

Leitrim's physical landscape

Susan Hegarty

County Leitrim possesses perhaps one of the most beautiful and diverse physical landscapes of any county in Ireland. From its stunning cliffs around the Glencar and Glenade valleys to its hills encircling Lough Allen, and its drumlin landscape to the south, the county has a variety and a remoteness that has both attracted many and yet also at times has been a downfall in the county's fortunes. The history of any Irish county is bound up in the characteristics and wealth of its natural landscape. This chapter aims to describe the creation of the physical landscape of Leitrim - a landscape that has evolved over the last 600 million years of earth's history. This landscape has also been endowed with minerals and deposits which drew the attention of entrepreneurs and industrialists in the eighteenth and nineteenth centuries. These main trends will also be explored, to give some insight into the characters who exploited the mineral resources of County Leitrim.

Precambrian

The foundation of Leitrim's rocks was formed more than 600 million years ago, when the landmass that we now know as Ireland was on two separate continents - the northwest of the country on the continent of Laurentia, which was formed from parts of modern-day America and Greenland, as well as Donegal; with the southeast of the modern island on a separate continent called Gondwana. Between these two continents lay a vast ocean, which geologists have called Iapetus.

The oldest rocks in the county are found in the north, from Manorhamilton to the Ox Mountains in Sligo (figure 1). Among the oldest rocks on this island, they form the rounded hill of Benbo, near Manorhamilton, and the area to the southwest as far as just north of Dromahair. An understanding of the formation of these rocks can lead to an appreciation of the landscape of Leitrim. Originally laid down within the Iapetus Ocean around 605 million years ago, they were subsequently deformed and metamorphosed into what geologists call the 'Slieve Donard division' during the earliest stages of the Grampian orogeny. An orogeny is a mountain building period, generally associated with the collision of tectonic plates. In this case, the orogeny, which received the name Grampian after the mountain range in Scotland, occurred as the volcanic islands that had been formed within the Iapetus Ocean collided with Laurentia. The tectonic plate beneath the Iapetus Ocean collided with, and subducted beneath, the continent of Laurentia. This caused the islands in the ocean to collide with the continent, causing the edge of the continent to deform and metamorphose. This orogeny occurred during the late Cambrian to early Ordovician (a geological time period which went from 500 million years ago to 475 million years ago).¹

Rocks from over 600 million years ago appear on the surface most noticeably at Skreeny, to the north of Manorhamilton. Gemstones called garnets adorn the rock faces, created by the forces and pressure of metamorphism caused by plate collision.

Ordovician and Silurian times in Leitrim

While the oldest rocks of the county are to be found in the northwest, the rocks from the subsequent period of geological history come to the surface in south-east Leitrim, bordering County Cavan southeast of the county (figure 1). These greywacke rocks are Ordovician in age (485-443 million years). Found around Carrigallen, they are part of what is known as the 'Longford-Down inlier' - a group of rocks formed from the sediments that were caught up in the subduction zone between the oceanic plate beneath the Iapetus Ocean and the Laurentian continent. These greywacke rocks represent the sediments that were washed off the ancient Laurentian continent into the Iapetus Ocean, and accumulated offshore. In turn, these were pushed upwards by the subducting of the oceanic plate, and were stacked on top of each other, in a formation known in geological terms as an 'accretionary prism'. The rocks formed within this prism are present on the surface from this area of Leitrim through Cavan and on to Down.

The next geological period represented within the surface rocks of Leitrim is the Silurian, during which the Iapetus Ocean continued to close. These rocks, fine-grained grey grits and shales, outcrop in a small area to the south and southeast of Drumshanbo, and were exploited in the second half of the nineteenth century as aggregate.²

Carboniferous

Most of Leitrim's rocks were laid down during the Carboniferous period - from 358 to 298 million years ago. These Dinantian limestones and sandstones (found in the north around Manorhamilton and in the south around Carrick-on-Shannon) were laid down at the beginning of the Carboniferous period. The Namurian sandstones and shales which contain layers of coal, found in the Slieve an Iarainn, Arigna and Drumkeeran areas (figure 1) were laid down in the second half of the Carboniferous. These Carboniferous rocks contain the most significant mineral deposits, which became a focus for entrepreneurs during the late eighteenth and throughout the nineteenth and twentieth centuries.

At the beginning of this geological period, during the Dinantian series, sea level began to rise, and the area we now know as Leitrim became inundated by a shallow, tropical sea, filled with coral reefs in some areas, while others were deeper and muddier. The coral produced sediment which formed the limestones around Manorhamilton in the north of the county and in the southern plains – we can still see the coral reefs in the form of fossils in these rocks today. Where these limestones were pure, they were dissolved by water to form a karst landscape, particularly east of Manorhamilton.

