

'Atmospheric stones and other circumstances'

200 years of the Limerick meteorite

By Kieron Heard

Introduction

Yesterday morning about nine o'clock, there was most dreadful thunder heard in the direction from Patrick's Well, towards Adare and Rathkeale in this county; the peals were very violent and continued for a considerable time, and were accompanied with some awful appearances - large fragments of atmospheric stones, and other circumstances, which indicated some very serious concussion to have taken place.

Thus the Limerick Chronicle of Saturday 11th September 1813 announced the fall of a new Irish meteorite, about five miles southwest of the city of Limerick in the county of the same name. This was the third of five recorded falls (after Pettiswood, County Westmeath in 1779 and Mooresfort, County Tipperary in 1810) to have occurred in what is now the Republic of Ireland, and it remains the largest meteorite seen to have fallen in the British Isles, with a mass in excess of 50 kg. It arrived at a time when the science of meteoritics was in its infancy and the extraterrestrial origin of meteorites (first proposed in print by Ernst Chladni less than twenty years previously) had only recently come to be widely accepted by the academic community.

Eventually scientists would classify Limerick (or *Adare*, as it was more often named in earlier texts and catalogues) as an H5 ordinary chondrite (veined) with a shock stage of S3, and today specimens are scattered among institutions and private collections worldwide. To mark the 200th anniversary of the fall, this paper reviews the (sometimes conflicting) evidence for the arrival of the meteorite and attempts to chart the subsequent fate of its many fragments.

Other contemporary accounts of the fall

Another local newspaper, the Limerick Evening Post, also covered the event (albeit briefly) on the 11th September and even announced that '*The curious can see one of these Stones at this Office*'. Four days later the Post returned to the story, as follows:

THE LATE PHENOMENON - In your last we stated that a quantity of stone had fallen near Adare in this County; we will now give some cursory remarks on the subject; first, confining ourselves to the fact as it occurred, then giving the opinions of some of the most learned on similar Phenomena. About 9 o'clock on the morning of Friday last, a great noise was heard, in the atmosphere, dissimilar to our usual thunder storms, rather resembling the repeated and rapid discharges of artillery, and, as we before mentioned, ending in a drum-like sound. Shortly after some large substances were seen falling and an extraordinary smoke, aided by a partial mist, checked for a few moments all further observation. When this cleared off, it was observable that a number of stones had fallen, some near 9lb. but in general from 1 to 3lb. one of the largest size, we understand, is in the possession of Mr. Tuthill of Faha, they chiefly consist of earthy and metallic substances - of silex, iron, magnesia, and neckel: hence, from the incongruity of their component parts, not of this sphere, from their appearance they seem as fragments of one large body - the surface is

rather black, smooth, and as if varnished by a commencement of fusion: on breaking, the inside appears grey, and several have been found warm.



Plate 1. The largest stone, originally in the possession of Mr. Tuthill of Faha House, became known as the Brasky Boulder (*image courtesy of National Museums Northern Ireland*)

A brief account of the event was published in the Limerick Gazette of 17th September 1813, but this seems to have been based entirely on previous newspaper reports. The Gentleman's Magazine and Historical Chronicle for December 1813 also contained a short and apparently derivative report with one additional piece of information, that '*no lightning*' accompanied the audible effects.

In the following year news of the fall was drawn to the attention of the European scientific community by the noted English chemist Smithson Tennant (1761–1815) while on a visit to France (Grossman 2007, 269). Tennant described the meteorite to members of the French Institute and even presented a sample to his fellow chemist Claude Louis Berthollet (1748–1822); this was probably the specimen that resides today in the National Museum of Natural History in Paris (*ibid*, 274).

In 1818, news of the Limerick meteorite was brought to a much wider audience by the publication of an eyewitness account in the Philosophical Magazine and Journal (Higgins 1818, 355). It is this report that is quoted most often when the circumstances surrounding the fall are described, and it is reproduced here since the evidence it contains is central to our understanding of the event.

Under the heading *Account of a Shower of Meteoric Stones which fell in the County of Limerick*, the magazine published a copy of a letter submitted by the Dublin Society Professor of Chemistry William Higgins (1763–1825). The letter had been written originally by Samuel Maxwell, an acquaintance of George Tuthill (b. 1743) of Faha House, on whose family estate part of the meteorite fell.

