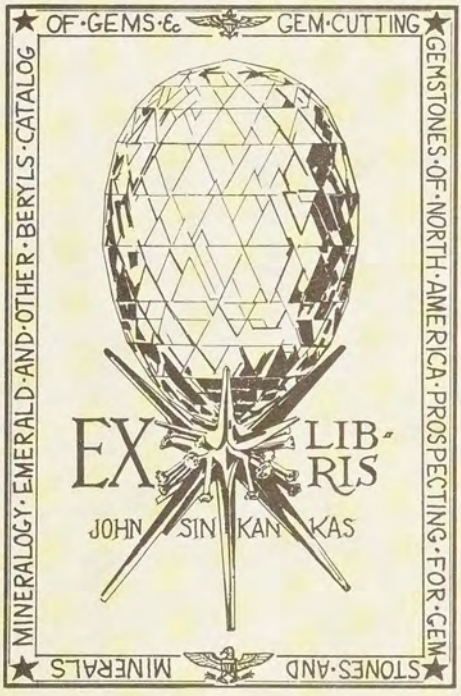

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Notes on the Mineralogy of Renfrewshire

Transactions

of the

Paisley Naturalists' Society

Vol. I.

Notes on the Mineralogy of Renfrewshire

By

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PREFACE.

THESE notes were compiled from all available sources for the Paisley Naturalists' Society, to assist in their endeavour to help to complete the collection of Renfrewshire minerals in the Paisley Museum. Though the collection is not yet completed, and perhaps because of this, it has been felt that the publication of these notes might elicit information from sources which could not otherwise be got.

A brief summary of the geology of the shire is first given, and then the mineralogy. The minerals are arranged according to the system of Dana, which is the system now generally adopted. The number of the minerals in Dana's system is given in brackets.

Records of seventy-six minerals being found in the shire have been noted, and of these forty-nine have been gathered recently by the Paisley Naturalists. Many of the original sources of the rarer minerals are not now available, and therefore the opportunity of securing specimens lost. But there is often a re-opening of strata or quarries, sometimes only temporarily, and an early visit is

therefore desirable. The co-operation of those interested is invited, and information sent either to the writer or the Secretary of the Society will be promptly taken advantage of. A special effort is being made to secure specimens of each recorded mineral, and also to add to the list.

The plan adopted was to gather as much as possible of the published information, and what was accumulated has been placed as the introduction to each mineral. The source of the first mention of each locality is given, and then full extracts of the records. Where the Paisley Naturalists' Society have been able to secure specimens, these have been authenticated as to locality and chemical composition, and in many cases full analyses have been given. Mention is made under each species of the museums which contain specimens of it, and lists of the collections in the principal museums are given at the end. There will also be found a chronological table giving the year of each mineral being recorded, a table giving minerals mentioned in each publication, and a third table giving the minerals recorded for each locality. Many other publications were consulted besides those given in Table 2, but only when a new record was contained was that publication put into the list. There are two exceptions,

as Nicol and Rammelsberg are included in the table though their records are not used as references.

If any reader can throw light on any point, such as (1) earlier records of localities than those given, and where published; (2) anything bearing on specimens in private collections, and especially those got from localities not now worked; (3) about quarries where minerals have been got, whether working now or not—*i.e.*, Hurlet Pits; Grainger's Quarry, Kilmacolm; etc.—it will be very cordially received.

The writer begs to thank the various members of the Paisley Naturalists' Society who have so kindly helped in the compilation of these notes, and his brother for assistance with the chemical analyses.

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CONTENTS.

LIST OF ABBREVIATIONS.

C. N.	Chemical News.
C. of W. S. F.	Catalogue of Western Scottish Fossils. 1876.
Dana.	Dana's System of Mineralogy. 1896.
E. J. of S.	Edinburgh Journal of Science.
E. N. P. J.	Edinburgh New Philosophical Journal.
F. F. & G.	Fauna, Flora, and Geology of the Clyde Area 1901.
G. & L. M.	Greg and Lettsom's Mineralogy. 1858.
Heddle.	Heddle's Mineralogy of Scotland. 1901.
Jameson.	Jameson's Mineralogy. 1816.
L. & E. P. M.	London and Edinburgh Philosophical Magazine.
N. S. A. of S. R.	New Statistical Account of Scotland—Renfrewshire. 1842.
Phillips.	Phillips' Mineralogy (edited by Allan). 1837.
P. M.	Paisley Magazine. 1828.
P. N. S.	Paisley Naturalists' Society.
Survey.	Geological Survey of Scotland — Glasgow District. 1911.
T. G. G. S.	Transactions of Glasgow Geological Society. 1858-1911.
Thomson.	Thomson's Mineralogy. 1836.
T. of R. S. of E.	Transactions of Royal Society of Edinburgh.
LONDON.	British Museum, London.
EDINBURGH.	Royal Scottish Museum, Edinburgh.
Glasgow.	Kelvingrove Museum, Glasgow.
Hunterian.	Hunterian Museum, University, Glasgow.
Paisley.	Museum, Paisley.

I.

BRIEF SUMMARY OF THE GEOLOGY OF THE SHIRE.

No rocks belonging to the Archean, Cambrian, Ordovician, or Silurian formations are exposed in Renfrewshire. The oldest rock, then, belongs to the Upper Old Red Sandstone series. Then there are some belonging to the Carboniferous period; but from this we find a long interval. Passing over the Mesozoic, or Secondary, and the Cainozoic, or Tertiary, periods, we find some formations which were laid down during Post-tertiary or Quaternary times.

The strata of the Upper Old Red Sandstone is represented at Wemyss Bay,[1] Port-Glasgow, Loch Thom, and Gourock.[2] Some portions of the Carboniferous strata are well developed in the shire. Sandstones are found at Cathcart and Giffnock;[3] at Waulkmill,[4] where they attain a thickness of 90 feet; at south of the Cloch;[5] at Howwood;[6] and south of Paisley. Copper is found disseminated in conglomerate sandstone (which consists principally of quartz pebbles) at Drumshantie, Gourock.[7]

[1] F. F. & G., p. 406. [2] T. G. G. S., ii., pp. 205, 206.
[3] T. G. G. S., ii., p. 204; xi., p. 199; xii., p. 270. [4] *Ibid.*, iii., p. 259.
[5] *Ibid.*, vii., p. 404. [6] *Ibid.*, xii. p. 266. [7] *Ibid.*, ii., p. 203.

One of the most persistent bands of limestone is termed the Index Limestone,[1] because it points to the coal and ironstone which lie immediately below it.[2] This bed averages from 6 feet to 10 feet thick. Below it are five well-defined beds of limestone, named, in ascending order, Hollybush, Blackbyres, Hurlet, Blackhall, and Hosie. Above it are other well-defined beds of limestone, viz.: Holeburn or Lyoncross, Orchard, and the Arden, which attains a thickness of 9 feet.[3] The Orchard limestone is considered by some geologists to be more a chemically than an organically formed limestone,[4] though this has been disputed.[5] A series of strata similar to the Ballagan series, which occur above Greenock in the district around Loch Thom, are regarded as Lower Carboniferous.[6] There are some thirty bands of nodular limestone interstratified with dark-coloured shales mixed with gypsum, and these beds may be regarded as the well-defined base of the Carboniferous system in the West of Scotland.[7] A freshwater limestone with ostracoda, said to be the only freshwater limestone south of the Clyde in the carboniferous limestone series, is reported from an old quarry at Jenny's Well, near Paisley.[8]

Towards the middle and top of the Carboniferous period are numerous coal seams and ironstone beds. The Hurlet Main Coal attains a thickness

[1] Survey, p. 45. [2] T. G. G. S., xii., p. 368. [3] *Ibid.*, xii., p. 370.
[4] *Ibid.*, v., p. 252. [5] *Ibid.*, xii., p. 392. [6] *Ibid.*, ii., p. 259.
[7] *Ibid.*, iv., p. 326. [8] *Ibid.*, xii., p. 64.

of $5\frac{1}{2}$ feet,[1] and at Nitshill[2] coal is found up to $2\frac{1}{2}$ feet thick. About 8 inches off the bottom of the seam of "Lillies" coal, in the Nitshill district, is "a good cannel coal yielding a fair percentage of oil when distilled."[3] Coal has also been extensively worked at Pollokshaws and Johnstone, and at the north-west extremity of the shire. Coal carbonised and rendered columnar in structure by contact with dolerite occurs at Jenny's Well and Arkleston, near Paisley.

Some of the Shales, such as in Waulkmill Glen, near Nitshill, extending to 30 feet in depth, contain a great mass of ironstone nodules.[4] These nodules in shale are found over the whole of the sedimentary portion of the shire. It has been remarked of the shales in this district that "on the whole the specimens of fossils in the Thornliebank shale are not very plentiful, but there is a great variety; and especially noteworthy is the unusually large number of the very rare species, and it is this characteristic which makes it so interesting. Taking it all over, we think it can without question be called the richest fossiliferous district ever found in the Glasgow district."[5] For further information on the fossils of the shire, see the Transactions of the Glasgow Geological Society, the Catalogue of Western Scottish Fossils, and the Fauna, Flora, and Geology of the Clyde Area.

[1] T. G. G. S., iii., p. 261. [2] *Ibid.*, iii., p. 261. [3] *Ibid.*, iii., p. 261.
[4] *Ibid.*, iii., p. 258. [5] *Ibid.*, xii., p. 377.

Shale producing alum, both naturally and by chemical treatment, was worked for many years around Hurlet (see page 22);[1] and shale producing oil was mined at Clippens and Walkinshaw, near Paisley. Fireclay has also been extensively worked at Paisley and Darnley.

Seams of Blackband ironstone, from 3 to 6 inches and up to 12 inches in thickness, have been extensively wrought around Paisley, Nitshill, Cardonald, etc. Sometimes a curious structure, called Cone-in-cone, is associated with the ironstone.[2]

During the Carboniferous period, great volcanic energy was developed, and the lavas and traps of the shire were then laid down. These volcanic rocks rest on the cement-stone series, yet where the volcanoes remained active for a long course of time, the sub-division is sparingly developed. Occasionally there are intercalations of sedimentary material, as for instance near Eaglesham, where Professor J. Geikie mapped "sandstones, shales, clay, ironstones, and impure limestones, with productus giganteus, which are intercalated in trap. . . . Near the top of the volcanic series there is a gradual passage through fine tuffs, which contain much sedimentary material, into the basement beds of the carboniferous limestone series near Eaglesham. . . . It is obvious, therefore, that volcanoes remained active during the greater part of the calciferous sandstone period."[3]

[1] T. G. G. S., iii., p. 261; xii., p. 380. [2] *Ibid.*, viii., p. 15.
[3] F. F. & G., p. 408.

These igneous outbursts form part of the great chain of trappean heights extending across Scotland from Ardrossan to Montrose.[1] The trap range above Shilford stands about 850 feet above sea level.[2] The only bore to ascertain the thickness of these beds that has been found recorded is one in the parish of Beith (outside the Renfrewshire boundary, however), where a bore of about 80 fathoms was made without their base being reached.[3] In a paper on Volcanic Disturbances in the Dalry District (which is also outside of our area), it is remarked—"Unfortunately for geological science, no correct journal of these beds was kept in sinking the numerous pits that perforated the strata around Dalry, and the geologist is confined to the part exposed in the water courses."[4]

The trap rocks are of very different composition in different places. On the north side of the Levern Valley it is spoken of as that "soft peculiar porphyrite of the Gleniffer Hills," while on the south side it is porphyritic claystone intercalated with layers of greenstone, and is certainly a subsequent deposit to the porphyrite on the north side.[5] Again, "that peculiar porphyrite found on Gleniffer occupying a plateau from Cappelie, near Neilston, to Tower, Lochwinnoch, and having an area of sixteen square miles, consists of a clay base with square or lozenge-

[1] T. G. G. S., ii., p. 149. [2] *Ibid.*, iii., p. 266. [3] *Ibid.*, vii., p. 233.
[4] *Ibid.*, vii., p. 235. [5] *Ibid.*, iv., pp. 18 and 46.

shaped crystals of felspar of limey-whiteness."[1] These felspar crystals hallmark this rock, so that it is recognised wherever found. In a paper on the Ice Age in Garnock Valley,[2] it says—"A little beyond Rigfoot we reach the home of the Fereneze and Lochliboside Hills' porphyrite, which is easily known, wherever found, by the abundant large crystals of Labrador felspar it contains."

Besides rocks with amygdules of Labradorite, we find rocks with amygdules of calcite, of analcite, and of Thomsonite (see page 20). In the upper or slaggy portion of the lava flows, prehnite is found, and among other minerals contained in the trap rock are the Zeolites for which Renfrewshire has become famous. The trap rocks have been well exposed at Kilmacolm in railway cuttings, quarries, etc. A copper lode, extending from Lochwinnoch to Kilmacolm was laid bare in the railway cutting in 1866. While at Kaim, Lochwinnoch, it was rich enough in copper to be worked, it is poor in metal at Kilmacolm (see page 21).

There are several large dykes and intrusions of Dolerite in the shire. One such occurs at Mill Street quarry, Paisley; another at Arkleston; and a third at Elderslie, Renfrew. Another large one, which contained a fine vein of Pectolite, was situated at Craigenfeoch, south of Johnstone, and others at Bishopton, Rashielee, and Cathcart. An exposure of globular trap, containing balls about

[1] T. G. G. S., iv., p. 46. [2] *Ibid.*, ix., p. 169.

6 feet in diameter, has been described as occurring at Shilford, near Neilston.[1]

No records belonging to the Secondary or Tertiary periods being found in the shire, we pass up to the Post-tertiary or Quaternary period, and find this largely represented. A series of bores put down at various places from Paisley to the Clyde, demonstrates the thickness of these deposits, which consist of mud, sand, gravel, and boulder-clay. The glacial sea-bottom is also shown by them "to have been very uneven and as much marked by heights and hollows as any boulder hillocky region on dry land. This was shown by nine of these bores—one at Candren, two at Walkinshaw, five at Blythswood, and one in the bed of the river at North Barr House—going through boulder-clay alone, by which we learn that, as the ground is flat, they were sunk in what are now subterranean hillocks, but which were once sub-marine islands or shoals, in a sea depositing mud around them. Sixteen bores—two at Candren, nine at Walkinshaw, one at Blythswood, three at the Barns of Clyde, and one at Blairdardie—went through sand and mud only, the silt of the glacial sea filling up the hollows between the submerged hillocks or shoals. The deepest of these bores was at Walkinshaw, one being 152 feet, and another 159 feet deep; one at Shiels, near Renfrew, was 144 feet deep; and the remainder from 80 to 100 feet deep."[2] The Geological Survey have

[1] T. G. G. S., xii., p. 62. [2] *Ibid.*, iii., p. 147.

issued a map in the Geology of the Glasgow District detailing a large number of bores.

