



MOURNE GULLION STRANGFORD ASPIRING UNESCO GLOBAL GEOPARK

GEOLOGICAL HERITAGE INTERPRETATION PLAN

MOURNEGULLIONSTRANGFORDGEOPARK.COM





INTRODUCTION

1.1 BACKGROUND

The Mourne Gullion Strangford Aspiring UNESCO Global Geopark (aUGGp) is located in the south-east of Northern Ireland, adjacent to the border with the Republic of Ireland and midway between the cities of Belfast and Dublin on the main road and rail network.

The aUGGp has an area of 954.30 sq km, and a population of 100,322 with over a quarter of the population living in the city of Newry in the heart of the proposed Geopark. The mean population density is 106.62 people per square kilometre but this ranges from the sparsely populated upland areas to the urban centres of Newry, Downpatrick, Newcastle and Kilkeel.

The region boasts three discrete upland regions in the Dromara Hills, Mourne Mountains, and Slieve Gullion (and the surrounding ring of hills known as the Ring of Gullion) with the highest point being Slieve Donard in the Mourne Mountains at 850 metres above sea level. The upland areas are surrounded by sweeping lowlands covered in glacial sediment, much of which is in the form of drumlins. The mountains are dissected by valleys formed by ice during the last glaciation. Carlingford Lough, a drowned glacial valley, lies on the southern edge of the proposed Geopark, and Strangford Lough, the

largest sea inlet in the UK and Ireland, lies at the eastern edge of the proposed Geopark.

The region owes much of its unique character to the underlying geology. The vast array of stunning landscapes, bounded and blessed with mountains and maritime settings, has provided the perfect backdrop to remarkable people and places.

1.2 CONTEXT

The Mourne Gullion Strangford aUGGp is managed with a holistic concept of conservation, education and sustainable development. This approach brings with it a requirement that the links between the important geological heritage and all other aspects of the area's natural, cultural and intangible heritage should be sustained, explored, developed and celebrated.

The Mourne Gullion Strangford aUGGp 10-year Masterplan has identified the following vision statement:

MOURNE GULLION STRANGFORD ASPIRING UNESCO GLOBAL GEOPARK: BORN OF FIRE AND SHAPED BY ICE, CARED FOR BY ITS PEOPLE AND SHARED WITH OTHERS.

The vision statement is supported by a number of aims, several of which support

the need to develop interpretation of the significant geological heritage of the aUGp:

- To continue to ensure that the Geopark's community and stakeholders build on previous initiatives which helped care for, promote and sustain its geology, heritage and cultural assets
- To raise awareness of the 'story of the UNESCO Global Geopark' through events, information and educational initiatives and opportunities.
- To support the development of a sustainable tourism sector with a range of sites, authentic experiences, activities, stories accommodation and events which complement and enhance the unique character of the geological landscape of the UNESCO Global Geopark and which establish sustainable tourism priorities to protect our tourism assets, our landscape and built heritage for future generations
- To create reasons for people from outside the Council area and the region to visit the UNESCO Global Geopark to learn, relax, integrate and to return.
- To establish external learning partnerships/networks with UNESCO Global Geoparks and other landscape and heritage sites

and assets which can bring new thinking, approaches and practice to the sustainable management, protection and presentation of the landscape character of the UNESCO Global Geopark and its geosites.

This plan is also in partial fulfilment of the UNESCO Global Geoparks Council Meeting (December 2022) report recommendations. Those relevant are as listed below:

- Develop an overview story of the identity of the region incorporating the geology, simplified and easily understandable.
- Develop links between geological and the other territorial heritages (i.e., natural biotic, culture, intangible) through interpretation, education, tours and geopark trails. Consider improving natural heritage information, interpretation and narratives.
- Strengthen the geological in-situ interpretation inside the aUGGp. Pay special attention to the rarity and beauty of Ring of Gullion, use the great potential of hiking the Mourne, and the glacial landscape (the Mourne, erratic boulders, Killard point etc).

2.0 INTERPRETATION

2.1 DEFINITION AND GUIDING PRINCIPLES

The interpretation of heritage can be defined as follows:

“Heritage interpretation is a structured approach to non-formal learning specialised in communicating significant ideas about a place to people on leisure. It establishes a link between visitors and what they can discover at heritage sites such as a nature reserve, a historic site or a museum.” – from Interpret Europe

According to the Association of Heritage Interpretation, heritage interpretation is primarily a communication that helps people make sense of, and understand more about, a site, collection or event. It should:

- Bring meaning to a cultural or environmental resource, enhancing visitor appreciation and promoting better understanding. As a result, visitors are more likely to care for what they identify as a precious resource.
- Enhance the visitor experience, resulting in longer stays and repeat visits. This will lead to increased income and create employment opportunities.

- Enable communities to better understand their heritage, and to express their own ideas and feelings about their home area. As a result, individuals may identify with lost values inherent in their culture.

In essence, heritage interpretation is essentially storytelling, in the case of geological heritage it is telling the story of the geological history of an area. Good geological heritage interpretation should bring it to life in a way that people can relate to it, appreciate and understand it and ultimately, take something of the experience away with them. It often includes revealing links between pieces of information that people already know rather than completely new facts and figures.

If heritage interpretation is to be successful in achieving these aims it should have the following characteristics.

- **Simplicity of message:** what understanding, thoughts and knowledge are left in the minds of users and visitors.
- **Layering of content:** provide for many levels of interest from the passing to the passionate.
- **Use of a variety of media:** encourage and assist understanding through discovery rather than

imposition, using a range of graphic, printed and digital mechanisms, events and activities.

- **Targeting effective media:** select the type, style and content of media to address different target audiences with different learning needs and interests.
- **Relating story to place:** ensure that all on-site interpretation has immediate relevance to its location and links each site to others, whether complementary or contrasting.
- **Follow the story:** ensuring that each part of the story of an area links with others to create a coherent and integrated picture, encouraging people to explore other aspects of the story.

2.2 AUDIENCE

The key task of interpretation will be to connect with a 'lay audience', defined as families with children aged 7-14. It is essential that existing and proposed interpretation can provide simple, good quality information about geological heritage to this audience, both local residents and visitors.

