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I.—*Minerals New to Britain.*

BY PROFESSOR HEDDLE.

Read December 23rd, 1880.

A NUMBER of minerals not before noticed as occurring in Britain have been described, and corroborative analyses thereof have been given, in the papers which I have, from time to time, published in the *Transactions of the Royal Society of Edinburgh*, and also, though to a smaller extent, in the *Mineralogical Magazine*.

Those which I now bring forward, have been analysed for the most part for a considerable time; but, as it must of necessity be long before I come to notice them, in their proper place, in my "Geognosy of Scotland," it is well to announce their occurrence without further delay.

Halloysite.

This was found in the Hospital Quarry, near Elgin, by Professor Nicol, and sent to me by him, as a substance which he could not recognise. As my own experience did not avail in determining it, the specimen was analysed.

Prof. Nicol obtained it in a vein of an inch and a half in thickness.

The colour is white to faint yellow, it is very soft and friable, with a minutely-granular structure.

It yielded—

Silica	39·300
Alumina	38·572
Ferric Oxide	1·428
Manganous Oxide	·250
Lime	·746
Magnesia	·833
Water	19·340

100·469

It loses 4·626 of the above water at 212°.

This quarry was afterwards visited by Professor Nicol, Mr. Dudgeon, and myself, under the guidance of Dr. Gordon, of Birnie; when the mineral was found in a very singular and interesting position.

On the north cliff of the quarry, in a now unworked portion thereof, there is a rent of about a couple of feet in width; this rent extends downward through the stratum to a greater depth than the working has been carried.

The rent has been filled to a depth of over thirty feet by boulder clay. At about five and twenty feet from the surface, we found the mineral in the boulder clay, disposed in granules, clotted-like masses, and threads. There could be no question that it was a product of change.

Imbedded portions of clay-like substances, of an obscurely fissile structure,—doubtless altered fragments of schists,—were also found imbedded in the sandstone of the quarry. These, upon analysis, yielded a composition which pointed to no evident formula of expression.

Fibrolite.

I found this mineral, in small quantity, coating gneiss, in thin veins on the north-west side of Pressendye Hill, in Aberdeenshire; at about 300 yards from the summit of the hill.

Its colour was white; it was in fibrous tufts, which were very tough. No piece was got large enough for ascertaining the specific gravity.

It yielded—

Silica	39·680
Alumina	58·822
Ferrous Oxide	·038
Manganous Oxide	1·100
Potash	·860
Soda	tr.
Water	·320

100·820

I have also found the mineral in much larger quantity, on Clashnaree Hill, in Clova, associated with *red andalusite* and *black mica*; but have failed to pick it out pure enough for analysis.

Here it is in parallel acicular crystals, which are highly lustrous, and it seemed to pass into the red andalusite.

Martite.

This was given me by Professor Archer, as having been found on the sea shore, on the north-west of the island of Bute.

The parcel consisted of rolled octahedral crystals; many of these had a red colour, and a loose and soft structure; the largest proportion, however, occurred in hard blue-black lustrous crystals, a very few of which were feebly magnetic. The majority of the crystals were entirely destitute of magnetism.

The powder was red; but in other respects the mineral seemed to be unchanged *magnetite*; the hardness and gravity being normal.

The blue-black crystals were analysed and yielded—

Ferric Oxide	97·049
Ferrous Oxide	1·096
Manganous Oxide.. .. .	·200
Lime	·952
Silica	·700
	99·997

There was no trace of titanio acid. *Martite* would thus appear to be in some cases merely altered *magnetite*.

Turgite.

This I found in isolated, imbedded, cubic crystals, in clay slate, in the Island of Kerrera, in Argyllshire; and also to the east of Oban.

These crystals have invariably a hollow in their centres: they are red-brown, and stain the hands of the same colour.

As imbedded *pyrite* occurs in the same rock, in their vicinity, they undoubtedly have resulted from its alteration.

Their specific gravity is 3·534. They yielded—

Ferric Oxide	86·585
Lime	·818
Water	5·559
Silica	7·692
	100·654

Xonaltite.

This was first found by Mr. Rose and myself, along with *gyrolite*, near Kilfinnichan, Loch Screden, Mull. More lately it was found by myself at Gribon, opposite Oronsay; and also on the north shore of Loch na Keal, in the same island.

At both of these places, it resembles a granular pink chalcedony. Its specific gravity is 2·605; it is generally associated with *gyrolite*, the plates of which are nearest to and radiate from the surface of the rock; they thus penetrate, as it were, the substance of the massive-looking *xonaltite*, which appears as if it had been poured over them.

It yielded—

Silica	.. .. .	48·910
Alumina	.. .. .	·111
Ferrous Oxide	.. .. .	2·966
Manganous Oxide	.. .. .	2·270
Lime	.. .. .	40·385
Magnesia	.. .. .	·559
Potash	.. .. .	1·164
Soda	.. .. .	·222
Water	.. .. .	4·173
		100·760

The occurrence, as British species, of the rocks and minerals which now follow, has been before noted; but, so far as I know, no analyses of these have been published.

