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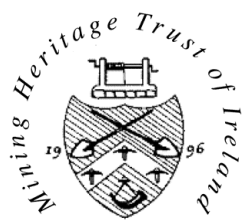
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GLENGOWLA: FROM LEAD MINE TO SHOW MINE

by Stephen Moreton

Abstract: Discovered in 1848, the lead/zinc/baryte/fluorite deposit at Glengowla East, near Oughterard, was one of the more successful Victorian mining ventures in Connemara. Worked intermittently from 1850 to ca. 1875, with a brief revival in 1907, the recorded production of nearly 363 tons of lead ore is probably only a fraction of the total produce. In the 1990s the Geoghegan family, who own the site, dewatered the mine, cleared it out and turned it into a tourist attraction, the first of its kind in Ireland. The deposit was noted for fine crystallised minerals, in particular octahedral fluorite crystals, and examples of these may be seen at the mine. *Journal of the Mining Heritage Trust of Ireland*, 17, 2019 3-13.

THE SETTING

The name Connemara invokes images of mountains, loughs and forests in a beautiful corner of the west of Ireland. Other than the famous ornamental green marble, still quarried to this day, few are aware there are treasures below ground as well as above. The rich and varied geology has led to the formation of a multitude of deposits of metals and minerals scattered across the entire district. Ores of lead, zinc, copper, molybdenum, tungsten, silver, iron, sulfur, arsenic, uranium, chromium, nickel, and even traces of gold and platinum group metals, along with talc, marble, baryte and fluorite have attracted the attention of speculators, from Victorian gentlemen adventurers to modern prospecting companies.

So far, of these treasures, only the green marble has been found in sufficient quantity and quality to sustain an extractive industry, but new discoveries continue to pop up to tease, and to inspire speculation that something significant may yet be revealed to finally put Connemara properly on the mining stage. Like a 240,000 ton deposit of 0.13 % molybdenum ore found near Carna in the 1950s. Or the chance find in 2015 of a vein of fluorite in the quarry at Shannapheasteen that produced a brief flood of fine specimens of this attractive and colourful mineral that now grace collections around the world. And the recent find of tiny, but bright blue, sapphires on Lettermore Island and several sites inland.

Connemara guards her underground treasures closely but that has not stopped entrepreneurs trying their luck. In the 19th century, against a backdrop of famine, poverty and depopulation, Connemara was the scene of a modest mining industry. Veins of copper and lead ores, along with pyrite and pyrrhotite from which sulfur for the chemical industry could be extracted, were the main treasures sought, although the industrial mineral baryte (barite, barytes) also attracted attention. This is the story of one of the more successful of these ventures, the Glengowla mine, just west of the village of Oughterard, sometimes referred to as the gateway to Connemara, being on the main road in from Galway city.

THE ADVENTURERS

Our story begins with George Fortescue O'Flahertie (1810 - 1873), a member of one of the major landowning clans of this part of the west of Ireland. In 1848 his cousin and brother-in-law Thomas (who had married George's sister Louisa-Lissy) died childless, but not before nominating George as his heir (Burke 1863; Walford 1860). Unfortunately it was not to prove a wise choice. George liked to live the high life, and before long was heavily in debt, debt compounded by being the loser in various disputes and expensive litigation.

By July 1851 his estate was controlled by the Commissioners of Encumbered Estates in Ireland (Registry of Deeds, 1851). Established by Act of Parliament in 1849, the Encumbered Estates Court was set up to facilitate the sale of Irish estates left impoverished by the famine. Lacking rental income, many landowners were heavily in debt and unable to meet their obligations. But often their estates were held in trust, or subject to restrictions that made it difficult to sell them. The Act removed those restrictions, allowing sale of land and distribution of the proceeds to creditors.

From his home at Lemonfield House (now demolished) at Oughterard, George managed an estate of over 4,500 acres. Like many a landowner, particularly those encumbered with debt, he would have been keen to extract as much income as possible from his land. So the discovery of lead ore in the townland of Glengowla East late in 1848 must have seemed like a godsend. Henry Bird (1852) relates the moment of discovery,

"Mr.O'Flahertie of Lemonsfield, on removing the soil, covering the surface of a rock, on his property at Glengowla, discovered some portions of lead ore. After due search, a vein of metal was laid bare, and exposed to view; and upon examination it was found, that there was every prospect of this mine paying well for the trouble and expense of working".

Mining began on 11 January 1850, initially under O'Flahertie's control (Anon. 1851; Kinahan & Nolan 1870), and very soon, according to Bird (1852):