Boulder-clay is found all over the lower parts of the shire—at Glasgow, Paisley, Greenock, Port-Glasgow, etc. The boulders in the clay are very various in quality and size. "At Paisley and neighbourhood, they are in something like the following proportions :—

"Sandstone and shales and coals,	50	per cent.
Traps, - - - -	32	,,
Limestones, - - -	10	,,
Clay-slate and greywacke, -	7	,,
Granite, - - - -	1	,, "[1]

In the clay beds at Paisley has been found the rare mineral Vivianite, or phosphate of iron ; and there has also been unearthed in these beds the horn of a red deer, in beautiful condition, and also many shells.[2]

A large number of erratic boulders, granite, schist, etc., are lying on the shore at Gourock, having been deposited there by ice. The origin of the granite boulders is stated to be "a tract of porphyritic granite extending round Meall Breac, on the eastern side of the upper part of Glen Fyne."[3]

Glaciers have acted as denuding agents in the shire, the amount of denudation in the Hurlet district being estimated to have been upwards of

[1] T. G. G. S., ix., p. 139. [2] *Ibid.*, vi., p. 53.
[3] *Ibid.*, ix., p. 348.

1,500 feet.[1] Glaciation also accounts for the rounded nature of the high lands in the shire, the striæ indicating the movement of the ice to have been south-east.

There is evidence that the land has been elevated in recent times. The 40 feet and 25 feet old sea-beaches, marking the last rises of the land in Scotland, are well seen along the shores of the Clyde near the Cloch, the present road running generally along the 25 feet beach.[2]

Deposits of sand and gravel are found near Loch Libo[3] and Bridge of Weir. Peat moss is found in several places, such as at the old lake of Cowden-glen, at Houston, and many other places.

A few notes concerning some of the famous quarries of the shire may be of interest.

1.—Boylestone Quarry, near Barrhead, has been a mine of wealth to the mineralogist. When it was first opened up, and for some time afterwards, it yielded a great number of specimens, but it is now temporarily exhausted. The mineral produced in largest quantities was Prehnite, which was found mostly in the scoriæ or surface of the trap rock. This mineral is found in various colours, translucent, opaque white, pale green, and pink. The next most common mineral is Analcite, and it is found here crystallised in more forms than anywhere else, as stated by Professor Heddle in

[1] T. G. G. S., iii., p. 267. [2] *Ibid.*, vi., p. 142.
[3] *Ibid.*, ix., p. 98; and xi., supp., p. 41.

Transactions of Edinburgh Geological Society.[1] He further says: "The crystals from Boylestone are white—purer than what Ruskin calls paper-white. The specimens formerly obtainable of this Boylestone white Analcite were the most showy to be got from any British locality, being superior to the Irish specimens, and even to the pale blue variety from Talisker in Skye. In addition to the opaque white specimens, however, Boylestone supplies us, though very much more rarely, with Analcite of an entirely different appearance. Upon the surface of mammillations of pale green Prehnite there were occasionally sprinkled isolated crystals of perfectly colourless and perfectly pellucid Analcite."

Other minerals found in this quarry comprise Native Copper, Calcite, Malachite, Orthoclase (Erythrite), Natrolite, and Thomsonite. The native copper, in pieces weighing up to 7 ounces, is principally found in rents, in a hard dense band, which crosses the quarry from east to west.

2.—The quarry at Kempoch Point, Gourock, the Renfrewshire home of the mineral Fluorite, has been worked for many years, and from the very first was found to be rich in minerals.

"There is a large whinstone quarry on the hill-side at Kempoch Point, where a fine section of trap nearly 100 feet in height is exposed. The rock is a fine-grained felstone porphyry. In former years, when it was quarried nearer to the face of

[1] T. E. G. S., vii., pp. 241-242 (1898).

the hill, circular cavities termed 'druses' were met with lined with crystals of quartz, calcite, dolomite, and fluorspar."[1]

Heddle states that "fluorspar is found in the following colours: colourless, honey yellow, pink, emerald green, and purple. The usual colour is purple. The first three colours are rare, and only occur in such cavities as contain calcite."[2]

3.—At Queenside, Muirshiels, above Lochwinnoch, there occurs a very large vein of Barite which has been wrought commercially for many years. Barite is found over all the shire, but the Queenside vein is by far the largest, attaining a width of about 20 feet.[3]

4.—At Kaim, near Lochwinnoch, copper existing as chalcosite, or sulphide of copper, disseminated in a lode through the trap rock, was mined for several years. It seems to have been started about 1848 and gone on intermittently till 1877. It was worked by a vertical shaft about 10 or 12 fathoms deep, and then along lodes. In 1861, in eight months, about 600 tons of dressed ore were shipped, *via* Troon, to Swansea. In several reports and letters which the proprietor kindly allowed me to peruse, the ore is referred to as grey copper ore and grey sulphuret of copper. It is surprising that no report of this mineral has hitherto been made in scientific publications. Digging operations were also started for copper

[1] T. G. G. S., vi., p. 143. [2] Heddle, i., p. 42.
[3] T. G. G. S., xi., p. 234.

at the head of Calder Glen, Lochwinnoch, but they do not seem to have gone past this stage.

5.—At Drumshantie, Gourock, "the green carbonate of copper has been found in the conglomerate sandstone in small granular particles dispersed through the sand. It was wrought for some time, but without the least prospect of success."[1]

6.—At Hurlet, alum was made for many years from shale. When this shale weathered, an incrustation was produced which consisted of alum. The shale was also treated chemically to achieve the same result. Alum works were started at Hurlet in 1766, but these must have stopped, as they were re-started in 1797 and continued until about 1893. Greg and Lettsom state that "the alum-schists raised near Glasgow in 1855 amounted to about 15,000 tons, producing about 6,000 tons of alum."[2] About twenty-two mines were sunk to procure the shale. They were worked on the ladder system in a vertical shaft, the miners descending with the empty baskets and ascending again with the full ones on their back. The Townhead Pit, situated to the south of the works, was about 20 fathoms deep. The Glasgow Geological Society visited this place, and the record is as follows:—"The tenth excursion was made on the 11th September, 1858, and was conducted by Mr. Cowan. They visited the Alum Works, some of the more active

[1] N. S. A. of S. R., p. 547. [2] G. & L. M., p. 466.

members going down the Townhead Pit in the alum shale. This was no joke, as the descent and ascent were made by a series of ladders, but once down the pit the exploration was easy enough."[1]

Associated with the alum are mentioned the following minerals—salmiac, mirabilite, gypsum, epsomite, melanterite, kalinite, halotrichite, and ozocerite, no specimens of which are in any of the museums.

[1] T. G. G. S., vii., p. 117.

II.

MINERALOGY OF THE SHIRE.

Copper, Native (Dana 15).

1842, N. S. A. of S. R., p. 504*; 1858, G. & L. M., p. 305; 1869, T. G. G. S., vol. iii., p. 267; vol. ix., p. 430; vol. xi., p. 317; 1876, C. of W. S. F., p. 158; 1901, Heddle, vol. i., p. 12; 1901, F. F. & G., p. 548; 1904, P. N. S.

First records—1842, Erskine, N. S. A. of S. R.; 1858, Neilston, G. & L. M.; 1869, Boylestone, T. G. G. S.[1]

The first record of this mineral for the shire is in the New Statistical Account of Scotland, Renfrewshire, 1842, page 504,* where under Erskine parish it says:—"While the workmen employed on the Glasgow and Greenock Railway were engaged in cutting through the West Ferry Hill, opposite Dumbarton Castle . . . there was found a thin but pure vein of dendritic native copper." Greg and Lettsom record it for Neilston, and the first record of it being found at Boylestone Quarry, near Barrhead, is in the year 1869, in the Transactions of the Glasgow Geological Society, vol. iii., p. 267, where it is stated that "Native copper is found in thin sheets lining fissures and cavities in the trap. It is not very abundant, specimens have, however, been found at intervals weighing several ounces." Heddle, vol. i., p. 12, says—"It

[1] For abbreviations see page 10.

occurs at Boylestone in four ways :—1, In delicate leaves and flat lumps up to seven ounces in weight, in rents in a hard dense band which crosses the quarry from east to west. When the rents are opened up the copper has an orange-red to golden colour and a very high lustre. 2, In distorted but very brilliant crystals which are sprinkled throughout crystals of pellucid calcite and sometimes throughout the mass of prehnite. 3, Very rarely in cavities in rough crystals. 4, In divergent strings with calcite and prehnite which lie between the radiating crystals of prehnite and communicate to it a rich brown colour. When the copper protudes above the surface of the prehnite it is coated with chrysocolla or with malachite."

No analysis of a Renfrewshire specimen seems to have been recorded. The following is the result of an analysis of a specimen from Boylestone :—

	per cent.
Metallic copper, - -	95·61
Metallic iron, - - -	·56
Copper oxide (Cu O), -	1·02
Ferric oxide ($Fe_2 O_3$), -	·80
Lime (Ca O), - - -	·58
Magnesia (Mg O), - -	·29
Sulphur, - - - -	...
Insoluble, - - -	1·20
	100·06

The quantity operated on was too small to examine for precious metals.

Specimens from Boylestone are exhibited in the following museums—London, Edinburgh, Glasgow, Hunterian, and Paisley.

Galena (Dana 45)—Sulphide of Lead.

1858, G. & L. M., p. 434 ; 1901, Heddle, vol. i., p. 24, and vol. ii., p. 72; 1903, P. N. S. ; 1911, T. G. G. S., vol. xiv., p. 173.

First records—1858, Bishopton, G. & L. M. ; 1903, Howwood, P. N. S. ; 1911, Giffnock, T. G. G. S.

No direct record of this mineral has been found, though it is incidentally mentioned as above by Greg and Lettsom and Heddle, for when speaking of Greenockite as being found at Bishopton they say—"associated with, occasionally, Galena." Neither of these authorities quotes galena under its own title for the shire. The specimen now described was found as a small boulder lying on the rock at a depth of about 15 feet from the surface, in a cutting on the new Dalry Railway near Drygate Farm, Howwood. As it occurred as a boulder, Mr. Goodchild of the Edinburgh Museum was asked if it should be reckoned a Renfrewshire species, and he kindly replied as follows :—"I never could make up my mind what we should do in the matter of boulders in counties with local records. If we go on the assumption that we accept proper to the locality all the minerals that occur there as the result of natural

causes, which seems a reasonable thing to do, then your galena, with its accompanying cerussite, should count as Renfrewshire minerals." It is therefore included in this list, and an analysis showed it to be practically pure Sulphide of Lead, no iron being present, but precious metals were not tested for.

A specimen is shown in Paisley Museum.

This is not the only record of a boulder of galena being found in this neighbourhood. In the Hunterian Museum a specimen of galena is shown, taken from a boulder, which weighed about a cwt., found in a gravel-bed 10 feet below the surface at the south-west corner of St. George's Place, Glasgow.

[Since the above was written a specimen of galena, found in a bed of fireclay underlying the coal seam in Braidbar Quarry, was shown at a meeting of the Glasgow Geological Society, on February 11th, 1911.]

Chalcosite (Dana 54)—Sulphide of Copper.

1904, Kaim, Lochwinnoch, P. N. S.; 1909, Waas Hill, Howwood, P. N. S.

This mineral has not hitherto been recorded for the shire. In the New Statistical Account of Scotland—Renfrewshire, reference is made, under Lochwinnoch Parish, to the finding of "copper pyritous" at Cloak. This may mean chalcosite, although copper pyrites is now scientifically classed as chalcopyrite. A specimen of chalcosite found

at Kaim Copper Quarry (see page 21), when analysed, gave the following results:—

	per cent.
Copper, - - -	72·36
Sulphur, - - -	20·10
Insoluble, - - -	6·30
	98·76

There is a slight loss here. The quantity available for analysis was small, but it proves that no other metal is present in any special quantity. Antimony was specially tested for, but was not found.

The specimen from Howwood was tested qualitatively. It is possible that the vein of chalcosite runs right across the valley.

Specimens are in the Paisley Museum.

Blende (Dana 58)—Sulphide of Zinc.

1905, Craigenfeoch, Johnstone, P. N. S.

This mineral has not hitherto been recorded for the shire. It has been found at Fairlie,[1] at Kirkaldy,[2] at Campsie Hills,[3] and at Beith.[4] That is, all round the shire but not in it. This specimen was found by Mr. John Smith, Dalry. The Blende, which is associated with calcite, was analysed and found to be nearly pure zinc sulphide.

A specimen is in Paisley Museum.

[1] T. G. G. S., iii., p. 29. [2] *Ibid.*, vi., p. 130. [3] *Ibid.*, ix., p. 78. [4] Heddle, i., p. 22.

GREENOCKITE (Dana 68)—Sulphide of Cadmium.

1840, E. N. P. J., xxviii., p. 390; 1842, N. S. A. of S. R., p. 504*; 1858, G. & L. M., p. 434; 1870, T. G. G. S., iv., p. 75, and viii. p. 196; 1876, C. of W. S. F., p. 159; 1896, Dana, p. 69; 1901, Heddle, i., p. 24; 1901, F. F. & G., p. 548.

First records—1840, Bishopton, E. N. P. J.; 1876, Erskine, C. of W. S. F.; 1896, Boylestone, Dana.

