

*The mineral collection of Thomas Pennant (1726–1798).*¹

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THOMAS PENNANT was born at Downing, Whitford, near Holywell, in 1726. A contemporary and correspondent of Linnaeus and Buffon, he is well known to zoologists as a pioneer of British zoology, and to him were addressed the letters of Gilbert White which form the greater part of 'The Natural History and Antiquities of Selborne'. He travelled very extensively in the British Isles and wrote many accounts of his tours, perhaps the best known being his account of London and his 'Tour in Wales'.

Up to the present, Pennant's sole claim to the attention of mineralogists has been his account of the mineral district of Flintshire, an account which appeared in 'A Tour in Wales' in 1778, and which was republished with some additions in 'The History of the parishes of Whiteford and Holywell' in 1796: it was largely quoted in the Geological Survey memoir dealing with that district.²

Though Pennant himself has told us very little of his study of minerals, his description of Flintshire shows that he had accurate information of the mines of that area and of the minerals which they produced. In 'The Literary Life of the late Thomas Pennant, Esq., By Himself', which he published in 1798, he tells us that in 1746 or 1747, while an undergraduate at Queen's College, Oxford, he made a tour from Oxford to Cornwall. In Cornwall he met William Borlase, Vicar of Ludgvan, and under his guidance commenced to collect minerals and fossils.

Though in 1798 Pennant felt that his literary career was at an end, he enjoyed five more years of a vigorous life. In 1796 he published 'The

¹ Communicated by permission of the Trustees of the British Museum.

² 'Geology of the neighbourhoods of Flint, Mold, and Ruthin,' Geol. Survey Memoir, 1890, p. 159 et seq.

History of the parishes of Whiteford and Holywell', which opens with an account of Downing, his birthplace and residence, and contains the following interesting statement: 'Downing may boast of a good and numerous collection of fossils and minerals, partly collected by myself, partly by my son in his extensive travels; many of the specimens are elegant, and most of them instructive' (p. 22). By the generous gift of the Earl of Denbigh this collection, after remaining almost untouched for more than a century, has become the property of the Trustees of the British Museum. The collection originally contained about 1,300 specimens; about 800 of these still remain, some 340 still bearing their original labels.

The son mentioned in the passage quoted above was David Pennant, eldest son of Thomas Pennant. He was elected a Fellow of the Royal Society in 1792. Sowerby¹ mentions him as the donor of specimens of calcite, calamine pseudomorphs, and blende. There are, with the collection, lists of Swiss and German minerals addressed to David Pennant, bearing various dates up to 1820, but there is no evidence of any work having been done at the collection after this date, either by David Pennant or by his son.²

Thomas Pennant was not only a keen collector of minerals and fossils, he was also a careful curator, and knew full well the value of an accurate catalogue. His earlier catalogues appear to have been destroyed, with the exception of a 'Catalogue of Flintshire Fossils'. This contains references to Hill's 'History of Fossils' (1748), and to Woodward's 'Natural History of the Fossils of England' (1729): it was never completed, but is especially valuable, as it contains an account of the collection of Flintshire calamine (*Lapis Calaminaris*), which does not find a place in his later catalogue.

In a letter to Edward Rawstone, in 1753, Pennant writes: 'I am very methodical in the disposition of my minerals. . . . I purchase most of the best writers on the subject, and from them shall form a new catalogue, with experiments made by myself and some few observations of my own.' This new catalogue has most happily been preserved: it extends to three quarto volumes of manuscript, the minerals occupying two volumes, entitled 'Native Fossils'.³ There are some 1,250 entries, each entry

¹ J. Sowerby, 'British Mineralogy,' 1804, vol. i, p. 10; 1809, vol. iii, p. 1; 1811, vol. iv, p. 173.

² David Pennant, junr., was elected a Fellow of the Geological Society of London in 1818.

³ The third volume deals with fossils. See R. B. Newton, *Geol. Mag.*, 1913, dec. 5, vol. x, p. 192.

comprising a description of the mineral, the locality, the name of the collector and donor, and frequently some additional remarks.

The catalogues bear no date, but the fact that among the original entries is one referring to specimens collected at Llanberis in August of 1757, while the references to Borlase's 'Natural History of Cornwall', published in 1758, are later entries, enables the time of writing to be fixed as the winter of 1757. When Pennant wrote his catalogue, the most recent English work on 'fossils' was Hill's 'History of Fossils' (1748), and to this he makes frequent references. There are also references to Plot's 'Natural History of Oxfordshire' (1677), Lhuys's 'Lithiophylacium Britannicum' (1699), and many other old works, but the style of the catalogue and the classification are based on Woodward's 'Natural History of the Fossils of England' (1729), from which frequently the definitions of classes are copied.