Sea-levels appear to have risen for much of the Carboniferous, but dropped towards its end, at the beginning of the Namurian stage. Within this setting, a river system north of Leitrim deposited vast quantities of mud and silt on the shallow sea floor. The rapid rates of deposition led to iron being precipitated out of the sediments to create nodules of ironstone.

Eventually sea-levels dropped completely and Leitrim was transformed from a tropical sea to marshes and subsequently tropical rainforests, whose trees eventually decayed and were buried beneath silt and mud. Over time, the compression of these layers of organic sediments created layers or seams of coal - a mineral that became a precious commodity during the late-eighteenth and nineteenth centuries.

The Carboniferous period bequeathed Leitrim with some of the outstanding landscape features of Leitrim, as well as many natural resources, such as lead, coal and iron.

Caves and cliffs

Limestone is present over 52% of the land area of the county in northwest Leitrim - from Killarga and Manorhamilton to the Atlantic coast at Tullaghan in southeast Leitrim - and from south of the Arigna and Slieve an Iarainn hills to Aghavas (figure 1). Pure limestones when eroded by rain, surface or groundwater, produce karst features, such as caves, dolines and sinkholes. These karstic features are concentrated in the north-west of the county, with the Geological Survey of Ireland noting sixty-three of the seventy-two karstic features mapped within Leitrim here (figure 2). The most spectacular of these karstic features are, without doubt, the cave systems.

Figure 2 illustrates that the majority of cave systems are found north of Manorhamilton. Coleman describes thirty-one of these caves in various levels of detail.³ Some occur at high altitude, which would indicate that they were formed at a time when water levels were different to what they are today and are possibly over 15,000 years old, some dating to before or possibly during the last glaciation.

An example of this type of cave is Poll na mBéar, in the scarp above the Glenade valley. Located 200 metres above the valley floor, it is formed in the very pure Dartry limestone formation, which was deposited within the tropical sea at the beginning of the Carboniferous period. The cave developed when a river was flowing through the limestone, and before the valley below was carved out by the glaciers of the last ice age. It has been suggested that the cave formation possibly occurred over 100,000 years ago, before the beginning of the last glaciation.⁴ Some of the passages within the cave itself are filled by glacial till sediments, again pointing to the fact that the cave developed at this time. When the cave was explored in the late 1990s, brown bear remains (which became extinct in Ireland approximately 7000 years ago) were found on the cave floor and scratch marks were found on the walls in one section of the cave. Some of the skeletal remains were of juvenile bears, suggesting that the cave was used as a nursery, while one depression within the cave was interpreted as a brown bear hibernation pit.⁵

Caves are not the only spectacular feature with which the karst has endowed Leitrim. Around Leann Mountain and The Doons, the karst landscape is one of limestone pavements with some relict karst towers – similar to the karst towers present today in parts of China. During the last glaciation, sections of the karst were eroded, leaving some of these relict towers behind. This limestone area is regarded by some geologists as the most interesting karstic area on the island of Ireland, with perhaps the highest density of dolines, or enclosed karstic depressions, of any region, but there have been few in-depth studies.⁶ The first surveyors of the Geological Survey, who mapped the district in the late 1860s and early 1870s, noted the many swallow holes, cliffs, unusual rock formations and caves. Some of them even sketched the formations onto their maps (figure 3). The area has also received attention because of the archaeological remains on the limestone pavement and associated shales. In a recent study, over 100 sites were located on Leann Mountain, ranging from hut

sites to pre-bog walls, hillforts to cairns, suggesting that the hill has been used by humans since the late Neolithic times, when deforestation facilitated agriculture.⁷

Lough Nahoo

Lough Nahoo, to the east of Dromahair, which the Ordnance Survey in 1835 recorded as meaning 'the lake of the cave',⁸ has been described as a human-induced turlough. The lake, which sits on top of karstic limestone, fills in the winter months, and drains during the summer, therefore allowing part of it to be classed as a turlough – lakes that disappear in summer, when the water table drops, and appear again during the wetter, winter months. To the south of the lake is a cave known as the Cove. However, it appears that the lake was not always a turlough. The first edition six-inch Ordnance Survey sheet, drawn in the 1836, shows the lake as any other, but by the time the second edition sheet was drawn up, half a century later, a road had been built through an area which had been covered in water. The Schools collection within the National Folklore Collection records a local poem about this, which relates the blasting of the rock at The Cove, to the south of the lake, by a group of men in an effort to drain the lake completely.⁹ In the middle of the nineteenth century, possibly at the same time, the surrounding wetlands were also drained and drainage from Lough Annary and other streams, that had been flowing into Lough Nahoo, were diverted eastwards. This human interference had a profound influence on the lake itself, reducing the amount of water that was getting to Lough Nahoo and the water table. The water table dropped so much during the summer months by the late nineteenth century that the lake completely disappeared, only to reappear during the winter when the water table rose.¹⁰