There may also be a further priority to consider the needs of visitors with a special or specific interest. These include but are not limited to:

- Walkers
- People with a special interest in the geology and geomorphology
- International visitors
- Educational (A-level and higher) audiences

2.3 TYPES OF INTERPRETATION

For the purposes of this document, interpretation has been grouped into three categories:

1. **Physical interpretation:** Tangible objects that serve a specific interpretation function. For example: displays; signs; panels.
2. **Virtual interpretation:** Publication or IT-based resources that may be used at any location to help interpret multiple sites. For example: websites; video; publications; exhibitions.
3. **Experiential interpretation:** Interpretation through experience, normally involving physically bringing the story to life. For example: fossil walks; presentations; walks; bus trips; festivals.

3.0 INTERPRETATIVE PLAN AIMS AND OBJECTIVES

This plan has been designed to fulfil the needs of physical interpretation. However, it should be acknowledged that there are numerous existing virtual and experiential interpretation opportunities already available in addition to physical interpretation. These are not covered in this plan.

3.1 AIM OF THE INTERPRETATIVE PLAN

To provide a framework for the physical geological interpretation of the Mourne Gullion Strangford Aspiring UNESCO Global Geopark.

3.2 OBJECTIVES OF THE INTERPRETATIVE PLAN

- To identify the main geological themes that make up the story of the Mourne Gullion Strangford UNESCO Global Geopark.
- To identify sites that collectively contribute to the main themes of the interpretation plan, taking into consideration existing sites and identifying sites for further development.
- To provide detailed interpretation for each of these sites that can be used as a guide for developing on-site interpretation where needed.



OVERARCHING STORYLINE A LANDSCAPE SCULPTED BY FIRE AND ICE

INTERPRETATIVE FRAMEWORK

The Mourne Gullion Strangford aUGGp is unique as it tells the tale of two oceans through just over 400 million years of geological history. It charts the closure of the Iapetus Ocean and the birth of the North Atlantic Ocean, generating large amounts of molten rock (or magma) both within and on the surface. The subsequent rocks and landscapes have since been shaped by numerous Earth processes, but dominated by those during the most recent Ice Age.

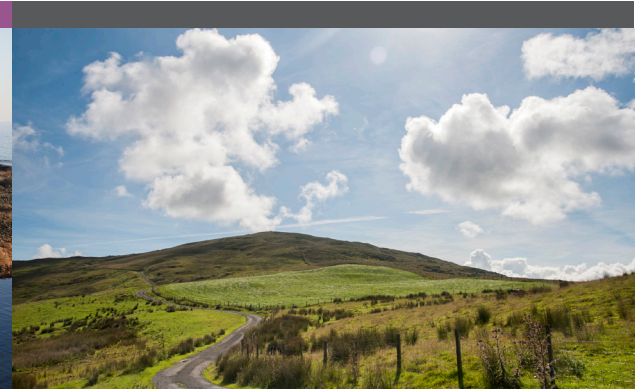
The story begins around 450 million years ago when the Iapetus Ocean first began to close. Sediments that formed on the bottom of this ocean were deformed as a result of the subduction of one tectonic plate beneath another, until ultimately the two parts of what is now known as the island of Ireland came together bringing this process to an end. With the final closure of the ocean around 400 million years ago, crustal melting occurred and large volumes of magma were emplaced along the line of ocean closure. In the Mourne Gullion Strangford aUGGp, three adjoining bodies intruded from northeast to southwest in the early Devonian to make the

Newry granodiorite and today extend from Slieve Croob in the northeast to Forkhill in the southwest.

The tale continues with the opening of the North Atlantic Ocean which began around 85 million years ago but was not seen in the Mourne Gullion Strangford aUGGp region until around 58 million years ago. The opening of the Atlantic Ocean and the resulting crustal stretching is marked by two discrete igneous complexes that formed in the early part of the Palaeogene period. The oldest is the Slieve Gullion ring-dyke complex which forms part of a multifaceted and violent volcanic system. This was then followed at around 56 million years ago by the Mourne Mountains Complex consisting of five distinct granite intrusions as well as minor dyke and cone-sheet intrusions. Although the granites were intruded at a high level in the crust, there does not appear to have been any volcanic activity.

All of these fiery events provided the building blocks for the geological history of Mourne Gullion Strangford aUGGp. However, it was sculpted into its present shape by the actions of the most recent Ice Age. The last glaciation, at its peak

between 27,000 and 23,000 years ago, scoured the landscape, moved rocks and sculpted it into landforms such as drumlins. The combination of mountain and coastal environments has led to the development of a hugely diverse range of glacial features not easily seen in such a small area. These range from the upland glacial features of the Mourne Mountains to the internally important glaciogenic sediments and landforms of Strangford Lough providing evidence of multiple stages of ice development and movement.



THEME 1: A TALE OF TWO OCEANS

The Mourne Gullion Strangford aUGGp is unique amongst UNESCO Global Geoparks as it tells a tale of two oceans through just over 400 million years of geological history. It charts the closure of the lapetus Ocean and the bringing together of the two parts of what we now know as the island of Ireland, and the birth of the North Atlantic Ocean. The lapetus Ocean first formed around 700 million years ago and lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) to the northwest, and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south.

The ocean began to close around 450 million years ago during the Ordovician period, and by the Silurian period, northward subduction was occurring bringing the the two parts of the island of Ireland together. Evidence for this activity is in the form of Silurian and Ordovician meta-sedimentary rocks that were formed on the floor of the lapetus Ocean, with the layers of near-vertical sandstone and mudstone often tightly folded. This sequence

of rocks formed as sediment was scraped off a northward facing subduction zone.

At final closure of the lapetus Ocean around 400 million years ago, and the coming together of the two parts of the island of Ireland, crustal melting occurred and large igneous bodies were emplaced along the line of ocean closure. In the Mourne Gullion Strangford aUGGp, three adjoining bodies intruded from northeast to southwest in the early Devonian to make the Newry granodiorite and today extend from Slieve Croob in the northeast to Forkhill in the southwest.

The opening of the North Atlantic Ocean is marked in the Mourne Gullion Strangford aUGGp region by two discrete igneous complexes that formed in the early part of the Palaeogene period. The complexes are part of the British and Irish Igneous Province, which is itself part of the North Atlantic Igneous Province. They all have contacts with the Silurian/Devonian end-lapetus lithologies making it possible to tell the story of the closing of the lapetus Ocean and the opening of the Atlantic Ocean in the same place.