Sir, - Friday morning, the 10th September 1813, being very calm and serene and the sky clear, about nine o'clock a cloud appeared in the east, and very soon after I heard eleven distinct reports, appearing to proceed from thence, somewhat resembling the discharge of heavy artillery. Immediately after this followed a considerable noise not unlike the beating of a large drum, which was succeeded by an uproar resembling the continued discharge of musquetry in line. The sky above the place whence this noise appeared to issue became darkened and very much disturbed, making a hissing noise; and from thence appeared to issue with great violence different masses of matter, which directed their course with great velocity in a horizontal direction towards the west. One of these was observed to descend; it fell to the earth, and sunk into it more than a foot and a half, on the lands of Scagh in the neighbourhood of Pobuck's Well, in the county of Limerick. It was immediately dug up; and I have been informed by those who were present, and on whom I could rely, that it was then warm, and had a sulphurous smell. It weighed about seventeen pounds, and had no appearance of having been fractured in any part, for the whole of its surface was uniformly smooth and black as if affected by sulphur or gunpowder. Six or seven more of the same kind of masses, but smaller, and fractured, as if shattered from each other or from larger ones, descended at the same time, with great velocity, in different places between the lands of Scagh and the village of Adare. One more very large mass passed with great rapidity and considerable noise at a small distance from me; it came to ground on the lands of Brasky, and penetrated a very hard and dry earth about two feet. This was not taken up for two days; - it appeared to be fractured in many places, and weighed about sixty-five pounds! Its shape was rather round, but irregular: it cannot be ascertained whether the small fragments which came down at the same time corresponded with the fractures of this large stone in shape or number; but the unfractured part of the surface has the same appearance as the one first mentioned. There fell also, at the same time, on the lands of Faha, another stone, which does not appear to have been part of, or separated from, any other mass: its skin is smooth and blackish, of the same appearance with the first-mentioned, and weighed above twenty-four pounds. Its shape is very irregular. This stone is in my possession, and for its volume is very heavy.

There was no flash of lightning at the time of, or immediately before or after, the explosion; the day continued very calm and serene; was rather close and sultry, and without wind or rain. It is about three miles in a direct line from the lands of Brasky, where the very large stone descended, to the place where the small ones fell in Adare, and all the others fell intermediately; but they appeared to descend horizontally, and as if discharged from a bomb and scattered in the air.

I am, sir,

Your obedient servant,

SAM. MAXWELL.

Such is the level of detail in Maxwell's account that it is reasonable to assume he was a reliable witness, particularly as his description of events was in direct response to a series of questions put to him by William Higgins *via* George Tuthill. Higgins certainly had no doubt about Maxwell's credibility, describing him as 'a gentleman of the highest respectability' (*ibid*).

Unfortunately little is known about Samuel Maxwell, other than that he was obviously in County Limerick at the time of the fall and was known to local landowner George Tuthill. A search of online sources suggests that Maxwell was not himself recorded as a landowner at that time. It is possible that he was among a list of signatories to a petition by local worthies in support of improvements to the River Shannon Navigation in May 1812 (House of Commons 1812, 311). It is also conceivable that he was the Major Samuel Maxwell, magistrate of Limerick and Cork and formerly of the 92nd Regiment (the Gordon Highlanders) who died at his home in Charleville, county Cork in May 1833 (Colburn 1833, 287).



Plate 2. The Faha stone, with a cast made before it was sawn (*image courtesy of Dara Lohnes / Oxford University Museum of Natural History*)

Mapping the strewnfield

From Samuel Maxwell's eyewitness account and earlier newspaper reports, we can infer that the parent meteoroid travelled in an approximately east to west direction, generating a substantial dust train and fragmenting in flight. Rolling 'explosions' were heard over many square miles, these being the sonic booms that resulted as each supersonic fragment generated its own shock wave. None of the reports mention bright lights or flashes (fireball or bolide), despite the fact that the sky was clear. In fact, two of the accounts state specifically that there was no '*lightning*' associated with the event.

At least three large masses are said to have fallen, at *Brasky* (65 lb / 29.5 kg), *Faha* (24 lb / 10.9 kg) and *Scagh* (17 lb / 7.7 kg), together with 'six or seven' smaller fragments that landed between Scagh and the village of Adare. The smaller masses included a 7.5 lb (3.4 kg) stone mentioned by Higgins (with an analysis of its mineralogy) in his comments appended to Maxwell's letter. According to Maxwell the stones all fell along a northeast–southwest line between Brasky and Adare, over a distance of approximately three miles.