In the Edinburgh New Philosopical Journal, vol. xxviii. (October, 1839—April, 1840), p. 390, the following is recorded:—"Greenockite from Bishopton—In a porphyritic and amygdaloidal trap rock containing crystals of felspar and amygdaloidal portions of calcareous spar, green earth, etc., Greenockite is found either super-imposed on the botryoidal surface of that mineral, or disseminated through its fibrous mass. First noticed by Lord Greenock. Analysis, p. 394, by Connel, gave:—

	per cent.
"Sulphur, - - -	22.56
Cadmium, - - -	77·30
Iron, - - - -	traces
	99·86"

Specimens from Bishopton are in the following museums—London, Edinburgh, Glasgow, Hunterian, and Paisley; and a specimen from Erskine is in the Hunterian Museum.

Millerite (Dana 70)—Sulphide of Nickel.

1901, Heddle, i., p. 25.

Heddle says:—"At Pollokshields, in the Giffnock limestone. J. F. Maclaren."

Bornite (Dana 78)—Sulphides of Copper and Iron.

1901, Heddle, i., p. 30.

Heddle says:—"Gourock, near Drumshantie, with malachite in sandstone."

Chalcopyrite (Dana 83)—Sulphides of Copper and Iron.

1842, N. S. A. of S. R., p. 84.

Under Lochwinnoch Parish, "Copper (pyritous) is recorded as being found at Cloak." (This may apply to chalcosite: see p. 27.)

Pyrites (Dana 85)—Sulphide of Iron.

1828, P. M., p. 319; 1842, N. S. A. of S. R., pp. 84 and 150; 1891, T. G. G. S., ix., p. 149; 1900, P. N. S.

First records—1828, Paisley, P. M.; 1842, Lochwinnoch and Nitshill, N. S. A. of S. R.; 1891, Arkleston, T. G. G. S.; 1900, Staneley, Blackstone, and Kaim, P. N. S.

For Paisley Magazine reference, see under Ozocerite. New Statistical Account of Scotland—Renfrewshire, p. 84, says:—"This mineral, as sulphuret of iron, is recorded for Hallhill;" and at page 150—"In the sandstone quarry at Nitshill a considerable quantity of iron pyrites occurs."

An analysis of the specimen from Staneley (cutting on Nethercraigs and Barrhead railway) gave—

	per cent.
Sulphide of Iron ($Fe S_2$), -	79·41
Sulphate of Iron ($Fe SO_4$),	3·03
Ferric Oxide ($Fe_2 O_3$) -	1·71
Arsenic, - - - -	·032
Insoluble, - - -	13·98
Moisture, - - -	1·25
	99·412

The specimens from Blackstone and Kaim were proved qualitatively.

A specimen is in the Paisley Museum.

Salmiac (Dana 168)—Ammonium Chloride.

1858, G. & L. M., p. 28; 1901, Heddle, i., p. 40.

First record—1858, Hurlet, G. & L. M.

Greg and Lettsom say—"Occurs at Hurlet, near Paisley;" and Heddle quotes the same.

Fluorite (Dana 175)—Calcium Fluoride.

1836, Thomson, i., p. 128; 1837, Phillips, p. 175; 1842, N. S. A. of S. R., p. 548; 1858, G. & L. M., p. 25; 1876, C. of W. S. F., p. 158; 1876, T. G. G. S., vi., pp. 111, 121, 130, 143; 1901, Heddle, i., p. 42; 1901, F. F. & G., p. 549; 1902, P. N. S.

First record—1836, Gourock, Thomson.

Fluorite is only found at Gourock in this shire. Thomson says: "In a trap rock at Gourock,

small yellow cubes are occasionally found." Phillips says: "Dark blue cubical crystals have been noticed in porphyritic greenstone near Gourock." N. S. A. of S. R. says: "In the light blue coloured porphyry forming Kempoch Point there is found fluorspar." Heddle says: "Gourock Quarry in porphyry (Jameson). Colourless, honey-yellow, pink, emerald-green, and purple. The first three of these colours are rare. The usual colour is purple. The rarer colours occur only in such cavities as contain calcite. Some of the green crystals are built up with a series of minute cubes, the solid angles of which are deficient by a regular decrement. Other calcitic druses contain colourless cubical crystals with layers of green." The other quotations are merely locality. For description of Gourock Quarry, see page 20.

Specimens are in the following museums—Edinburgh, Glasgow, and Paisley; those in Edinburgh being of various colours.

Quartz (Dana 210)—Silica.

1828, P. M., p. 319; 1842, N. S. A. of S. R., pp. 84, 148, 358, 360, 386, 411, 504*, and 548; 1876, C. of W. S. F., p. 161; 1872, T. G. G. S., iv., p. 305; vi., p. 143; x., p. 379; 1901, Heddle, i., pp. 49, 50, and 51; 1901, F. F. & G., p. 549; 1902, P. N. S.

First records—1828, Paisley, P. M.; 1842, Lochwinnoch, Gourock, Kilbarchan, Eaglesham, Greenock, and Erskine, N. S. A. of S. R.; 1896, Bridge of Weir, T. G. G. S.; 1901, Hartfield, Heddle; 1902, Kilmacolm, Loch Thom, Craigenfeoch, and Waas Hill, P. N. S.

The N. S. A. of S. R. gives the following localities under Lochwinnoch parish.

Agate (fortification), -	Edge, Glenward, Misty Law Moor.
Amethyst, - - -	Misty Law Moor, Glenward.
Chalcedony (common),	Misty Law Moor.
Do. (carnelian),	Misty Law Moor, Glenward.
Hornstone, - - -	Misty Law Moor (small quantity).
Jaspar (common), -	Dunshill, Longyard, Tandlemoor.
Do. (striped), - -	Misty Law Moor (rare).
Quartz (common crystallized), -	Misty Law Moor, Calderbank.
Do. (rock crystal), -	Misty Law Moor, Glenward, The Cruickhill.

Under Paisley parish (p. 148), "greenstone is traversed by numerous veins of jasper and chalcedony," also "hornblende rock with quartz," and "porphyry abounds with crystals of quartz."

Under Kilbarchan parish (p. 358): "In widening a road a little to the west of the village, upon the border of the secondary trap, and very near its junction with the coal formation, a curious variety of rock is found. It consists of pieces of chalcedony, in size from one-half to one-fourth of an inch or less in diameter. The pieces of chalcedony were firmly united together by an argillaceous cement, forming a compound exceedingly hard. It occurred in ill-defined flags overlaid by claystone and both resting on very fine-grained greenstone. The pieces of chalcedony were angular, forming with the cementing substance a chalcedonic brezzia. A few specimens of white carnelian were observable in the claystone overlying it." And further: "Crystallized quartz is found in small quantities at Pennel Brae, a little north of the village."

Under Eaglesham parish (p. 386): "In a quarry

by the roadside leading to Glasgow, a greenstone rock is curious for the number of extraneous minerals it contains, such as jasper, chalcedony, blue quartz, etc."

Under Greenock parish (p. 411): "The conglomerated strata are chiefly composed of rolled pebbles of quartz," and "the secondary greenstone contains quartz crystals."

Under Erskine parish (p. 504*): "At cuttings in West Ferry Hill there have been found some fine specimens of amethystine quartz and agate (fortification)." Page 548: "At Kempoch Point there are found small rock crystals."

The Transactions of the Glasgow Geological Society, vol. iv., p. 305, says: "Opposite Ashton, a large rounded boulder of mica slate veined with quartz;" and "at Lunderston Bay, a large oblong boulder of gneissose schist with quartz veins." Vol. vi., p. 143, says: "Druses in fine-grained felstone porphyry of Kempoch Hill quarry, lined with crystals of quartz." Vol x., p. 379, states that there was exhibited a specimen of crystalline quartz filling a drusy cavity in trap rock found in a quarry near Bridge of Weir.

Heddle, vol. i., p. 49, quotes cairngorm or smoky quartz as being found at Gourock, "in druses in porphyry (lower carboniferous lava) rarely colourless." Page 50: "Amethyst, near Lochwinnoch, at Linthills and Lairdside, with rock crystal, carnelian, and agate." And at p. 51: "Zeolitic quartz at Hartfield Moss."

The other references are only localities.

A specimen of quartz from Kilmacolm gave the following analysis :—

Silica, - - -	97·88	per cent.
Iron and alumina, -	1·10	,,
Lime, - - -	·64	,,
Magnesia, - -	...	,,
Loss on ignition, -	·60	,,
	100·22	
Specific gravity, -	2·458	

The specific gravity of a specimen from Loch Thom was 2·619.

Agate was got, in 1905, in the North quarry, Craigenfeoch, and crystallized quartz was got, in 1907, in a druse on Waas Hill, above Howwood, by the Paisley Naturalists' Society.

Specimens from Kilmacolm, Gourock, and Boylestone, are in the Edinburgh Museum; from Bridge of Weir, in the Hunterian Museum; and from Kilmacolm, Loch Thom, Craigenfeoch, and Waas Hill, in the Paisley Museum. In the latter museum there is also a fine specimen of smoke quartz crystal from Edge, Lochwinnoch.

Cuprite (Dana 224)—Cuprous Oxide.

There is no published record, but a specimen, presented by A. Craig Christie, from Boylestone, is in Edinburgh Museum.

Hæmatite (Dana 232)—Ferric Oxide.

1901, Heddle, i., p. 89, at Gourock.

Heddle says: "At the porphyry quarry in thin crystals." A specimen from Gourock is in the Edinburgh Museum, and specimens from Neilston are in the Paisley Museum.

Magnetite (Dana 237)—Ferric and Ferrous Oxides.

1880, T. G. G. S., vii., p. 49, at Kilmacolm.

The above reference is: "Kilmacolm district—an outcrop by the side of the road, on the Rowan-tree Hill, is a dolerite with a large quantity of magnetic iron." A specimen is in the Glasgow Museum.

Gothite (Dana 257)—Hydrous Oxide of Iron.

1836, Thomson, i., p. 438; 1858, G. & L. M., p. 253; 1901, Heddle, i., p. 107; 1901, F. F. & G., p. 549.

First records—1836, Gourock, Thomson; 1901, Bishopton, Boylestone, and Kilmacolm, Heddle.

Thomson calls it dihydrous peroxide of iron, and says: "A nodule of this mineral, about the size of a hen's egg, was found in a trap rock at Gourock." Greg & Lettsom say: "In nodule of trap rock at Gourock." Heddle quotes six varieties of this mineral: 1. rubinglimmer; 2. needle iron-stone; 3. onegite; 4. feathery columnar to scaly fibrous; 5. columnar or fibrous; 6. compact massive or granular; only three of which, Nos. 1,

2, and 5, are recorded for the shire. The first variety he records for Kilmacolm, Gourock quarry, Bishopton tunnel, rarely; and about the Boylestone quarry specimen, he says: "In beautiful dark red rosettes of crystals, adherent in isolated groups to the surfaces of analcite crystals, and lodged throughout the crystals of the scaly thomsonite there found, but avoiding the other zeolites even in the same cavity." Second variety—Gourock, with rubinglimmer. Fifth variety—Gourock quarry, rarely.

Specimens from Boylestone are in Edinburgh and Paisley Museums.

Manganite (Dana 258)—Hydrous Oxide of Manganese.

1842, N. S. A. of S. R., p. 84; 1898, T. G. G. S., xi., p. 234.
First record—1842, Lochwinnoch, N. S. A. of S. R.

The reference under Lochwinnoch parish is: "Oxide of manganese (earthy), common, in small quantities in whin rocks; crystallised variety found at Ruchburn." T. G. G. S. says: "At the Queenside barytes mine, some dark spots scattered through the barytes are black oxide of manganese."

Limonite (Dana 259)—Hydrous Oxide of Iron.

1842, N. S. A. of S. R., p. 84, Lochwinnoch.

Under Lochwinnoch parish: "Argillaceous oxide of iron (bog ore) common."

A specimen from Gleniffer is in Paisley Museum.

WAD (Dana 269 *a*)—Oxide of Manganese.

1842, N. S. A. of S. R., p. 548; 1901, Heddle, i., p. 113; 1901, F. F. & G., p. 549; 1902, P. N. S.

First records—1842, Gourock, N. S. A. of S. R.; 1902, Kilbarchan, Barrhead, and Lochwinnoch, P. N. S.

N. S. A. of S. R. says: "In the light blue porphyry at Kempoch point there is found oxide of manganese." Heddle says: "In Gourock quarry, solidly plugging druses up to 6 inches wide—rarely." F. F. & G. says: "Composition variable, but chiefly an oxide of manganese—bog manganese."

Two of Paisley Naturalists' specimens were analysed, with the following results:—

	No. 1.	No. 2.
Insoluble, - - -	60·70	18·66
Iron and Alumina, - -	18·62	29·69
Oxide of Manganese, -	8·44	20·71
Phosphate of Lime, - -	2·54	1·73
Sulphate of Lime, - -	·76	·84
Carbonate of Lime, - -	...	...
Carbonate of Magnesia, -	3.64	·45
Moisture (loss by ignition),	5·20	9·08
,, (loss at 212°), -	...	19·80
	99·90	100·96

No. 1.—From Kilbarchan (near Waterstone). The ore as found was mixed with quartz, to remove which, if possible, the whole was ground between cloths, then passed through a fine sieve. That which passed through was taken for analysis.

No. 2.—From Barrhead. Sample was got by passing through a fine sieve and taking what passed through for analysis.

Mr. Goodchild says these are "manganiferous decomposition residues."

The third specimen got by the Paisley Naturalists is from trap rock at Edge, Lochwinnoch.

A specimen from Gourock (styled psilomelane) is in the Edinburgh Museum, and specimens from Kilbarchan, Barrhead, Neilston, and Lochwinnoch, in the Paisley Museum.

Calcite (Dana 270)—Carbonate of Lime.

1828, P. M., p. 319; 1840, E. N. P. J., xxviii., p. 390, and liii., p. 283; 1842, N. S. A. of S. R., pp. 84, 117, 148, 360, 386, 411, 504*; 1858, G. & L. M., p. 40; 1866, T. G. G. S., ii., p. 158, vi., p. 143, and viii., pp. 15, 23; 1876, C. of W. S. F., p. 157; 1901, Heddle, i., pp. 133, 134, 135; 1901, F. F. & G., p. 549; 1902, P. N. S.

