibres or flat crystals, of a high almost pearly lustre, and a pinkish cream colour. The hardness is 4·5. The specific gravity 2·712. It phosphoresces when broken.

The analysis is the third column in the table.

SiO_2	..	54·	53·215	52·202
Al_3O_3	..	..	·093	
FeO	..	..	·21	1·335
CaO	..	30·79	26·178	28·635
MgO	..	2·59	6·815	5·12
K_2O	..	..	n. det	·852
Na_2O	..	5·55	n. det	6.504
H_2O	..	5·43	5·228	5·276
(Walker,		98·36)		99·915

As it is evident that Walker had thrown down much of his magnesia along with his lime, the last analysis alone is used in the calculation of atoms. It gives—

			ATOMS	P. C.
SiO_2	..	1·74	7	53·71
CaO	..	1·023	4	28·65
MgO	..	·25	1	5·12
N_2O	..	·24	1	7·92
H_2O	..	·586	2	4·6

The formula may be written thus:—

$$7\ (CaO^4,\ MgO,\ Na_2O,\ H_2O)\ SiO_2 + H_2O.$$

I also recognised in the collection lately belonging to the Royal Society of Edinburgh, three fine specimens—veins nearly three inches in thickness—gathered by Sir George Mackenzie at the Bin of Burntisland, and at Corstorphine; but I could not obtain any portion of these for analysis when the collection was made over to the University.

There being now no question that this, although standing near it, is a substance quite distinct from pectolite, I propose for it the name of Walkerite, after its discoverer.

From Professor Walker, who was a diligent mineralogist, Jameson probably derived his first love of the science.

Walker made several discoveries which have since been credited to others.

From the sixth volume of the "Edinburgh Philosophical Journal," I quote the following, which is probably from the pen of Jameson himself.

"Walker found in 1761 *strontianite*, ore, and ochre of nickel. Plumbum Pellucidum of Linneus, *(cerussite)*, Plumbum decahedrum, *(cerussite)*, and Cyaneum *(linarite)*, both undescribed. Saxum metalliferum of the Germans. Ponderosa aerata of Bergmann *(Witherite)*, and the Morettum, which afterwards appeared to be a peculiar sort of zeolite *(Brewsterite)*. All these were here for the first time discovered in Britain.

Besides, the green, gray, and yellow ores of lead, with other minerals which are rare and seldom met with in other places.

In 1764, the beautiful carnelian marble of Tirey (Tiree); the white marble of the same island, with green transparent schorl *(sahlite)*, the green serpentine, and Lapis Nephriticus of Iona; the green jasper of Rume; the amianthine rock of Bernerey; and the black-lead of Glenelg.

Examined Morvern, and the mines of Strontian. 'There I found several rare minerals, and particularly that singular substance, since called the strontianite,in great plenty; though I had observed it, but very sparingly, three years before in the mines of Lead-hills.'

In 1771 in the mines of Tynandom nothing uncommon excepting a beautiful crystalline ore of zinc (yellow blende.)

Walker's collection in 1822, constructed on his arrangement, consisted of 323 genera—1559 species and varieties,—with duplicates, the number being probably double."

The names within brackets are by the writer.

The so called strontianite of the Leadhills has been proved, by an analysis of the writer's, conducted upon a specimen which can be distinguished by its weight, but not by the eye, from strontianite of Strontian, to be merely a strontiferous arragonite. This specimen was ticketed by Torry "Green Strontianite from Leadhills."

Only those who have explored such places as Rum and Berneray can form a just estimate of the scientific zeal which must have animated the man who did so in the year 1764.

Walker was truly the Father of British Mineralogy.