Schiller Spar.

I found this mineral first in the immediate neighbourhood of Aberdeen. There is to be observed in the long sand-beach which stretches from Aberdeen to Forvie Ness, at the distance of about four miles from the town, a mass of rock, which, from some fancied resemblance, has received the name of "the Black Dog." This consists of crystals of *talc*, matted in such confusion as to form both a tough and a hard rock.

A little seaward of this, there lie, impacted in the sand, and submerged at high water, two very dark masses. The three, occurring in line, point to the little Burn of the Black Dog. The banks of this burn indicate that a vein of similar material may have been lodged in it. This vein may run to the large mass of serpentine which occurs in the neighbourhood of Belhelvie, as mentioned below.

The black masses, when broken into, proved to be a mixture of a dark *serpentine*, with crystalline lumps of the mineral in question.

These crystalline lumps cleaved uniformly in one direction;—they had no trace of definite external form.

In appearance they in every way were identical with the Basta specimens,—being, however, markedly larger in the glimmering foliations.

Their specific gravity was 2·649. The portion analysed was as much as possible freed from the dark serpentinous *rods* which penetrate the mineral in so singular a manner; but, at the best, this could be effected to but a small extent. It need hardly be said that the portion chosen was one in which the green glimmering matter predominated.

The analysis was conducted on 1·092 grammes, and yielded:—

Silica	.. .. .	38·186
Alumina	.. .. .	2·178
Sesquioxide of Chromium	.. .. .	·276
Ferric Oxide	.. .. .	·028
Ferrous Oxide	.. .. .	8·479
Manganous Oxide	.. .. .	·513
Lime	.. .. .	2·912
Magnesia	.. .. .	32·418
Potash	.. .. .	1·401
Soda	.. .. .	·065
Water	.. .. .	14·030

100·486

Of the Silica, 5·914 per cent was insoluble in boiling sodium carbonate.

Shortly after having discovered the mineral at this locality, it was found by Professor Nicol and myself, in two quarries which are cut into a hill-side near the farms of Craigie and White-Cairns, on the west side of the Belhelvie Hills. We were guided to these quarries, first by the blackness of the road-metalling, and then by being startled by seeing what we took for *buttons of bronze*, lying among the dark and ground-up metal of the road. These bronzy buttons proved to be slightly weathered and loose lying crystals of *schiller-spar*. Even in the quarry they are not so unaltered as those which, upon the sands at the Black Dog rock, were shut off from the air by the sea water.

Native gold has been said to occur in serpentine in this neighbourhood; the occurrence here of *pyrite* in dendritic forms, and of a surprisingly golden tint, doubtless accounts for the assertion.

It will be seen from the above analysis, that this substance is very much of the nature of a serpentine; or perhaps it would be more correct to say that it is an apparent passage of an enstatitic mineral into serpentine; like the so-called *bronzite* of Balhammie Hill, an analysis of which I have given elsewhere.

Indeed, a section of this Schiller-spar shows, under the microscope, *processes* of serpentine extending from the serpentine rods; these processes branch and anastomose, so as, in parts of the slide, almost to usurp the whole ground of the transparent mineral.

Hydrous Saussurite.

The late Mr. David Forbes has stated that Saussurite is a common mineral in Scotland. While there are certain of the massive granular *labradorites*, or mixtures of *labradorite* with *anorthite*, which bear some resemblance to the Saussurite of the Geneva blocks, I have never by analysis been able to prove the existence of true Saussurite in Scotland.

The substance which bears most resemblance to it, is an opaque, white, minutely-granular substance, which, along with large crystals of diallage, forms the "*diallage rock*" which occurs upon the shore, a little northward of Lendalfoot, in Ayrshire.

This substance has a greasy lustre, and is exceedingly tough. It has no cleavage. The specific gravity is 3·088.

Its analysis yielded:—

Silica	..	..	..	..	..	..	39·923
Alumina	..	..	..	..	..	..	27·511
Ferric Oxide	..	..	..	..	..	..	1·918
Lime	..	..	..	..	..	..	17·126
Magnesia	..	..	..	..	..	..	1·663
Potash	..	..	..	..	..	..	1·395
Soda	..	..	..	..	..	..	4·626
Water	..	..	..	..	..	..	6·124

100·186

This looks somewhat like a hydrated Saussurite; but the following fact throws much doubt upon the correctness of such an inference.

Grey striated crystals of *anorthite* also occur in association with the diallage at the same locality. These have a specific gravity of 2·761.

Well marked crystals of this mineral yielded:—

Silica	.. .. .	44·224
Alumina	.. .. .	31·442
Ferric Oxide	.. .. .	1·955
Lime	.. .. .	14·180
Magnesia	.. .. .	1·000
Potash	.. .. .	1·480
Soda	.. .. .	1·625
Water	.. .. .	4·023—3·348

99·929

The crystals chosen for analysis were taken as being quite apart from any contact, or mixture, with the former mineral. But, where the larger masses of the first analysed mineral occur, they are, when broken up, almost always found to contain a more translucent and distinctly-striated *centre of anorthite*,—which latter *passes by insensible gradation into the so-called Saussurite*.