HUB SITE: CASTLEWELLAN FOREST PARK

The Mourne Gullion Strangford aUGGp is unique amongst UNESCO Global Geoparks as it tells a tale of two oceans through just over 400 million years of geological history. It charts the closure of the lapetus Ocean, the bringing together of the two parts of what we now know as the island of Ireland, and the birth of the North Atlantic Ocean.

Castlewellan is perfectly poised to see evidence of all of these significant events in the Geopark history. Directly beneath your feet are Silurian sedimentary rocks that would have been deposited on the bottom of the lapetus Ocean floor. It would have existed from around 700 million years ago and lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) to the northwest, and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south.

The ocean began to close around 450 million years ago and as it did so it brought together the two parts of what we now know as the island of Ireland. Crustal melting occurred and large

volumes of magma were emplaced along the line of ocean closure. The remains of this can be seen in the upland area of Slieve Croob, formed out of a granite-type rock called granodiorite that formed as the magma cooled and solidified.

The final stage in this story is the opening of the North Atlantic Ocean is marked resulting in crustal stretching and thinning and the emplacement of more igneous rocks. The Mourne Mountains are evidence of this, formed from magma, or molten rock that was injected into pre-existing older rock around 56 million years ago.

Status: In development

ON-SITE INTERPRETATION

I) SLIEVE CROOB

Slieve Croob provides access to exposures of a granite-like rock called granodiorite and Silurian sedimentary rocks that together with a number of other sites, form the Newry Igneous Complex.

The granodiorite was formed 410 million years ago. This is an igneous rock type, and was injected as magma (molten rock) into pre-existing older rocks – Silurian sedimentary rocks. The magma then cooled slowly and eventually formed huge masses of solid rock deep beneath the surface. Each of these igneous

rock units is referred to as a pluton. Three of these are present which collectively make up the Newry Igneous Complex that extends over an area of about 45km² from Slieve Croob in the northeast to Forkhill in south Armagh.

The rocks at Slieve Croob form part of the northeast pluton and are of great importance as they display the complex relationships between the granodiorite and the Silurian sedimentary 'host' rock.

These rocks form part of a wider geological story. Some 450 million years ago, a now lost ocean called the Iapetus Ocean, was beginning to close as the continents on either side came together and eventually collided. The Silurian sedimentary rocks that formed in this ocean are exposed at Slieve Croob.

These sedimentary rocks have been altered by the heat of the igneous intrusion; a process known as contact metamorphism. This has caused the rocks to change composition resulting in a different appearance from the rest of the Silurian sedimentary rocks that are widespread across Co. Down. In some cases, the intrusion of the granodiorite has caused the 'host' rock to mobilise and this can be seen as contorted or twisted layers. The Silurian rocks at Slieve Croob

contain the mineral cordierite that is common in metamorphosed sedimentary rocks of this type. Where this mineral has been weathered out the rock takes on a pitted appearance.

Status: Identified for future development

II) TOLLYMORE FOREST PARK

Along the banks of the Shimna River in Tollymore Forest are Silurian sedimentary rocks. The near-vertical layers of sandstone, siltstone and mudstone are often folded and faulted, and have been subject to intense earth movement. These rocks were deposited as a result of underwater avalanches as sediment was washed off the continental shelf into deeper water, known as turbidites.

Rocks of this type can be found throughout Counties Down and Armagh and are part of what is known as the Southern Uplands-Down-Longford Terrane. They were formed at the bottom of an ancient ocean called Iapetus that lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) to the northwest, and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south.

The ocean began to close around 450 million years ago during the Ordovician period, as one tectonic plate moved beneath another (a process known as subduction) bringing the two parts of the island of Ireland together. As a result, the layers of near-vertical sedimentary rocks were deformed as they were scraped off the subduction zone.

Status: Identified for future development

III) LIGHTHOUSE ROAD

The Mourne Gullion Strangford aUGGp is unique amongst UNESCO Global Geoparks as it tells a tale of two oceans through over 400 million years of geological history. It charts the closure of the Iapetus Ocean and the bringing together of the two parts of what we now know as the island of Ireland, and the birth of the North Atlantic Ocean. At Lighthouse Road you can see evidence of the closing of one ocean and the opening of the other.

The Iapetus Ocean lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south. The lower ground that you see is made up of sedimentary

rocks (sandstone, siltstone and mudstone) that formed at the bottom of this ocean.

The ocean began to close around 450 million years ago during the Ordovician period, as a result of plate tectonic activity. It finally closed completely around 400 million years ago, bringing with it the coming together of the two parts of the island of Ireland. Associated with this was crustal melting leading to large igneous bodies being emplaced along the line of ocean closure. The high ground at Lighthouse Road is made up of the remnants of one of these igneous bodies, made up of a granite-like rock called granodiorite.

The opening of the Atlantic Ocean began around 85 million years ago, and resulted in crustal stretching and thinning. The associated crustal melting on this occasion led volcanic activity in Co. Antrim but also led to the emplacement of two discrete igneous complexes that formed in the early part of the Palaeogene period (just under 60 million years ago). One of these igneous complexes is the Mourne Mountains which is clearly seen from here. Made up of granite, a type of igneous rock, they are more resistant to weathering and erosion than the surrounding sedimentary rock, so they now stand proud from the landscape.

Status: To be added when replacing existing panel

IV) WINDY GAP

The Mourne Gullion Strangford aUGGp is unique amongst UNESCO Global Geoparks as it tells a tale of two oceans through over 400 million years of geological history. It charts the closure of the Iapetus Ocean and the bringing together of the two parts of what we now know as the island of Ireland, and the birth of the North Atlantic Ocean. At Windy Gap you can see evidence of the closing of one ocean and the opening of the other.

The Iapetus Ocean lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south. The lower ground that you see is made up of sedimentary rocks (sandstone, siltstone and mudstone) that formed at the bottom of this ocean.