First records—1828, Paisley, P. M.; 1840, Bishopton, E. N. P. J.; 1842, Eaglesham, Erskine, Greenock, Howwood, Kilbarchan, Inchinnan, Lochwinnoch, N. S. A. of S. R.; 1858, Kilmacolm, G. & L. M.; 1876, Boylestone, C. of W. S. F.; 1877, Gourock, T. G. G. S.; 1901, Nitshill, F. F. & G.; 1905, Crofthead, Craigenfeoch, Langbank, P. N. S.

N. S. A. of S. R., under Lochwinnoch parish, gives the following localities: "Netherhouses, Howwood, Calderbank, Longyard, Misty Law moor." Under Kilbarchan parish, "at a little to the north of the village of Pennel Brae."

Heddle gives the following localities: "Bishopton, Boylestone, Erskine, Gourock, Kilmacolm."

Paisley Naturalists' Society record the following localities: 1, Boylestone; 2, Kilbarchan; 3, Blackstone; 4, Gleniffer; 5, Hurlet; 6, Gourock;

7, Crofthead ; 8 and 9, Kaim ; 10, Howwood ; 11, Craigenfeoch ; 12, Langbank.

Nos. 1, 2, 3, 5, 6, 8, 10, 11, 12, are massive and crystalline. Nos. 4, 7, and 9 are amygdaloids, varying in size from a small pea to a fair-sized egg. Calcite is the most widely spread of all the minerals of the shire. The amygdaloidal forms are found in widely separated localities, and their common origin is being further considered. All the above specimens were tested qualitatively, and proved to be carbonate of lime.

Specimens are in the following museums—Edinburgh, Glasgow, Hunterian, Paisley.

Dolomite (Dana 271)—Carbonates of Lime and Magnesia.

1876, C. of W. S. F., p. 158 ; 1877, T. G. G. S., vi., p. 143 ; 1901, Heddle, i., p. 138 ; 1901, F. F. & G., p. 550.

First records—1876, Cathcart and Gourock, C. of W. S. F. ; 1901, Bishopton, Heddle.

T. G. G. S. says : "Druses in fine-grained felstone porphyry of Kempoch Hill quarry, lined with dolomite among other minerals." Heddle says : "At Gourock quarry ; at Bishopton (Thomson)."

Ankerite (Dana 271 *a*)—Carbonates of Lime, Magnesia, and Iron.

1842, N. S. A. of S. R., p. 548, at Gourock quarry.

In this reference, it is called "brown spar."

SIDERITE (Dana 273)—Carbonate of Iron.

1842, N.S.A. of S.R., pp. 84, 159, and 547; 1863, T.G.G.S., i., p. 129; ii., pp. 147, 245, 247; iii., p. 264; iii. supp., p. 90; iv., p. 161; v., pp. 271, 272; viii., pp. 5, 19, 23; 1902, P. N. S.

First records—1842, Lochwinnoch, Blackhall, Hurlet, Kilbarchan, Houston, Johnstone, N. S. A. of S. R.

Paisley Naturalists' Society have the following records: Massive, from 1, Walkinshaw, 2, Blackstone, 3, Nitshill, 4, Corkerhill, and nodules from 5, Staneley, 6, Hurlet, 7, Ferguslie. Nos. 1, 2, 5, and 6 have been analysed, with the following results:—

	Walkinshaw.	Blackstone.	Staneley.	Hurlet.
	per cent.	per cent.	per cent.	per cent.
Carbonate of Iron ($FeCO_3$),	53·36	48·08	67·90	56·16
Ferric Oxide (Fe_2O_3),	1·40	4·14	1·76	...
Carbonate of Manganese,	...	1·25	11·75	1·24
Sulphide of Iron (FeS_2),	...	3·71	·41	·31
Sulphate of Lime ($CaSO_4$),	traces	·64	...	...
Phosphate of Lime ($Ca_3(PO_4)_2$),	4·33	3·49	1·40	traces
Carbonate of Lime ($CaCO_3$),	·31	1·95	6·66	3·41
Carbonate of Magnesia ($MgCO_3$),	9·39	7·27	6·36	9·31
Moisture,	·70	1·40	·70	1·00
Insoluble { Organic Matter,	3·60	4·26	·40	5·08
Insoluble { Clay,	26·80	23·43	2·20	24·12
	99·89	99·62	99·54	100·63
Specific gravity,	3·098	3·046	3·172	3·171

The other specimens were tested qualitatively, and proved to be principally carbonate of iron.

Specimens are in the Paisley Museum.

ARAGONITE (Dana 277)—Carbonate of Lime.

1842, N. S. A. of S. R., pp. 84, 148; 1876, C. of W. S. F., p. 157; 1901, Heddle, vol. i., p. 142; 1901, F. F. & G., p. 550; 1905, P. N. S.

First records—1842, Lochwinnoch and Paisley, N. S. A. of S. R.; 1876, Greenock, C. of W. S. F.; 1901, Pollok Castle, Heddle; 1905, Howwood, P. N. S.

N. S. A. of S. R. says, found at Linthills in Lochwinnoch parish, and in amygdaloidal porphyry near Paisley.

The Paisley Naturalists' Society specimen was found in a cutting in the new railway near Howwood, and, on being tested, was found to consist of carbonate of lime.

A specimen is in Paisley Museum.

CERUSSITE (Dana 281)—Carbonate of Lead.

This mineral has not previously been recorded for the shire. The specimen now recorded is associated with Galena in the boulder found in the cutting at Drygate Farm, Howwood (see p. 26). An analysis showed it to consist of carbonate of lead, and its identity has been confirmed by Mr. Goodchild.

A specimen is in Paisley Museum.

MALACHITE (Dana 288)—Carbonate of Copper.

1842, N. S. A. of S. R., pp. 84, 411, 547; 1866, T. G. G. S., vol. ii., pp. 158, 203; vol. iii., p. 267; vol. vi., p. 143; vol. vii., p. 403; 1901, Heddle, vol. i., p. 145; 1901, F. F. & G., p. 550; 1902, P. N. S.

First records—1842, Gourock and Lochwinnoch, N. S. A. of S. R.; 1866, Kilmacolm, Boylestone, and Cloch, T. G. G. S.; 1901, Greenock, Heddle.

The N. S. A. of S. R., under Lochwinnoch, gives two localities: Kaim and Tandlemoor. T. G. G. S., vol. vii., p. 403, says: "In fossiliferous shale, near Cloch lighthouse, some fissures are filled with green carbonate of copper (malachite)." Heddle says: "Barrhead, in Boylestone Quarry—in small mammillations and crystals. South of Gourock, at Drumshantie—in small mammillations in sandstone. Inland from Greenock—with slaty anthracite in sandstone. In Kaim Parish, Lochwinnoch—in fibrous filaments on quartz, crystallized in vesicles of a dyke of dolerite, traversing wacké."

The Paisley Naturalists' Society specimen is from Boylestone, and was qualitatively proved to be carbonate of copper.

Two specimens from Drumshantie and one from Gourock are shown in the Edinburgh Museum, one from Bishopton in the Hunterian Museum, and specimens from Boylestone and Kaim in the Paisley Museum.

Orthoclase (Dana 313)—Felspar; Silicates of Alumina and Potash.

1840, E. N. P. J., vol. xxviii, p. 390; 1842, N. S. A. of S. R., pp. 84, 386; 1867, T. G. G. S., vol. ii., p. 206; vol. iv. pp. 47, 305; vol. vii., p. 49; 1904, P. N. S.

1840, Bishopton, E. N. P. J.; 1842, Eaglesham and Lochwinnoch, N. S. A. of S. R.; 1867, Gourock and Kilmacolm, T. G. G. S.; 1905, Langbank, P. N. S.

E. N. P. J. says: "At Bishopton, a porphyritic and amygdaloidal trap rock containing crystals of

felspar." N. S. A. of S. R. says, under Lochwinnoch: "Felspar—red—Misty Law Moor." Under Eaglesham: "Felspar—compact, beautifully crystallised." T. G. G. S., vol. ii., says: "In sandstone from Gourock;" vol. iv., p. 47, gives "Neilston to Lochwinnoch," and p. 305, "Near Cloch Inn a boulder of granite with flesh-coloured felspar;" vol. vii., "a porphyritic felstone with large crystals of felspar, at Kilmacolm."

The Paisley Naturalists' Society specimens are from boulders on the shore near the Cloch and at Langbank.

Specimens are in Paisley Museum.

ORTHOCLASE—variety, Erythrite.

1901, Heddle, vol. ii., p. 4. Boylestone and Gryffe Tunnel, near Gourock.

ORTHOCLASE—variety, Weissigite.

1858, G. & L. M., p. 193; 1876, C. of W.S.F., p. 158; 1901, F. F. & G., p. 550.

First record—1858, Hartfield, G. & L. M.

The references are merely records of locality.

PLAGIOCLASE (Dana 315 *a*)—Silicates of Alumina, Potash, and Soda.

1879, T. G. G. S., vol. vi. p. 61, and vol. vii., p. 47.

The references merely quote localities—Craigie Linn, Paisley, and Kilmacolm.

Albite (Dana 316)—Silicates of Alumina and Soda.

1901, Heddle, vol. ii., p. 13. Boylestone.

The reference is: "as zeolitic albite (weissigite) of a brick red colour with zeolites."

Labradorite (Dana 319)—Silicates of Alumina, Lime, and Soda.

1836, Thomson, vol. i., p. 297; 1842, N. S. A. of S. R., p. 148; 1902, P. N. S.

First record—1836, Paisley, Thomson.

Thomson says: "The hills on the south side of Paisley, contain a great quantity of a peculiar green stone, in which labradorite supplies the place of the felspar." A specimen analysed in his laboratory from that locality gave—

Silica,	58·0	per cent.
Alumina,	27·3	,,
Lime,	9·8	,,
Protoxide of Iron,	traces	
Soda,	2·0	,,
Water,	1·2	,,
	98·3	

He remarks that it was impossible to free it from all traces of hornblende. The N. S. A. of S. R. says: "Paisley Parish—Porphyry abounds with pretty large rhomboidal plates of felspar" (this probably refers to Labradorite). The T. G. G. S.,

vol. ix., p. 169, refer incidentally: "A little beyond Rigfoot we reach the home of the Fereneze and Lochliboside Hills' porphyrite, which is easily known wherever found by the abundant large crystals of labrador felspar it contains."

The Paisley Naturalists' Society specimen is from the Gleniffer Hills, south of Paisley, and gave the following analysis:—

Silica,	53·82	per cent.
Alumina,	28·09	,,
Ferric Oxide,	2·88	,,
Oxide of Manganese,	traces	
Lime,	3·62	,,
Magnesia,	4·24	,,
Potash,	2·25	,,
Soda,	3·70	,,
Water (ignition),	2·00	,,
	100·60	

Labradorite is widely distributed over the Gleniffer Hills.

Specimens are in Paisley Museum.

Augite (Pyroxene) (Dana 325)—Silicates of Lime, Magnesia, and Iron.

1842, N. S. A. of S. R., pp. 84, 148; 1880, T. G. G. S., vol. vii., p. 47.

First records—1842, Lochwinnoch and Paisley, N. S. A. of S. R.; 1880, Kilmacolm, T. G. G. S.

N. S. A. of S. R. says: "Lochwinnoch—common in trap of secondary formation;" and "Paisley—

Basalt is found massive toward the western extremity of the range, nearly black in colour and replete with crystals of augite and olivine."

A specimen from Gleniffer is in Paisley Museum.

Pectolite (Dana 330)—Hydrous Silicates of Lime and Soda.

1858, G. & L. M., p. 216; 1901, Heddle, vol. ii., p. 31; 1905, P. N. S.
First records—1858, Bishopton, G. & L. M.; 1905, Craigenfeoch, P. N. S.

G. & L. M. quote Bishopton as a locality, and give the following analysis No. 1 :—

	No. 1. Bishopton.	No. 2. Craigenfeoch.
Silica,	52·07 per cent.	55·38 per cent.
Alumina,	4·20 ,,	traces
Lime,	32·80 ,,	33·68 ,,
Magnesia,	... ,,	traces
Soda,	9·60 ,,	7·20 ,,
Water,	2·00 ,,	3·30 ,,
	100·67	99 56

G. & L. M. say their specimen is compact and fibrous in greenstone; colour, yellowish-white with a tinge of green. No. 2 specimen is from South Quarry, Craigenfeoch, and was first noticed by Mr. John Smith, Dalry. It was in considerable quantity, existing as a thin vein running right across the quarry from east to west, but it is now worked out. Like the Bishopton specimen, it is compact and fibrous and white in colour.

A specimen from Craigenfeoch is in the Paisley Museum.

Hornblende (Dana 338)—Silicates of Lime and Magnesia.

1842, N. S. A. of S. R., pp. 84, 148; 1872, T. G. G. S., vol. iv., p. 305.

First records—1842, Lochwinnoch and Paisley, N. S. A. of S. R.; 1872, Gourock, T. G. G. S.

N. S. A. of S. R. says, under Lochwinnoch: "Hornblende (basaltic)—Misty Law Moor;" and under Paisley, "Hornblende schist, with quartz and felspar, frequently occurs in detached masses both on the high and low grounds; and on the road to the farm of Braehead, about 400 feet above sea level, hornblende occurs, almost without admixture with any other mineral. Its colour is dark green approaching to black, and it is so friable as to be easily reduced to its crystalline form." T. G. G. S. says: "Opposite George Place, Gourock, a large oblong mass of dark hornblendic schist." Thomson, in his Mineralogy, vol. i., p. 297, incidentally refers to hornblende when speaking of labradorite found to the south of Paisley.

Nephelite (Dana 357)—Silicates of Alumina, Potash, and Soda.

1911, Survey, Glasgow District, p. 131.

Cathcart (in teschenite), and Barshaw, near Paisley (in theralite).

Olivine or Chrysolite (Dana 376)—Silicates of Magnesia and Iron.

1842, N. S. A. of S. R., p. 148; 1876, C. of W. S. F., p. 158; 1880, T. G. G. S., vol. vii., p. 47; vol. ix., p. 415; 1901, Heddle, vol. ii., p. 52; 1901, F. F. & G., p. 550; 1902, P. N. S.

First records—1842, Paisley, N. S. A. of S. R.; 1880, Kilmacolm and Langbank, T. G. G. S.; 1901, Boylestone, Heddle.

N. S. A. of S. R. reference is:—"Basalt is found massive, towards the western extremity of the range, nearly of a black colour and replete with crystals of augite and olivine."