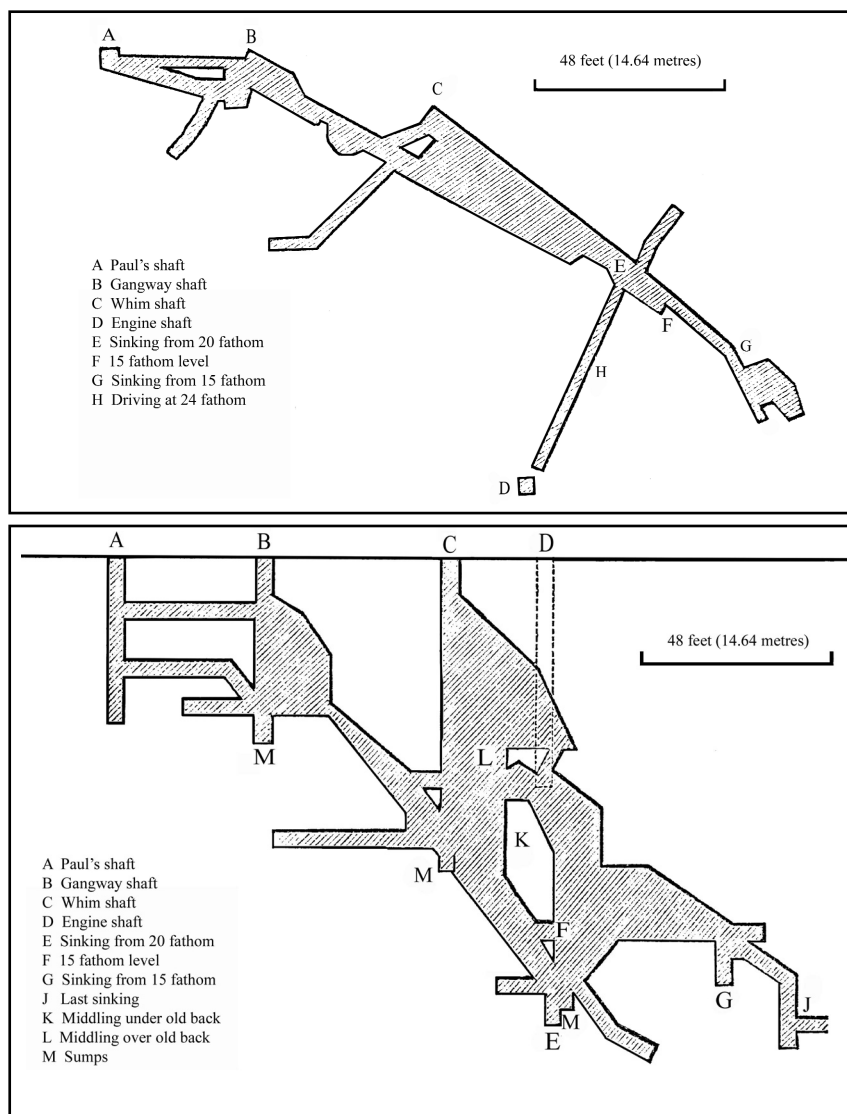


Figure 1. Plan and section of the main mine based on originals by Captain Tracy. Reproduced from Kinahan and Nolan (1870).

"on the very place where bleak desolation had reigned alone, there sprung up, as if by the touch of magic, neat cottages for the occupation of the miners, sheds, cleansing and sifting frames, and shafts, with many other unequivocal signs of man's vicinity; and better still, man's industry. Thus, then, the formerly almost barren spot became covered with buildings and machinery, and presented a scene of bustle and activity."

By the end of the year an impressive 192 ½ tons of ore had been raised (Anon. 1851). In January 1851 75 tons of this ore had been sold for £11/5/- a ton, and at least three shafts had been started, these being named Cooney's, Colonel's and Paul's shafts. The first two were producing ore, and Paul's showed "good promise" (Anon. 1851).

Being heavily in debt, O'Flahertie probably had little choice but to mortgage his estate to one William James Stokes, later described in the Registry of Deeds as a trustee of O'Flahertie. The sum of £3,650 was advanced, with the estate as security, in return for mining rights for 41 years, and a rental of 1/16th of the production to be paid to O'Flahertie. The money, however, was not Stokes', but came from Henry Hodgson (Registry of Deeds 1851).

An experienced mining entrepreneur, Henry Hodgson (1796 - 1878) had made a fortune in the copper and sulfur mines at Avoca, County Wicklow. His first venture at the Ballymurtagh copper and sulfur mine in 1822, ended in his bankruptcy in 1831, despite it being a rich mine. But the failure soon afterwards of the Royal Irish Mining Company gave Hodgson the opportunity to secure their leases to two other mines, Ballygahan copper and sulfur mine adjoining Ballymurtagh, and Glenmalure lead mine, also in County Wicklow (Schwartz and Critchley 2014).

The latter seems to have met with only modest success, but Ballygahan made him rich enough to build a tramway to facilitate moving the ore to Arklow (Duffy 2003). By the 1850s he was looking westward and was already mining for copper and sulfur north of Oughterard when he took on Glengowla. He also bought the Merlin Park house and demesne in 1852, and the adjoining lands including the black marble quarries (Anon. 1852a). These quarries, it was later remarked, Hodgson worked at "a considerable profit" (Anon. 1867). He moved to Oughterard and his descendants still live there at Currarevagh House, which they run as a hotel.

Historians should note, at this point, that confusion arose owing to the similarity in surnames between Henry Hodgson and one George Hudson. The latter, M.P. for Sunderland, was a railway magnate, whose business empire at its peak made him one of the richest and most powerful men in the country. But it was an empire built on debt and corruption, and by now was beginning to collapse, making him an unlikely investor. Yet a plethora of newspaper reports from early in 1853 incorrectly state that he had bought Merlin Park and was mining at Glengowla.