Limestone as a building material

Although Leitrim has limestone bedrock over more than half of the county, the limestone has not been used much as a decorative building stone in the area. Kinahan states that the best cut stones for buildings have generally been brought from neighbouring counties. He lists four quarries in the south of the county, in Mealwood, Castleslavin, Ballinamore and Kilbride, one mile from Drumsna, but he notes that the stone is difficult to work and splinters easily.¹¹ Such limitations did not prevent the stone from being used primarily for wall building during the great expansion in institutional building in the second half of the nineteenth century. The quarry close to the railway station at Carrick-on-Shannon supplied the stone for Carrick-on-Shannon Catholic Church (although the chiselled stones were supplied from quarries at Lanesborough and Creeve in County Longford).¹² The surveyors of the Geological Survey noted that stone from the quarries at Aghavilla, to the north of Carrigallen, were used in the building of Carrigallen Catholic Church.¹³ Meanwhile, the quarries between Dromod and Drumsna were used for the ashlar, groins and sills in the Catholic Church at Aughamore, while schoolhouses were built using the stones from quarries at Crummy and Cloonmorris.¹⁴

Lead mining in Leitrim

In some places, this limestone bedrock contains veins of metals, which were laid down on the ancient ocean floor. One of these metals, found in varying quantities in Leitrim, is lead, which in places is found in conjunction with smaller quantities of other metals, such as copper and even silver. Lead has been mined in Lurganboy, near Manorhamilton, since the end of the eighteenth century. McParlan noted a 'large quarry of lead ore' on the Sligo road outside of Lurganboy.¹⁵ By the time the Geological Survey examined the area in the 1860s,

the mines lay idle – the Memoir commenting that ‘it is now many years since they were abandoned by the last company who worked them’.¹⁶ According to contemporary accounts, the most productive of these mines was the lead mine in Twigspark, on land identified as Frazer’s farm.¹⁷ Further nineteenth century lead mines were located at the adjoining townlands of Shanvaus and Pollboy. These mines centred on Lurganboy were opened in 1842, and closed in 1846, when the company failed. The workings were not extensive, however, as quantities as small as fifteen cwt were transported by cart to Sligo, from where it was being shipped to Swansea. The copper was being sold there for £12 per ton, and the galena £17 per ton.¹⁸ No further mining was carried out in either Twigspark or Shanvaus, although prospecting was carried out in the area in the 1950s by the Thornton Mining Company, with a view to exploiting the lead and zinc deposits. This was not pursued, as it was deemed to be uneconomical, although recommendations were made that the pyrite in the area could be economically mined.¹⁹ Copper and silver were also found here, and Kinahan mentions that copper was mined prior to 1845 in the mines at Shanvaus, although he states that the date when prospecting first took place in these rocks is unknown.²⁰ The first edition Ordnance Survey 6” sheet shows a silver mine on the boundary of the townlands of Twigspark and Shanvaus, but it is not referred to in the accompanying name books which state that ‘limestone [is] in abundance but no quarries have yet been opened’.²¹

Iron and coal in Leitrim

Iron is Leitrim’s most commonly occurring ore, with economically viable quantities of the metal occurring in rocks around Dromond, in the south of the county, and in the vicinity of Lough Allen to the north-east in the aptly named Slieve-an-Iarainn and west of Lough Allen, close to the boundary with Roscommon (figure 4). While the iron in the Lough Allen area is associated with the coal measures, and is found within the Carboniferous Namurian sandstone rocks, the iron in the south is found in veins of haematite, a mineral containing iron ore, within a small inlier of much older volcanic Ordovician rocks in the townland of Gortinee, north of Dromod.

The iron industry in south Leitrim developed at the end of the seventeenth century. Land was granted to Captain William Slacke of Derbyshire in the 1690s. Together with his partners John Skerret and Joseph Hall, he established ironworks at Dromod and Ballinamore in 1695, which he worked until 1717, when the fuel (timber and charcoal) ran out.²² The iron industry during the eighteenth and nineteenth centuries was heavily dependent on fuel to power the furnaces required for smelting the iron. At the inception of the industry, there was a seemingly endless supply of wood and charcoal and the ironworks were located close to the source of the bulky fuel. By the late eighteenth century, however, the Irish woodlands were becoming depleted, and with the disappearance of the energy source, the iron industry also began to decline. Only in areas where there was a supply of coal in close proximity to the iron ores would the iron industry survive. Thus, the iron furnaces of south Leitrim, which were dependant on wood and charcoal for fuel, fell silent in the late eighteenth century, while the iron industry of Arigna, with its plentiful supply of coal, flourished late into the nineteenth century.