The Paisley Naturalists' Society specimen was got on Gleniffer, and gave the following analysis:

Silica,	43·31	per cent.
Alumina,	15·46	,,
Ferric Oxide,	6·72	,,
Ferrous Oxide,	5·54	,,
Oxide of Manganese,	...	
Lime,	17·82	,,
Magnesia,	8·87	,,
Soda,	·84	,,
Water (ignition),	1.86	,,
	100·42	

The material was partly soluble in acid and very difficult to fuse with alkali carbonates ($Na_2CO_3 + K_2CO_3$). The ferrous oxide was estimated by dissolving in hydrofluoric acid and sulphuric acid.

Specimens have also been got from Sergentlaw Road—one of black dolerite enclosing olivine

crystals, and the other of porphyry with the olivine in amygdaloidal form.

Specimens are in the Paisley Museum.

Ferrite (Dana 376)—Hydrous Silicates of Iron and Alumina.

1864, T. G. G. S., vol. ii., pp. 36, 170; 1896, Dana, p. 455; 1901, Heddle, vol. ii., pp. 52 and 144; 1901, F. F. & G., p. 550; 1902, P. N. S.

First Records—1864, Gleniffer, T. G. G. S.; 1896, Boylestone, Dana.

The following is a transcript of the original record of this mineral in the T. G. G. S., vol. ii., page 36 :—

"XV. *Note on the Analysis of a Red Mineral from Paisley.*
By J. Wallace Young.

"Mr. John Young was, I believe, the first to direct the attention of the members to this mineral. The specimen analysed was found in amygdaloidal porphyry from Gleniffer Braes, Paisley. It had a deep red colour, and was easily pulverised.

"Water,	4·66	per cent.
Magnesia,	5·26	„
Ferric Oxide,	68·93	„
Soluble Silica,	11·80	„
Insoluble Silica,	9·53	„
	100·18	

The large amount of insoluble silica shows that it is not in its normal condition, but is merely an altered form of some other mineral. From the large percentage of ferric oxide which the variety contains, it might perhaps be named Ferrite."

In the same volume, p. 170, it says: "This mineral in its red state is probably pseudomorphous,

and specimens of it were obtained, showing the change from the normal colour of blackish green, into that of bright red."

An analysis (No. 1) by Heddle, and (No. 2) of a specimen from Gleniffer, gave—

	No. 1. Heddle. per cent.	No. 2. Gleniffer. per cent.
Silica,	13·03	15·68
Alumina,	13·16	5·40
Ferric Oxide,	53·47	61·47
Ferrous Oxide,	4·51	...
Oxide of Manganese,	·15	traces
Lime,	·75	2·03
Magnesia,	6·62	10·41
Alkali,	...	...
Water,	8·39	5·04
	100·08	100·03

The Paisley Naturalists' Society have also secured specimens from Sergentlaw Road showing beautiful crystals.

Specimens are in the Paisley Museum.

Datolite (Dana 401)—Hydrous Silicate and Borate of Lime.

1858, G. & L. M., p. 230; 1876, C. of W. S. F., p. 158; 1901, Heddle, vol ii., p. 63; 1901, F. F. & G., p. 551.

First records—1858, Bishopton, G. & L. M.; 1876, Barrhead (Boylestone), C. of W. S. F.

G. & L. M. say: "A few finely crystallised specimens, engaged on prehnite, were met with

in cutting the railway tunnel near Bishopton." Heddle says: "In the Bishopton railway tunnel, in magnificent groups of snow-white crystals, engaged in spherical brushes of green prehnite."

Specimens are in the following museums—London, Edinburgh, Hunterian, and Paisley.

Prehnite (Dana 411)—Hydrous Silicates of Alumina and Lime.

1816, Jameson, vol. i., p. 296; 1831, T. of R. S. of E., vol. xi. p. 459; 1836, Thomson, vol. i., p. 275; 1837, Phillips, p. 23; 1842, N. S. A. of S. R., pp. 148, 317, 411, 504*; 1858, G. & L. M., p. 197; 1869, T. G. G. S., vol. iii., p. 267; vol. iv., p. 75; vol. vii., p. 215; 1876, C. of W. S. F., p. 161; 1896, Dana, p. 532; 1901, Heddle, vol. ii., p. 72; 1901, F. F. & G., p. 151; 1902, P. N. S.

First records—1816, Hartfield, Jameson; 1831, Kilmacolm, Thomson, in T. of R. S. of E.; 1842, Greenock, Erskine, and Paisley, N. S. A. of S. R.; 1858, Bishopton, G. & L. M.; 1869, Boylestone, T. G. G. S.; 1901, Lochwinnoch, Heddle.

Thomson gives the analyses of two Renfrewshire specimens:—

	No. 1. Hartfield. per cent.	No. 2. Kilmacolm. per cent.
"Silica,	43·60	42·22
Alumina,	23·00	23·68
Lime,	22·33	23·52
Protoxide of Iron,	2·00	3·06
Protoxide of Manganese,	...	...
Alkali,	...	...
Water,	6·40	5·58
	97·33	98·06

The loss being only 2 per cent., I [Thomson] did not suspect the presence of alkali, and therefore did not search for it. No. 1 was light green in colour and fibrous; No. 2 was white and fibrous."

The second analysis is quoted in the Royal Society of Edinburgh Transactions.

N. S. A. of S. R. says: "Paisley—occasionally large druses (in the porphyry) are lined with prehnite." At page 317 it says: "Prehnite is the most common mineral to be met with near Hartfield. It is there found beautifully crystallised, having a broad rectangular four-sided prism rather flatly feoilled in the extremities. It is curious, indeed, that its formation should be in the middle of a moss. We have found large specimens of it so imbedded, and not very many years ago sent a most splendid specimen of it, picked up by us, to the late amiable and talented professor of natural history in the University of Glasgow, Mr. Lockhart Muirhead. The celebrated Brochante, it is said, could not rest satisfied till he visited the place of its formation, Hartfield Moss, and took away with him some of the finest specimens he could find." Reference is made to Brochante, 1-295 and Ann. de. Chem., 1-213.

The Paisley Naturalists' Society have secured specimens from Boylestone, Sergentlaw Road, and Craigenfeoch.

The following specimens from Boylestone were analysed :—

	No. 1. per cent.	No. 2. per cent.	No. 3. per cent.
Silica, - -	42·02	40·22	42·25
Alumina, -	27.92	24·64	27·40
Ferric Oxide, -	traces	4·22	traces
Lime, - -	23·82	25·02	25·99
Magnesia, -	1·23	...	...
Alkali (Soda), -	...	1·16	...
Water, - -	5·40	5·20	3·87
	100·39	100·46	99·51
Specific gravity,	2·858	2·918	not done

No. 1 was massive and crystalline. No. 2 was composed of amygdaloids about 1/8 inch to 1/4 inch in diameter. When the amygdaloids were extracted from the porphyry it was noticed that they had different appearances, and they were separated into four lots thus—

1. Opaque, which are Analcite, forming about $\frac{5}{10}$ths of the quantity.
2. Sugary, which are also Analcite, forming about $\frac{3}{10}$ths of the quantity.
3. Silky fibrous, which are Thomsonite, forming about $\frac{1}{10}$th of the quantity.
4. Transparent, which are Prehnite, forming about $\frac{1}{10}$th of the quantity.

The analysis was performed on these transparent amygdaloids ; only about 2 per cent. of the water was driven off over a bunsen, the blowpipe being required for the rest.

No. 3 was a pink variety. Owing to the proximity of calcite, the sample was treated with weak H Cl before analysis of this specimen.

London Museum has specimens from Boylestone and Hartfield; Edinburgh, specimens from Boylestone and Bishopton; Glasgow, specimens from Boylestone, Bishopton, and Hartfield; Hunterian, specimens from Boylestone, Bishopton, and Erskine; and Paisley has specimens from Hartfield and of the three Boylestone specimens analysed.

Heulandite (Dana 438)—Hydrous Silicates of Alumina and Lime.

1842, N. S. A. of S. R., pp. 317, 411; 1858, G. & L. M., p. 168; 1870, T. G. G. S., vol. iv., p. 75; 1876, C. of W. S. F., p. 159; 1901, Heddle, vol. ii., p. 85.

First records—1842, Greenock and Hartfield, N. S. A. of S. R.; 1858, Kilmacolm, G. & L. M.

The references are merely localities.

Specimens from Kilmacolm are in the Edinburgh and Hunterian Museums; and from Kilmacolm, Port-Glasgow, and Lochwinnoch in the Paisley Museum.

Phillipsite (Dana 441)—Hydrous Silicates of Alumina, Lime, and Potash.

1840, L. & E. P. M., December, p. 402 (Thomson); 1901, Heddle, vol. ii., p. 87.

First records—1840, Bishopton, Thomson, as above; 1901, Kilmacolm, Heddle.

References are localities only.

Harmotome (Dana 442)—Hydrous Silicates of Alumina and Baryta.

1840, L. & E. P. M., December, p. 402 (Thomson); 1901, Heddle, vol. ii., p. 88.

First records—1840, Bishopton, Thomson, as above; 1901, Kilmacolm, Heddle.

References are localities only.

A specimen is in the Hunterian Museum.

Stilbite (Dana 443)—Hydrous Silicates of Alumina and Lime.

1842, N. S. A. of S. R., pp. 84, 148, 360, 387, 411, 548; 1858, G. & L. M., pp. 162, 163; 1870, T. G. G. S., vol. iv., p. 75; vol. vii., p. 46; 1876, C. of W. S. F., p. 162; 1896, Dana, p. 585; 1901, Heddle, vol. ii., p. 91; 1902, P. N. S.

First records—1842, Eaglesham, Greenock, Kilmacolm, Kilbarchan, Lochwinnoch, and Paisley, N. S. A. of S. R.; 1858, Port-Glasgow, G. & L. M.; 1901, Hartfield, Heddle; 1905, Langbank, P. N. S.

N. S. A. of S. R. says that the red variety is found at Eaglesham, Kilbarchan, Lochwinnoch, and Paisley; the yellow variety at Kilmacolm. The variety from Greenock is not stated. G. & L. M. gives Port-Glasgow, and also states that a white variety is found at Kilmacolm. Although recorded for nine localities, stilbite is not a common mineral.

The Paisley Naturalists' Society have specimens from two localities, both being of the red variety. The first is from a cutting on the roadside near Bruntsfield Farm, two miles west from Kilbarchan, where it is plentiful, though in small pieces. This specimen was confirmed by Mr. Goodchild. An analysis gave—

Silica,	55·02	per cent.
Alumina,	16·48	,,
Oxide of Iron,	traces	
Lime,	7·24	,,
Magnesia,	·58	,,
Soda,	4·46	,,
Water (at red heat),	17·00	,,
	100·78	

The second specimen was found on the shore at Langbank. It may have been tipped there along with other material extracted from the cutting near by—the Caledonian Railway is only a few yards off.

The Edinburgh Museum has specimens from Kilmacolm and Bishopton; the Glasgow and Hunterian Museums have specimens from Kilmacolm; and in the Paisley Museum there are specimens from Kilmacolm, Port-Glasgow, Gleniffer, Langbank, Bruntsfield, and Lochwinnoch—the first two being the yellow variety, the others the red variety.

Laumontite (Dana 445)—Hydrous Silicates of Alumina and Lime.

1816, Jameson, vol. i., p. 329; 1837, Phillips, p. 27; 1840, L. & E. P. M., December, p. 402 (Thomson); 1842, N. S. A. of S. R., pp. 84, 317, 360; 1858, G. & L. M., p. 182; 1870, T. G. G. S., vol. iv., p. 75; 1876, C. of W. S. F., p. 159; 1896, Dana, p. 588; 1901, Heddle, vol. ii., p. 93; 1901, F. F. & G., p. 551.

First records—1816, Paisley, Jameson; 1840, Bishopton, Thomson (as above); 1842, Kilbarchan, Lochwinnoch, and Hartfield, N. S. A. of S. R.; 1858, Kilmacolm and Meikle Cloak (Lochwinnoch), G. & L. M.; 1901, Boylestone and Port-Glasgow, Heddle.

Jameson says: "It is found along with cubicite (analcite) in amygdaloid, near Paisley." N. S. A. of S. R. says, under Lochwinnoch Parish, at Edge Brae and Calderbank; and "at a little north of the village of Pennel Brae, Kilbarchan." Heddle quotes: "Boylestone, Bishopton, Kilmacolm, Lochwinnoch, Hartfield, Paisley, and Port-Glasgow."

London Museum has a specimen from Kilmacolm; Edinburgh Museum has specimens from Hartfield and Bishopton; Glasgow Museum has specimens from Kilmacolm and Port-Glasgow; and the Hunterian Museum has about twenty specimens from Erskine, Kilmacolm, and Boylestone. Paisley Museum has one specimen.

Chabazite (Dana 447)—Hydrous Silicates of Alumina and Lime.

1829, E. J. of S., p. 262; 1831, T. of R. S. of E., vol. xi.. p. 457; 1836, Thomson, vol. i., p. 333; 1837, Phillips, p. 146; 1840, L. & E. P. M., December, p. 402 (Thomson); 1842, N. S. A. of S. R., pp. 84, 148, 317, 387, 548; 1858, G. & L. M., p. 171; 1870. T. G. G. S., vol. iv., p. 75; 1876, C. of W. S. F., p. 157; 1896, Dana, p. 592; 1901, Heddle, vol. ii., p. 95; 1901, F. F. & G., p. 551.

First records—1829, Kilmacolm, E. J. of S.; 1842, Eaglesham, Lochwinnoch, Hartfield, and Paisley, N. S. A. of S. R.; 1858, Port-Glasgow, G. & L. M.; 1901, Boylestone, Heddle.

Analyses of three specimens from Kilmacolm :—

	No. 1. per cent.	No. 2. per cent.	No. 3. per cent.
Silica, - -	50·14	48·756	49·20
Alumina, -	17·48	17·440	17·91
Ferric Oxide,	...	...	...
Lime, - -	8·47	10·468	9·64
Soda, - -	...	...	...
Potash, -	2·58	1·548	1·92
Water, - -	20·83	21·720	20·41
	99·50	99·932	99·08
Specific gravity, ...		2·088	...