This would lead to the conclusion that the sea water had effected the change; a conclusion which, however, hardly can account for the marked increase of specific gravity.

The fact of the occurrence of *Prehnite*, (a mineral with a very similar composition,) in the immediate neighbourhood, scarcely, in the present state of our knowledge, aids in explaining the relationship.

The *Prehnite*—(which has been analysed) and which occurs in crystals, is found to form the white bands of a highly-convoluted and much-altered schistose rock; one which, in its denser and more altered portions, somewhat simulates an igneous one.

Though the district has been examined by more than one eminent geologist, it calls for a very much more careful examination than it has received: and this examination will fall far short of perfection if it be not supported by, or based upon an extensive series of analyses. While I do not adopt Dana's view that true *Saussurite* is allied to *zoisite*, I also hesitate to assign the present mineral to *Saussurite*; and have given it the above qualified name, merely to direct attention to it, and to the interesting circumstances of its occurrence.

Tachylite.

This was found as a crust of about half-an-inch in thickness, upon the under surface of one of the beds of amygdaloid which occur in the approach to the Quiraing in Skye,—near the summit of that approach. The dolerite was itself dense and close grained. The

tachylite appeared to be the result of the fusion of the dolerite, or perhaps of its rapid chilling when first poured out; there being a passage of structure at the point of contact.

The tachylite was in parts dark-brownish-black, and it was then lustrous. More usually it was black, or pitchy brown; then its lustre was resinous. It was much fissured, and had a conchoidal fracture.

Its specific gravity was 2·68. It yielded—

Silica	45·615
Alumina	14·423
Ferric Oxide	4·927
Ferrous Oxide	9·411
Manganous Oxide.. .. .	·153
Lime	8·098
Magnesia	4·000
Potash	2·397
Soda	4·186
Water	6·830

100·090

Loses 1·834 of the above water at 212°. It fuses readily, with sodium re-action, to a lustrous black glass; the rock does the same; and fused portions of the rock are very similar to the tachylite.

The Dolerite.

To ascertain what change had been induced in the rock itself through its conversion into tachylite,—or if, in fact, tachylite was but a fused dolerite,—a portion of the latter, broken at a distance of about five inches from the tachylite crust, was analysed.

This portion was hardly a typical piece of the general mass of the rock, being denser in structure; that is, it did not show the crystalline constituents well:—it also appeared to be slightly weathered.

It yielded—

Silica	46·423
Alumina.. .. .	14·010
Ferric Oxide	5·027
Ferrous Oxide	9·022
Manganous Oxide.. .. .	n. d.
Lime	8·104
Magnesia	3·820
Potash	2·000
Soda	3·820
Water	7·222

99·448

The change is thus very slight. The portion which has fused is slightly more alkaline; and, from its retention of water, it must have liquified under great pressure.

—————
Pitchstone.

From Corrieghil, Arran. This is the dark brown-black *pitchstone* which, with imbedded transparent crystals of colourless *sanidine*, forms the well known and beautiful porphyry of this locality.

It yielded—

Silica	72·066
Alumina.. .. .	11·263
Ferric Oxide	3·237
Manganous Oxide.. .. .	·002
Lime	1·530
Magnesia	·003
Potash	5·612
Soda	·605
Water	5·449
	99·767

—————
Spherulite.

From the pitchstone of Corrieghil, Arran. It occurs in the paler green varieties of the pitchstone. Where this weathers, it exhibits a spherical structure on its surface; which seems to show that the spherical portions of the rocks are less soluble in water, than the amorphous. When broken, the imbedded spherules are seen to have a radiated structure, cinctured now and again with one which is concentric. The concentric bands are sometimes white and powdery.

Silica	77·230
Alumina.. .. .	10·440
Ferric Oxide	1·867
Manganous Oxide.. .. .	·538
Lime	·904
Potash	5·740
Soda	2·225
Water	1·186

100·130

It loses ·342 per cent. of water at 212°. Taking into consideration this larger proportion of silica,—along with the radiating structure and its more sparing solubility, it would appear that this is a pitchstone which contains bundles of radiating crystals of quartz, or perchance *tridymite*.

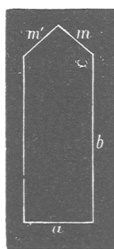
Paulite.

"*Hypersthene*" has, or rather *had* been for long considered to occur among the Coolin Hills of Skye.

My analyses of specimens, furnished by those who most strongly maintained its existence there,—which analyses were published in the *Transactions of the Royal Society of Edinburgh*,*—proved that the mineral supposed to be hypersthene, was *augite*.

The mineral had, however, been said also to occur in the neighbourhood of Portsoy, in Banffshire. This I find by analysis to be correct. It occurs, somewhat ill-defined, in some veins or beds,—it is difficult to say which,—of diorite, on the west shore of the East Bay of Portsoy. But, in company with Mr. Peyton, I have found it to occur in such finer specimens in the loose masses of a wasted outcrop, on the west side of Craig Buroch, in the same county; while again Mr. Peyton had himself previously found it, in still finer specimens, south of the farmhouse of Retannach, in the same neighbourhood. Here also it occurred in loose blocks. The blocks on Craig Buroch lie in line, and indicate the weathered outcrop of a bed.

