Geology at The Gobbins Cliff Path

THE GOBBINS

A Dramatic Coastal Walk

The Gobbins Cliff Path was supported by Mid & East Antrim Borough Council and the European Regional Development Fund in Partnership with Sliabh Liag.

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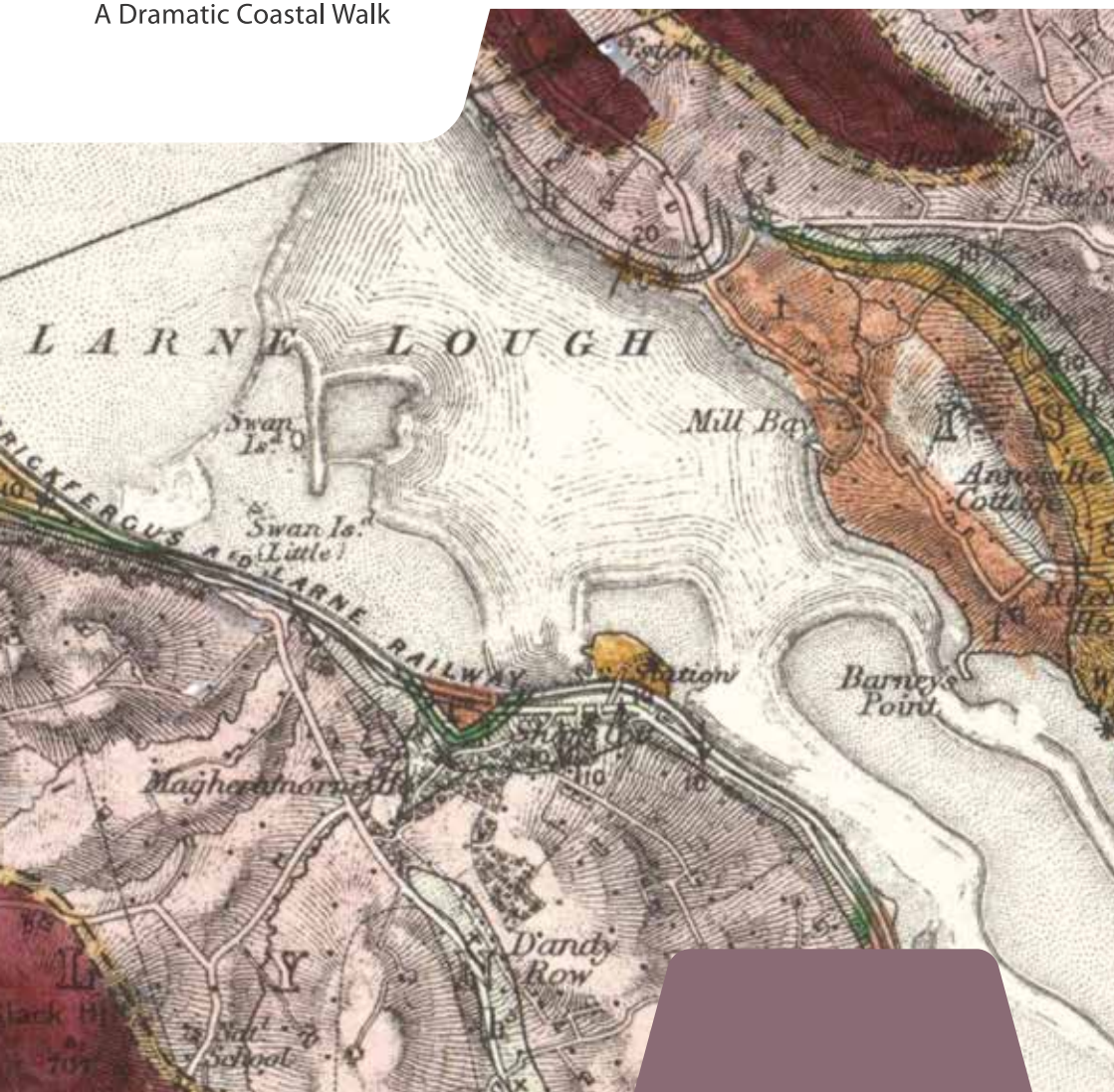


Introduction

Stretching from City of Derry Airport in County Londonderry, to Carrickfergus in County Antrim, the Causeway Coast and Glens area includes some of the most geologically diverse landscapes on Earth.