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Status: To be added when replacing existing panel

V) ST. PATRICK'S ROAD

The rocks around St. John's Point are Silurian sedimentary rocks. The near-vertical layers of sandstone, siltstone and mudstone are often folded and faulted, and have been subject to intense earth movement. These rocks were deposited as a result of underwater avalanches as sediment was washed off the continental shelf into deeper water, in a sequence known as a turbidite.

Rocks of this type can be found throughout Counties Down and Armagh and were formed at the bottom of an ancient ocean called Iapetus. The ocean lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) to the northwest, and the continents of Gondwana (modern day Africa and Australia) and Avalonia (parts of modern-day England, Wales, and the southern half of Ireland) to the south.

Here at St. John's Point there are a number of sedimentary structures on display, all of which help to interpret the environment of deposition. These include cross-bedding, sole markings and flute moulds which help to determine the direction of current at time of deposition, the amount of energy required to move the sediment and also whether the rocks are the right way up.

This site also includes a number of igneous intrusions known as dykes. These vertical sheets of once molten rock was intruded into a pre-existing weakness in the sedimentary rocks, and therefore formed afterwards. In this case they were intruded during the Palaeogene period, just under 60 million years ago. The dykes at this location are formed from lamprophyre, an igneous rock that is very similar to basalt but it contains more mica. It is easily recognisable

as it is a slightly different colour to and cross-cuts the Silurian sedimentary rocks.

The lamprophyre dyke is locally referred to as St. Patrick's Causeway and is associated with the nearby St. Patrick's Holy Well.

Status: Identified for future development

VI) ARDGLASS

The rocks exposed at Ardglass formed during the Silurian Period, approximately 420 million years ago and tell a story of the closure of the Iapetus Ocean that concluded 400 million years ago.

The main rock types are thin layers of fine-grained sandstones and siltstones. They were originally deposited as a result of underwater avalanches, known as turbidites, and were formed as sediment was washed off the continental shelf into deeper water.

They were formed at the bottom of an ancient ocean called Iapetus that lay between the continent of Laurentia (modern day North America, Greenland, Norway, Scotland and the northern half of the island of Ireland) to the northwest, and the continents of Gondwana (modern day Africa and Australia) and Avalonia

(parts of modern-day England, Wales, and the southern half of Ireland) to the south.

The ocean began to close around 450 million years ago during the Ordovician period, as one tectonic plate moved beneath another (a process known as subduction) bringing the two parts of the island of Ireland together. As a result, with the layers of near-vertical sedimentary rocks were deformed as they were scraped off the subduction zone.

Status: Identified for future development



THEME 2: THE RING OF GULLION RING DYKE

The Slieve Gullion ring-dyke complex dominates the cultural and historical geography of south County Armagh. The complex itself is made up of Slieve Gullion, together with the Ring of Gullion, the name given to the ring of low-lying hills that surround it. Slieve Gullion Forest Park offers the perfect opportunity to explore the entire complex and experience a landscape that has been shaped by fire and ice over the past 400 million years.

The Slieve Gullion area exposes the roots of a complex and violent volcanic system. It consists of three main parts. The first is a ring of around 15km in diameter made up of two main types of igneous (molten) rock – felsite and granophyre. The second is Slieve Gullion, composed of sub-horizontal layers of granophyre, and dolerites and gabbros. The third component is an area of fine-grained granite centred on the summit of Black Mountain in Co. Louth.

Around 58 million years ago a huge mass of molten rock occupied a magma chamber below this area and eventually the stresses generated in the unsupported roof above resulted in collapse. A circular fracture formed around the periphery of the magma chamber,

into which magma was injected. This the first phase of eruption formed the felsite that makes up the south west of the ring dyke. This was followed by another phase of eruptive activity occurred forming the granophyre.

The central mass of Slieve Gullion was originally thought to be the core of an ancient volcano, but they are now thought to be horizontal intrusions of magma, that were injected into the pre-existing rock. The two different rocks that make up the layers, dolerites / gabbros and granophyres would have originally co-existed in their molten state. However, they become molten at different temperatures so as the magma cooled, two separate rock types formed – granophyre becomes molten at around 800oC whereas dolerite / gabbro becomes molten at around 1100oC.

The last phase of activity was the intrusion of granite centred on Black Mountain, which breaches the ring dyke in the south east, and make up an area of around 10 sq km. Volcanic activity ceased in the area around 56 million years ago.

HUB SITE: SLIEVE GULLION COURTYARD

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Status: In progress

ON-SITE INTERPRETATION

I) CAMLOUGH QUARRY

Camlough Quarry is the ideal place to explore the 400 million-year-old geological history of the Ring of Gullion, and tells a tales of two oceans, one that is long since disappeared and one that was only just opening when these rocks were formed.

The first thing you will notice is a clear contrast between dark grey rocks at the base of the back wall of the quarry and lighter coloured pinkish-brown rocks on top.

The dark rock is a large fragment of Silurian age sedimentary rock, formed at the bottom of the lapetus Ocean over 410 million years ago. It is enclosed in granodiorite, a granite-like rock that formed as the lapetus Ocean closed, leading to crustal melting approximately 400 million years ago. The heat from the molten rock has ‘hornfelsed’ or baked the sedimentary rocks, obscuring many of their original features.

The paler rocks are part of the Slieve Gullion ring-dyke, the name given to the ring of low hills that surrounds Slieve Gullion. This feature formed as due to the collapse of a magma chamber 58 million years ago, forcing molten rock, or magma, to be intruded into the circular fractures that developed around the periphery of

the chamber. This ‘volcanic’ activity was a direct result of crustal stretching associated with the opening of the newly formed Atlantic Ocean.

Status: No access so interpreted through video

II) GLENDESHA FOREST

Glendesha Forest is within the Slieve Gullion volcanic complex and is located along the western side of Slievebrack. During the Palaeogene period, around 58 million years ago, Slieve Gullion and the surrounding area was the site of extensive volcanic activity. When the underlying magma chamber eventually collapsed, circular fractures or faults developed around its periphery. This ‘ring fault’ acted as a zone of weakness into which molten rock was injected. This produced the ring-dyke, the ring of low hills known as the Ring of Gullion, and one of the best examples of such a feature in Ireland and the UK.