In the letter to Edward Rawstone, quoted above, Pennant wrote: 'Woodward's System is now generally esteemed the most plausible, and is what I favour, being very consonant to the structure of the Earth to such depths as I have ventured myself.'

The main outlines of Pennant's classification are given here, as it affords a very good idea of what he regarded as the important characters in minerals.

PENNANT'S CLASSIFICATION.

Class.	Minerals included.
I. Earths and Earthy Substances ...	Clays, lithomarge, pyrolusite (wad), steatite, serpentine, talc-chlorite-schist.
II. Talcs and Talky Bodies	Anthracite, barytes (Lapis bononiensis), graphite, mica, molybdenite, talc.
III. Selenitae	Gypsum (crystals).
IV. Alabasters (Gypsa or Plaister stones)	Alabaster, pyrophyllite.
V. Fibrous Fossils :	
i. Of the same genus with Class IV, and like them burning to a Plaister	Gypsum (satin-spar).
ii. Not calcining, or suffering scarce any alteration in the fire	Asbestos, chrysotile.
VI. Crystals :	
i. Composed of the common crystalline matter	Fluor, quartz.
ia. Schirl or Cockle	Hornblende.
ii. Of the finest kind, or Gems ...	(No entries.)
VII. Spars :	
i. Crystalliform or cubic spars ...	Calcite.

Class.	Minerals included.
ii. Spars breaking into rhomboid or parallelepiped masses. Among these I place the <i>fluores lamellati</i> on account of their breaking into parts of that shape	Barytes, calcite.
iii. Terrene incrusting spars, alabastrine spars, tuberos and efflorescent spars. <i>Fluores ericaeformes</i>	Calcite.
iv. Stalactitae	Calcite.
v. Stalagmitae	Oolites and spherulitic structures.
VIII. Fossils which are solid and formed into strata :	
i. Stone of a coarse texture, or quarry stone	
a. Freestone, or such that break with equal indifference in any direction.	
b. Slates, or stones which split only horizontally.	
ii. Stone of a fine texture whose basis is spar. Marble :	
a. Forming strata.	
b. Found in nodules.	
iii. Stone of a fine texture whose basis is crystal with some mixture of talc. Granite :	
a. Composing strata.	
b. Found in nodules.	
iv. Stone of the finest and hardest texture whose basis is crystal, coloured and spotted with different kinds of earth. Porphyry.	
IX. Ludi Helmontii, or septaria.	
X. Crustated ferruginous bodies (including Bezoar minerals).	
XI. Fossils found in small roundish masses or nodules, whose basis is crystal, sometimes pure but generally more or less debased with earth :	
i. The semipellucid gems	Chalcedony, sard, garnet.
ii. Opaque gems	Jasper, &c.
iii. All the different kinds of pebles and flints	Jasper, menilite, wax-opal, serpentine.
iv. Sands.	
v. Gritts.	
XII. Salts	Halite.
XIII. Bituminous Fossils :	
i. Such as are solid : coals, jet, amber, and the like	Amber, coal, copalite, jet.
ii. Liquid, as bitumen, naphtha, petroleum	Bitumen.
XIV. Sulphurs	Sulphur.

Class.	Minerals included.
XV. Slags and other substances vomited out of volcanoes.	
XVI. Marcasites and pyritae :	
i. Marcasites : those that are found in the veins or perpendicular fissures	Chalcopyrite, iron-pyrites, mispickel (mundic), blende (mock-ore).
ii. Pyritae : those which are found independent and lodged in strata	Marcasite (concretions).
XVII. Semi-metals	Cinnabar, ores of antimony and cobalt.
XVIII. Gold.	
XIX. Silver	Molybdenite, silver.
XX. Tin	Cassiterite.
XXI. Lead	Cerussite, galena, pyromorphite.
XXII. Copper	Azurite, copper, cuprite, malachite.
XXIII. Iron	Hæmatite, limonite.

The classification was evidently never quite satisfactory. 'Lapis Calaminaris' (calamine, $ZnCO_3$), which figured prominently in the 'Catalogue of Flintshire Fossils', found no place in the new catalogue; and it was frequently difficult to assign a mineral to one class when it showed the properties of several. Barytes presented particular difficulties in this respect, and it figures under both 'tales' and 'spars' in its different forms.