Iron in south Leitrim

Kinahan states that iron was mined in the area around Drumsna, in the townland of Gortinee, in the sixteenth or seventeenth century.²³ At the beginning of the nineteenth century, the quarries in Gortinee were worked by Major Francis Nesbitt of Derrycarne demesne, with the ironstone rock being sent to Dublin for export. The railway line from Longford to Sligo, built in the early 1850s, cut right through the location of one of the original lead mines in Gortinee. The cutting, on the property of Rev. Henry Stepney, exposed three bed-like veins of limonite, which were subsequently worked via two vertical shafts which were sunk around 1870. The ore was sent to Bristol to be smelted but the works were abandoned due to the falling price of iron in the mid-1870s.²⁴

The foundries that had been operational in the parish of Annaduff and processed the ore from Gortinee were in ruins by 1835, when the Ordnance Survey engineers were collecting data for the Name Books.²⁵ McCracken notes that the works were established in February 1695 by William Slacke, John Skerret and Joseph Hall. This furnace was closed in 1798, with its demise linked to the over-exploitation of wood in the area. From this date on, the iron was exported to Britain for smelting.²⁶ The townland of Furnace, formerly Bleankillew, received its name from this furnace that was located in the southern part of the townland.

Iron and coal in the Lough Allen district

The mineral resources of the Lough Allen area, in Counties Leitrim and Roscommon, are among the richest in the island of Ireland. In the early 1840s, Robert Kane wrote:

As I walked on, there lay around my path masses of iron ore, equally rich with the best employed in England. I knew that in those hills, whose desolate aspect weighted upon my mind, there were concealed all the materials for successful industry. A population starving, and eager to be employed at any price; a district capable of setting them at work, if its resources were directed by honesty and common sense; but all sacrificed to the stock-jobbing speculations of a few men acting on the gross ignorance and credulity of some others. If the industrial circumstances of this country were really known, such events as the jobbing of the Arigna Company could not have occurred.²⁷

'The Iron Mountain' area

The economic events referred to by Kane will be further discussed further below. Iron ore had been mined and smelted in the Lough Allen district of Leitrim from the mid-seventeenth century. Sir Charles Coote had a foundry at Creevelea (figure 4), in which, it is said, he employed only English and Dutch workers. This foundry was not as profitable for Sir Charles Coote as his works at Mountrath in County Laois, because of a lack of transportation.²⁸ Coote's ironworks at Creevelea and in the Argina valley were burnt during the 1641 rising.²⁹ At the beginning of the nineteenth century, MacParlan wrote that:

At Ballinamore and Dromshambo, little towns within a few miles of this mountain, iron furnaces and works have been carried on till lately by Sir Charles Coote, and in my own time by Mr Reynolds; and the remains of several furnaces are visible on different parts north and south of the mountain, which seem to have been carried on formerly to great extent.³⁰

The Creevelea works at Knockacullion were restarted in February 1852 by a Scottish company run by Donald Currie, who built two blast furnaces, a smaller furnace as well as steam engines, kilns and a small number of workmen's cottages. The source of iron ore for these works appears to have been the deep ravine to the east of Lough Altscrahagh.³¹ Currie became bankrupt in 1854, however, when the works were purchased by a Mr Ridges of London, who rented them to a Dublin businessman of the name of Potts, who in turn continued to work the mines at a smaller scale, using peat to smelt the iron. Due to the proximity of the fuel source, a peat tramway was constructed to bring peat from the bog to the south of Lough Altscrahagh to the ironworks. A tramway had also been constructed to transport the iron ore to the Creevelea iron works.³² The use of peat within the foundry was not sustainable, however, and Potts abandoned the works in 1858-59.³³ Nonetheless, iron was smelted from the works during the 1850s. The Memoirs of the Geological Survey note that a cannon made from the pig iron from the works was used during the Crimean War and the iron was also used by the Coates and Young shipbuilding firm in Belfast.³⁴ The works were opened intermittently in the 1860s, 1870s and 1890s, but the falling price of iron and the lack of transport made the works uneconomical. Despite petitions to a variety of bodies, including the Congested Districts Board, the railway was never extended to the area - a factor which those involved blamed for the closure of the mines at the end of the nineteenth century.³⁵ The works marked on the late-nineteenth century map are a testament to the extent of the ambition of the entrepreneurs who, despite their financial input, were disappointed in the return they received.