In these blocks it occurs in what are probably exfiltration-veins; and its immediate associates are, striated grey *labradorite*, massive *isericine*, *pyrite*, and an *augite*, which much resembles *enstatite*.



The colour of the Paulite is bronzy, with a shade of red-purple on one cleavage; it is black and lustreless at right angles to this. The cleavage was as figured—*b* being the lustrous face; *a* the black. It had a lustre quite as brilliant as have the Newfoundland specimens. Its specific gravity is 3·32; its powder is light-brown.

1·3 grammes yielded—

Silica	.. .. .	51·461
Ferric Oxide	.. .. .	4·022
Ferrous Oxide	.. .. .	12·673
Manganous Oxide	.. .. .	·692
Lime	.. .. .	5·299
Magnesia	.. .. .	24·230
Potash	.. .. .	·252
Soda	.. .. .	·741
Water	.. .. .	·519

99·889

It loses at 212°, 436 per cent. of water.

* Vol. XXVIII, p. 478.

The *Paulite* both of Retannach and of the East Bay of Portsoy, seems to pass into the glassy bottle-green enstatite-like variety of augite. I considered this bottle-green mineral to be enstatite until it was analysed. Its analysis is published in the *Transactions of the Royal Society of Edinburgh*, Vol. XXVIII, p. 465.

In polished slabs of the rock from Portsoy, the bronzy flash of Paulite is seen surrounding the translucent green mineral like a fringe. Sections of the Retannach augite, again, are bronzy in spots; and these spots the microscope shows to be "shot" more or less profusely by the characteristic flattened-tube structure of the Paulite.

Zoisite.

This has been stated by Jameson to occur at Glenelg. From its occurrence at several other limestone localities in Scotland, this is far from improbable; but I have not myself, during several visits, succeeded in finding it there.

A specimen moreover, from this locality, which was given to me for analysis by Principal Forbes, as Jameson's *Zoisite*, proved to be malacolite; it was in a lanceolate form, one in which I have there found that mineral in abundance.

1. I first found *Zoisite* in Scotland in a quartzose bed in the limestone at Gartally, in Glen Urquhart. It occurs in colourless and grey crystals, imbedded either in horny quartz, or in the lime itself.

Its specific gravity is 3·014. It yielded

Silica	.. .. .	39·600
Alumina..	.. .. .	31·083
Ferrous Oxide	.. .. .	2·071
Manganous Oxide	.. .. .	·078
Lime	.. .. .	23·336
Magnesia	.. .. .	tr.
Potash	.. .. .	·566
Soda	.. .. .	1·056
Water	.. .. .	2·412

100·202

2. This specimen was given me by Professor Geikie. It was got in a limestone quarry on a hill side about half-a-mile west of Laggan, Dulnan Bridge, near Grantown, Invernesshire.

It here occurs in pale brown crystals imbedded in a bed of translucent, but muddy quartz. On visiting the locality, I found that it is associated immediately with *chlorite*, *sahlite*, *Biotite*, and other minerals occurring in limestone. In the near neighbourhood are found *kyanite*, also small quantities of *galena* and *blende*.

The specific gravity of the Zoisite is 3·438. It yielded—

Silica	38·750
Alumina.. .. .	28·144
Ferric Oxide	6·547
Manganous Oxide	·916
Lime	22·026
Magnesia	·416
Water	3·333

100·132

It loses ·155 per cent. of moisture at 212.°

Idocrase.

The specimen analysed was part of a magnificent dark-brown crystal of nearly seven inches in length by one in thickness,—unfortunately broken in the extraction, or rather in the discovery,—which was got in the limestone quarry of Dalnabo, in Glengairn, Aberdeenshire.

Its specific gravity is 3·43. There was obtained—

Silica	36·251
Alumina.. .. .	18·626
Ferric Oxide	·932
Ferrous Oxide	5·036
Manganous Oxide.. .. .	·844
Lime	33·935
Magnesia	1·574
Potash	·568
Soda	·529
Water	1·780

99·875

The Idocrase is associated with so large a number of minerals, that it is a source of great regret that the quarry is no longer worked.

Andalusite.

Red andalusite—formerly called “red schorl,” has for long been, known as occurring in Aberdeenshire; and Achindoir has been given as the locality.

The late Rev. Mr. Morgan, of Stonehaven, undoubtedly found the locality; but he kept it a close secret. It took the writer many wanderings, during part of three summers, before he found the place.

This is the southern slopes of the hill of Clashnaree in Clova;—and also in small amount on the south side of the Peat Hill.

The specimens all lie loose; being fragments of veins which have endured, after the disintegration of a very micaceous gneiss.

The mineral very rarely is crystallised in distinct forms; being frequently bacillary. Its associates are *labradorite*, *fibrolite*, and an ill-defined *black mica*.