This short guide to the geology of The Gobbins Cliff Path demonstrates why The Gobbins quite rightly takes its seat amongst three Areas of Outstanding Natural Beauty (Binevenagh, Causeway Coast and Antrim Coast and Glens) and Northern Ireland's only World Heritage Site (the Giant's Causeway and Causeway Coast) to provide a world class experience for those interested in the natural and cultural heritage of the Causeway Coast and Glens Area.

Sixty years after it closed in 1954, visitors to the newly reopened Gobbins Cliff Path at Islandmagee, can once again walk on the edge of a landscape sculpted by millions of years of geological activity, weathering and erosion.

The rich geology and biodiversity along Islandmagee's coastline combine with coastal processes at the Gobbins to present a landscape of exceptional scientific, aesthetic, historical and cultural value. During your visit to the Gobbins we hope this guide helps explain some of the rock formations and features through which the coastal path winds. We also hope this guide helps explain how the geology of the Gobbins links with the geology of sites in the Causeway Coast and Glens area and partner sites across the globe.

Inishtrahull Island (Oldest rocks in Ireland)
- Google Royalty Free

Globetrotting at the Gobbins

Northern Ireland is one of the most geologically diverse places on Earth for an area of its size. Every era of geological history is recorded in the rocks and landscapes found across the north of the island.

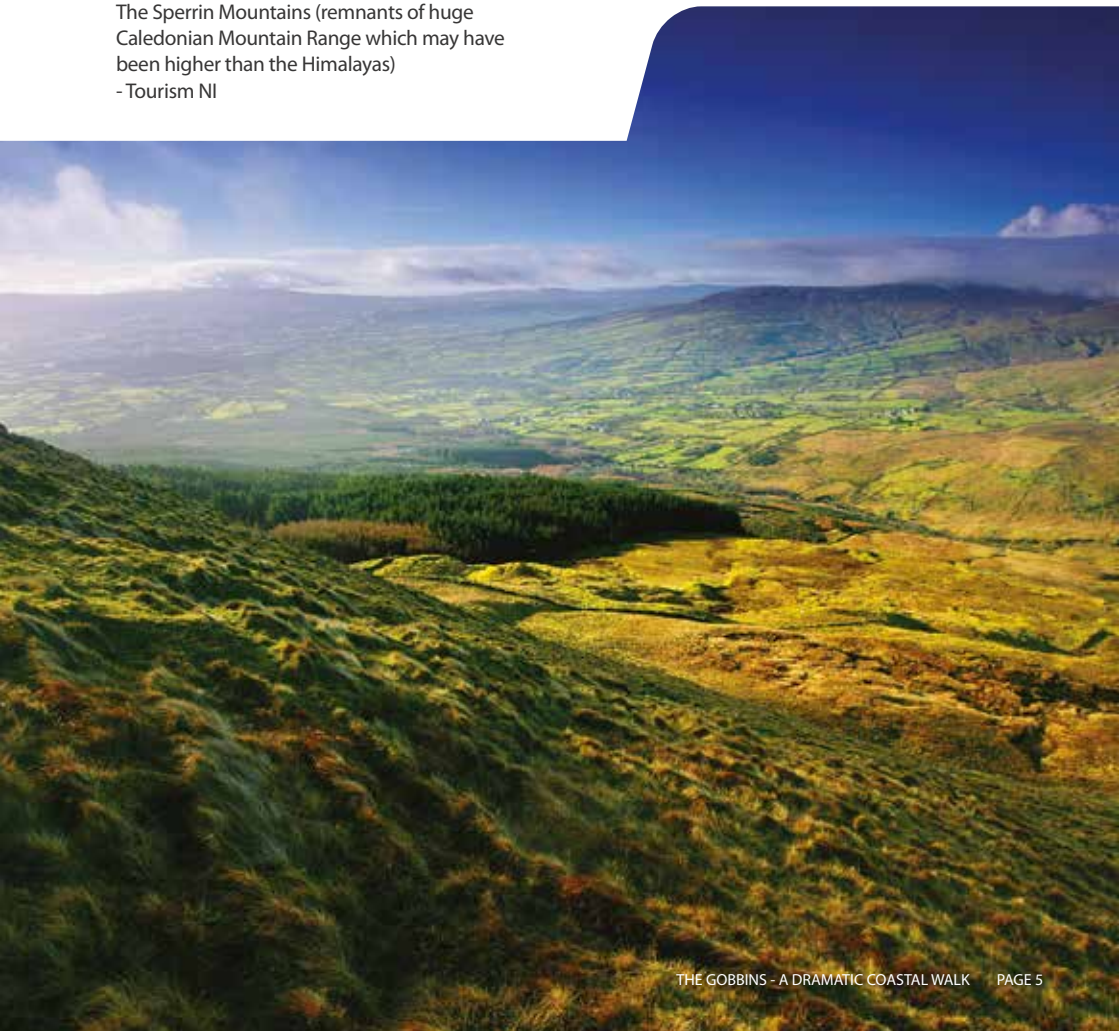
The oldest rocks in Ireland are found at Inishtrahull Island off the north coast of County Donegal. This rock (gneiss) dates from around 1700 million years ago and formed during the Pre-Cambrian period when Ireland was located near the South Pole and was part of a large supercontinent called Rodinia.