The error can be traced to "The Tuam Herald" which, on 20 November 1852, in reporting on the sale the day before of the Merlin Park estate, named "Mr. H. Hudson (owner of the Wicklow copper mines)" as a purchaser. Clearly this was Henry Hodgson as confirmed elsewhere (Anon. 1852a), but in due course it got into the Mining Journal (Anon. 1853a) which embellished it thus:

"George Hudson Esq., M.P. for Sunderland, has just taken possession of the Merlin park estate in Galway which he lately purchased in the Irish Incumbered Estates Court. Mr Hudson is largely engaged in mining speculations in different parts of Ireland, and is at present working the Glengola lead mines, in the neighbourhood of Oughterard. The Merlin Park marble quarries are supposed not to be surpassed in Ireland, as the regards the supply and quality of the material, and Mr. Hudson is about to work them on a scale that will afford permanent employment to a large number of labourers and mechanics."



Figure 3. Restored magazine for storing gunpowder.



Figure 4. Miners' kibble on some old timbers.



Figure 5. Mine owner Keith Geoghegan with a heavy chunk of ore from the mine.



Figure 6. General view of the mine buildings, modern and old. From left to right: modern shop, original stables and mine agent's cottage.



Figure 7. Original hydraulic pipe and timbers in one of the deepest parts of the mine.



Figure 8. Looking up Whim shaft.

This erroneous report was then copied verbatim by numerous other papers in the following weeks.

A rare insight into the daily routine at the newly commenced mine is provided by a series of biweekly reports in a barely legible notebook preserved in the National Library of Ireland signed by "Pierre J. Foley", and covering the period June to October 1851. St. Pierre J. Foley, from County Waterford, was a colourful character. Cowman (1992) tells us that he appeared in 1822 offering lectures "*On the Doctrines and Principles of Chemical Philosophy and Astronomy including the Principles of Optics, Hydrostatics, Pneumatics and Electricity*" at a costly 6 shillings each. Unsurprisingly, these were poorly attended, but Foley evidently knew enough about geology to make a living surveying the estates of the landed gentry in his neighbourhood and waxing lyrical on the mineralogical wealth he claimed to have found, in some cases encouraging the landowners to invest in trials. The resulting endeavours proved fruitless, except one - Knockmahon - which would make the Mining Company of Ireland, which had previously dismissed his optimistic reports, rich.

Whilst this may have secured his reputation it did not secure him steady employment and he embarked on a peripatetic life, turning to lecturing again, this time in Limerick in 1842, but continuing to dabble in mining and writing glowing reports of Ireland's mineral potential. In 1850 he was secretary of the short-lived "*Mining Company of Wales*" (Bick 1982) but the following year he was back in Ireland where he was managing the Glengowla mine, and copper and sulfur mines at nearby Drumsnane and Curraghduff.

Exactly when Foley arrived at Glengowla is not known, but his earliest dated report is for 21 June 1851 in which he described the lode (or mineral vein) in a section of the mine he called "*The Backs*", as "*regular and strong - 3 ft wide*" and yielding 10 tons of ore per fathom, there were 22 tons 8 cwt of ore in stock, 13 tons 8 cwt of it at Galway.

His weekly reports continue (Foley 1851) and tell us of a water course, evidently to supply water from a nearby lough, part of which was raised on "*perches*", an engine shaft already being sunk in June from which men were diverted to drive a connection from Colonel's shaft to Paul's, and a magazine under construction, presumably to store gunpowder.

Influx of water was a problem. A windlass was erected over the Engine shaft to haul up the water (9 July) and the work on Paul's shaft had to stop until pumps were installed (16 July). On Saturday 19th July he wrote that Engine shaft was 16 feet deep, but the top 10 feet were dangerous (not being in solid rock). He proposed oak timbers to secure it rather than stone walling "*as masons are bad builders here & dear*". It still cost £7 (2 August).

By the end of July he was expecting a much needed whim to deal with the water, but it was not until the end of August that the men began blasting out space to accommodate the whim barrels. A few weeks later launders for the water course were completed and a water wheel nearly so (24 September). A sump for the pumps was "*progressing*" but in ground that was "*hard and wet*" (18 October). When the whim and pumps were final-

ly operational is unknown as Foley's reports cease after October.

Of the workmen Foley says little other than his disparaging remark about the masons. We do learn that the bargain system was in use - a gang of four men were paid £5 a fathom to drive west along the lode (5 July) and stoping (removing a section of vein) earned the men £2 per cubic fathom and 5/- per ton of ore produced (30 July). A later manager wrote a list of sums paid to miners dated 24 October 1854 in which he gave names to some (Lumsden 1854). First on the list is one Michael Geoghegan, paid a shilling for unspecified work. Geoghegan is the name of the family who currently own the mine. A Pat Cooney was paid 6/8, and Ned Cooney 7/10. Again the work done is not stated. Readers will remember there was a Cooney's shaft.

Arduous though the work must have been, the miners were the lucky ones. They had jobs and income. A journal by a young Scotsman, sent to inspect the enormous Connemara estate of the bankrupt Martin family, describes appalling poverty, suffering and despair throughout the district (Scott 1995). Finding skeletons of famine victims still in their hovels was not unusual. Nor was he impressed by Oughterard, a few miles down the road from Glengowla:

"Oughterard", as a town, is contemptible in every respect; the people are poor, proud, spiritless and indolent; the arrangements of the streets, irregular and unmeaning; the houses dilapidated and filthy. There is no decent cottage, nook or corner, within its area, and whether in sunshine or shower, there is a bleak and comfortless aspect over, and all around it."