Its colour is a dull but uniform red;—occasionally the central core is purple.

Its specific gravity is 3·121.

The analysis, on 1·302 grammes, yielded

Silica	36·712
Alumina.. .. .	59·678
Ferric Oxide	2·302
Manganous Oxide	·230
Lime	·860
Magnesia	tr.
Water	·465
	<hr/>
	100·247

Not unfrequently it passes directly into fibrous white *fibrolite*.

2. This variety was found in the banks of the stream, near the Mill of Auchintoul, Kinnairdy Castle, Marnoch, Banffshire.

It occurs in imbedded crystals of half-an-inch in length, along with small twin crystals of brown *grenatite*: the matrix is a scaly micaceous schist. Specks of magnetite are also present. Water-friction having removed the more friable mica, the imbedded crystals are frequently left protruding. The crystals are ash-grey; of a vitreous lustre; and hardly touched by the knife; in parts not at all so. They contain, imbedded in their mass, apparently only a minute quantity of the matrix. The angle of the crystals is *near* a right angle.

There was obtained, from very carefully picked crystals—

Silica	52.538
Alumina.. .. .	39.314
Ferric Oxide	1.094
Ferrous Oxide	3.267
Manganous Oxide .. .. .	.461
Lime .. .. .	.861
Magnesia .. .. .	.846.
Alkalies	tr.
Water	1.110
	<hr/>
	99.491

It is thus evident that much of the matrix pervades these crystals throughout.

This locality was found by the Rev. Mr. Peyton.

The bed of schist which carries these crystals is seen, to the northward, a little east of the village of White Mills; it courses up the country, southward to the Coreen Hill, near Lumsden in Aberdeenshire. In Marnoch the rock has been used for mill-stones; at Lumsden it is utilised for pavements. The intensely hard crystals of andalusite in both cases, protrude from the general surface of the stone; they act in the first case as grinding teeth; in the second, they admirably prevent slipping.

Besides the bed which crops out on the shore near White Mills, other smaller ones are seen along the same shore; some of these—notably one near Banff—exhibit small concretions of a colour either darker or lighter than the general mass of the rock; and, as many of the crystals in the Clova district have a form as undefined or ill-defined as these concretions, I incline to regard the latter as being probably an interrupted stage in the formation of the crystals of the mineral.

The analysis would indicate that nowhere in this district has the crystalline force succeeded in absolutely excluding the rock matrix; though there is not here, or at least in this deposit, that definitiveness in the mode of its exclusion, or rather *extrusion*, which produces *chiastolite*. That mineral however occurs in a bed of clay slate, a little west of Portsoy. It should also be noted that most of the crystals at White Mills, are converted into a steatitic material of a purple colour; the varying depth of which exhibits the *chiastolite*

arrangement of particles : so that it may be said that in this district, both the *segregatory formation*, and the *decay* of this mineral is to be seen.

At the head of Glen Creran on its west side, in Glen Nevis, and near Cuil Bay, in Appin, I have also seen a rock which seems to contain incipient crystallisations of andalusite.

Withamite.

From Glencoe. The specimens, before the picking, showed minute traces of quartz, and sometimes a surrounding layer of a white dull substance ; this was thought by Allan to be *Saussurite*.

The associated minerals were *green epidote*, a granular green mineral like *chlorite*, but which was probably *Delessite*, silky colourless *byssolite*, and, in the near neighbourhood, a single specimen of *Wavellite* was found.

The picking was executed with the most extreme care,—only crystalline portions being taken.

There was got—

Silica	..	..	..	..	..	..	..	43·230
Alumina..	..	..	..	..	..	..	..	23·090
Ferric Oxide..	..	..	..	..	..	..	..	6·675
Ferrous Oxide	..	..	..	..	..	..	..	1·131
Manganous Oxide..	..	..	..	..	..	..	..	·138
Lime	..	..	..	..	..	..	..	20·003
Magnesia	..	..	..	..	..	..	..	·884
Potash	..	..	..	..	..	..	..	·962
Soda	..	..	..	..	..	..	..	·935
Lithia	..	..	..	..	..	..	..	·253
Water	..	..	..	..	..	..	..	2·400
								99·701

This does not agree over well with epidote, to which *Withamite* is always assigned ; but the measured angles of the crystals leave little doubt as to its being a variety of that mineral. It is strongly dichroic ; showing carmine, and straw yellow.

Olivine.

From columnar basalt at Shooter's point, Elie, Fife.

It occurs in large imbedded masses—a couple of inches in diameter,—associated with *pyrope*.

These masses are sometimes rudely crystalline; they are much fissured, of a vitreous lustre, and an apple green colour.

The specific gravity is 3·327. I obtained—

Silica	42·615
Alumina.. .. .	3·154
Ferric Oxide	2·965
Ferrous Oxide	6·261
Manganous Oxide.. .. .	·230
Lime	4·436
Magnesia	36·692
Potash	1·072
Soda	1·483
Water	1·164

100·072

2. Was found near the summit of Halival, and more rarely on Hæskheval in Rum.

It occurs in badly developed crystals, in the “augite rock,” along with glassy green *augite* and *labradorite*. The colour is yellow, and slightly brownish. The lustre is vitreous. Frequently there is slight decomposition, the much flawed crystals becoming powdery and dull. The powder is earthy, and of much the same colour as the unaltered mineral.