In the early nineteenth century, coal was being mined in Aghacashel, in the parish of Kiltubrid by Captain Johnston. He was reported as having a number of collieries in the Sliabh an Iarainn area and built a road to access them, although George Wynn in 1836 noted that 'It is some years since they have been worked'.³⁶ The area, which is sandwiched between the Cuilcagh mountains and Lough Allen, did not attract the same attention from prospectors as that to the west of Lough Allen. Although there were some trials sunk in the late nineteenth century,³⁷ it was not until the twentieth century that these seams were exploited. The Bencroy colliery was opened in 1925 by Thomas Cull and Patrick Gannon.³⁸ This colliery continued until the 1990s, although the coal there was of poor quality, its greatest production occurring during 'The Emergency', when the government promoted indigenous sources of energy. In 1981 the mine was employing 20 men, mining 140 tonnes of coal a week. Most of this was destined for the ESB power station at Arigna.³⁹

The Arigna iron and coal works

The Arigna iron and coal works, which straddle the counties of Leitrim and Roscommon, have been the subject of intensive mineral exploitations since the eighteenth century (figure 4). The story of the exploitation of these resources is complex, and requires a more extended treatment than can be given here.⁴⁰

The smelting of iron ore using charcoal around Drumshanbo last occurred in 1765, although this probably used iron from the eastern side of the lake.⁴¹ The land in the west on which iron was found was owned by Colonel Thomas Tenison of Castle Tenison (now Kilronan Castle), County Roscommon, who wished to exploit the natural resources of coal and iron there. With the planned expansion of a canal from the Liffey to the Shannon in the late eighteenth century, the resources of Lough Allen would be opened up to the major markets in east of the island and overseas.⁴² Tenison had encouraged the O'Reilly family of Dublin to become

involved in the business, and in 1784 had leased on lives 'renewable forever' land in the townland of Aughabehy to Mrs Mary O'Reilly for the purpose of erecting an iron manufactory. Tenison retained an interest in the resource, as he had to be paid a royalty of two shillings per ton of coal, which was only to be used in the iron smelting.⁴³

Mary O'Reilly was a wealthy widow from Thomas Street in Dublin. Her son, Thomas, was an iron merchant and had erected an iron foundry near Lucan previously.⁴⁴ In 1786, Thomas petitioned the House of Commons for financial aid for the iron works in County Leitrim.⁴⁵ The hope was that the parliament would further support the effort in Leitrim 'as an earnest of the great future work of a canal through the level country between the Shannon and Liffey'.⁴⁶ In spite of continuous petitions, parliament did not look favourably on the request and the money was never forthcoming, although by 1789 parliament had set up a committee to report.⁴⁷ The commitment of parliament instead focused on placing tariffs on imported iron. The O'Reillys continued to invest in the industry. By 1790 they had already invested £21,000 of their own money in the enterprise.⁴⁸ That same year, the works employed over 300 people, and the situation of the people around the area had improved, as locals were involved in the search for ironstone, carting coal and undertaking other ancillary duties.⁴⁹ The location of the iron foundries was continually in the debates by the House of Commons to justify the completion of the Royal Canal to the Shannon - something that was never achieved. The O'Reillys borrowed money from La Touche's bank in the hope of keeping the business afloat. However, by 1793 they were forced to admit defeat, were declared bankrupt and had to sell the enterprise after defaulting on a £10,000 loan from La Touche.

The business was purchased by Peter La Touche around 1793 from the court of chancery, paying around £25,000. His purchase of the ailing enterprise was also a further means of gaining a foothold in County Leitrim, a county he had been representing as an M.P. since 1780 until losing his seat in 1790.⁵⁰ Nonetheless, La Touche also failed to increase the fortunes of the business.

In mid-June 1795, rebellion would visit Leitrim's ironworks. Thomas O'Reilly, who knew the works well and was by now a United Irishman, took siege of Arigna ironworks along with the men of the Defenders - agrarian rioters and conspirators who used violence to fight for the abolition of tithes and higher wages for agricultural labourers. The Defenders needed weapons, and O'Reilly knew a ready-source of iron. From here, he and his men made 600 pikes in a day with which to fight the enemy.⁵¹ The Defenders apparently benefitted more from the Arigna ironworks than La Touche himself, who is quoted as saying that the only thing he got out of the ironworks was the gates to his house at Bellevue in Wicklow, iron gates which cost him £80,000.⁵²