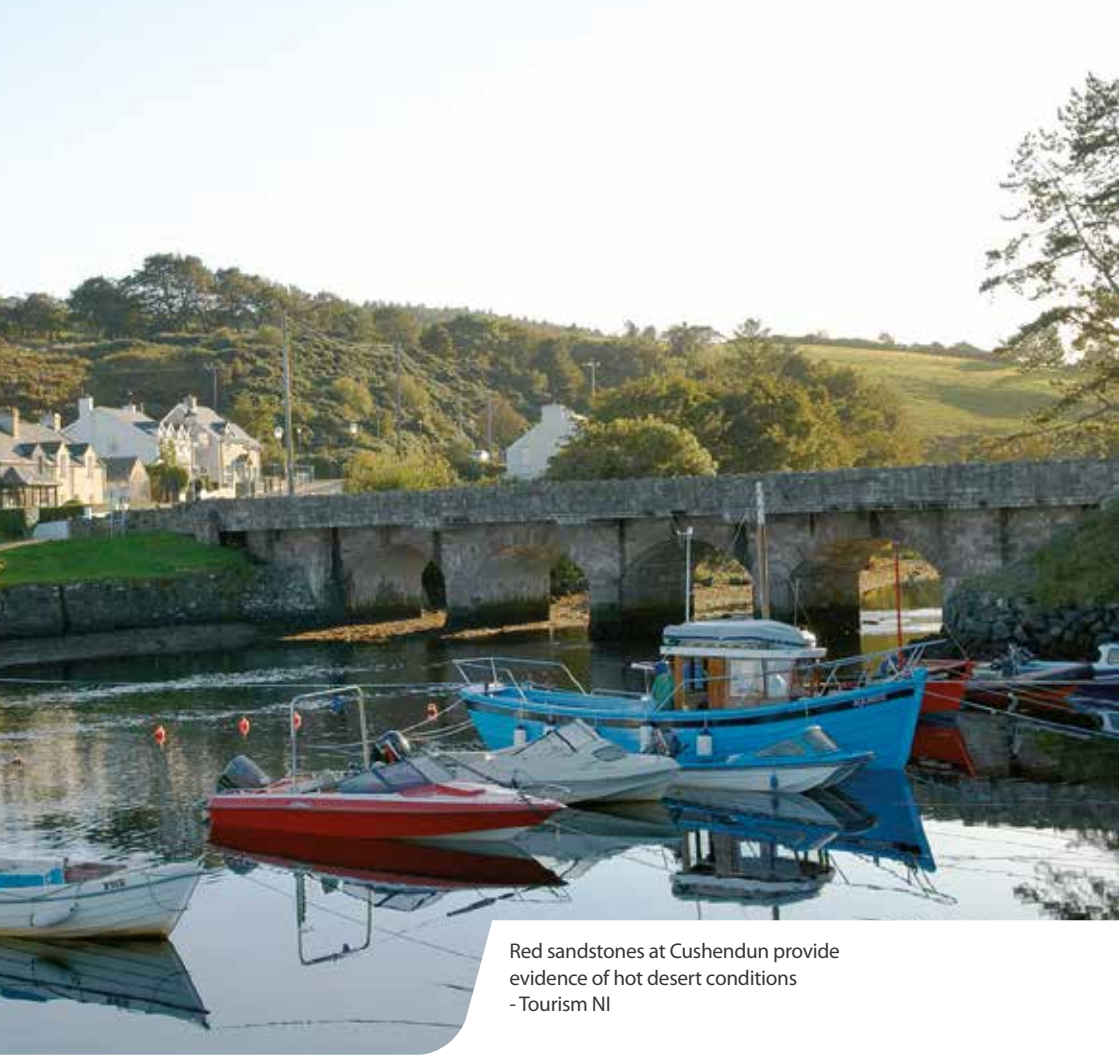
The Cambrian, Ordovician and Silurian periods followed the Pre-Cambrian. From around 545 to 410 million years ago what is now recognised as Ireland was split into two halves by a new ocean known as Iapetus. Within this ocean huge volumes of marine sediment accumulated forming extensive beds of sandstone, shale and mudstone.