No. 1 is given by Connell in the E. J. of S. ; Nos. 2 and 3 are by Thomson. G. & L. M. says : "Recently very fine specimens have been found at Granger's Quarry, half a mile north of Alton House, two and a half miles south-west of Kilmacolm." N. S. A. of S. R. quotes Maich Water, Paisley, Kilmacolm, and Eaglesham (banks of Cart). Heddle quotes Boylestone, Kilmacolm, Hartfield, and Port-Glasgow. In the Transactions of the Royal Society of Edinburgh (as above) Thomson says : "Chabazite exists rather abundantly in the neighbourhood of Glasgow. The finest specimens have been found at Kilmacolm, and I am indebted to my friend and pupil Mr. Brown, for a very fine collection of chabazites from that locality." Rammelsberg, in his Minerology, page 148, published in 1841, quotes the analysis by Connell as above.

Specimens from Kilmacolm are in London, Edinburgh (also one from Gryffe tunnel), Glasgow, Hunterian (25 specimens), and Paisley Museums.

Levynite (Dana 449)—Hydrous Silicates of Alumina and Lime.

1837, Phillips, p. 146; 1858, G. & L. M., p. 179; 1876, C. of W. S. F., p. 159; 1896, Dana, p. 595; 1901, Heddle, vol. ii., p. 96; 1901, F. F. & G., p. 551.

First record—1837, Hartfield, Phillips.

All references are the same record.

A specimen from Bishopton Tunnel is in London Museum.

Analcite (Dana 450)—Hydrous Silicates of Alumina and Soda.

1816, Jameson, vol. i., p. 321; 1842, N. S. A. of S. R., pp. 84, 317, 387, 411, 504*; 1858, G. & L. M., p. 186; 1869, T. G. G. S., vol. iii., p. 268; vol. iv., p. 75; vol. vii., p. 46; 1873, C. N., vol. xxvii., p. 56; 1876, C. of W. S. F., p. 157; 1896, Dana, p. 597; 1901, Heddle, vol. ii., p. 100; 1901, F. F. & G., p. 551; 1902, P. N. S.

First records—1816, Hartfield, Jameson; 1842, Eaglesham, Erskine, Greenock, and Lochwinnoch, N. S. A. of S. R.; 1858, Bishopton and Kilmacolm, G. & L. M.; 1869, Boylestone and Gleniffer, T. G. G. S.; 1873, Crofthead, C. N.; 1876, Inverkip, C. of W. S. F.; 1901, Neilston, Heddle; 1901, Port-Glasgow, F. F. & G.; 1902, Bardrain Glen, P. N. S.

Jameson says: "Count de Bournon observed in some specimens from Hartfield Moss a transition from cubicite (analcite) to prehnite." J. Wallace Young, in the Chemical News, quotes two analysis of specimens from Crofthead and Boylestone.

	Crofthead. per cent.	Boylestone. per cent.
" Silica, - -	54·85	55·54
Alumina, - -	22·59	22·27
Lime, - -	·89	...
Soda, - -	12·58	13·75
Water, - -	9·06	8.55
	99·97	100·11
Specific gravity,	2·153	2·259

Only soda was present in each specimen, and each constituent was determined at least twice."

Heddle quotes Bishopton, Boylestone, Erskine, Greenock, Kilmacolm, Hartfield, Neilston, Crofthead, and also gives a short account of Boylestone Quarry, "the storehouse of zeolites" (see page 19). The Paisley Naturalists' Society have noted specimens from Boylestone (three forms), Bardrain, Glen Killoch, and Port-Glasgow, and four analyses have been made :—

	No. 1. per cent.	No. 2. per cent.	No. 3. per cent.	No. 4. per cent.
Silica, - -	54·42	52·83	54·22	55·31
Alumina, -	23·02	24·69	23·42	22·89
Ferric Oxide,	...	traces	traces	...
Lime, - -	·95	·39	·42	·63
Magnesia, -	·26	...	·38	·13
Soda, - -	13·36	12·92	13·68	13·49
Water, -	8·20	8·60	8·20	8·40
	100·21	99·43	100·32	100·85
Specific gravity, ...		2·168	...	2·252

Nos. 1 and 4 were massive and crystalline; No. 2, opaque amygdaloids; No. 3, sugary amygdaloids. Nos. 1, 2, and 3 from Boylestone, and No. 4 from Bardrain. The amygdaloids (Nos. 2 and 3) were associated with Thomsonite and prehnite, and constituted five-tenths and three-tenths of the amount (see under Prehnite, page 54).

Edinburgh Museum has specimens from Bishopton and Boylestone; Glasgow Museum, a specimen from Barrhead; the Hunterian Museum, specimens from Bishopton, Boylestone, Inverkip, and Kilmacolm; and Paisley Museum, specimens from Kilmacolm, Boylestone, Port-Glasgow, Bardrain, Glen Killoch, and Howwood.

Edingtonite (Dana 452)—Silicate of Alumina and Baryta; variety, Glottalite.

1836, Thomson, i., p. 328; 1870, T. G. G. S., iv., p. 75; 1896, Dana, p. 599; 1901, F. F. & G., p. 551.

First record—1836, Port-Glasgow, Thomson.

Thomson gives the following analysis:—

Silica,	37·01	per cent.
Lime,	23·93	,,
Alumina,	16·31	,,
Peroxide of iron,	·50	,,
Water,	21·25	,,
	99·00	

Specific gravity, 2·181

G. & L. M., page 171 (under Chabazite), says that the glottalite of Thomson is chabasite (see Phil. Mag., August, 1855, vol. ix., p. 181), occurring in small aggregated and irregular crystals after the manner of phacolite. Heddle states (Phil. Mag., ix., 181) that it is probably edingtonite mixed with harmotome.

The above analysis, showing no baryta, seems to support Greg and Lettsom's contention.

Natrolite (Dana 453)—Hydrous Silicates of Alumina and Soda.

1852, E. N. P. J., liii., p. 283 (Scott); 1858, G. & L. M., p. 151; 1870, T. G. G. S., iv., p. 75; 1873, C. N., xxvii., p. 56; 1876, C. of W. S. F., p. 160; 1896, Dana, p. 603; 1901, Heddle, ii., p. 105; 1901, F. F. & G., p. 551.

First records—1852, Bishopton, E. N. P. J.; 1858, Hartfield, G. & L. M.; 1870, Port-Glasgow, T. G. G. S.; 1873, Loch Thom, C. N.; 1876, Lochwinnoch (Cloak), C. of W. S. F.; 1901, Boylestone and Kilmacolm, Heddle.

	No. 1. Bishopton.	No. 2. Loch Thom.
	per cent.	per cent.
Silica, - -	47·626	46·29
Alumina, -	27·170	27·10
Soda, - -	15·124	15·37
Lime, - -	...	·72
Water, - -	9·780	10·43
	99·700	99·91

In the E. N. P. J., Dr. Scott gives the above analysis (No. 1), of a specimen from Bishopton, and in the Chemical News, Mr. J. Wallace Young gives the analysis (No. 2) of a specimen from Loch Thom He remarks that the alkali is soda only.

Heddle quotes: Bishopton, Boylestone, Gryffe Tunnel, south of Greenock, Hartfield Moss, Loch Thom cutting, Kilmacolm.

Specimens from Boylestone, Bishopton, Gryffe Tunnel, and Wemyss Bay are in the Edinburgh Museum. A specimen from Port-Glasgow is in the Glasgow Museum. Specimens from Bishopton, Boylestone, Erskine, Kilmacolm, and Port-Glasgow are in the Hunterian Museum; and specimens from Boylestone, Neilston, and Kilmacolm are in Paisley Museum.

Natrolite (Dana 453)—Variety, Mesotype.

1842, N. S. A. of S. R., pp. 411, 504*; 1880, T. G. G. S., vii., p. 46.

First records—1842, Erskine and Greenock, N. S. A. of S. R.; 1880, Kilmacolm, T. G. G. S.

Specimens from Kilmacolm and Port-Glasgow are in the Paisley Museum.

Natrolite (Dana 453)—Variety, Galactite.

1858, G. & L. M., p. 151; 1896, Dana, p. 603; 1901, Heddle, ii., p. 104.

First record—1858, Bishopton, G. & L. M.

Heddle quotes the analyses, made by himself, of two specimens from Bishopton :—

	White. per cent.	Pink. per cent.
Silica, - -	47·60	47·76
Alumina, -	26·60	27·20
Lime, - -	·16	·93
Soda, - -	15·86	14·28
Water, - -	9·56	9·56
	99·78	99·73

These analyses are stated to have appeared in Phil. Mag., xi., 272, which would be before Greg and Lettsom's record, as they quote the same analyses.

A specimen from Port-Glasgow is in the Glasgow Museum.

Scolecite (Dana 454)—Hydrous Silicates of Alumina and Lime.

A specimen from Kilmacolm is in the Hunterian Museum, but there is no printed record.

Mesolite (Dana 455)—Hydrous Silicates of Alumina and Lime.

1852, E. N. P. J., liii. p. 283 (Scott); 1858, G. & L. M., p. 155; 1876, C. of W. S. F., p. 160; 1896, Dana, p. 606; 1901, Heddle, ii., pp. 109, 111; 1901, F. F. & G., p. 551.

First records—1852, Bishopton, E. N. P. J.; 1858, Hartfield, G. & L. M.; 1901, Loch Thom, Greenock, and Kilmacolm, Heddle.

Dr. Scott, E. N. P. J., says: "Natrolite occurs at Bishopton in juxta-position with mesolite and

calcareous spar." Heddle quotes: "Hartfield Moss, Kilmacolm, Loch Thom, and the Gryffe Water Works Tunnel, Greenock."

Specimens from Kilmacolm are in London, Edinburgh, and Glasgow Museums, and specimens from Port-Glasgow in the Edinburgh and Paisley Museums.

Thomsonite (Dana 456)—Hydrous Silicates of Alumina and Lime.

1836, Thomson, i., p. 314; 1842, N. S. A. of S. R., pp. 317, 504*; 1858, G. & L. M., pp. 159, 160; 1866, T.G.G.S., ii., p. 158; iii., pp. 32, 268; iv., p. 75; vii., p. 432; 1876, C. of W. S. F., p. 162; 1896, Dana, p. 608; 1901, Heddle, ii., p. 111; 1901, F. F. & G., p. 551; 1902, P. N. S.

First records—1836, Lochwinnoch, Thomson; 1842, Hartfield and Erskine, N.S.A.of S.R.; 1858, Kilmacolm and Port-Glasgow, G.& L.M.; 1868, Loch Thom and Boylestone, T. G. G. S.; 1901, Bishopton, Greenock, Johnstone, and Crofthead, Heddle.

	No. 1. per cent.	No. 2. per cent.	No. 3. per cent.	No. 4. per cent.	No. 5. per cent.
Silica, - -	36·80	37·56	38·44	33·86	41·45
Alumina, - -	31·36	31·96	30·24	32·24	27·71
Lime, - -	15·40	15·10	13·44	16·22	13 61
Magnesia, - -	·20	1·08	...	traces	·51
Protoxide of Iron,	·60	·72	...	...	traces
Alkali (Soda), -	...	...	6·45	3·63	3·81
Water, - -	13·00	13·20	11·83	14·20	12·80
	97·36	99·62	100·40	100·15	99·89

Analyses Nos. 1 and 2 are by Thomson, of specimens from Lochwinnoch. He says alkali was specially tested for, but none was present. Greg and Lettsom say: "A considerable portion

of the lime, usually one equivalent, is generally replaced by soda. Thomson, however, has given two analyses (see above) of a thomsonite from Lochwinnoch which is remarkable for the entire absence of soda."

No. 3 is an analysis, by Lacroix, quoted by Heddle, of a Bishopton specimen, which appeared in Bull. Soc. Min., vol. x., p. 149.

Nos. 4 and 5 are analyses of two Boylestone specimens—No. 4 fibrous and No. 5 amygdaloidal. These amygdaloids form part of the amygdaloids extracted from the porphyry, and constituted a tenth of the whole (see page 54).

Paisley Naturalists' Society have also specimens from Sergentlaw Road and Craigenfeoch.

Heddle quotes: Bishopton, Boylestone, Greenock, Johnstone, Kilmacolm, Lochwinnoch, Loch Thom, Port-Glasgow, Crofthead (Wallace Young).

Specimens from Boylestone and Bishopton are in Edinburgh, Glasgow, and Hunterian Museums; also from Gryffe Tunnel in Edinburgh, from Hartfield in Glasgow, and from Erskine in Hunterian. Paisley Museum has specimens from Boylestone, Craigenfeoch, Sergentlaw, and Kilmacolm.

Mica (Dana 458)—Hydrous Silicates of Alumina, Magnesia, and Potash.

1842, N. S. A. of S. R., p. 84; 1867, T. G. G. S., ii., pp. 200, 204, 205, 206, 208; iv., p. 305; 1902, P. N. S.

First records –1842, Lochwinnoch, N. S. A. of S. R.; 1867, Cathcart, Giffnock, Port-Glasgow, and Gourock, T. G. G. S.; 1902, Langbank, P. N. S.

N. S. A. of S. R. says: "Mica, lamellar, Barr Quarry, in freestone." T. G. G. S. says: "Opposite Ashton a large rounded boulder of mica schist;" and "in sandstone from Braidbar Quarry, Cathcart, and sandstone at Giffnock, Port-Glasgow, and Gourock."

The Paisley Naturalists' Society specimens are from granite boulders on the shore near Cloch, and at Langbank.

Specimens are in Paisley Museum.

Delessite (Dana 478)—Hydrous Silicates of Alumina, Iron, and Magnesia.

1880, T. G. G. S., vii., pp. 46-47; 1901, Heddle, ii., p. 128.

First record—1880, Kilmacolm, T. G. G. S.

A specimen from Kilmacolm, also a microscopic section by A. Pratt, are in the Hunterian Museum.

Paisley Museum has a specimen from Erskine.

Serpentine (Dana 481)—Hydrous Silicate of Magnesia.

1876, C. of W. S. F., p. 161. Locality—Bishopton.

Steatite (Dana 484)—Hydrous Silicate of Magnesia.

1842, N. S. A. of S. R., pp. 84 and 387.