The Arigna ironworks, through a series of deals, was granted to Roger Flattery, a Dublin architect, in early 1824.⁵³ The economic atmosphere at the time was heady with the idea of joint stock companies. Early 1824 had seen a number of mining companies being created in London (the Real del Monte, United Mexican and Anglo-American in Mexico, among others) and the idea of creating a mining company to exploit Irish resources was in the air.⁵⁴ With this in mind, and with a view to making a quick profit, Flattery travelled to London and approached Sir William Congreve in June 1824, to propose the formation of a company to run the mines. Congreve, in turn, approached Henry and Joseph Clarke, and together they decided to purchase the Arigna property from Flattery for £10,000 on 30 October, 1824.⁵⁵

It is from here that the 'jobbing' referred to above by Kane becomes evident. Later that day, a memorandum of agreement was drawn up between Congreve (represented by his solicitor) and the Clarkes which would see Congreve becoming the director of a stock company which would purchase the mines for £25,000, rather than for the £10,000 that Flattery had agreed. Along with Congreve, the Clarkes, with eight others, formed the board of directors. The £15,000 made on the deal was divided among the directors.

News of the scam soon reached the shareholders, and the price of shares plummeted. After some tension, all of the original directors of the company were removed by the shareholders in May 1826. Later that year a select committee was set up by parliament to investigate the 'origin, management and present state of the Arigna Iron and Coal mining company and to report the same, with any special matter touching the conduct of any members of this House'.⁵⁶ A bill was introduced to Chancery by the shareholders in an attempt to be refunded the £15,000 with interest. Sir William Congreve fled for France, but not before writing a letter to *The Times* protesting his innocence of any wrongdoing. Nevertheless, he was found guilty (in his absence) of fraudulent activity in May of 1828 by the Lord Chancellor, just before his death in Toulouse.⁵⁷ Eventually, in September 1831, chancery found in the company's favour, and the Clarke brothers and others were ordered to repay the money to the Arigna Mining Company.

Following the removal of the board of directors and the formation of a new board, the company was unsure of the true value of the business'. In 1830, it appointed J.A. Twigg, a mining surveyor of Chesterfield, to examine their holdings. While the reports of Twigg were favourable, he stressed the need for careful management of the company.⁵⁸

Flattery's fate was somewhat better than that of Congreve or the Clarkes. After chancery found in his favour, he restarted the iron works around Lough Allen in 1836.⁵⁹ In 1837 Thomas Rhodes' report on the ironworks shows Flattery as in charge of the works. Flattery was also making firebricks, as well as working the iron ore in the area. Rhodes suggests that Flattery 'manufacture the iron in to pig and send it off to market', potentially in Limerick 'as there is a foundry lately erected there'.⁶⁰ However, the works never prospered. The lack of suitable transport dogged the ironworks, and they were eventually wound down.

The Arigna Iron and Coal Company was not the only company involved in mining in the area in the early nineteenth century. The Tullynahaw colliery, on the land of Colonel Owen Lloyd, was opened by the Mining Company of Ireland in 1825 and produced more than £634 worth of coal that year, but closed in 1826 due to the poor return on the coal.⁶¹ The collieries were reopened in 1827, as the Board of Ordnance and Military Depots agreed to take the coal.⁶² However, the lack of suitable roads also hindered the progress of this colliery and each year in the 1820s the company raised the issue with the government. In 1830, the Board of Directors was citing the examples of its success elsewhere as a testament to the value of perseverance in the request of road improvement of the situation. By 1832, the steam engine which had been purchased for the Tullynahaw colliery was repurposed and moved to the company's colliery at Slieveardagh in Tipperary, heralding the end of the working of the Tullynahaw colliery.⁶³ By the time of Griffith's valuation in the middle of the century, the collieries in the townland were unoccupied and unworked.⁶⁴ By 1861, Patrick Buchan was working the seam, as well as the collieries at Seltanaskeagh and the Knockatean colliery at Tullymurry.⁶⁵

The isolation and remoteness of this area of Leitrim continued to be the overwhelming argument used to explain the failure of the various enterprises. Eventually in 1888 the Arigna tramway was built, extending the railway from the Cavan and Leitrim Railway line at Ballinamore to just beyond Drumshanbo. It was still over four miles to the coalmines at Rover Lower and Aughabehy, however, and the tramway was of little use to other areas to the north of Lough Allen. Coal had to be brought by cart to the terminus at the Arigna station in the townland of Bodorragha. It was not until 1920 that the government extended the rail to the coalmines themselves.