The main rock exposed at Glendesha is a type of igneous (or molten) rock called felsite that makes up the majority of the ring-dyke. Volcanic vent agglomerate is also exposed, formed during an explosive eruptive phase. This violent explosion would have ripped through older rock, namely the Newry granodiorite, the fragments of which, together with the volcanic lava and other material, now make up the agglomerate. It is this mishmash

of rock fragments that gives Slievebrack its name – translated from the Irish as ‘speckled mountain’.

Glendesha and the surrounding area are of international geological importance, for the part they have played in a number of theories related to the development of and interaction between these igneous rocks. Glendesha also provides a fuller understanding of the geological history of the Slieve Gullion Ring complex.

Status: In progress

III) BERNISH VIEWPOINT

From here you can get a view of Slieve Gullion and the entire Ring of Gullion, a landscape that has been shaped by fire and ice over the past 400 million years.

The Slieve Gullion area exposes the roots of a complex and violent volcanic system. It consists of three main parts. The first is a ring of around 15km in diameter made up of two main types of igneous (molten) rock – felsite and granophyre. The second is Slieve Gullion, composed of sub-horizontal layers of granophyre, and dolerites and gabbros. The third component is an area of fine-grained granite centred on the summit of Black Mountain which can be clearly seen

from this location and is identified by the presence of a radio mast on the summit.

Around 58 million years ago a huge mass of molten rock occupied a magma chamber below this area and eventually the stresses generated in the unsupported roof above resulted in collapse. A circular fracture formed around the periphery of the magma chamber, into which magma was injected. This the first phase of eruption formed the felsite that makes up the south west of the ring dyke. This was followed by another phase of eruptive activity occurred forming the granophyre.

The central mass of Slieve Gullion was originally thought to be the core of an ancient volcano, but they are now thought to be horizontal intrusions of magma, that were injected into the pre-existing rock. The two different rocks that make up the layers, dolerites / gabbros and granophyres would have originally co-existed in their molten state. However, they become molten at different temperatures so as the magma cooled, two separate rock types formed – granophyre becomes molten at around 800oC whereas dolerite / gabbro becomes molten at around 1100oC.

The last phase of activity was the intrusion of granite centred on Black Mountain, which breaches the ring dyke in the south east, and make sup

an area of around 10 sq km. Volcanic activity ceased in the area around 56 million years ago.

Status: Identified for future development

IV) MOYRY CASTLE

Moyry Castle was built in the 15th century to defend the Moyry Pass, or Gap of the North. This landscape feature is of historic military importance as it provides a ‘pass’ through the ring of hills known as the Ring of Gullion, and was on the main route between Ulster and the area around Dublin. However, this important location is as a direct result of the area’s internationally important geological heritage.

Slieve Gullion ring-dyke, or the Ring of Gullion, is the name given to the ring of low hills that surrounds Slieve Gullion. This feature formed due to the collapse of a magma chamber 58 million years ago, forcing molten rock, or magma, to be intruded into the circular fractures that developed around the periphery of the chamber. This ‘volcanic’ activity was a direct result of crustal stretching associated with the opening of the newly formed Atlantic Ocean.

Volcanic activity ceased around 56 million years ago, and as the molten rocks cooled, regional stresses were released causing fracturing or

faulting. Some of these faults are extensive. The Camlough Fault extends from Cam Lough to Ravensdale and is over 17km long, displacing the 'ring' by 2km. The Newry Fault is even longer and has caused a displacement of 2.5km. Such faults cause a weakness in the surrounding rock meaning that they are easier to exploit by weathering and erosion, particularly during glacial events such as those during the last Ice Age.

Many of these faults are much smaller, and one of these can be found at Moyry, but they still formed in the same way and are still subject to weathering and erosion. It is this weakness that has led to the formation of the Moyry Pass where it has not only been exploited by natural processes but subsequent human influences as well.

Status: Identified for future development

V) MULLAGHBANE NORTH - CASHEL ROAD

The small hills in the countryside around you are part of the Slieve Gullion ring-dyke, or the Ring of Gullion. This feature formed due to the collapse of a magma chamber 58 million years ago, forcing molten rock, or magma, to be intruded into the circular fractures that developed around the periphery of the chamber. This 'volcanic' activity was a direct

result of crustal stretching associated with the opening of the newly formed Atlantic Ocean.

On either side of the road you can see rocks that formed during the earliest part of this volcanic activity. These first rocks were felsite, a type of volcanic rock that is light in colour. They are associated with vent agglomerate, the name given to a mishmash of fragments of rock, formed as a violent explosive eruption rips through the pre-existing rock.

Further along the road you can see another type of rock, granophyre which, together with felsite makes up the majority of the ring dyke. Granophyres, like felsite, are igneous rocks meaning that they were once molten, but they never reached the surface and are classed as intrusive igneous rocks. They are similar to granite and are common when magma cools close to the surface.

This location is an important site for helping to understand the relationship between the two main rock types of the ring dyke. The granophyre displays a chilled margin where it comes into contact with the felsite. This is characterised by a glassy or fine-grained zone which is caused by rapid cooling as it comes into contact with the lower temperature

pre-existing rock. From this evidence it is clear that the felsite was formed before the granophyre, aiding in our understanding of the evolution of the Slieve Gullion ring dyke.

Status: Identified for future development

VI) SLIEVE GULLION

The Slieve Gullion area exposes the roots of a complex and violent volcanic system that was active between 58 and 56 million years ago. It consists of three main parts. The first is a ring of around 15km in diameter, the Ring of Gullion, made up of two main types of igneous (molten) rock – felsite and granophyre. The second is Slieve Gullion, composed of sub-horizontal layers of granophyre (light in colour), and dolerites and gabbros (dark in colour). The third component is an area of fine-grained granite centred on the summit of Black Mountain in Co. Louth.

The central mass of Slieve Gullion was originally thought to be the core of an ancient volcano, but is now thought to be horizontal intrusions of magma, that were injected into the pre-existing rock. The two different rocks that make up the layers, dolerites / gabbros and granophyres would have originally co-existed as magma. However, they become molten at different temperatures so as the magma cooled, two

separate rock types formed – granophyre becomes molten at around 800oC whereas dolerite / gabbro becomes molten at around 1100oC.