Localities given — Eaglesham, Lochwinnoch (Loanhead and Calderbank).

Saponite (Dana 488)—Hydrous Silicates of Alumina, Iron, and Magnesia.

1901, Heddle, ii., p. 141; 1902, P. N. S.

First records—1901, Boylestone and Greenock, Heddle; 1902, Kilbarchan, Bridge of Weir, Craigenfeoch, and Howwood, P. N. S.

Heddle says: "At Boylestone Quarry, generally lavender coloured;" and "at Gryffe Tunnel, Greenock, crystallised in minute plates on natrolite, sap-green."

Paisley Naturalists' Society have secured seven specimens—three from Boylestone (dark green, dark red, and green), and one each from Kilbarchan, Bridge of Weir, Craigenfeoch, and Howwood.

The first five have been analysed, with the following results:—

	Boylestone			Kilbarchan	Bridge of Weir
	Dark Green per cent.	Dark Red per cent.	Soft Green per cent.	per cent.	per cent.
Silica,	33·96	36·65	32·62	35·02	40·43
Alumina,	16·14	5·61	17·82	22·82	9·33
Peroxide of Iron,	8·00	4·69	3·70	4·16	1·12
Protoxide of Iron,	8·93	5·33	8·21	3·55	3·74
Oxide of Manganese,	...	...	·62	...	...
Lime,	7·10	4·01	...	1·22	2·06
Magnesia,	7·49	17·29	21·26	23·99	23·36
Alkali (Soda),	·98	2·55	2·41	·40	2·87
Carbonic Acid,	3·17	3·15	...	...	...
Water (Ignition),	13·62	20·44	13·91	9·14	17·10
	99·39	99·72	100·55	100·30	100·01
Specific gravity,	...	2·224	2·426	...	2·239

The Kilbarchan specimen was confirmed by Mr. Goodchild.

In connection with the above analysis of the dark red specimen from Boylestone, about 1·7 per cent. was soluble in water. The mineral was very easily soluble in H Cl. The protoxide of iron was estimated in the H Cl solution. The mineral fell to pieces when placed in water.

For analyses of saponites, see T. G. G. S., vol. vii., p. 212.

Specimens of all the above are in Paisley Museum.

SAPONITE (Dana 488)—Variety, Bowlingite.

There are no printed records for the shire.

Paisley Naturalists' Society record it from Boylestone and Craigenfeoch. The Boylestone specimen was analysed as follows:—

Silica,	29·71	per cent.
Alumina,	22·01	,,
Peroxide of Iron,	1·60	,,
Protoxide of Iron,	15·41	,,
Oxide of Manganese,	traces	
Lime,	4·19	,,
Magnesia,	15·39	,,
Alkali,	...	
Carbonic Acid,	traces	
Water (ignition),	11·49	,,
	99·80	

This specimen was confirmed by Mr. Goodchild. Specimens are in Paisley Museum.

CELADONITE (Dana 489)—Hydrous Silicates of Iron, Magnesia, and Potash.

1901, Heddle, ii., p. 146. Locality—Muirhouse.

Heddle says: "In a quartzose and calcitic vein cutting a fine grained dolerite at (? Muirhouse) Quarry, in massive bands."

KAOLINITE (Dana 492)—Hydrous Silicate of Alumina.

Also called Lithomrage and Porcellanite.

1842, N. S. A. of S. R., pp. 84 and 411; 1905, P. N. S.

First records—1842, Greenock and Lochwinnoch, N. S. A. of S. R.; 1905, Ferguslie, P. N. S.

The N. S. A. of S. R. says: "Lochwinnoch—road from the village to the Langyard;" and "Greenock—the secondary greenstone of which the surrounding hills are formed—contains rare but distinct specimens of a very fine greenish lithomrage."

The Paisley Naturalists' Society specimen was pure white, in a vein from $\frac{1}{4}$ inch to 1 inch thick, and gave the following analysis:—

Silica,	47·99	per cent.
Alumina,	39·77	,,
Oxide of Iron,	none	
Lime,	traces	
Magnesia,	none	
Water (ignition),	12·54	,,
	100·30	

A specimen is in Paisley Museum.

CHRYSOCOLLA (Dana 504)—Silicate of Copper.

1901, Heddle, ii., p. 150. Locality—Boylestone.

Heddle says: "At Boylestone, coating prehnite, and in association with native copper."

A specimen from Boylestone is in the Edinburgh Museum.

APATITE (Dana 549)—Phosphate of Lime.

There are no printed records for the shire.

Paisley Naturalists' Society record coprolites (phosphate of lime) from Blackstone, Hurlet, and Corkerhill. The specimens were proved qualitatively to be phosphate of lime, and a full analysis of the Blackstone specimen gave the following result:—

	per cent.
Phosphate of Lime ($Ca_3(PO_4)_2$),	68·73
Carbonate of Lime ($CaCO_3$), -	15·56
Sulphate of Lime ($CaSO_4$), -	2·34
Carbonate of Magnesia ($MgCO_3$),	2·44
Carbonate of Iron ($FeCO_3$), -	·93
Oxide of Iron, - - - -	...
Sulphide of Iron (FeS_2), - -	2·10
Oxide of Manganese, - -	...
Oxide of Copper, - - -	traces
Organic Matter, - - -	·63
Clay, - - - - -	6 82
Water, at 212° F., - - -	·80
	100·35

The pyrites could be distinguished in the mass before grinding, but it was impossible to separate it.

Specimens are in the Paisley Museum.

Vivianite (Dana 597)—Phosphate of Iron.

1877, T. G. G. S., vi., p. 55. Locality—Paisley.

Dr. Robertson, in the above Transactions, says: "The clay in the new tank (No. 4) excavation, down to the depth of 18 or 20 feet, was very black in colour and had a forced and disturbed appearance, much of it along the west side being composed of blocks of red and black mould pressed together and traversed in all directions by numerous fractures, which were filled with patches of vivianite or blue phosphate of iron."

A specimen is in Paisley Museum.

Barite (Dana 719)—Sulphate of Barium.

1842, N. S. A. of S. R., pp. 84, 387, 411; 1858, G. & L. M., p. 66; 1876, C. of W. S. F., p. 157; 1893, T. G. G. S., x., pp. 127 and 169; xi., p. 234; 1901, Heddle, i., p. 145, and ii., pp. 93 and 168; 1901, F. F. & G., p. 552; 1902, P. N. S.

First records—1842, Eaglesham, Greenock, and Lochwinnoch, N. S. A. of S. R.; 1898, Muirshiels (Queenside), T. G. G. S.; 1901, Gourock and Mearns, Heddle; 1902, Kilbarchan and Blackstone, P. N. S.

N. S. A. of S. R. says: "Eaglesham—a great quantity of heavy spar (barite) at Balagich Hill, two miles west of the village." "Greenock—secondary greenstone contains sulphate of barytes," and "Lochwinnoch—Raith Water, Kaim, Knows, and Cruickhill." T. G. G. S., vol. x.: "Maich

Water—a vein of this mineral 10 inches thick can be seen." Vol. xi. gives a good description of Queenside Mine at Muirshiels (see page 21). This vein of barite runs up to 20 feet thick. Heddle quotes: "Eaglesham, Gourock, Lochwinnoch, Mearns, and Muirshiels."

The Paisley Naturalists' Society have secured specimens from Kilbarchan, Blackstone, Queenside, and Kaim, the first three of which were analysed as follows:—

	Kilbarchan. per cent.	Blackstone. per cent.	Greenside. per cent.
Sulphate of Baryta ($BaSO_4$),	97·30	97·60	96·22
Sulphate of Lime ($CaSO_4$), -	1 71	2·30	4·62
Ferric Oxide, - - -	·55	·30	traces
Water (ignition), - - -	·18	·47	...
	99·74	100·67	100·84
Specific gravity, - -	4·316	4·336	4·164

Specimens from Gourock are in the Edinburgh and Hunterian Museums, and Paisley Museum has specimens from Gourock, Neilston, Lochwinnoch, Kaim, Muirshiels, Waterstone (Kilbarchan), and Blackstone.

Mirabilite (Dana 743)—Sulphate of Soda.

1842, N. S. A. of S. R., p. 154; 1876, C. of W. S. F., p. 160; 1901, F. F. & G., p. 552.

First record—1842, Hurlet, N. S. A. of S. R.

N. S. A. of S. R. says: "The Hurlet mines occasionally produce specimens of native sulphate of soda."

Gypsum (Dana 746)—Sulphate of Lime.

1842, N. S. A. of S. R., p. 411; 1858, G. & L. M., p. 74; 1873, T.G.G.S., iv., p. 326; 1876, C. of W. S. F., p. 159; 1901, Heddle, ii., p. 180.

First records—1842, Greenock, N.S.A. of S.R.; 1858, Hurlet, G. & L. M.; 1873, Loch Thom, T. G. G. S.; 1901, Gourock, Heddle.

N. S. A. of S. R. says: "Greenock—the sandstone rocks contain a few small portions, lately discovered, of gypsum." T. G. G. S. say: "Loch Thom—a fine section exposed at the south-west end of the loch, showing some thirty beds of nodular limestone interstratified with dark-coloured shales mixed with gypsum."

A specimen from Gourock is in the Edinburgh Museum.

Epsomite (Dana 748)—Sulphate of Magnesia.

1816, Jameson, ii., p. 309; 1837, Phillips, p. 185; 1842, N. S. A. of S. R., p. 154; 1858, G. & L. M., p. 70; 1901, Heddle, ii., p. 180; 1901, F. F. & G., p. 552; 1911, T. G. G. S., xiv., p. 173.

First records—1816, Hurlet, Jameson; 1901, Giffnock, F. F. & G.

Jameson says: "Occurs as an efflorescence at Hurlet with natural alum." N. S. A. of S. R. says: "The Hurlet mines occasionally produce specimens of native sulphate of magnesia."

A specimen from Hurlet is in the London Museum, and specimens from Kilbarchan and Giffnock in the Paisley Museum.

Melanterite (Dana 751)—Sulphate of Iron.

1837, Phillips, p. 232; 1858, G. & L. M., p. 274; 1876, C. of W. S. F., p. 160; 1896, Dana, p. 942; 1901, Heddle, vol. ii., p. 181; 1901, F. F. & G., p. 552; 1902, P. N. S.

First records—1837, Hurlet, Phillips; 1902, Staneley, P. N. S.

Phillips says: "In most cases it is produced by the decomposition of other minerals, particularly iron pyrites. In aluminous shale at Hurlet." G. & L. M. say: "In fibres of a green colour in the aluminous shale at Hurlet." Heddle says: "Hurlet and many other localities."

The Paisley Naturalists' Society specimen is from a cutting at Staneley, on the new Paisley, Nethercraigs, and Barrhead Railway, where it is found associated with iron pyrites in sandstone. The pyrites, when analysed, gave the following results:—

Sulphide of Iron,	-	79·41 per cent.
Sulphate of Iron,	-	3·03 ,,
Ferric Oxide, -	-	1·71 ,,
Arsenic,	-	·03 ,,
Insoluble,	-	13·98 ,,
Moisture,	-	1·25 ,,
		99·41

This shows that three to four per cent. of melanterite ($Fe\ SO_4 + 7\ H_2O$) is present. It comes out as an incrustation or efflorescence, and when this was tested separately it was found to be sulphate of iron.

Specimens are in Paisley Museum.

KALINITE (Dana 764)—Potash Alum.

1837, Phillips, p. 202; 1858, G. & L. M., pp. 71, 466; 1896, Dana, p. 951; 1901, Heddle, ii., p. 181; 1901, F. F. & G., p. 552.

First record—1837, Hurlet, Phillips.

G. & L. M. says: "In considerable quantity in shale at Hurlet" (see p. 22).

Halotrichite (Dana 769)—Iron Alum.

1816, Jameson, ii., p. 305; 1836, Thomson, i., p. 472; 1842, N. S. A. of S. R., p. 154; 1858, G. & L. M., p. 274; 1876, C. of W. S. F., p. 159; 1896, Dana, p. 955; 1901, Heddle, ii., p. 181; 1901, F. F. & G., p. 552.

First records—1816, Hurlet, Jameson; 1901, Giffnock F. F. & G.

Jameson says: "It occurs as an efflorescence on the surface of bituminous shale and slate-clay at Hurlet." Thomson quotes two analyses (Nos. 1 and 2), presumably made on specimens from Hurlet, as this is the only place he quotes, and he also gives an analysis (No. 3) by Phillips, presumably also from the same place (Phillips' 1837 edition does not give this analysis):—

	No. 1. Thomson. per cent.	No. 2. Thomson. per cent.	No. 3. Phillips. per cent.
Sulphuric Acid, -	35·600	28·635	30·9
Protoxide of Iron,	13·560	19·935	20·7
Alumina, - -	7·127	2·850	5·2
Water, - -	43·713	48·580	43·2
	100·000	100·000	100·0

Greg and Lettsom quote Thomson's first analysis (No. 1 above) as from Hurlet, and say: "This is probably a mixture of true iron alum with melanterite, for Dr. Thomson observes that the amount both of protoxide of iron and of the alumina is found to vary;" and at page 466 they

say: "At Hurlet, clay-slate having been long exposed to air and moisture, sulphate of iron and sulphate of alumina are formed. This double sulphuret occurs in the form of soft delicate fibres, nearly colourless, and with a silky lustre." They then quote Phillips' analysis (No. 3 above). Heddle says: "An analysis by Dr. Thomson of a specimen from Hurlet closely accords with the theoretical composition." This seems to confute Greg and Lettsom's statement given above.

ASPHALTUM—see Ozocerite (p. 79).

ALBERTITE.

1901, F. F. & G., p. 552. Locality—Nitshill (Hurlet).

CARBONITE, or Carbonated Coal.

1901, F. F. & G., p. 553; 1902, P. N. S.

First records—1901, Paisley (Jenny's Well), F. F. & G.; 1902, Arkleston, P. N. S.

This is coal carbonated by contact with hot lava, and it has become coked and quite columnar in structure. Paisley Naturalists' Society have specimens from both places. An analysis of a specimen from Jenny's Well gave—

Carbonaceous matter, -	74·00 per cent.
Ash, - - - -	26·00 „
Moisture, - - -	traces.
	100·00

Specimens are in Paisley Museum.