Henry Bird (1852) commented on the benefits to the poor locals:

"Soon after the opening of the mine, it gave employment to upwards of 50 men, women and children and at this period it is not unreasonable to presume that nearly double that number are employed; and I cannot refrain from adding that a great and important good has been effected in the locality by the opening of this important work by the employment of young lads, who would otherwise be strolling about in the vagabondism too often the offspring of idleness - learning and practicing every vice. Numbers of young men of this class are now to be seen honestly earning their own support, and in many instances, saving from want, and death, an aged parent, or dependent sister. None can appreciate the felicity of eating the bread of industry, save he who works; how much then should we BLESS the cause producing such results."

He also provides a few details about the working of the mine:

"The lead ore, when first brought up from the mine, is dressed by women and boys, who with hand-hammers separate the greater part of the adhering impurities, such as the zinc blende, iron pyrites, quartz, &c.; the remainder is then broken down into pieces of about the size of large chestnuts; washed from all the clay adhering to it, and is then ready for smelting."



Figure 9. Main stope.



Figure 10. Modern mine entrance. Paul's shaft is to the left, Gangway shaft is under the tripod.

Oddly, he does not describe washing the crushed ore, to remove contaminants, leaving the dense ore behind, as was standard practice, although the mention of "*cleansing and sifting frames*" indicates that the ore was thus treated. The ore was sent off every two or three weeks to Galway, from whence it was shipped to smelters in Swansea (Bird, 1852; Anon. 1852c). A report of 55 tons of lead ore and 20 tons of copper from Glengowla being despatched to Swansea (Anon. 1852c) is probably in error as copper is very scarce at Glengowla, but it was being actively mined by Hodgson at Glann, to the north of



Figure 11. What would the miners have thought of this?



Figure 12. Octahedral fluorite crystals 13 mm on edge from Glengowla. Author's specimen, David I. Green photo.



Figure 13. Colourless octahedral fluorite crystals on calcite. Keith Geoghegan specimen, SM photo. Specimen is 115 mm long.

Oughterard. The Glengowla ore contained 68 % lead, and sold for £12 to £14 10s per ton, but cost only £4 per ton to produce, making the mine very profitable (Bird 1852). By the time Bird wrote his account the mine had reached a depth of 37 fathoms (222 feet or 67.7 metres).

Occasional visits were made by mining experts. Passing mentions are made in Foley's notebook of a Captain Webster (23 August) and a Captain Tracy (22 October). "Captain" in relation to mining, is a Cornish term, and simply means the person in charge, or manager. Tracy was agent to Henry Hodgson and after Foley's departure managed Glengowla. He was already managing copper and sulfur mines at Glann, north of Oughterard, on behalf of Mr Hodgson, and had a cottage at Curraghduff, close by those mines (Kinahan & Nolan 1870). Of Webster nothing is known.

Mineral collectors would drool at the repeated mentions in Foley's reports of "vughs", "loch holes" or "lough holes". A "vug" is a natural cavity in rock, often lined with crystals, and Glengowla was to acquire a reputation for these. Over and over again, Foley refers to them. Thus on 25 June, *"The sinking very irregular - full of loch holes (or vughs) One dipping SSW 3 ft High and 7 feet Wide full of Large Lime Spar"* (calcite). On 2 July, *"a large lough hole now in the Breast"*. On 12 July, *"large lough hole towards the north"*. And a particularly spectacular one on 26 July:

"a vugh broken into on the extreme N corner of forebreast, running N and S showing an inclination to cover the entire forebreast when driven 2 feet farther - this vugh has an air communication with the sole [floor] of Backs, its upper surface as far as a scraper can reach exposes all lead ..."

The thought of a scraper ruining doubtless many fine examples of crystallised galena (lead ore) and other minerals will make mineral enthusiasts cringe, but Ireland never had much of a tradition of mineral specimen collecting, and to the proprietors, managers and miners, it was all just ore. The vug of 26 July proved to be 26 feet long, as well as being of sufficient vertical extent to connect to the level above called *"the Backs"* (30 July). Mentions of large vugs continue throughout Foley's reports, one with *"Chrystals of Lead"* (10 October). One can only wonder at what mineralogical treasures were lost.

Foley was still around in February 1852 when he wrote a report to his boss *"On the mineral features of certain districts of Connemara - Co. Galway"*, one of a series covering the area. This one (number 5 in the series) survives as two rough, and hard to read, drafts (Foley 1852). After describing the local geology and mineral potential he turns to business. With portions scored out (but reproduced here) he wrote:

"... with respect to the Royalty ~~to be asked provided you let this Since to a Company~~, the highest Royalty rent payable in this district is 1/16th, and that in the Glengola Lead Mine which is paying a handsome profit - this mineral district being comparatively still undeveloped the object should be to attract ~~English~~ Capital to it ..."

and in the other draft:

"The general Royalties paid here are from the 1/16th to the 1/18th and as the object of the landed Proprietor desire [is to] encourage Capitalists, I have no doubt that the Royalties would be much less and every encouragement given to assist in every way."