The coal of the Lough Allen area was subsequently mined by smaller companies (figure 4). When collecting information for the Ordnance Survey Name Books in the 1830s, it was noted the townland, which belonged to Col. Jones, had 'on the south west end of this townland [...] some coal pits which belong to an English company who wrought them some time with success and who are about to commence again to work them'.⁶⁶ Michael Leyden began working the coal in Tullymurray and Knockatean in the 1870s and 1880s, and his family were to continue the tradition to the closure of the coalmines in the 1990s. At the time of the 1911 census, there were twenty coalminers in the area of Leitrim to the west of Lough Allen. Two Laydon brothers, living in the townland of Glackaunadarragh, recorded themselves as coalminers, as well as other Laydons in Roscommon.⁶⁷ The Laydons also were working the colliery at the Rover, although the lack of transport here dogged the mines, as the Commission of Inquiry set up by the first Dáil notes that coal was being removed from the mine faster than it could be transported, thus leading to a build-up of coal at the mouth of the mine. A similar situation was reported at the Altagowan mine, also run by the Laydon brothers.⁶⁸

With its high ash content, the coal of the Connacht coal field was never very suitable for domestic use and industry needed to step forward to purchase this native fuel. Steam engines used some of the Arigna coal in the nineteenth century, and the industries in Limerick also purchased quantities of fuel. The coal mining industries in Arigna and Slieve an Iarainn received a major boost when in 1958 a coal-burning power station was commissioned by the ESB on the western shore of Lough Allen. Coal from the surrounding hills was to be burned in the station, which would require 1000 tons of coal per week. The amount of coal was split between the main collieries of the area, with the Arigna collieries at Altagowan, owned by the Leydon family, supplying the majority of the fuel. The Bencroy colliery, then owned by Paddy Wynne, also supplied fuel to the station. With the closure of the power station in 1993, the main consumer of coal from the Leitrim and Roscommon mines left the scene. The collieries were wound down from 1990 on. In their wake they left a heritage of mining, and a people proud to be part of it. The Arigna Mining Experience is currently one of the main tourist attractions of the Lough Allen area, and provides employment for many of the men who formerly worked the coal in the area.

More recent deposits

Like much of the Republic of Ireland, there are no rocks of a younger age than the Carboniferous found within County Leitrim. Any rocks that were deposited during the Mesozoic era have been eroded away. The next major event to affect the physical landscape of Leitrim was the onset of glaciation during the Quaternary, approximately two million years ago.

The ice sheets of the Quaternary era carved the large valleys at Glenade and Glencar as ice flowed from the Lough Erne lowland through the lowest points on the landscape. It has been suggested that the trim line, or the height of the glacier as it passed through the valley during the most recent glaciation, is represented by the point above which the scree slopes occur in the Glenade valley.⁶⁹ Above these, there are small corries which indicate that the highlands acted as accumulation zones for ice, with moraines at the corrie mouths.⁷⁰ Towards the end of the last glaciation, it has been suggested that the summits of some of these highland areas were standing above the glaciers (as would also be suggested by the trim line within the valley itself). This produced 'periglacial' features, or features created by the churning of the soil by freeze-thaw action within these very cold environments, such as patterned ground at the summit of Truskmore.⁷¹

The most indicative glacial landform found within County Leitrim is the drumlin field of south Leitrim, from Drumshanbo to Mohill, as well as within the Drumkeeran, Glenade and Glencar valleys. These drumlins, formed beneath the last ice sheet to have occupied the area, point to ice flowing quickly, potentially due to increased water being present at the base of the glacier. Drumlins are streamlined, indicating the direction of flow of the ice as they were being deposited. Some of the drumlins in the area are cross-cutting (meaning that drumlins within the same area are pointing to flow both northeast-southwest and north-south). This occurs most noticeably in the area to the south of Lough Allen, around Leitrim town, although other areas also show this pattern.⁷² This has been interpreted as a changing dynamics within the last ice sheet to cover the area, as ice flow shifted.⁷³ The drumlins also indicate ice streaming offshore from the Lough Allen area through the Glenade and Glencar valleys and the Lough Gill area and out into Sligo Bay and Donegal Bay.

Conclusion

Over the course of this chapter the natural landscape of County Leitrim has been explored from its rock foundation to the influence of ice on the landscape. The natural resources of this landscape have been used since the industrial revolution to attempt to improve the lot of both individuals and the general public. While the landscape of Leitrim is one of outstanding natural beauty, its remoteness and the lack of accessibility to some of the areas have been one of the difficulties for the development of industry and enterprise over the past two centuries. In some ways it could be said that part of the wealth of Leitrim - its landscape - has also been its downfall. The arguments to parliament throughout the nineteenth century about railway, road and canal access to remote parts of County Leitrim in order to enhance economic development find a resonance today in the demands for wider broadband access to these same areas, also for economic benefit. The challenges of developing this physical landscape remain the same today as in yesteryears.