As the two rock types formed, the dolerite ‘chilled’ against the lower temperature granophyre resulting in a chilled margin where the two come into contact. Because the planes of contact were pliable as they slowly cooled, large pockets and lobes have deformed the boundaries between the two meaning that they are not always apparent as horizontal layers. The high temperature of the dolerite meant that it was able to remelt the solidified granophyre creating hybrid rocks.

As you weave your way up the flanks of Slieve Gullion, look out for the light and dark coloured rocks indicating the layers of granophyre and dolerites / gabbros that make up the mountain.

Status: Complete



THEME 3: THE GRANITE STORY OF THE MOURNE MOUNTAINS

At a distance of 10 to 25 kilometres from the ring-dyke features of Gullion, lies the Mourne Mountains Complex consisting of five distinct intrusions as well as minor dyke and cone-sheet intrusions. The granites were intruded into the Silurian metasedimentary sequences approximately 56 million years ago which have been altered to hornfels close to the contact between the two. Although the granites were intruded at a high level in the crust, there does not appear to have been any volcanic activity.

The earliest phases of igneous activity led to the emplacement of the north-west trending dyke swarm that is well exposed along the coast. This was followed by further fracturing of the crust and the emplacement of elliptical cone-sheets that now encircles the granites.

The main phases of igneous activity however, are the five granite intrusions that are divided into three in the Eastern Mourne Centre, and two in the Western Mourne Centre. These were emplaced at a relatively shallow level with the eastern granites (G1-G3) being emplaced prior to the western granites (G4 and G5).

In addition to its geological significance, Mourne granite is notable as a building stone and has been used from Neolithic times to present. This once thriving industry has left its indelible mark on the landscape with many mountain quarries in the area including Thomas's Mountain Quarry that overlooks Newcastle, as well as the remnants of stonemasons' shelters built from discarded quarry blocks throughout the mountains.

The granite was used most notably in the construction of the Mourne Wall between 1904 and 1922, made up of a 22-mile-long wall to enclose the catchment area of public drinking water reservoirs. However, Mourne granite has been exported and used around the world in a number of famous locations including the Hans Christian Anderson statue in Central Park, New York, Parliament Buildings at Stormont, Belfast, the "Silence" Water Feature, Connaught Hotel, London and the 911 British Memorial Garden, New York.

HUB SITE: ANNALONG CORN MILL / MOURNE GATEWAY

The Mourne Mountains Complex are home to Northern Ireland's highest peaks and

are known the world over as a source of inspiration for artists and writers. However, it is their underlying geology that we are celebrating, with the Mourne famously being made up of a type of rock called granite.

The Mourne Mountains are made up of five different granites that were intruded into the surrounding Silurian sedimentary rocks between 56 and 51 million years ago. There were two centres of activity, the earlier, in the east emplaced granites 1 to 3; the later, in the west emplaced granites 4 and 5.

During this time, fracturing of the crust associated with the opening of the Atlantic Ocean led to a period of volcanic activity in Northern Ireland, beginning with the extensive volcanic activity that produced the Antrim Plateau and the Giant's Causeway. Volcanic activity continued further south beginning with the Slieve Gullion igneous complex, before activity began in the Mourne area.

Although there were five phases of granite formation, it was preceded by a number of smaller igneous intrusions, known as dykes

and cone-sheets. These would have been intruded into pre-existing fractures within the pre-existing rock and are well exposed at a number of locations along the coast.

In addition to its geological significance, Mourne granite is notable as a building stone and has been used from Neolithic times to present. This once thriving industry has left its indelible mark on the landscape with many mountain quarries in the area. Much of this granite would have been transported to the coast before being exported by sea from locations such as here at Annalong.

Status: Complete

ON-SITE INTERPRETATION

I) SAMUEL'S PORT

The Mourne Mountains were formed around 56 million years ago when huge volumes of magma were injected into the pre-existing Silurian sedimentary rocks. Although there were five phases of granite formation, this was preceded by the intrusion of cone-sheets and dykes, the latter of which is clearly seen at Samuel's Port.

During this time, fracturing of the crust associated with the opening of the Atlantic Ocean led to a period of volcanic activity in Northern Ireland, beginning with the extensive volcanic activity

that produced the Antrim Plateau and the Giant's Causeway. Volcanic activity continued further south beginning with the Slieve Gullion igneous complex, before activity began in the Mourne area. This was initiated by the intrusion of molten rock into pre-existing faults and fractures in the older rocks, eventually forming vertical sheets of rock known as dykes.

The dyke at Samuel's Port shows evidence of four phases of magma intrusion into this small section of the Earth's crust. The dyke material ranges from dark basalts to a coarse-grained granite. This variation indicates different sources of magma and also of magma mixing. One of the fine grained dark basaltic dykes also contains pieces of gabbro, a coarse-grained basaltic rock. This material provides clues of where the magma has come from and what rocks it passed through on its ascent through the crust. The gabbro inclusions at Samuel's Port are the only known occurrence of its kind within the Mourne area.

Status: Identified for future development

II) GLASSDRUMMAN PORT

The Mourne Mountains were formed around 56 million years ago when huge volumes of magma were injected into the pre-existing Silurian sedimentary rocks. Although there

were five phases of granite formation, this was preceded by the intrusion of dykes and cone-sheets, the latter of which is clearly seen at Glassdrumman Port and is part of a larger feature that encircles the Mourne Mountains.

During this time, fracturing of the crust associated with the opening of the Atlantic Ocean led to a period of volcanic activity in Northern Ireland, beginning with the extensive volcanic activity that produced the Antrim Plateau and the Giant's Causeway. Volcanic activity continued further south beginning with the Slieve Gullion igneous complex, before activity began in the Mourne area. This was initiated by the intrusion of molten rock into pre-existing faults and fractures in the older rocks. In the case of a cone sheet, these intrusions are made up of relatively thin inclined sheets with the geometry of a downward-pointing cone.

The bedrock at the beach is made up of grey Silurian sedimentary rocks, but near the top of the shore there are distinctive rounded outcrops of pink granitic rock, bounded at the top and bottom by a darker rock. This 15m wide cone sheet trends almost parallel to the coast at this location, and dips towards the mountains.