After many years of expansion the Iapetus Ocean began to close, resulting in continental collisions which metamorphosed (changed by heat and/or pressure) the marine sediments into much harder schists, quartzites and marbles.

Further compression of these rocks formed large mountains known as the Caledonian Mountain Range that stretched through present day Scotland, Scandinavia, North America and Ireland. Remnants of these mountains are found in the Sperrin Mountains. Where the rocks were exposed to extreme heat and pressure at depth they formed magma which cooled within the Earth's crust to form granite-type rocks now exposed at the surface in places such as Donegal, Wicklow and Newry. Throughout this period the continental landmasses moved north-east towards the tropics.

The Sperrin Mountains (remnants of huge Caledonian Mountain Range which may have been higher than the Himalayas)
- Tourism NI

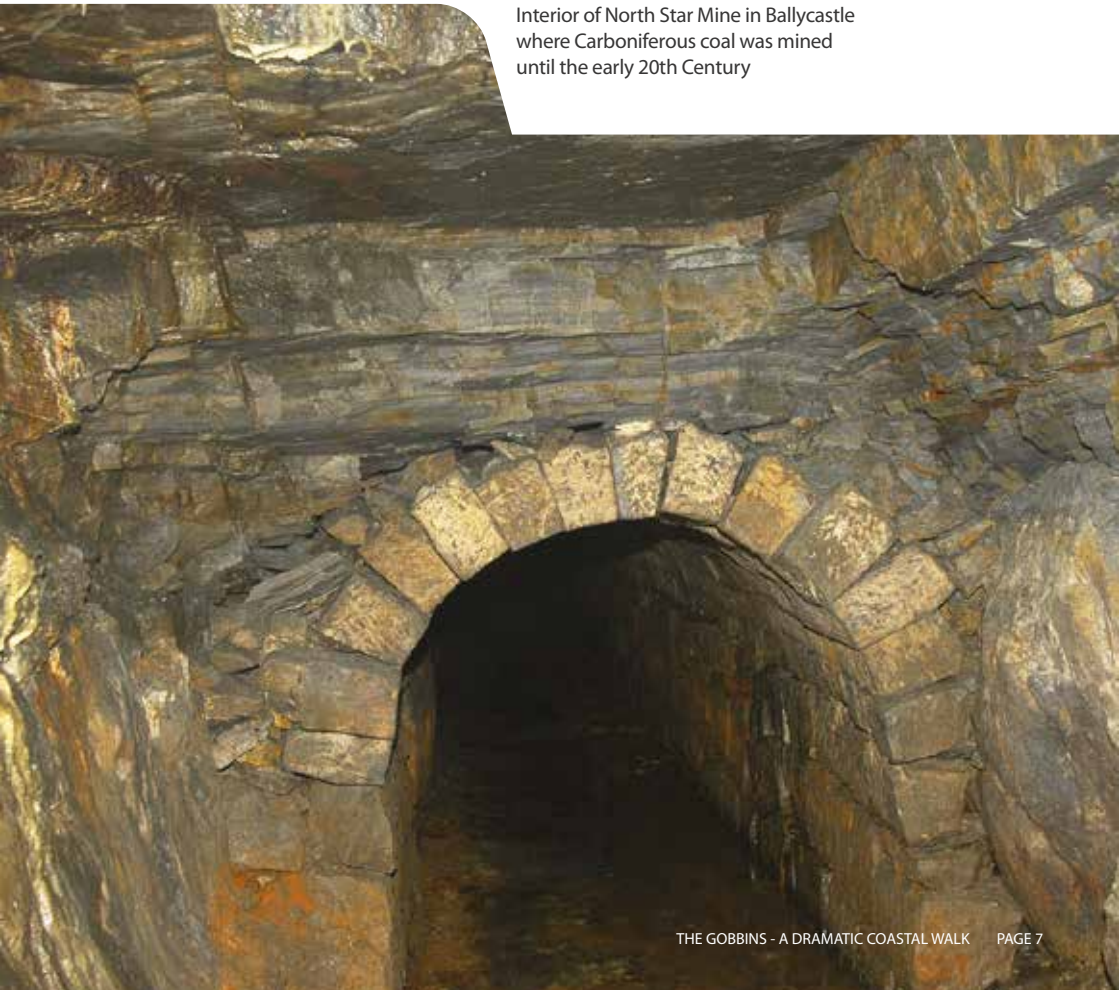




Red sandstones at Cushendun provide evidence of hot desert conditions - Tourism NI

With the formation of the Caledonian Mountains and closing of the Iapetus Ocean, Ireland experienced a dramatic change in environmental conditions. During the Devonian Period, around 400 million years ago, Ireland was located in