In order to attempt to map the Limerick strewnfield it is necessary first to understand the system of land division in Ireland. County Limerick (like all of the Irish counties) is divided into successively smaller administrative units called baronies, parishes and townlands. The townland is the oldest geographical unit, covering an area on average of about 350 acres. In 19th-century documents, references to localities that began '*lands of.....*' often meant the townland of that name. Thus, when Maxwell stated that one of the meteorite masses fell '*on the lands of Faha*' he was referring to the townland of Faha Desmesne, an area of approximate one square mile that had formed part of the Tuthill family estate since at least the early 1740s.

The '*lands of Brasky*' was almost certainly a reference to one of the adjoining townlands of Briska More and Briska Beg (*More* and *Beg* are Gaelic words meaning *large* and *small* respectively), which are located immediately northwest and north of Faha Desmesne – the local pronunciation of Briska is '*Brisky*', hence Maxwell's '*Brasky*'. The townlands of Faha Desmesne, Briska More and Briska Beg are shown on Figures 1 and 2; unfortunately, in the absence of further information it is not possible to locate the impact sites of the Faha and Brasky stones more precisely.

The identification of the site of the fall of the 17 lb stone, '*on the lands of Scagh in the neighbourhood of Pobuck's Well*' has bedevilled researchers for many years. Scagh (spelt with a C) is not shown on the Ordnance Survey of Ireland's first edition six-inch map of 1837–42 (available online at www.osi.ie) nor does it appear as a place name in the Primary Valuation (the so-called Griffith's Valuation) of 1847–64, which was the first full-scale valuation of property in Ireland (searchable online at www.askaboutireland.ie/griffith-valuation/index.xml). However, Skagh (with a K, and with alternative spellings such as Skeagh and Skea) is a reasonably widespread Irish place name, being derived from the Gaelic *Sceach*, meaning 'hawthorn' (Mills, 2003). Its use as a place name was probably connected to the tradition of using thorn bushes as boundary markers.

In fact, there *is* a townland called Skagh in the general vicinity of the fall; it is in the parish of Croom, approximately 4.5 miles south of Faha Desmesne (Figs. 1 & 2). However, since Skagh does not lie on a line between *Brasky* (Briska More / Briska Beg) and Adare (along which line Maxwell stated that the meteorite fragments fell), researchers have tended to discount it as the likely impact site of the 17 lb stone. Certainly, such a wide dispersal of fragments would run counter to the usual pattern of distribution within an elongated and elliptical strewnfield that has its long axis parallel to the direction of flight.

In an attempt to place the 17 lb stone within the zone described by Maxwell, one writer has assumed (without obvious justification) that '*the lands of Scagh*' referred to the general area of the two Briska townlands (Seymour 1947, 160). Of course, there still remains the possibility that in this instance Maxwell was not referring to a townland but to a local, perhaps informal, place name that had gone out of use by the time of the compilation of the First Edition Ordnance Survey map in the late 1830s.