The crystals are sometimes imbedded in those of the augite,—more commonly they lie side by side. Their general appearance is somewhat like that of chondrodite.

They yielded —

Silica	38·006
Alumina.. .. .	·286
Ferric Oxide	2·933
Ferrous Oxide	18·703
Manganous Oxide.. .. .	·100
Lime	·336
Magnesia	38·000
Water	1·587

99·945

The specimen analysed was not *absolutely* free from the powdery portion: the ferric oxide may represent the change to some extent. That change in no way resembled a passage into serpentine: indeed it has to be remarked that the mineral itself does not resemble olivine; while the associated glassy augite very much resembles it.

Pinite.

This mineral has been noted by Dr. Macculloch as occurring in certain porphyries which cut the quartzite of the Cairnwell hills in Perthshire; he also notes it as actually imbedded in quartzite, west of Ben y Gloe. I will not say that the mineral he observed was not something of this nature:—it is in small six-sided prisms,—but these are distinctly foliated, and they always appeared to me more like a black mica which was somewhat decomposed.

I have myself noticed a substance very similar to these crystals, and which bore much more resemblance to *pinite*, in the red porphyry which is interstratified with the quartzite of Canisp, in Sutherland.

The substance I at present note, however, is not to be mistaken,—though its colour is somewhat unusual for *pinite*. It occurs imbedded in micaceous gneiss in the banks of a stream—the Burn of Craig,—on the north-east slopes of the Buck of the Cabrach, in Aberdeenshire. It is associated with *Biotite* (or *lepidomelane*).

It is crystallised in prisms of about an inch in width, and passes into *chlorophyllite*; its colour is asparagus green, it is transparent, and of vitreous lustre. Its appearance is intermediate between *apatite* and *beryl*; and it is altogether very gem like.

Its specific gravity is 2·911. ·98 grammes yielded—

Silica	41·224
Alumina	28·498
Ferric Oxide	·156
Ferrous Oxide	5·484
Manganous Oxide	·102
Lime	·914
Magnesia	6·612
Potash	10·367
Soda	·953
Water	5·670

99·980

Of the silica only ·198 per cent. were insoluble in sodium carbonate solution.

Gigantolite.

This was first given me by the Revd. Mr. Peters, of Deer, through Mr. Alexander Cruickshank, as from Torry, Aberdeen. In 1877 it was obtained by myself, along with the last named gentleman and Professor Nicol,—in a granitic vein, a little east of the remains of the old breakwater at Torry. I was associated with *Davidsonite* (beryl) *specular iron*, *muscovite* and *tourmaline*.

The *gigantolite* or *iberite* occurs in crystals of an inch in width, by two in length; the form is generally obscure, having frequently as much resemblance to that of tourmaline as to *iolite*. The colour at the deeper-seated end is dark green; the structure minutely foliated and dense. At the other extremity of the crystals, the material is almost wholly apparently *muscovite*; arranged as a matted mass of somewhat loosely-coherent crystals.

The specific gravity of the dark dense substance analysed, was 2.898. 1.3 grammes yielded—

Silica	41.307
Alumina.. .. .	28.709
Ferric Oxide .. .	14.175
Manganous Oxide..	1.000
Lime .. .. .	.473
Magnesia	2.615
Potash	6.560
Soda	1.642
Water	4.250

100.231

The possible impurity here was *mica*.

Chlorophyllite.

I found this in a deep cutting in the banks of the head-stream of the Burn of Craig, about one mile north-east of the Buck of the Cabrach, in Aberdeenshire. It was associated with *Lepidomelane* (?), and it contained, in the centre of some of its crystals, unaltered *pinite*. It was in crystals of an inch in size. Its colour was green, slightly brownish in parts; lustre somewhat pearly; opaque; it was softer than the *pinite*. It was precisely similar to the American *chlorophyllite*. Specific gravity 2.715.

Silica	41.266
Alumina	28.881
Ferrous Oxide .. .	5.207
Manganous Oxide ..	.333
Lime .. .. .	.858
Magnesia	6.633
Potash	10.083
Soda	1.406
Water	5.812

100.479

There is thus very little difference between it and the *pinite* which it enveloped, and of which it seemed to be but an alteration product.

Scapolite.

Many years ago, while compiling his work on British Minerals, Greg wrote to me, expressing his surprise that a mineral so common elsewhere as scapolite, had never been found in Britain.

Some time after this Dr. Lauder Lindsay reported on the occurrence of a crystallised scapolite, in association with a hornblendic mineral, near lime, in the vicinity of Loch Callater, in Aberdeenshire. These crystals, however, on examination proved to be malacolite.