Ozocerite—Variety, Elaterite.

1828, P. M., p. 319; 1837, Phillips, p. 389; 1842, N. S. A. of S. R., pp. 84, 155, 156; 1858, G. & L. M., p. 14; 1876, C. of W. S. F., p. 157; 1901, Heddle, ii., p. 186; 1901, F. F. & G., p. 553; 1907, P. N. S.

First records—1828, Paisley, P. M.; 1837, Hurlet, Phillips; 1842, Lochwinnoch, N. S. A. of S. R.

Phillips calls it "earthy bitumen at coal mines of Hurlet, enclosing crystals of calcareous spar." N. S. A. of S. R. quotes it as bitumen at Garpal Lime Quarry; and G. & L. M. and Heddle say: "with calcite at Hurlet."

An exceedingly interesting account of this substance occurring in Mill Street Quarry, Paisley, is contained in a letter by Mr. A. K. Young, in the Paisley Magazine, 1828, page 319, of which the following is a copy:—

"Sir,—As your magazine ought to be the proper medium for diffusing scientific as well as literary novelties, I shall trouble you with the following description of a curious bituminous substance which has been occasionally found in the crevices of whinstone at the quarry in Mill Street. Of late it has attracted the attention of many of your readers, not less by its singular appearance than by its extraordinary locality. The whinstone rock in which it is found forms an extensive bed on the east side of the town and to the south of the Glasgow Road. It lies but a few feet below the surface, and has been wrought to the depth of perhaps 17 or 20 feet for building and causwaying materials. The stone is of a hard and compact texture, of a light grey colour, and contains numerous rhomboidal crystals of carbonate of lime and cubes of sulphuret of iron. In the course of the veins, small cavities are frequently met with lined with crystallised silex or coated with mammillary concretions of carbonate of

lime. In these cavities, the substance to be described is principally found. In colour and consistence the substance in question nearly resembles that of soft soap, being of a pale brownish or greenish yellow. It has a resinous lustre, a soft greasy feel, and so transparent in the recent state as to admit of subjacent objects being seen distinctly through it. Upon being exposed for some time to the air it retains its colour, but assumes a firmer and more wax-like texture. It exhales a strong bituminous odour resembling that of oil of amber, and appears to be of the specific gravity of ·910, a little less than that of olive oil. When heated in a spoon over a spirit lamp it speedily melts, boils, and diffuses a whitish fragrant vapour. It is not remarkably inflammable, but when made to burn gives a light resembling that of a common candle, and leaves but little residuum. It readily dissolves in spirits of turpentine. In pure naphtha procured from coal tar it becomes fluid, but remains at the bottom of the vessel in which the experiment is made, like a drop of olive oil. In sulphuric, nitric, and muriatic acids it remains unaltered. It differs in colour, viscidity, and inflammability from the mineral oil or petroleum of Jameson, though undoubtedly it must be considered as a variety of that substance. It is held in high estimation by the quarriers as a healing salve, and when it can be procured is applied with a liberal hand to their cuts and bruises.

"Paisley, May 29th, 1828."

The N. S. A. of S. R. makes a copy of the latter half of this letter, and in a footnote says: "In the former Statistical Account, vol. vii., p. 83, notice is taken of a substance somewhat similar being found in other places. A bituminous substance is found both in the limestone and whinstone quarries. It drops in a fluid state from the limestone at Blackhall; in that at Hurlet it is found solid, sometimes so indurated as to be cut with a knife; in both cases highly inflammable."

The Paisley Naturalists' Society have secured a specimen at a cutting in Kilnside Road, just at the former Mill Street Quarry, which contains, in one piece, all the minerals mentioned by Mr. Young, viz., pyrites, quartz, calcite, and ozocerite.

A specimen from Hurlet is in Edinburgh Museum, and specimens from Mill Street and Gas Works are in Paisley Museum.

III.

TABLE 1,

Giving Chronological Order and Year of the Various Minerals being Recorded.

1816. Prehnite, Laumontite, Analcite, Epsomite, Halotrichite.

1828. Pyrites, Quartz, Calcite, Ozocerite.

1829. Chabazite.

1836. Fluorite, Gothite, Labradorite, Glottalite, Thomsonite.

1837. Levynite, Melanterite, Kalinite.

1840. Greenockite, Orthoclase, Phillipsite, Harmotome.

1842. Copper (Metallic), Chalcopyrite, Manganite, Limonite, Wad, Ankerite, Siderite, Aragonite, Malachite, Augite, Hornblende, Olivine, Heulandite, Stilbite, Mesotype, Mica, Steatite, Kaolinite, Barite, Mirabilite, Gypsum.

1852. Natrolite, Mesolite.

1858. Galena, Salmiac, Weissigite, Pectolite, Datolite, Galactite.

1864. Ferrite.

1876. Dolomite, Serpentine.

1877. Vivianite.

1880. Magnetite, Plagioclase, Delessite.

1901. Millerite, Bornite, Haematite, Erythrite, Albite, Saponite, Celadonite, Chrysocolla, Albertite, Carbonite.

1902/05. Bowlingite, Apatite, Cerusite, Chalcosite, Blende.

1911. Nephelite.

Indefinite. Cuprite, Scolecite.

TABLE 2,

Giving Renfrewshire Minerals named in each Publication.

1816. *Jameson.*—Prehnite, Laumontite, Analcite (Cubicite), Epsomite, Halotrichite.

1828. *Paisley Magazine.*—Pyrites, Quartz, Calcite, Ozocerite.

1829. *E. J. of S.*—Chabazite.

1831. *T. of R. S. of E.*—Prehnite, Chabazite.

1836. *Thomson.*—Fluorite, Gothite, Labradorite, Prehnite, Chabazite, Glottalite, Thomsonite, Halotrichite.

1837. *Phillips.*—Fluorite, Prehnite, Laumontite, Chabazite, Levynite, Epsomite, Melanterite, Kalinite, Asphaltum.

1840/52. *E. N. P. J.*—Greenockite, Calcite, Orthoclase, Natrolite, Mesolite.

1841. *Rammelsberg.*—Greenockite, Prehnite, Phillipsite, Harmotome, Laumontite, Chabazite, Glottalite, Thomsonite, Halotrichite.

1842. *N. S. A. of S. R.*—Copper (Native), Greenockite, Chalcopyrite, Pyrites, Fluorite, Quartz, Manganite, Limonite, Wad, Calcite, Ankerite, Siderite, Aragonite, Malachite, Orthoclase, Labradorite, Augite, Hornblende, Olivine, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Analcite, Mesotype, Thomsonite, Mica, Steatite, Kaolinite, Barite, Mirabilite, Gypsum, Epsomite, Halotrichite, Asphaltum, Ozocerite.

1858. *G. & L. M.*—Copper (Native), Galena, Greenockite, Salmiac, Fluorite, Gothite, Calcite, Weissigite, Pectolite, Datolite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Levynite, Analcite, Natrolite, Galactite, Mesolite, Thomsonite, Barite, Gypsum, Epsomite, Melanterite, Kalinite, Halotrichite, Asphaltum.

1860/1911. *T. G. G. S.*—Copper (Native), Galena, Greenockite, Pyrites, Fluorite, Quartz, Magnetite, Manganite, Calcite, Dolomite, Siderite, Malachite, Orthoclase, Plagioclase, Augite, Hornblende, Olivine, Ferrite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Analcite, Glottalite, Natrolite, Mesotype, Thomsonite, Mica, Delessite, Vivianite, Barite, Gypsum, Epsomite.

1873. *Nicol.*—Greenockite, Fluorite, Prehnite, Stilbite, Chabazite, Levynite, Galactite, Thomsonite, Epsomite, Melanterite, Kalinite, Halotrichite.

1873. *Chemical News.*—Analcite, Natrolite.

1876. *C. of W. S. F.*—Copper (Native), Greenockite, Fluorite, Quartz, Calcite, Dolomite, Aragonite, Weissigite, Olivine, Datolite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Levynite, Analcite, Natrolite, Mesolite, Thomsonite, Serpentine, Barite, Mirabilite, Gypsum, Melanterite, Halotrichite, Asphaltum.

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1911. *Survey.*—Nephelite.

TABLE 3,

Showing Minerals found in each Locality.

Localities arranged alphabetically; Minerals according to Dana.

Barrhead.—Wad.

Bishopton.—Galena, Greenockite, Gothite, Calcite, Dolomite, Orthoclase, Pectolite, Datolite, Prehnite, Phillipsite, Harmotome, Laumontite, Analcite, Natrolite, Galactite, Mesolite, Thomsonite, Serpentine.

Boylestone.—Copper (Native), Greenockite, Cuprite, Gothite, Calcite, Malachite, Erythrite, Albite, Olivine, Ferrite, Datolite, Prehnite, Laumontite, Chabazite, Analcite, Natrolite, Thomsonite, Saponite, Bowlingite, Chrysocolla.

Bridge of Weir.—Quartz, Saponite.

Cathcart.—Galena, Dolomite, Nephelite, Mica.

Cloak, under Lochwinnoch.

Corkerhill.—Siderite, Apatite.

Craigenfeoch.—Blende, Quartz, Calcite, Pectolite, Thomsonite, Saponite, Bowlingite.

Crofthead.—Calcite, Analcite, Thomsonite.

Drumshantie, under Gourock.

Eaglesham.—Quartz, Calcite, Orthoclase, Stilbite, Chabazite, Analcite, Steatite, Barite.

Erskine.—Copper (Native), Greenockite, Quartz, Calcite, Prehnite, Analcite, Mesotype, Thomsonite, Delessite.

Giffnock.—Mica, Epsomite, Halotrichite.

Gleniffer, under Paisley.

Gourock and District.—Bornite, Fluorite, Quartz, Haematite, Gothite, Wad, Calcite, Dolomite, Ankerite, Malachite, Orthoclase, Hornblende, Mica, Barite, Gypsum.

Greenock and District.—Quartz, Calcite, Aragonite, Malachite, Erythrite, Prehnite, Heulandite, Stilbite, Analcite, Mesotype, Mesolite, Thomsonite, Saponite, Kaolinite, Barite, Gypsum.

Hartfield.—Quartz, Weissigite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Levynite, Analcite, Natrolite, Mesolite, Thomsonite.

Houston.—Siderite.

Howwood.—Galena, Chalcosite, Calcite, Aragonite, Cerussite, Saponite.

Hurlet.—Pyrites, Salmiac, Calcite, Siderite, Apatite, Mirabilite, Gypsum, Epsomite, Melanterite, Kalinite, Halotrichite, Asphaltum, Albertite, Ozocerite.

Inchinnan.—Calcite.

Inverkip.—Analcite.

Johnstone.—Siderite, Thomsonite.

Kaim.—Chalcosite, Pyrites, Calcite.

Kilbarchan.—Quartz, Wad, Calcite, Siderite, Stilbite, Laumontite, Saponite, Barite.

Kilmacolm.—Quartz, Magnetite, Gothite, Calcite, Malachite, Orthoclase, Plagioclase, Augite, Olivine, Prehnite, Heulandite, Phillipsite, Harmotome, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Mesotype, Scolecite, Mesolite, Thomsonite, Delessite.

Langbank.—Calcite, Orthoclase, Olivine, Stilbite, Mica.

Loch Thom.—Quartz, Natrolite, Mesolite, Thomsonite, Gypsum.

Lochwinnoch and District.—Chalcosite, Chalcopyrite, Pyrites, Quartz, Manganite, Limonite, Wad, Calcite, Siderite, Aragonite, Malachite, Orthoclase, Augite, Hornblende, Prehnite, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Thomsonite, Mica, Steatite, Kaolinite, Barite, Asphaltum.

Mearns.—Barite.

Muirhouse.—Celadonite.

Muirshiels.—Barite.

Neilston.—Copper (Native), Analcite.

Nitshill, under Hurlet.

Paisley and District.—Pyrites, Quartz, Limonite, Calcite, Siderite, Aragonite, Plagioclase, Labradorite, Augite, Hornblende, Nephelite, Olivine, Ferrite, Prehnite, Stilbite, Laumontite, Chabazite, Analcite, Kaolinite, Apatite, Vivianite, Barite, Melanterite, Carbonite, Ozocerite.

Pollok Castle.—Aragonite.

Pollokshields.—Millerite.

Port-Glasgow—Stilbite, Laumontite, Chabazite, Analcite, Glottalite, Natrolite, Thomsonite, Mica.

Queenside, under Muirshiels.

Waas Hill.—Quartz.

TABLE 4.

SPECIMENS OF RENFREWSHIRE MINERALS ARE SHOWN IN THE RESPECTIVE MUSEUMS AS FOLLOWS :

British Museum, London.

Copper (Native), Greenockite, Datolite, Prehnite, Laumontite, Chabazite, Levynite, Mesolite, Epsomite.

Royal Scottish Museum, Edinburgh.

Copper (Native), Greenockite, Fluorite, Quartz, Cuprite, Haematite, Gothite (Rubinglimmer), Wad (Psilomelane), Calcite, Malachite, Datolite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Mesolite, Thomsonite, Chrysocolla, Barite, Gypsum, Asphaltum.

Kelvingrove Museum, Glasgow.

Copper (Native), Greenockite, Fluorite, Magnetite, Calcite, Prehnite, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Galactite, Mesolite, Thomsonite.

Hunterian Museum, University, Glasgow.

Copper (Native), Greenockite, Quartz, Calcite, Malachite, Datolite, Prehnite, Heulandite, Harmotome, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Scolecite, Thomsonite, Delessite, Barite

Museum, Paisley.

Copper (Native), Galena, Chalcosite, Blende, Greenockite, Pyrites, Fluorite, Quartz, Haematite, Gothite, Limonite, Wad, Calcite, Siderite, Aragonite, Cerussite, Malachite, Orthoclase, Labradorite, Augite, Pectolite, Olivine, Ferrite, Datolite, Prehnite, Heulandite, Stilbite, Laumontite, Chabazite, Analcite, Natrolite, Mesotype, Mesolite, Thomsonite, Mica, Delessite, Saponite, Bowlingite, Kaolinite, Apatite, Vivianite, Barite, Epsomite, Melanterite, Carbonite, Ozocerite.

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