This confirms the rental of 1/16th of the produce being paid to O'Flahertie, and that the mine was profitable. As an indication of how rich the ore was, a mass of it weighing one hundred weight (112 lbs or 50.8kg) was sent to an exhibition in Cork, along with other mineral samples from the mine (Anon. 1852b). As with his starting date, exactly when Foley left his job at Glengowla is not recorded, but in September 1853 he was reporting on the lead and silver mine at Caherglassaun about 40km to the south east (Anon. 1853b). Just a few weeks previously he was inspecting Welsh gold mines, and witnessed a spectacular find at the Prince of Wales mine (Hall 1988). Perhaps inspired by this he gave up on Ireland and spent the next few years searching for the yellow metal in Merioneth.

In January 1853 it was announced that a new lode had been found *"to the north of the main one, recently so productive for lead"*. Four fathoms had been driven along it, with 7 inches of solid ore visible in the floor and roof (Anon. 1853c). But just a fortnight later the mine was inactive and partly flooded (Anon. 1853d) but things were soon underway again in February with ore *"continuing to increase"* and a new drive being commenced from Paul's shaft *"to cut the Maria lode, which is supposed to be about 5 fms. south"*. *"Maria lode"* is an enigma as no other mention has been found, and the new lode referred to earlier was to the north. In addition, a new trial was being started about a mile to the west (Anon. 1853e). This last was likely in the neighbouring townland of Glengowla West.

Confusingly, a brief notice in the *"Dublin Evening Mail"* informs us that *"George F. O'Flahertie, Esq., of Lemonfield, has let the Glengola lead mines also to a Galway company"* (Anon. 1854a). But there is no indication in any other source that there had been any change in the lease to Hodgson. His days at Glengowla were coming to a close, however. In November 1853 the Commissioners of Encumbered Estates ordered the sale of O'Flahertie's estate (Anon. 1853f).

Then, as now, bureaucracy moved slowly, and it was not until October the following year that adverts for the pending sale appeared. As well as mentioning the mines, which had an over-shot wheel, 18 ½ feet in diameter, for pumping the water out of the workings, Henry Hodgson was mentioned as having an interest (Anon. 1854b). The sale took place on Tuesday 7 November 1854. Only four of the 14 lots were sold (a fifth was sold privately) and these did not include Glengowla. The sale did, however, realise £5,000, which was sufficient to pay off Mr. O'Flahertie's debts (Anon. 1854c).

In February 1855, with funds at his disposal, O'Flahertie repaid the original £3,650 loan from Hodgson (made via Stokes) who surrendered his lease. So now O'Flahertie was back in control (Registry of Deeds, 1855). Evidently it did not go smoothly, however. The Geological Survey Memoirs report that mining ceased, despite good ore in sight, owing to a legal dispute with Mr. Hodgson (Kinahan and Nolan 1870). Details of this dispute do not survive, although the "Oughterard Heritage" website



Figure 14. Slender quartz crystals from Glengowla.
Specimen is 62 mm wide. Author's specimen & photo.



Figure 15. Aerial view, looking south. Whim shaft below left of centre. Photo Robert Lawson.

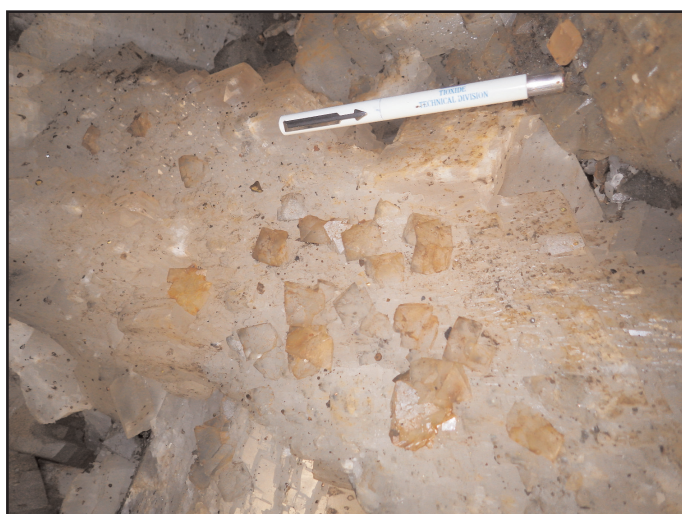


Figure 16. Octahedral fluorite crystals on calcite in situ.
The pen is 13 cm long.

says it was prolonged and left George the loser, and back in debt (Culture & Heritage Group 2010).

With O'Flahertie again in direct control of mining, it was reported in January 1857 that he had sold several tons of baryte at £3 per ton, and a "*large body*" of this mineral was located at a depth of about 20 fathoms in the mine (Anon. 1857). Baryte (also spelled barite or barytes) is a dense white mineral consisting of barium sulfate, and found use as an ingredient in paint. Nor did he give up trying to sell his land. An advert in July 1859 for the sale of the adjoining townlands mentioned that Glengowla East and Glengowla West could be included if the buyer wished. A "*valuable lead mine*" being an enticement (Anon. 1859). He tried again in 1864, by which time the mines had four shafts, one about 36 fathoms (66 metres) deep (Anon. 1864). George O'Flahertie apparently never found a buyer for Glengowla. The Mineral Statistics list him as the proprietor up until 1865, when working was "*suspended*" but no production figures are given. The Oughterard Heritage website says that he still owned 2340 acres in the 1870s, and the family were selling off land as late as 1916 (Culture & Heritage Group 2010).