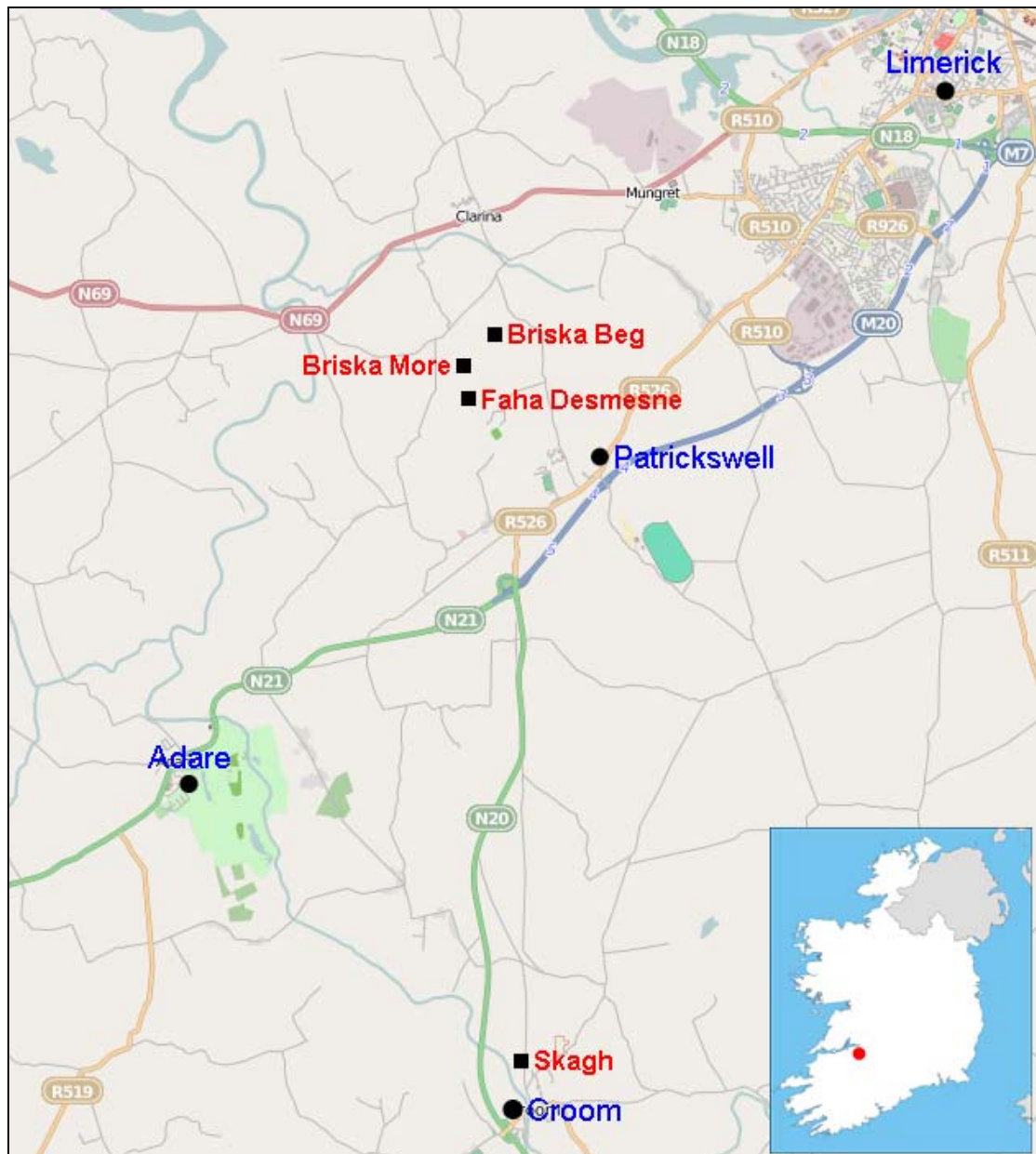


Figure 1. Location map showing places mentioned in the text (base maps © www.d-maps.com (inset) and © OpenStreetMap contributors / www.openstreetmap.org)

Maxwell's '*Pobuck's Well*' is also a matter of some debate. Again, it does not appear as a place name on the Ordnance Survey map of 1837–42, nor in the Griffith's Valuation of 1847–64 or any of the readily available online sources for the geography of 19th-century Ireland. Caroline Wyndham-Quin, Countess of Dunraven, published an account of the meteorite (including some interesting comments by Nevil Story-Maskelyne, Keeper of Minerals at the British Museum) in 1865. Drawing largely on Maxwell's evidence, for some reason she substituted '*Patrick's Hill*' for '*Pobuck's Well*' (Wyndham-Quin 1865, 275). Most subsequent writers have chosen instead to interpret the place name as '*Patrick's Well*'. There is some justification for this, because that is the name of one of the principal towns in the area of the fall, less than one mile southeast of Faha House (Figs. 1 & 2). It is assumed generally (although impossible to prove) that the editor of the *Philosophical Magazine* simply misread '*Patrick's Well*' as '*Pobuck's Well*'. If this assumption is correct, it has the

obvious effect of placing Maxwell's '*lands of Scagh in the neighbourhood of Pobuck's Well*' closer to the impact sites of the other stones, as described by Maxwell.



Figure 2. Google Earth image with townland boundaries superimposed

As for the shower of smaller fragments that fell in the vicinity of Adare (between Scagh and Adare, according to Maxwell) the Countess of Dunraven tells us that some of these at least were '*picked up in the street of the town*' (of Adare) and that by 1865 three of them were on display in the town's museum (*ibid*, 149; Pl. 3).