Although Pennant distinguishes between 'cubic spars' and 'spars breaking into rhomboid or parallelepiped masses', he appears to have had no idea of the importance of interfacial angles. Thus, when describing the calcite of Pen-y-bryn, he says: 'They break constantly, even to the most minute particles, into parallelepipeds. . . . They are exactly of the same structure and break into pieces of the same form as the common potter's lead-ore [i.e. galena], and very probably may determine that species of ore to that figure, and what is a support to this conjecture is its being commonly found accompanying lead-ore.' It must be remembered that this was written fifteen years before Romé de l'Isle published his famous 'Essai de Cristallographie' (1772), and nearly thirty years before the writings of Haüy.

Pennant appears to have procured later books on minerals, whenever such were published in English or Latin. Thus one finds later entries referring to Cronstedt's 'System of Mineralogy', translated by Engestrom, with notes by da Costa (1770), and to the later edition by Magellan (1788). In 1772 appeared Wallerius's 'Systema Mineralogicum', and from this Pennant copied the classifications of ores and suggested

modifications. All these books, however, came when he was fully occupied with his zoological work.

Pennant's catalogues contain references to many friends who added largely to his collection. The contributions of three of these call for special attention.

Rev. William Borlase, who has already been mentioned as arousing Pennant's interest in minerals, sent seventy-eight specimens, of which twenty-six are still identifiable. He was the author of a paper entitled 'Spar and Sparry Productions called Cornish Diamonds',¹ and of 'The Natural History of Cornwall'. In the latter work he enumerates eight kinds of 'steatite',² of which four are still represented among Pennant's minerals. Against the entry in his catalogue Pennant has written the number used by Borlase in his description. Numbers I and IV are true steatite from the Soap Rock, near The Lizard, the location of which is given in Pennant's catalogue. Number VI is, however, lithomarge, and number VIII is serpentine.

Another interesting specimen is one of 'flake ore'³ (botryoidal chalcopyrite). Mamillated malachite was known as 'enamelled copper ore'; and a mass of fine-grained native copper and cuprite in white quartz is called by Borlase 'red copper'.

Erich Ludvigsen Pontoppidan (1698-1764), Bishop of Bergen, was the author of 'The Natural History of Norway' (1755), (translated from the Danish, 1758). Pennant's own copy of this book is in the possession of the Countess of Denbigh, to whom I am indebted for the following information. At the beginning of the book Pennant has written: 'The places marked with a † denote what the author of this history has presented me, A.D. 1756.' The minerals thus marked are: Amianthus, or asbestos rock, p. 89; Amianthus, section VI, p. 168; Copper from Røraas, p. 192; and Iron, section XII, p. 199.

Pennant's catalogues show that Pontoppidan presented him with fifteen specimens of minerals, several of which are described in 'The Natural History of Norway'. Eleven of these have been identified. The most interesting are: the 'Veegsteen' or 'Talkstein',⁴ a talc-chlorite-schist; asbestos⁵ from Birkedal fen, in the parish of Waldens, which had been regarded as petrified wood until Pontop-

¹ W. Borlase, *Philosophical Transactions*, 1749, vol. xlv, p. 250.

² W. Borlase, 'The Natural History of Cornwall,' Oxford, 1758, p. 67.

³ W. Borlase, *ibid.*, p. 197.

⁴ E. L. Pontoppidan, 'The Natural History of Norway,' London, 1755, p. 166.

⁵ E. L. Pontoppidan, *ibid.*, p. 89 and p. 168.

pidan pointed out the error; 'Lapis suillus'¹ or 'Swine's stone' (fetid barytes).

Emanuel Mendes da Costa (1717-1791) wrote original notes and additions to Engestrom's translation of Cronstedt's Mineralogy (1770) and 'A Natural History of Fossils' (1757).² He was in correspondence with Pennant in 1752, and it is an extraordinary fact that none of the correspondence is preserved with da Costa's other letters at the British Museum. Contemporary letters show that in 1756 the two collectors had some disagreement, but in 1757 we find da Costa mentioning Pennant first among 'the gentlemen who have generously communicated their observations or favoured me with specimens from their collections'.³ He contributed forty-three specimens to Pennant's collection: of these only five are now identifiable, three of which are described by da Costa: 'viz. *Steatites* from Fichtelberg, Franconia; *Steatites indurata* from Wunsiedel; and wad (*Ochra friabilis nigro-fusca*, or 'black wadd') from Portaway lead-mine, near Winster, Derbyshire. No other specimens in the collection can be identified with da Costa's descriptions.