The cone-sheet is made up of two distinct rock types: its margins are of basalt (the darker rock) which enclose the later central member which is quartz-feldspar porphyry (the pink granitic rock). Close to the margins, there are also xenoliths, fragments of 'foreign rock' of the surrounding sedimentary rocks that have been caught up in the intrusion, while the porphyry contains 'blobs' or enclaves of basalt. These blobs have lobate or crenulated (wavy) contacts with the granite, showing that they were included as magma rather than fragments of solid basalt.

Status: Identified for future development

III) SPELGA DAM

Spelga Dam is just one of several reservoirs that supply drinking water to the Greater Belfast area, many of which have been chosen due to their upland location in combination with the underlying impermeable granite.

The Mourne Mountains are made up of five different granites that were intruded into the surrounding Silurian sedimentary rocks between 56 and 51 million years ago. There were two centres of activity, the earlier, in the east emplaced granites 1 to 3; the later, in the west emplaced granites 4 and 5.

The Mourne granites were intruded by a process called cauldron subsidence in which massive cylindrical blocks, kilometres across, subside relatively quietly into the molten mass below. However, exposures at Spelga Dam would suggest that this process may have been more complicated and that emplacement in some cases may have been more violent.

Downstream of Spelga Dam, a substantial dyke (a vertical intrusion of molten rock into a pre-existing weakness) of the fourth granite can be seen to penetrate the older sedimentary rocks. The granite of the dyke exploits the joints within the sedimentary rock, detaching masses up to several metres across that are now suspended in the granite. Such destruction of pre-existing rocks during the injection of large bodies of molten rock, to create space for them to occupy, is called stoping.

Status: Complete

IV) CARRICK LITTLE CAR PARK

The Mourne Mountains are made up of five different granites that were intruded into the surrounding Silurian sedimentary rocks between 56 and 51 million years ago.

The Mourne Mountains igneous complex as it is known, probably began with crustal extension that led to the formation of a swarm of fractures formed that were then filled with molten rock, forming the dyke swarms.

The next phase was more localised with pressure associated with the magma body within the crust leading to further fractures. This led to the formation of inwardly dipping intrusions of igneous rocks known as cone sheets.

The main phase of igneous activity followed with the emplacement of the five granites that make up the spectacular scenery of the Mourne Mountains. The various granites were named as G1 to G5 with two centres of activity: the earlier, in the east emplaced granites 1 to 3; the later, in the west emplaced granites 4 and 5.

Status: To be added when replacing existing panel

V) THOMAS'S QUARRY

Mourne granite is known the world over as a durable, yet beautiful building stone, and evidence of stone-working can be seen throughout the region. Thomas's Quarry is just one of many that would have been active, providing a vital source of employment and income for the local area.

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During this time, fracturing of the crust associated with the opening of the Atlantic Ocean led to a period of volcanic activity in Northern Ireland, beginning with the extensive volcanic activity that produced the Antrim Plateau and the Giant's Causeway. Volcanic activity continued further south beginning with the Slieve Gullion igneous complex, before activity began in the Mourne area.

The granite at Thomas's Quarry is in the second (G2) of the five in the Mourne and contains some unusual features and minerals. The granite at this location contains veins of rock, which aren't that unusual, but in this case the veins contain a green rock called greisen that actually replaces the granite. The veins also contain stilbite, one of a series of minerals classed as zeolites, as well as the rare mineral siderophyllite.

When the granite was cooling, hot chemical-rich fluids and gases were released and migrated

along natural fractures, causing alteration of the mineralogy of the walls of the veins as they go. This is a process called pneumatolysis and is what produces greisens. Although these are recorded from other locations in the Mourne, this is by far the best example.

Status: Part of larger tourism plan

VI) MEELMORE

See theme four

VII) BLOODY BRIDGE

The Mourne Mountains are made up of five different granites that were intruded into the surrounding Silurian sedimentary rocks between 56 and 51 million years ago. There were two centres of activity, the earlier, in the east emplaced granites 1 to 3; the later, in the west emplaced granites 4 and 5.

During this time, fracturing of the crust associated with the opening of the Atlantic Ocean led to a period of volcanic activity in Northern Ireland, beginning with the extensive volcanic activity that produced the Antrim Plateau and the Giant's Causeway. Volcanic activity continued further south beginning with the Slieve Gullion igneous complex, before activity began in the Mourne area.

The route along the Bloody Bridge River traverses the Silurian sedimentary country rock (the rock enclosing the granite) from the coast to the contact with the second granite (G2). The country rock in this section is hornfelsed (baked and toughened) resulting in alternating bands of greenish and purple Silurian sedimentary rocks. They have not been deformed at the contact with the granite suggesting that there was no violent disturbance as the granite was emplaced.

As you get closer to the contact between the two rocks, the Silurian sedimentary rocks are transformed into diopsidic (diopside is a pale green mineral of the pyroxene group) and biotitic (dark coloured mica) bands resulting from heating due to the granite intrusion. This altered zone of country rock around the granite is known as a metamorphic aureole.

Status: Complete



THEME 4: THE GLACIAL LANDSCAPES OF MOURNE GULLION STRANGFORD

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains. Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape into drumlins and ribbed moraines, helping us to understand the direction the ice moved.

The landforms provide evidence of multiple stages of ice development and movement and the ice interaction with the rocks show the stark difference between the harder rocks that make up the high mountains in the region and the relatively softer rocks now found in the lowlands.

The high Mournes have notable evidence of glacial features such as corries, cols, east-west hanging valleys and deep north-south glaciated valleys. Carlingford Lough is a drowned fault-

controlled glaciated valley. The valley floors have deep glacial deposits and surrounding the mountains, the deposits are shaped into drumlins by the ice. The flat areas of the Mourne Plain are covered in a thick fluvioglacial and glaciomarine deposits of muds, sands and gravels including a raised beach feature which allow for good drainage and therefore good agriculture.

While most of the Mourne mountain peaks are ice-smoothed and rounded, Slieve Bearnagh and Slieve Binnian have tors at their peaks. The island of Ireland has only one other mountain with tors however these are the finest examples. They show horizontal and vertical jointing and their existence might be related to post-glacial accentuation of fractures or they may have been exposed as nunataks during the last glaciation and therefore resulting in deeper weathering than the rest of the Mournes.