Plate 3. 35 g specimen of one of the smaller stones that fell in or around the town of Adare (*image courtesy of Limerick City Museum*)

Some writers (such as Seymour) have used the size distribution of the Limerick fragments (with the smaller stones falling at Adare and the larger ones descending in the Faha Desmesne and Briska townlands) to propose that the direction of flight was not east to west, as stated by Maxwell, but rather southwest to northeast. Of course, it is generally accepted that the larger components of a meteorite shower travel further along their line of flight before falling to the ground, but this is not always the case; Portales Valley (1998) is a notable example of a shower in which the recovered fragments were larger and less numerous up-range of the witnessed flight path, due possibly to there having been more than one fragmentation event (Kring *et al* 1999, 663). Consequently there is no reason to doubt that Maxwell was correct in his description of a generally east-to-west direction of flight.

Subsequent distribution of the meteorite

What became of the fragments of the Limerick meteorite in the years immediately after the fall, and where can they be found today? The latest edition of the Catalogue of Meteorites (Grady 2000, 303) lists fifteen institutions that held specimens in 2000, and to this list might be added the French National Museum (Grossman 2007, 274), the Limerick City Museum and others confirmed in the course of research for this paper. An updated catalogue of Limerick specimens held in public institutions is included as an Appendix.

The largest fragment (the so-called Brasky Boulder) was in the possession of the Tuthill family at Faha House until at least 1866 (Lenihan 1866, 430). The subsequent

history of this stone has been described comprehensively elsewhere (Seymour, 1947). Briefly, it passed by marriage into the ownership of the Taylor family of Hollypark, Kilkornan, County Limerick. In the late 1930s a farmer, John Collins, bought the stone at an auction as part of a miscellaneous lot. Apparently it caught Mr Collins's attention because it had been his grandfather (who had worked for both the Tuthill and Taylor families) who was charged with transporting the meteorite from Faha House to Hollypark. In 1946 the meteorite was acquired by the National Museum of Ireland, Dublin, and subsequent analyses proved beyond doubt that it was part of the 1813 fall that had been 'lost' to science for over 130 years. H. J. Seymour, Professor of Geology at University College, Dublin, co-ordinated the analysis of the meteorite, and his description suggests an irregularly-shaped fragment with overall dimensions of 32 cm x 26 cm x 21 cm and a mass of just over 27 kg (59.5 lb). He describes numerous faces, generally with a thin, brownish black fusion crust (primary and secondary) and some with deep regmaglypts. Other faces have only incipient regmaglypts, and/or partial crust as flow ridges or flashings (*ibid*, 160).

The Faha stone, originally in the possession of Samuel Maxwell, resides today in the Oxford University Museum of Natural History, where it is on permanent display. It was presented to the University by the Reverend J. W. Griffiths of Wadham College, Oxford and Bishopstrow, Wiltshire in 1825; how it came into his hands is not known. Nevil Story-Maskelyne (1823–1911) was among the first to analyse the stone at Oxford; he was Professor of Mineralogy at Oxford University (1856–95) and Keeper of Minerals at the British Museum (1857–80) and the meteoritic mineral maskelynite was named after him. In 1865 he reported the mass of the Faha stone as 18 lb 11 oz (8.5 kg), (quoted in Wyndham-Quin 1865, 276) and G. T. Prior recorded the same mass in 1923 (Prior 1923, 99). Today, the Faha stone has a mass of only 7.7 kg, it having been sectioned several times so that samples could be distributed to other academic institutions.

The smaller masses were no doubt in private hands initially, before academics and curators around the world acquired many of them. It is likely that there were significantly more small stones than the '*six or seven*' described by Maxwell, given the amount of material that has found its way into those collections. A 7.5 lb (3.4 kg) stone analysed by Higgins has been mentioned already, as have three stones that were once displayed in the museum in Adare; according to Wyndham-Quin these weighed 10.7 oz (303 g), 8.7 oz (247 g) and 2.9 oz (82 g). A partially crusted stone with a mass of 304.9 g is housed in the Limerick City Museum (Pl. 3), although this is likely to be one of those displayed originally in the museum at Adare. Another example is a 1.5 lb (680 g) fusion-crust specimen analysed by James Apjohn (1796–1886) in the 1830s, when he was Professor of Chemistry at the Royal College of Surgeons in Dublin (Apjohn 1839, 18). It had belonged previously to Apjohn's friend, Daniel Reardon, of Dublin. The present location of that stone is not known.

And finally, what became of the Scagh stone described in such detail by Samuel Maxwell? Just as the location of its fall is unclear, so its subsequent fate is unknown – there is certainly no evidence to indicate that it was ever acquired by a museum or subjected to academic scrutiny. It can only be hoped that it has been preserved to this day in private hands, perhaps as a family heirloom.