The next mention is in 1870, by geologists from the Geological Survey, cited earlier, who state that the mine was then flooded (Kinahan and Nolan 1870). By now it had a watercourse 1 ½ miles long to convey water from the Owenfough to turn the waterwheel which operated the pumps and winding gear. Four shafts had been sunk: Paul's, Gangway, Whin (Whim) and Engine shafts, the names "Cooney's" and "Colonel's" used earlier apparently having been discarded. There was also a two-horse whim with chain and buckets, an agent's house, blacksmith's shop, magazine, and a dressing floor where the ore could be processed, but these were "*all more or less out of repair.*"

Prospects improved the following year. On 30 November 1871, the "*Galway Mining Company*" was incorporated, with leases to several mines in the area, including Glengowla. The company was a project of one John Gibb a "*sometimes contractor's clerk*" who, holding the leases to various mines but lacking the funds to develop them, enlisted a group of fellow Scotsmen to enter into partnership. Together they raised capital of £20,000 and set about mining on their prospects at Cregg, Glengowla East, Glengowla West, Cranrower, Bunnagippaun, and Luggakareen, in the neighbourhood of Oughterard (Anon. 1875a).

As is often the case with the history of Glengowla, very little survives to tell us of this venture. The Mineral Statistics merely list the "*Galway Mining Co.*" as proprietor, and one John Floyd as their manager, for the years 1876 to 1881 inclusive. No production is recorded and, as we shall see, these dates are incorrect. Floyd may have previously worked at Glengowla as there is a mention in 1870 of a trial on "*Floyd's lode*" in the neighbouring townland of Glengowla West (Kinahan and Nolan 1870). Other than a fleeting mention of one William McSkimming advertising for sale his ten shares at £20 in 1873 (Anon. 1873) nearly all that is known of this phase comes from the sorry disintegration of the company and falling out between the shareholders, as covered in the reports on the resulting litigation (Anon. 1875a; Anon. 1875b).

PRODUCTION

By November 1856 it was reported that the mines had produced a total of 362 tons, 17 cwts of lead ore in the period January 1850 to February 1852 (Anon. 1856). Oddly, no mention is made of production in the years following 1852, and the mineral statistics mention only 60 tons of ore in 1851, 50 in 1852 and are silent on the other years (Hunt 1853). As 192 ½ tons were raised in 1850 (Anon. 1851) these total 302 ½ tons, not 362 tons & 17 cwt. The memoirs repeat the 362 tons & 17 cwts figure (Kinahan and Nolan 1870) without giving a source (possibly Anon. 1856) and mention that a few tons of sphalerite (zinc ore) and baryte were also produced. As a considerable amount of mining took place under Hodgson, and possibly the Galway Mining Company, as well as under O'Flahertie's direct control, the actual tonnage is likely very much higher than that reported. Even assuming 50 tons a year (based on the Mineral Statistics for 1852) would indicate a yield of around 400 - 450 tons for the years 1857 to 1865 when the mine was listed as "*suspended*". Add on whatever was produced in the 1870s by the Galway Mining Company, and a total production in excess of a thousand tons is possible.

All lead ore contains a little silver as a natural impurity and this is routinely recovered during the smelting and refining process. The Mineral Statistics for 1852 state that 50 tons of Glengowla lead ore yielded 140 ounces of silver, or 2.8 ounces per ton. This should be seen as a theoretical yield based on assays as the ore, on arrival at the smelter, may have been mixed with ore from other mines, smelted and refined. It would not have been possible to point to a particular ingot and say that it came from Glengowla, but silver was certainly present, and likely recovered.

Some work had been undertaken but was unsuccessful (Anon. 1875a). The advert for the sale of the company's assets in 1877 states that two mines had been worked, though which are not stated (Anon. 1877), and no production figures have survived. A final attempt at a revival came in 1907 as recorded in the HMSO's "*List of mines*" (Gerrard, 1908). Messrs Symington and Blair, of 94 Hope Street, Glasgow had begun work at a mine named as "*Hodgsons*", at Oughterard, with 24 people employed, all above ground. Although not expressly stated that this was Glengowla, it very likely was, being the largest mine in the neighbourhood and having formerly been operated by Mr. Hodgson, hence the name. The minerals sought were "*Copper ore and lead*", although copper is scarce at Glengowla. It should be noted that a contemporary mine (Clement's) near Maam, was also listed as being for "*Copper ore and lead*" although it too was just a lead mine.

The following year the company had changed its name to "*Galway Mines Ltd.*", had moved up the road to no. 116 Hope Street, and had 22 people employed, again all on surface (Gerrard 1909). A small snippet of additional information comes from a notice in "*The Scotsman*" (Anon. 1908):

"NEW JOINT STOCK COMPANIES

... Galway Mines, 116 Hope Street, Glasgow, to purchase and develop mining rights. Capital, £75,000, in shares of £1 each. The public are not invited to subscribe for shares. ..."

The "*List of mines*" still mentions Galway Mines Ltd. in 1910 and 1911, but with no employees, and no production recorded. It had ceased by 1912. As the activity was all on the surface it likely consisted only of reprocessing wastes, with no active mining.