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- ⁴ M.J. Simms and N.T. Monaghan, 'The origin and occupation history of Poll na mBéar, Glenade, Co. Leitrim' in *Irish Speleology*, 17 (2008), p. 50. Simms and Monaghan suggest that the cave formation could have occurred over a million years ago.
- ⁵ *Ibid.*, p. 53.
- ⁶ Geological Survey of Ireland geological heritage inventory (available online at GSI.ie); Gordon Herries Davis and Nicholas Stephens, *Ireland* (London, 1978), p. 59.
- ⁷ Tatjana Kytmanow, Thorsten Kahlert and Chris Hunt, 'The Doons Hillfort' in *Archaeology Ireland*, 24:3, (Autumn 2010), pp 18-21.
- ⁸ Ordnance Survey Name Books, Loughnahoo, parish of Drumlease.
- ⁹ The Schools' Collection, Volume 200, p. 94.
- ¹⁰ R.H. Thorn, *Sligo and West Leitrim*, IQUA field guide no. 8 (Dublin, 1985), pp 25-32.
- ¹¹ G.H. Kinahan, *Economic geology of Ireland* (Dublin, 1889), p. 182.
- ¹² *Ibid.*, p. 201.
- ¹³ Geological Survey of Ireland (hereafter GSI) archive: 6 inch field maps, sheet 30_1, townland of Aghavilla.
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- ¹⁵ James McParlan, *Statistical survey of County Leitrim* (Dublin, 1802), p. 14.
- ¹⁶ A.B. Wynne, *Explanatory memoir to accompany sheets 42 and 43 of the maps of the geological survey of Ireland* (Dublin, 1885), p. 28.
- ¹⁷ The GSI Memoir cites 'Pat Maguire and others' as being the source of this information: *ibid.*
- ¹⁸ GSI memoir 42 and 43, p. 29.
- ¹⁹ Report by J.G. McCluskey to the Geological Survey on 'Prospecting operations at Twigspark, Co Leitrim', 19 December, 1951L: GSI archives.
- ²⁰ Kinahan, *Economic geology*, pp 31, 90.
- ²¹ Ordnance Survey Name Book, Leitrim, Killasnet parish, townland of Twigspark.
- ²² Jane Donovan, 'Henry Foxall and the Arigna Ironworks' in *Breifne* (2002), p. 496.
- ²³ Kinahan, *Economic geology*, p. 47.
- ²⁴ W.B. Leonard and R.J. Cruise, *Memoirs of the geological survey to accompany sheets 78, 79 and 80*, Dublin:1873, p. 41; Kinahan, *Economic geology*, p. 90.
- ²⁵ Ordnance Survey name book, Parish of Annaduff, Gurtineagh townland.
- ²⁶ Eileen McCracken, 'Charcoal-burning ironworks in seventeenth and eighteenth century Ireland' in *Ulster Journal of Archaeology*, 20 (1957), p. 131.
- ²⁷ Robert Kane, *Industrial resources of Ireland* (2nd ed., Dublin, 1845), pp 16-17.
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- ³² Geological Survey of Ireland six inch fieldsheets, Leitrim 16/3.
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- ³⁶ Ordnance Survey Name Books, Leitrim, parish of Kiltubbrid, townlands of Aghacashel, Ranthoues Glebe, Mullaghgarrow.
- ³⁷ Cf. GSI memoirs Sheets 66 and 67, p. 33.
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- ³⁹ British Mining Consultants coal report, 1982: Aghacashel Bencroy colliery, p. 115.
- ⁴⁰ For a more extended history of the Arigna Coal and Mine Company, see Susan Hegarty 'The Arigna Coal and Mine company during the nineteenth century' in *Breifne* (forthcoming).
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- ⁴⁵ *Ibid.*, Jan.-May 1786, vi, pp 76-7.
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- ⁴⁷ The parliamentary register or proceedings and debates of the House of Commons of Ireland, Jan-May 1786, Volume 6, p. 77 (SHOULD THIS BE THE JOURNALS OF THE HOC? VERY SIMILAR TO REF 42); *The journals of the House of Commons for the kingdom of Ireland, 1789-90*, ix, p. 178.
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- ⁶⁵ Robert Hunt, *Memoirs of the geological survey of Great Britain and of the Museum of Practical Geology, appendix to the mineral statistics of the United Kingdom of Great Britain and Ireland for the year 1861* (London, 1862), p. 66.
- ⁶⁶ Ordnance Survey Name Books, Leitrim, parish of Inishmagrath, townland of Knockatean.
- ⁶⁷ N.A.I.: 1911 census.
- ⁶⁸ Dail 1921 Commission of Inquiry, pp 133, 138.
- ⁶⁹ Herries Davies and Stephens, *Ireland*, p. 149.
- ⁷⁰ R.H. Thorn, *Sligo and West Leitrim*, IQUA fieldguide no. 8 (Dublin, 1985), p. 6.
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