desert latitudes south of the equator. In these hot continental desert conditions sandstones formed. Rocks from this period can be seen in the red sandstones in Cushendall and Cushendun. The Devonian period of geological history is notable for increased plant and animal colonisation on land and the evolution of many forms of fish and amphibians.

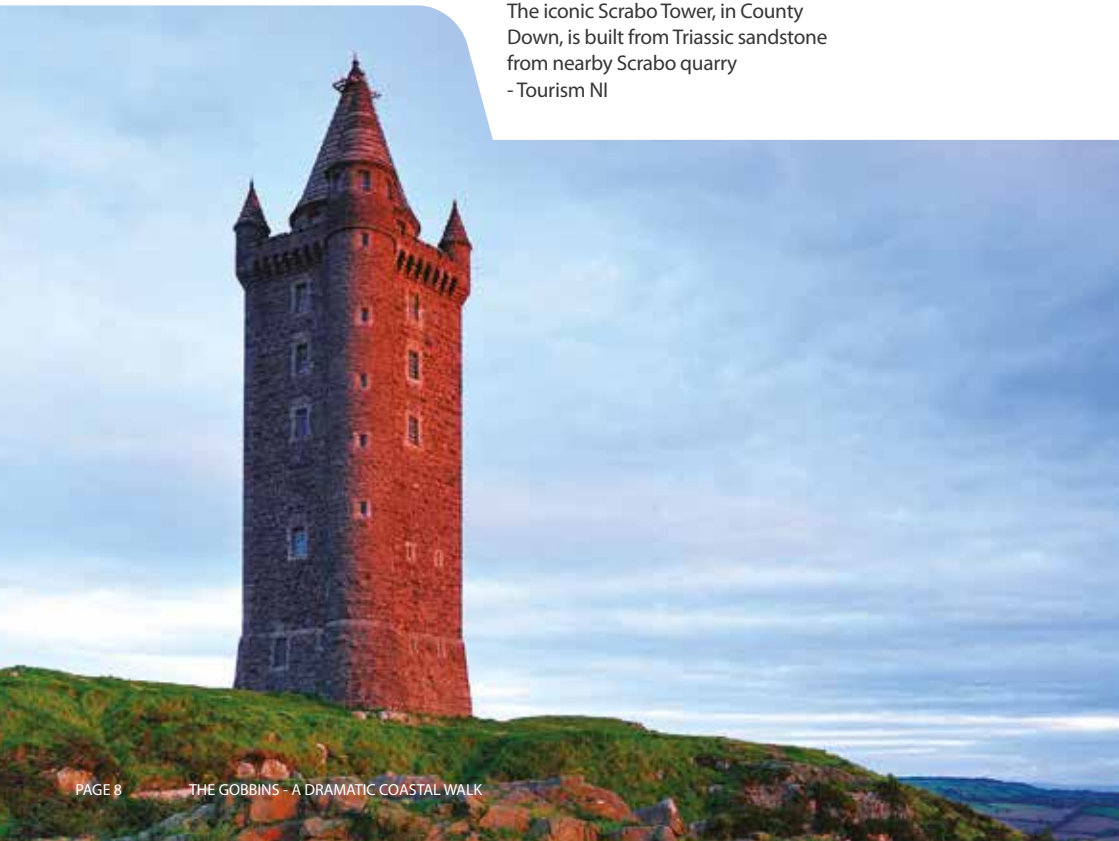
The Carboniferous period followed the Devonian, beginning around 350 million years ago. During this period the desert landscape gradually flooded as global sea levels rose. The change to tropical marine conditions resulted in an explosion of marine life including fish, shellfish and coral reefs. Fossil evidence of this marine life is well preserved in limestone; particularly along the west coast of Ireland. Weathering processes have created karst scenery and features in Carboniferous limestone e.g. the spectacular Marble Arch Caves in County Fermanagh. As sea levels fell throughout the Carboniferous period, plants periodically flourished forming thick deposits of plant remains which were compressed to form coal. Carboniferous coal seams can be seen along the coast at Ballycastle in County Antrim, where small collieries developed in the 19th and early 20th centuries.