The proprietor at this time was one J. P. O'Flahertie (Daly 1917), probably Jack, son of Theobald, George's cousin who had inherited the estate from the childless George (Culture & Heritage Group 2010). He had no interest in reopening the mines, although would have leased them "*to any desirable person or company*" (Daly 1917). None such came forward, and so

ended the story of mining at Glengowla, though not the story of the mines themselves.

A NEW BEGINNING

For decades the mines attracted little attention beyond an occasional visit by geologists and mineral collectors, although the waste heaps were removed at some point, possibly as a convenient source of aggregate. In 1989 Keith Geoghegan inherited the site from his great uncle Matthias, whose ancestors the Conneelys had lived there since about the time the mine closed. At first, the Geoghegan family regarded the open shafts as a liability and, acting on a suggestion from a friend, tried to plug one with a car wreck (a blue Renault according to Keith), and were thinking of filling them in altogether.

Then a chance meeting changed everything. In summer of 1991 a keen young mineral collector (yours truly) turned up in hope of finding some of the fine crystallised minerals for which the mine had been noted. This being my second visit (the first was when Matthias was still resident). Keith's parents, Paddy, and his wife Pat, took an interest in the pieces of mineral to be found in what scant mine waste remained, and were delighted by copies of the mine plan and section I had with me. And they listened when it was suggested that filling the mine in was not the way to go.

They did more than listen. From seeing the mine as a liability, the enterprising and imaginative Geoghegan family turned to seeing it as an opportunity. The following year the main mine was pumped out and surveyed by the Camborne School of Mines with a view to opening it as a tourist attraction. Later the Shropshire Caving and Mining Club visited and gave useful advice. Three of the shafts had their old collars replaced (the Engine shaft remained untouched as it was never completed, and did not connect with the main workings), and many tonnes of accumulated rubble and rubbish were cleared out, including the car wreck.

The walls were washed down to expose the minerals and patterning in the marble wall-rock, a well pump installed to keep

GEOLOGY AND MINERALOGY

The geology of Connemara is 750 million years long, and very complex. For a detailed modern account the reader is referred to Morris *et al.* (1995), Leake and Tanner (1994) and, for the technically-minded, Friedrich and Hodges (2016). Here we shall concentrate on the mine and its immediate environs. The mine is hosted by the Lakes Marble Formation, a series of thick limestone beds interspersed with sandstones and volcanic rocks, all metamorphosed into marble, quartzite and amphibolite respectively. This series, a mere 600 million years or so old, is distinct from, and slightly younger than, the famous green marble, but like its more colourful cousin began life as calcareous sediment on an ancient ocean floor, before being hardened into rock, squashed and deformed, subjected to intense heat and pressure, and ultimately uplifted and exposed by erosion.

Intruded into this formation is a series of granites, and Glengowla lies in a strip of Lakes Marble sandwiched between two such intrusions. About 150 metres to the north is the Oughterard granite, dated to 463 million years (Ma) old by careful measurement of its uranium and lead isotope ratios (Friedrich and Hodges 2016). Radioactive uranium decays into lead at a fixed rate. By carefully measuring the traces of these in certain minerals in the granite an age can be calculated.

A few kilometres to the south lies the huge Galway granite comprising a series of intrusions spanning about 392 - 402 million years ago as determined by the uranium-lead method (Feely *et al.* 2003), but the Glengowla mineral deposit is likely much more recent. There was a widespread event in the Triassic period (251 - 199 million years ago), in which hot watery fluids possibly mobilized by rifting, pervaded the Galway Bay area, forming many small deposits of lead, zinc, fluorite and barite (O'Connor *et al.* 1993). Thus, on the basis of its mineralogical similarity, it is tempting to attribute Glengowla to this event. And dating (by the potassium-argon method) of Glengowla vein material at 212 +/- 4 Ma places it comfortably in the Triassic (O'Reilly *et al.* 1997).

But there is a catch. The Geological Survey Memoirs state that the Glengowla vein is cut off to the west by a granite dyke (Kinahan and Nolan 1870). As the granites in the neighbourhood are all around 400+ Ma then, if the vein is cut by one, it must be older than 400 Ma. Either the Memoirs are wrong, or Connemara guards her mysteries well.

What we do know is that deposits of this type form from hot watery fluids, or hydrothermal solutions, and the Triassic ones were the last in a series of fluid movements through Connemara's rocks spanning some 200 Ma. Tiny traces of these fluids remain included in the crystals that form from them, and careful analysis of these indicates that the solutions that formed the Glengowla deposit had a temperature of around 200°C and were salty (O'Reilly *et al.* 1997).

Marble (calcium carbonate) is easily attacked by such solutions, hence the creation of large void spaces in which the ore and other minerals could precipitate. It is likely for this reason that the deposit became noted for its huge crystal-lined vugs. The memoirs refer to "*beautiful octahedron crystals of green fluorite and crystals of quartz*" (Kinahan and Nolan 1870) and it is those fluorite crystals that have attracted the most attention amongst mineral collectors.