The Strangford Lough coastline is one of the best places to study glaciogenic sediments, particularly from the end of the last glaciation. The stretch of coast at Ballyhornan includes Killard Point, a designated site that records the events and processes that operated in the

area from 15,000 to 13,000 years during the closing stages of the final glaciation to affect the island of Ireland. The site is so important that this short period has won a place in the scientific literature as the Killard Point Event.

HUB SITE: DELAMONT COUNTRY PARK

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains.

Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape into drumlins and ribbed moraines, helping us to understand the direction the ice moved.

Strangford Lough is famous for its drumlins, the name given to smooth elliptical hills, produced under the flowing ice and elongated

in the direction of ice movement. Drumlins are most common from the most recent glaciation and occur in wide 'belts' referring to the widespread area that they occupy. In this case, the drumlin belt stretches across counties Down, Armagh and into Monaghan and Cavan.

The drumlins in Strangford Lough are referred to as a 'basket of eggs' in recognition of their egg-shaped appearance from the air. They are called drowned drumlins as many are partially submerged as a result of rising sea levels after the end of the last glaciation.

Delamont Country Park is just one of many sites in the Geopark that glacial features can be found including the upland glacial features of the high Mournes, the deep glaciated valleys of Carlingford Lough, and the glacial deposits around the Strangford Lough coastline.

Status: In progress

ON-SITE INTERPRETATION

I) CLOUGHMORE

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and

advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains. Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape the shape we see today.

Cloghmore is just one example of the glacial environment that this area experienced. As you ascend on the path up you will see some outcrops of grey-green sedimentary rocks. These are Silurian in age and are approximately X years old. Cloghmore itself is a massive boulder of granite, sitting on top of the Silurian sedimentary rocks. The 'big stone' as it is known, was carried here by ice as it moved down the Irish sea from Scotland during the last glaciation. As the ice sheet began to melt, it lost energy and deposited the boulder far away from its source. Due to the difference in geology between the boulder and the underling bedrock, it is referred to as a glacial erratic.

The name Cloghmore comes from the Irish 'an Chloch Mhór' – 'the big stone'. Legend has it that Fionn MacCumhaill, the giant, threw the stone from Slieve Foye (across Carlingford Lough) during a fight with a rival. Of course, the real story is much more exciting with this

boulder being brought here from the west coast of Scotland over 10,000 years ago.

Status: In progress

II) SILENT VALLEY

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains. Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and carving out deep north-south glaciated valleys.

These deep glaciated valley, combined with the impermeable underling granite bedrock make these locations perfect for reservoirs, something that was recognised as far back as the last 19th century. However, it wasn't until 1923 that work began here at Silent Valley and over the next 10 years, over 2,000 men worked to build the dam that we see today.

The Silent Valley Reservoir was officially opened in 1933, and was augmented in 1957 by the building of the Ben Crom dam. Together, the two reservoirs can hold almost 21 billion litres of water. The buildings and the surface dressing of the dam at the Silent Valley Reservoir are made of granite, and the project represents one of the last large projects created in Mourne granite.

Status: Identified for future development

III) MEELMORE

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From here you can see some of the best examples of upland glacial features in the entire Geopark as you look up the Trassey River valley, as far

as Hare's Gap at the skyline. In the foreground, the fields are underlain by material, known as moraines, deposited as a glacier moved eastwards down the Shimna Valley (i.e. from right to left). In the middle distance, the broad U-shaped landform is a hanging valley, while in the distance is Hare's Gap, a feature known as a col. The steep sides of a corrie, an armchair-shaped hollow formed by glacial erosion can be seen at the northern side of this col.

The contact or boundary between the Silurian sedimentary rocks to the north (nearer) and the granites to the south (further away) is clearly visible on the slopes of Slieve Meelmore to the west (right). This is the northern margin of the Eastern Mourne Complex.

Status: Identified for future development

IV) FLAGSTAFF

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains. Between 27,000 and 23,000 years ago, Ireland was completely covered by an

ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape into the one we see today.

One such glacial feature is Carlingford Lough, formed as a glacier moved slowly from Lough Neagh to the Irish Sea carving out a broad u-shaped valley as it did so. The precise location is controlled by an underlying-fault, or fracture in the Earth's crust, which has acted as a line of weakness between the Palaeogene igneous rocks of the Cooley Peninsula (to the south) and the Mourne Mountains (to the north).

The moving ice exploited this line of weakness, removing the softer underlying bedrock. As sea-level rose after the end of the last glaciation, the valley became flooded or 'drowned' giving us Carlingford Lough.

Status: To be added when replacing existing panel

V) CAMLOUGH

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and

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Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape into the one we see today.

The body of water in front of you is Cam Lough, a narrow ribbon lake, occupying a valley carved out by ice moving southwards to Dundalk Bay. The gouging out of this valley was facilitated by the fact that a major fault zone cuts the rocks along this line, making them weaker and more susceptible to erosion.

Status: Complete

VI) BALLYHORNAN

The landscape as we know it today was shaped by ice in the last tens of thousands of years with the last glaciation happening between 115,000 and 12,000 years ago. During this time an ice sheet in the highlands of Scotland grew and advanced southwards across to Ireland where it joined with ice sheets from the Irish mountains.

Between 27,000 and 23,000 years ago, Ireland was completely covered by an ice sheet up to 1.5km thick, flowing over the top of mountains such as Slieve Donard and Slieve Gullion. The ice scoured the landscape, moving rocks and mud southwards and shaping the landscape into the one we see today.

The Strangford Lough coastline is one of the best places to study glacial sediments, particularly from the end of the last glaciation. The stretch of coast at Ballyhornan includes Killard Point, a designated site that records the events and processes that operated in the area from 15,000 to 13,000 years during the closing stages of the final glaciation to affect the island of Ireland. The site is so important that this short period has won a place in the scientific literature as the Killard Point Event.

The general picture that emerges from the Killard section is of a rapidly flowing ice sheet entering a tidal sea. This is the only site in the Irish Sea with a spread of sub-glacial sediments that discharge directly and extensively into a marine environment. The evidence it provides has been used to argue that the rapid flow of ice in the area was due to its unconfined access to the sea which has an accelerating effect on the rates of flow.

Status: In progress



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