Turning now to the minerals collected by Pennant, one finds only a few, apart from the Flintshire minerals, which possess more than historic interest. There are, however, some which deserve mention.

Among the foreign minerals the only specimen of much interest is one of green serpentine. This is classed with the 'Jaspers', and is described as 'a Nephritic Stone from the Harz Forest'. Pennant probably had this specimen from da Costa, who gave him many German minerals, and who refers to the 'Nephritic Stone' or 'Jasper' of the Harz forest.⁵ The fact that this is not true nephrite throws some light on these old records.

A large series of iron-ores from the Forest of Dean are of interest, as Pennant has recorded the miners' names then in use for the different ores. These include varieties of 'Brush Ore', 'Mayburn', 'Pipey Ore', 'Grey Ore', and 'Smith Ore'.

A fine piece of mendipite from the Mendip Hills was entered in the

¹ In his description of this specimen Pennant writes: 'Sent me by Bishop Pontoppidan with the title of Lapis suillus or Swine stone, perhaps from its offensive smell, though he, in his history, p. 168, derives its name from another cause, viz., its efficacy in curing the orasiuk, a disease among the swine in Norway, where this spar is found in great quantities.'

² The proposals for this book were issued in 1752, but only one part was ever published.

³ E. M. da Costa, 'A Natural History of Fossils,' London, 1757, p. vi.

⁴ E. M. da Costa, *ibid.*, pp. 41, 102.

⁵ E. M. da Costa, *ibid.*, p. 40.

catalogue after 1757. The only other specimen of this mineral is a small piece given to Pennant by John Hughes as coming from Galway, Ireland: it is, however, almost certainly from the Mendips.

Several specimens of malachite, labelled Staffordshire, are probably from Ecton. They include one pseudomorph after chalcopyrite, the chalcopyrite being altered to limonite.

A specimen of copalite, similar to 'Highgate resin', is described as amber, and comes from 'the great clay pit at Richmond, Surrey'.

'Pitch' from Pitchford, Shropshire, is interesting, as the specimen was described by Pennant.¹

Pennant visited Ireland in 1754, but never published any account of his journey. The catalogue contains an entry of specimens collected at Killarney on August 22, 1754. He visited Muckross, Co. Kerry, and it is very interesting to note that Pennant's visit to this copper mine was made just at the close of its period of great prosperity (1749-54), during which large quantities of cobaltite were found.² Pennant's minerals from Muckross, however, consist only of chalcopyrite, fahlerz, and a curious mass of limestone impregnated with native copper. A fair collection of cerussite from the Silvermines district, Co. Tipperary, was also made on this Irish tour.

Perhaps the most interesting specimen in the collection is one described as 'Dark greyish copper ore, mixed with a pale red, from a mine on Llanymynech Hill, Shropshire'. The pale red mineral has been identified by Mr. Arthur Russell as rhodochrosite. The occurrence of these crystals is not mentioned by Pennant in his account of Llanymynech Hill.³ The other specimens from this locality are stalactites of calcite and some very fair cubo-octahedra of galena.

The treatment of the Flintshire minerals has been left to the last; and as they constitute the basis of Pennant's description of the mineral district of Flintshire and represent the produce of many mines well known to Pennant, but long since closed down, they will be treated in some detail.

Pennant described a 'green lead ore'⁴ as being found in small amount some years previous to 1778 in the Silver Rake on Halkin Mountain. The catalogues contain records of seven specimens of this green lead ore, all from the Silver Rake. They are described as being 'of a dark green

¹ T. Pennant, 'Tour in Wales,' London, 1810, vol. iii, p. 264.

² Trans. Geol. Soc. London, 1821, ser. 1, vol. v, p. 595.

³ T. Pennant, 'Tour in Wales,' London, 1810, vol. iii, p. 218.