Interior of North Star Mine in Ballycastle where Carboniferous coal was mined until the early 20th Century

Moving into the Permian period around 298 million years ago, the climate returned to hot desert conditions as the land, that now represents Ireland, became locked within a vast continent (Pangea) and moved north of the equator. There are no exposures of rock from the Permian period in the Causeway Coast and Glens area; however evidence from across the globe indicates that a widespread extinction event occurred at the end of the Permian. The cause of this extinction event is still debated.

During the Triassic, beginning 250 million years ago, Ireland was still part of Pangea and lay at the latitude of the Sahara Desert. Evidence of a semi-arid environment is presented in the form of alternating beds of sandstone and mudstone. The best examples of Triassic sandstones are found at Scrabo Quarry in County Down, where trace evidence (footprints) of early reptiles can be seen. There is evidence of the development of shallow lagoons and the formation of salt pans during the Triassic. These salt deposits are now mined at Carrickfergus, County Antrim.

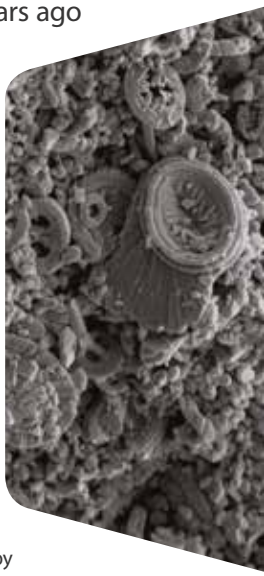


The iconic Scrabo Tower, in County Down, is built from Triassic sandstone from nearby Scrabo quarry - Tourism NI

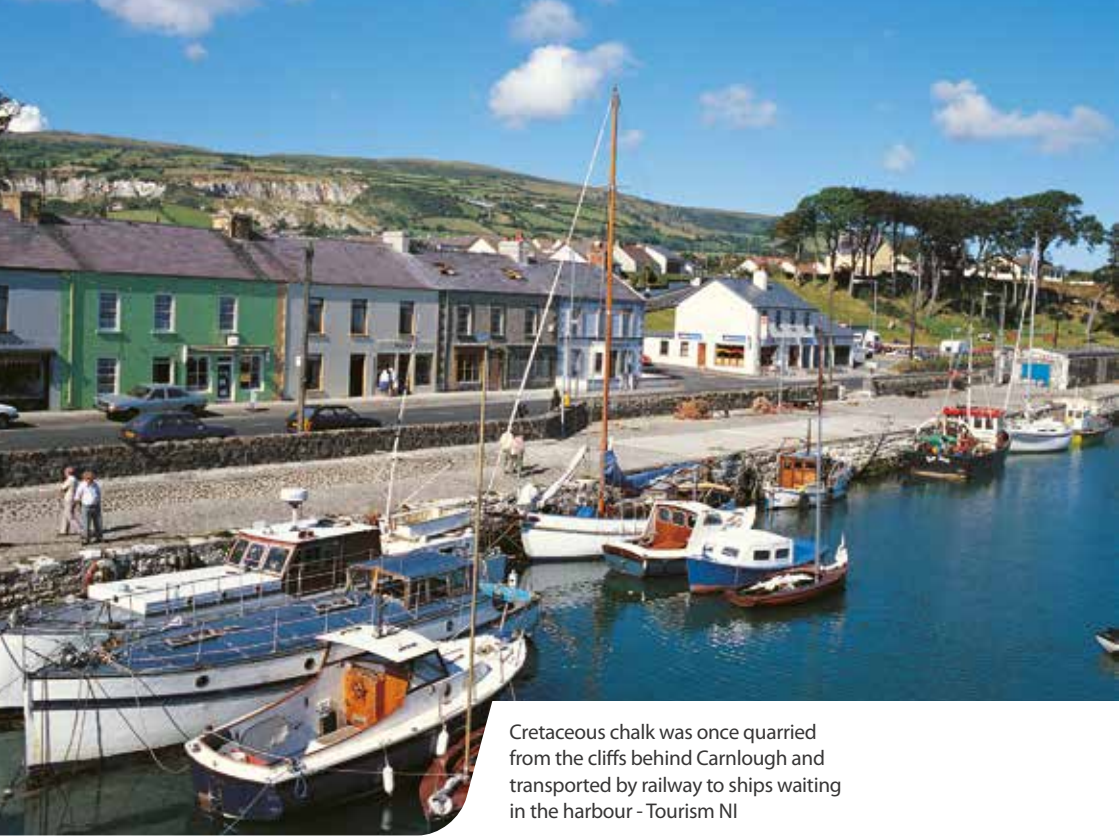
Ichthyosaur Fossil from Waterloo Beds in Larne (NMNI)