Although a common mineral, fluorite is immensely popular with specimen collectors on account of its often clear and highly coloured crystals. Normally they adopt a simple cubic form. Octahedrons are much less common and so are highly sought after. Purple is the most common colour, followed by green. Amber, blue and even bright pink varieties are also known, the last (from the Alps) command eye-wateringly high prices on account of their beauty and rarity. Those from Glengowla are generally rather colourless, tending to pale purple or green, but they are large (up to several centimetres) and well-formed.

Factors affecting the crystallisation of fluorite are complex, although temperature is one. Laboratory experiments indicate that above 374°C the octahedral form results (Franke 2015). As this is much higher than the temperature of the Glengowla mineralization other factors, such as fluid composition, must be involved.

Other minerals crystallised in the vugs are quartz as white to colourless slender prisms up to several centimetres in length, white barite, calcite (usually translucent white, though some is the clear "Iceland spar" variety), galena (lead ore), brown sphalerite (zinc ore), pyrite ("fool's gold") and very small amounts of chalcopyrite (copper ore), dolomite and aragonite. Examples of most of these can be seen in the museum at the mine. Sadly, only a few 19th century examples of the octahedral fluorite survive in museum collections, but those that do are considered by collectors to be world-class.

the workings dry, a near-surface drive roofed over with concrete to make a secure entrance, and concrete steps, handrails and electric lights installed. On the surface the mine captain's house, smithy and powder magazine were restored, the old wheel pit cleared out and a replica horse whim built (Geoghegan 2003). As a builder, Paddy was well placed to assist Keith in this work. A shop with museum, and a bus and car park followed later. Meanwhile the Geoghegans became founding members of the Mining History Society of Ireland in 1996 (later renamed the Mining Heritage Society of Ireland, and finally Mining Heritage Trust of Ireland).

By the end of 1997, most of the works at Glengowla were complete, and Peter Eggleston and Mike Moore had produced a video of the mine (available from the I.A. Recordings website). The following year the mine opened and has been a popular attraction ever since. A guided tour talks the visitors through the history of the mine, and 19th century mining methods. The underground part takes in five levels where can be seen the shafts, stopes, shot-holes and timbers, some of these last being thought to be pitch pine brought back from the eastern USA by emigrant "coffin ships". These ships transported the poor fleeing the famine to a new life in the states. Pitch pine, a species

native to the eastern U.S. seaboard was prized for use as mine timber because its high resin content acted as a natural preservative. The timbers remain in remarkably good condition today. Some examples of the minerals can still be viewed in situ, although the best surviving vugs are in the deepest parts of the mine, unfortunately currently not accessible to visitors.

On the surface visitors may wander around the site where explanatory boards describe the visible remains. Inside the museum is a collection of mining implements and mineral specimens found during the rehabilitation of the mine. A seismograph, part of the National Seismic Network, monitors Irish earth tremors (yes, they do happen!) and has proved a very popular exhibit. Visitors may also try their hand at gold panning and, by appointment, may also get to see sheep herding and peat cutting - Glengowla is, after all, a working farm. A shop with a selection of souvenirs, literature and mineral specimens from around the world provides an opportunity to purchase a reminder of one's visit.

As well as tourists and school parties, the mine has attracted students from Athlone Institute of Technology practising their underground mapping skills, and recently served as a film set. "*An Klondike*" ("*Dominion Creek*" in the U.S.) tells the story of three Irish brothers seeking their fortunes in the Klondike gold rush of 1896-9. And so the story of Ireland's first show mine goes on. And it all started because during the Great Famine, George Fortescue O'Flahertie found a boulder of glittering rock on his estate.

GLOSSARY

Bargain system. A system of payment in which a miner or a group of miners was contracted to carry out a specified task (e.g. drive a set length along a level, or raise a certain amount of ore) for a fixed sum, or price per ton of ore, agreed in advance.

Baryte (barytes, barite, heavy spar). A common mineral consisting of barium sulfate. Used as a whitener for paint and paper, and in drilling mud in the oil industry.

Cwt. Abbreviation for a hundredweight, or 112 lbs (50.6 kg).

Fathom. Six feet, or 1.83 metres.

Fluorite (fluorspar). A common mineral consisting of calcium fluoride, used as a flux in steel making, and as a source of fluorine chemicals.

Galena. The main ore of lead, consisting of lead sulfide. When freshly broken it has a shiny, glittering appearance.

Launders. Troughs for conveying water.

Lough (loch) hole. See vug.

Ma. Abbreviation for "megaannum", used by geologists to denote one million years.

Powder magazine. A small building located safely away from the main area, in which gunpowder was stored.

Overshot waterwheel. A waterwheel in which the water is delivered to the top of the wheel, just forward of the axle. The weight of the water collecting in the buckets turns the wheel. This design is more efficient than the undershot wheel, often placed in a stream, the natural flow of the stream turning the wheel.

Sphalerite (zinc blende). The main ore of zinc, consisting of zinc sulfide.

Stope. A section of the vein that has been removed by the min-

ers leaving a void space. This space may, or may not, be backfilled with waste.

Vug (vugh, lough hole, loch hole). A natural cavity in the rock or vein, often lined with crystals.

Whim. A device for hauling materials out of a mine, consisting of a drum or barrel mounted on a vertical axle, around which ropes were wound. Turning was usually by water or animal power.

Windlass. A small winch, working on a similar principle to a whim, though with the barrel oriented horizontally, often turned by hand.

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