Again, in a report on the Granites of Donegal, submitted to the British Association by Mr. Robert H. Scott, Sir R. Griffith, and the Rev. Dr. Haughton, it is stated that in almost all the limestone localities, they found a peculiar rock, which, from the great abundance of that substance, they turned "sphene rock." "It consists of orthoclase, green pyroxene, and quartz; and in it we have discovered minute crystals of blue apatite; and in one locality (Glenleheen) a great abundance of white Scapolite." The precise locality is afterwards stated to be the cross roads, in Glenleheen; and it is also stated to occur at Tirlyn. Mr. Scott has kindly forwarded to me a specimen of the Glenleheen mineral, with the remark, "on a closer examination I think it is like a felspar."

The specimen consists of crystals of over half an inch in size, imbedded singly in quartz. These crystals have a rectangular section, and almost a pearly lustre. They are cream coloured, with a cleavage which is at least *nearly* a right angle. Here and there they seem to be striated. They have much the look of a felspar; but the fact that some of the imbedded rectangular crystals present a lustrous cleavage face, which is *also* apparently nearly at right angles to the other two, must throw doubt upon this conclusion.

Having no authority to detach any portion for measurement or examination, I am able to say no more than that these crystals cannot be *scapolite*, and in general appearance much resemble *albite*.

It is only within the last few years that I have found this mineral in Scotland; and on both of the occasions in which I [have done so, it was a "chance find."

1. Making a habit of examining fully, and, if there be a sufficiency, of analysing every substance which I am unable satisfactorily to recog-

nise, I set apart for examination a rough crystal, which I worked out of the limestone which occurs about a mile north-east of Milltown, in Glen Urquhart, Rosshire.

This rough crystal was imbedded among the *Zoisite* which is there found. It occurred in what I am unable to designate more precisely than *the central of the many quarries* which have been opened in the highly convoluted stratum of limestone.

It was a greyish coloured translucent crystal; and, being imbedded, no form could be made out. It was separated from the *zoisite* and set apart for examination, on account of its being of a greyer tint; and was suspected to be *andesine*,—*scapolite* not having been thought of.

It was very slightly mixed with pale-green *actynolite*,—say $\frac{1}{200}$ th part;—and this may not have been absolutely separated from the portion analysed. Its specific gravity is 3·004.

Quantity analysed 1·305 grammes.

Silica	..	..	..	..	..	..	45·900
Alumina	..	..	..	..	..	..	27·369
Ferric Oxide	..	..	..	..	..	..	tr.
Ferrous Oxide	..	..	..	..	..	..	2·954
Lime	..	..	..	..	..	..	20·211
Magnesia	..	..	..	..	..	..	·306
Potash	..	..	..	..	..	..	·315
Soda	..	..	..	..	..	..	·582
Water	..	..	..	..	..	..	2·089
							99·728

4·34 per cent. of the silica was insoluble in boiling sodium-carbonate.

I know not whether to rank this with *scapolite* or with *paranthine*.

2. In dissolving the Tیره marble, in order to obtain the *tirecite* described in a late number of the Magazine, I obtained a very large quantity of crystals of *sahlite*. From out of many pounds of these crystals, I picked about 100 grains of fairly-well developed crystals of a pure white, and pinkish-white mineral. Though the angles of the crystals were,—like those of the *sahlite* and *sphene*, which occur in this limestone,—rounded, yet the form of *scapolite* was easily made out. The square prism had its lateral angles truncated;—and there was a four-sided pyramid. The crystals were of the size of large shot. The only other substance which accompanied these crystals was *talc*, in minute flakes.

1·3 grammes yielded.

Silica	.. .. .	48·923
Alumina	.. .. .	22·098
Ferric Oxide	.. .. .	3·159
Ferrous Oxide	.. .. .	1·508
Manganous Oxide	.. .. .	·538
Lime	.. .. .	7·753
Magnesia	.. .. .	2·769
Potash	.. .. .	6·058
Soda	.. .. .	1·279
Water	.. .. .	5·694
		<hr/>
		99·779

Loses at 212°, ·972 per cent. of water. 2·358 per cent. of the silica was insoluble in boiling solution of sodium-carbonate.

Pyrrhotite.

From a limestone quarry about 200 yards south-west of Fiermore, south of Tullich Hill, Blair Athole. Occurs in lumps in the vein-stone of the lime, associated with *chlorite*, *sphene* and *ilmenite*.

I obtained :

Sulphur	38·544
Iron	60·300
Silica	·153
Carbonate of lime	1·538
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		100·695

Though the lime is here given as in combination with carbonic acid, as the probable form of combination, yet not the smallest trace of effervescence could be seen when acid was added to the crushed mineral.

Pyromorphite.

The specimen examined was the bright orange, or so called "chromo-phosphate of lead," from Leadhills. It was in well developed hexagonal crystals,—quite free from matrix or any impurity.

There was obtained :

Phosphate of Lead	.. .. .	89·038
Chloride of Lead	.. .. .	10·477
Phosphate of Iron	.. .. .	·447
		<hr/>
		99·892

The colour would seem to be due to phosphate of iron: there was not a trace of chromium.

Aragonite.