At the beginning of the Jurassic period, around 200 million years ago the supercontinent Pangaea began to breakup. In Ireland this period is represented by mudstone and limestone beds which can be seen along the Antrim Coast road. These rocks are rich in marine fossils e.g. bivalves, ammonites and occasional marine reptiles. Perhaps the most famous fossil is that of an ichthyosaur discovered at Waterloo Beds in Larne. The Jurassic is well known as the age of the dinosaurs; however during this time the earliest birds also took to the air.

At the beginning of the Cretaceous period 144 million years ago global sea levels rose dramatically. Much of Europe from Ireland to the Caucasus Mountains in Russia were submerged under a warm, shallow sea in which thick deposits of limestone formed as well as deposits of sandstone, siltstone and marl.



Scanning Electron Microscope image of chalk showing micro-fossils dominated by coccoliths - Heine Bus Madsen, Denmark



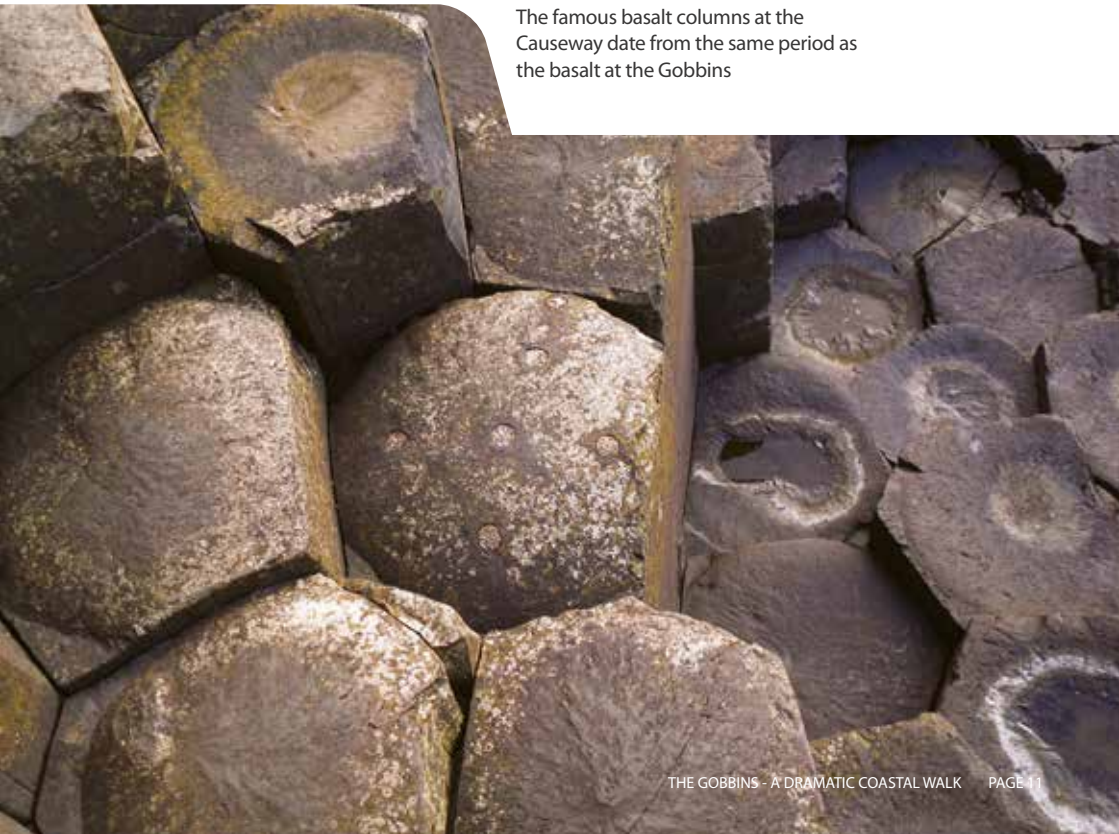
Cretaceous chalk was once quarried from the cliffs behind Carnlough and transported by railway to ships waiting in the harbour - Tourism NI