⁴ T. Pennant, 'Tour in Wales,' 1778, p. 418.

colour, of a stony appearance and breaking with a smooth surface like that of flint', sometimes covered with 'minute sparkling green crystallizations' or with 'elegant tubera, some of which are smooth, others crystallized'. The green ore is associated with 'brown stony ore or cauke', or with 'pale whitish green crystallized ore, which appear on some parts like efflorescences, on others like thin laminae, and are semi-pellucid'. The best green ore is entered as yielding '1200 $\frac{3}{4}$ lb. of lead to the ton, but scarce any silver'. It is much to be regretted that only one of these valuable specimens has survived with its label still attached. It consists of galena, coated with well-crystallized cerussite (the 'pale whitish green crystallized ore') and some pale-green botryoidal pyromorphite. It has been suggested¹ that the green lead ore may have been anglesite. However, the descriptions in the catalogue and the evidence of the sole-remaining specimen prove that its identification with pyromorphite is correct. Pyromorphite was again recorded from Flintshire by Traill² in 1821, a large quantity being found in a mine called Gelly-Fowler Fields, on Halkin Mountain.

The 'brown lead ore', 'caulk' (or 'cauke') of Pennant³ is cerussite, as are also 'the pellucid crystallizations of ore' mentioned in his catalogue.

Calamine ($ZnCO_3$) is only briefly described by Pennant,⁴ but the 'Catalogue of Flintshire Fossils' contains elaborate details of forty-five specimens. Nineteen of these have been identified with certainty, and besides these there are forty-one specimens which either have lost their labels or were never entered in the catalogue. They include fine, canary-yellow, botryoidal specimens from Talargoch, 'from a Drift the side of the Hill with a stream running through it'. Other specimens worthy of mention are eight from Moel-y-crio, Halkin Mountain. Seven of these are pseudomorphs after calcite; they include a large hollow crystal showing a scalenohedron twinned on (111), others are prisms $\{\bar{1}10\}$ with $\{2\bar{1}\bar{1}\}$, others again show $\{110\}$ and $\{2\bar{1}\bar{1}\}$. The eighth specimen is an epimorph of green calamine on cubes of purple fluor.

Moel-y-crio also yielded cleavage fragments of fine yellow fluor, but this was not described by Pennant.

The only spar described is 'refracting spar, *Spatum Islandicum*, of

¹ 'Geology of the neighbourhoods of Flint, Mold, and Ruthin,' Geol. Survey Memoir, 1890, p. 178.

² T. S. Traill, *Edinburgh Philosophical Journal*, 1821, vol. iv, p. 246.

³ T. Pennant, 'Tour in Wales,' 1778, p. 418.

⁴ T. Pennant, *ibid.*, p. 420.

great purity and transparency, and often elegantly infected with marcasite finely disposed', from Pen-y-bryn mine, Holywell.¹ The catalogues contain nine entries of the spars from Pen-y-bryn mine. These are described as sometimes colourless, sometimes tinged with yellow; many of them enclosed layers of small 'green and gold marcasites', which in one case marked out another rhombohedron within the mass. Pennant adds a note to his entries as follows: 'These spars burn to a white colour and slake with water to a lime, but will not run in the fire, though I have tried them with the black flux and strongest heat my furnace is capable of.' Again it is most regrettable that only one of these spars remains: this is a cleavage rhombohedron of a pale yellow colour and is fairly clear.

Mr. Rudler has suggested² that the included 'marcasites', mentioned as occurring in the Pen-y-bryn calcite, may have been chalcopyrite, a suggestion which is confirmed by Pennant's description of them as 'green and gold' or 'of a brassy bright green colour'.

A petroleum, or rock-oil, is described by Pennant,³ and a specimen in the collection is recorded as 'a kind found frequently in the limestone rocks in the lead mines at Brocknalt, near Holywell, and flows out of them when they are split or blasted. . . . It is of an oily feel, a deep brown colour, and though liquid when first found hardens to a pretty thick consistency when long kept.'

Another specimen which may be mentioned is a small iron wedge or chisel, $5\frac{1}{4}$ inches long, encrusted with galena and rust, from Talargoch mine. This is described by Pennant⁴ as evidence of the antiquity of the workings.

Pennant was very careful to record the exact localities of his Flintshire minerals. The catalogues contain entries of some 110 specimens representing twenty-six localities. The number of these specimens which can still be identified is only about thirty, but, as the descriptions of the minerals are clear, the species of the missing specimens can usually be made out by comparison with descriptions of others which have survived. The catalogues themselves therefore present a record of the mines which were working up to 1757 and of the minerals then obtained. The

¹ T. Pennant, 'History of the parishes of Whiteford and Holywell,' London, 1796, p. 254.

² F. W. Rudler, 'Handbook to the Minerals of the British Isles in the Museum of Practical Geology,' 1905, p. 124.