From Leadhills. *Strontianite* has been said to occur at Leadhills. Walker mentions this as a locality. The substance analysed was purchased in Jameson Torry's collection; and was named "Strontianite, Leadhills."

It could not be distinguished from green strontianite even under the lens: perhaps the radiating crystals were somewhat more glassy in lustre, and slightly more transparent.

I obtained:—

Carbonate of lime	.. .. .	96·430
Carbonate of strontia	.. .. .	1·730
Potash	.. .. .	·593
Soda	.. .. .	1·095
Water	.. .. .	·345
		100·193

This is a most singular result. The amount of carbonic acid obtained was sufficient merely to saturate the lime and strontia; still it is altogether inconceivable that the alkalies existed free.

Pale-green aragonite in small brushes of crystals, has recently been got at Leadhills; but this has no resemblance to strontianite.

Reddle.

This was found in imbedded nodules, in sandstone in Newton Quarry, near Elgin. It was soft and clay-like when damp; powdery when dry; colour deep and bright-red.

It yielded:—

Silica	.. .. .	55·746
Alumina	.. .. .	17·253
Ferric Oxide	.. .. .	8·263
Ferrous Oxide	.. .. .	1·655
Manganous Oxide	.. .. .	·278
Lime	.. .. .	·567
Magnesia	.. .. .	2·481
Potash	.. .. .	5·590
Soda	.. .. .	1·400
Water	.. .. .	6·550
		99·783

Lydian Stone.

Occurs in the volcanic "necks" to the east of Kinkell, Fife; partly as volcanic bombs, consisting of perfectly formed Lydian stone: partly coating imbedded masses of altered shale, from which it had evidently been formed.

The shale in the centre of these masses, which are sometimes a foot or two in diameter, is much split up in the lines of its cleavage and cross-cleavage. The cleavages disappear when it passes into the vitreous Lydian stone, with conchoidal fracture.

The bombs are smaller, being rarely over half a foot in size. They are dense, conchoidal in the fracture, deep blue in colour; forming an excellent touchstone. The specific gravity is 2.598.

Silica	61.200
Alumina.. .. .	17.536
Ferric Oxide	3.163
Ferrous Oxide	5.446
Manganous Oxide..900
Lime	3.136
Magnesia	2.700
Water	5.889
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	99.97

It loses 1.011 per cent. of water at 212°.

Hornstone.

This somewhat chalcedonic variety occurs in the clinkstone quarry on the north-east side of Blackford Hill, Edinburghshire.

The colour is brown; the mineral is translucent, but dull in lustre. It sometimes has a quartz centre. Its specific gravity is 2.598.

It yielded—

Silica	89.692
Alumina.. .. .	.974
Ferrous Oxide	1.373
Manganous Oxide.. .. .	tr.
Lime	2.283
Potash540
Soda	2.271
Water	2.773
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	99.906

Loses .624 per cent. of the water, at 212°.

Chert.

This occurs in veins of two inches in thickness, cutting the veinstone of the Fee Donald mine at Strontian, in Argyllshire. Its colour is pale emerald green; its structure is minutely granular; it has sometimes a colourless massive-granular centre; sometimes a quartz centre. It contains imbedded cubes of *galena*.

It yielded—

Silica	89·692
Alumina	·769
Ferrous Oxide	1·671
Manganous Oxide	·076
Lime	2·843
Potash	·440
Soda	2·180
Water	2·005
	99·676

Loses ·22 per cent. of the water, at 212°.

Lignite.

Was taken from a bed which was under the "Organ," at the Giant's Causeway. This bed was overlaid by a bed of *plynthite*, which sometimes contained nests of augitic-glass.

It was underlaid by the "shale," an analysis of which follows.

The *lignite* showed the structure of dicotyledonous wood. In parts it was dull-brown and woody,—this had a specific gravity of 1·36. Other parts were dense black, and like cherry coal; both were analysed.

	Lignite.	Cherry Coal.
Gas	42·41	38·02
Volatile at 240°	4·44	
Carbon, residual	40·05	51·16
Water	7·18	7·72
Ash	5·92	3·10

The *shale* was of a black colour; it gave off no *inflammable* gas; and left a brown ash.

Gas	14·82
Carbon	4·23
Water	10·06
Ash	70·89

Ozokerite.

This name has been vaguely applied to substances which have not been analysed.

The substance to which I apply it has been found, for many years, at Binny quarry, in Linlithgowshire. I have got lumps of it of half the size of a man's head. These have a rudely-foliated structure; a clove-brown colour, yellowish in thin portions; and they show an unmistakable fluorescence. It is brittle, easily cut, and very soft. It has a greasy to a waxy lustre, and a greenish reflection. Specific gravity .961. 30·4 grains were analysed—

Naphtha, which has an odour of		
elastic bitumen, volatile at 205°		·691
Gas		96·974
“Free” Carbon		2·039
Ash		·372
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		100·031

The ash was in thin brown shreds, somewhat like withered leaves.

The miners melt this substance up with tallow, and mould it into candles; these are nearly black in colour, and, from choking of the wick, burn very badly: there is also much carbon deposited from the flame.