Plate 4. 34 g fusion-crust fragment in the Vatican collection (*image courtesy of Brother Guy Consolmagno / Vatican Observatory*)

Acknowledgements

This paper developed from a discussion on the British and Irish Meteorite Society forum in 2011. BIMS member David Entwistle carried out much of the original research and commented on an early draft of the text. Stuart Boulter, Martin Goff and Alison Telfer also are thanked for their comments on earlier drafts. Errors or omissions remain the sole responsibility of the author.

The following curators and archivists kindly provided information on specimens or documents in their collections:

Joseph Boesenberg: Research Associate, Department of Earth and Planetary Sciences, American Museum of Natural History

Franz Brandstaetter: Natural History Museum, Vienna, Austria

Deborah Cassey: Curator of Meteorites, Natural History Museum, London

Brother Guy Consolmagno: Vatican Observatory

Ansgar Greshake: Museum of Natural History, Berlin

Brian Hodkinson: Acting Curator, Limerick City Museum

Mary Lehané: Senior Technical Officer, School of Biological, Earth and Environmental Sciences, University College Cork

Nicole Lunning: National Museum of Natural History (Smithsonian), Washington

Mike Maguire: Reference & Local Studies Department, Limerick City Library

Nigel Monaghan: Keeper, Natural History Division, National Museum of Ireland

Matthew Parkes: Assistant Keeper, Natural History Division, National Museum of Ireland

Monica Price: Assistant Curator, Mineral Collections, Oxford University Museum of Natural History

Michael J. Simms: Curator of Palaeontology, National Museums Northern Ireland

Patrick N. Wyse Jackson: Department of Geology, Trinity College, Dublin

Dalibor Velebil: National Museum, Prague



Plate 5. 7.4 g part slice with fusion crust, from one of the smaller stones (image courtesy of Martin Goff / www.msg-meteorites.co.uk)

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Plate 6. 1.32 g part slice with fusion crust, probably from the Faha stone (in the author's collection)

Appendix: Limerick specimens in public institutions (2013)

Institution	Weight (g)	Comments
National Museum of Ireland, Dublin	27.060 6.7	Brasky main mass plus several small Adare 'aerolites'. Also holds a cast of the Faha stone and a cast of a 19g specimen
Oxford University Museum of Natural History	7700	Faha main mass
Natural History Museum, London	710.9	Eight fragments of the Faha stone, ranging from 0.5g to 249g
Limerick City Museum	304.9	Individual, probably one of the Adare stones displayed originally in Adare Museum
National Museum of Natural History (Smithsonian), Washington	173.13 24* 9*	Faha fragment acquired from Oxford University Museum of Natural History in 1969. 24g fragment acquired from Leopold Eger of Vienna in 1901 (subsequently divided). 9g individual donated by Dr. Stuart H. Perry in 1955 (subsequently divided).
Natural History Museum, Vienna	69* 54* 40*	69g fragment donated by Karl Ludwig Giesecke, Prof. of Mineralogy, Royal Dublin Society in 1818. 54g fragment acquired in 1827 as part of the collection of Jacob van der Null. Van der Null had it from Prof. Giesecke, Royal Dublin Society. 40g fragment acquired in 1821 from G. B. Sowerby, of London.
Trinity College, Dublin	154.9* 2.52*	The 2.52g specimen is made up of numerous tiny fragments
Arizona State University, Tempe	148*	
National Museum of Natural History, Paris	132.74*	Probably acquired from Smithson Tennant, via Claude Louis Berthollet
American Museum of Natural History, New York	113	Faha slice acquired from Oxford University Museum of Natural History in 1955
University College, Cork	96.88*	
Field Museum of Natural History, Chicago	52* 30*	30g specimen formerly in the DuPont collection
National Museum, Prague	74*	Fragment purchased from Julius Böhm of Vienna in 1912
Vatican Collection, Rome	33.9* 13.4* 0.25*	All three specimens acquired from the Marquis de Mauroy collection in 1905 & 1935. The largest is a small individual. The 0.25g acquisition is a collection of tiny fragments
Indian Museum, Calcutta	39*	
Geological Survey of Canada, Ottawa	9.94*	
Max Planck Institute, Mainz	6*	
Museum of Natural History, Berlin	3.5*	Part crusted fragment acquired from the Chladni collection in 1827

Specimens marked with an asterisk are of unknown provenance