³ T. Pennant, 'Tour in Wales,' 1778, p. 421.

⁴ T. Pennant, 'History of the parishes of Whiteford and Holywell,' 1796, p. 122.

following tabulated list has been prepared, giving Pennant's localities, the identification of these localities on the one-inch Ordnance map, and the minerals occurring at each. It is hoped that this list may be of use to those interested in Flintshire localities.

Pennant's Localities.	Localities on 1-inch Ordnance Maps.	Minerals recorded by Pennant.
Daller Goch, near Disert. A mine above Disert. Gronant mine, near Tre- lacre. Gronant, near Llanasa.) Treloggan (Treloggin or Trelogin).	Talargoch, Dyserth. On Craig-fawr, Dyserth. Talaere mine, near Gro- nant, Llanasa parish. Trelogan, Llanasa parish.	Calamine (ZnCO ₃). Malachite. Galena (gravel-ore), Galena with cerussite, Calamine (black). Marcasite (?), Galena and blende on massive calcite, Calamine, pseudomorph after calcite. 'Dull dark grey ore, yield- ing 500 lb. of lead to the ton.'
Pen-y-gelli, Whitford parish.	Coed Pen-y-gelli, Whit- ford parish.	Chalcopyrite (?), Calcite, cleavage rhombo- hedron (?).
Bryn-y-caseg, Whitford.	Bryn-y-gaseg, Whitford parish.	Iron-pyrites (?), Galena with cerussite.
Creacas.	Creacas, Whitford parish.	'Fine plated spar, yel- low' = Calcite (?). Calcite, scalenohedra (?).
Pen-y-Ball.	Pen - y - Ball, Holywell parish.	Petroleum, Galena.
Maes-Whiteford.	Maes Whitford, Holywell parish.	Calcite, Chalcopyrite, Ca- lamine.
Brocknallt.	Brocknallt, Holywell parish.	Calamine.
Pen-y-Bryn.	Pen-y-bryn, Holywell parish.	Calamine.
Quoitia Mawr.	Coetia-mawr, Holywell parish.	Calamine.
Butler's Fields.	? Coetia Butler, Holy- well.	Calamine.
Pant-y-Godidw.	?	"
Driniog.	?	"
Bryn-driniog.	?	"
Llin eer.	?	"
Ty Maen.	?	Calcite (?).
Claudh mine, Holywell.	? Clawdd-ford (or Cornel- pylle), Brynford parish, near Holywell.	Galena, Cerussite, Cala- mine.
'A mine near Caerws.'	Near Caerwys.	Calcite.
Silver Rake, Halkin Mountain.	Silver Rake, on Halkin Mountain, Brynford parish.	Pyromorphite, Cerussite, Galena.
Pentre Halkin.	Pentre Halkin, Halkin parish.	Calamine.
Pant.	?Pant lode, Halkin parish.	Fluor (pinkish-violet), Galena (plated lead-ore), " (gravel-ore), Calamine.

Pennant's Localities.	Localities on 1-inch Ordnance Maps.		Minerals recorded by Pennant.
Moel - y - Cria, Halkin Mountain.	Moel - y - crio, parish.	Halkin	Fluor (clear, yellow cleavage masses), Fluor (small, pale-purple cubes),
Moel-y-Cria, near Ros-sesmer.	"	"	Calamine, pseudomorphs after calcite and fluor.
'A mine 70 yards deep.'	Probably Moel - y - crio, Halkin parish.		Fluor, dark-purple cubes, with calamine.
Coccoed, near Kilken. Newmarket parish.	Near Cilcain. Newmarket parish.		Calamine. Limonite (Linden's 'gold ore').

By his careful cataloguing Pennant has left us a valuable record of the mineralogy of his time, and in particular of the mines and minerals of Flintshire. The collection is one of considerable historical value, especially as it represents the work of ten years of Pennant's life of which he has told us little in his writings. All that is known of Pennant's work from 1747, when he met Borlase in Cornwall, to 1761, when he published 'The British Zoology', is that he wrote two papers in the Philosophical Transactions, one dealing with an earthquake in Flintshire,¹ the other describing some corals.² It is extremely interesting to find that these few years were as fully occupied as the rest of the strenuous life of this early naturalist, and it is hoped that these few notes will serve to show that they were not spent in vain.

¹ T. Pennant, Philosophical Transactions, 1750, vol. xlvi, p. 687.

² T. Pennant, *ibid.*, 1756, vol. xlix, part ii, p. 513.