This limestone is displayed in exemplary fashion along the Antrim Coast Road and can be seen at Portmuck where it forms white limestone cliffs composed almost entirely of the remains of microscopic shells. These limestones are between 70 million years old and 100 million years old.

At the Gobbins this white limestone can be found to the south of the coastal path as you look towards Blackhead. The nearby village of Whitehead derives its names from the limestone cliffs in this region. Blackhead on the other hand derives its name from the black basalts which overlie the white limestone. These basalts date from the Palaeogene period that was much later.

Approximately 75 million years ago global sea levels fell to reveal a low, rolling, lightly vegetated limestone landscape. The land which forms present day Ireland was located near the area of southern France today.

Approximately 65 million years ago the continental landmasses continued to breakup as North America and Europe split apart (a process which began around 80 million years ago and that continues today!). Crustal thinning resulted in the eruption of large volumes of basalt lava. Initially these eruptions were explosive, creating huge volumes of volcanic ash. This initial violent phase was followed by a period of much reduced volcanic activity, during which the surface of the land weathered to form deep soils. Evidence of these soils is found throughout the Causeway Coast and Glens in the form of red bands of laterite rock that divides sequences of basalts, laid down by the volcanic eruptions. The upper basalts (above the red laterite) were deposited during the second phase of volcanic activity when huge volumes of basaltic lava flooded the surface of the land. Where this lava pooled within flooded valleys it cooled and contracted to form the extremely regular columns, best seen at the Giant's Causeway. You might even spot some columnar basalt alongside The Gobbins Cliff Path. It is this palaeogene period of volcanic activity which is responsible for forming the basalt cliffs around which The Gobbins Cliff Path has been engineered.



The famous basalt columns at the Causeway date from the same period as the basalt at the Gobbins

The granites of the Mourne Mountains.
- Tourism NI

Rotational failures of basalt along The Gobbins Cliff Path - Ian Enlander

Further south in Northern Ireland, igneous activity of a different sort was taking place during the Palaeogene period. Here the magma never reached the surface but instead remained below where it cooled and hardened. In some cases such as in the Mourne Mountains, this formed a large mass of an igneous rock called granite and following millions of years of erosion it is now exposed at the surface. In other places such as the Ring of Gullion and on the Cooley Peninsula in County Louth, it formed large-scale ring-shaped features known as ring dykes, that give these areas their characteristic landscapes.

Moving into the present geological period, the Quaternary, which began 1.8 million years ago, huge ice-sheets spread south from polar latitudes. This ice acted like sandpaper on the land, sculpting the landforms and landscapes that we recognise as Northern Ireland. Much of the scenery we see today dates from the end of the last significant glaciation (Ice Age) approximately 15,000 years ago. In fact, because an Ice Age is defined as any period when there is ice at either the north or south pole, we are still technically in an Ice Age! As ice retreated from Ireland it deposited huge volumes of material from fine sands and gravels through to huge boulders. Landslips occur frequently along stretches of the Antrim Coast Road as the present day landscape attempts to adjust to modern environmental conditions.

A Continental Commute


N
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25 million years ago)
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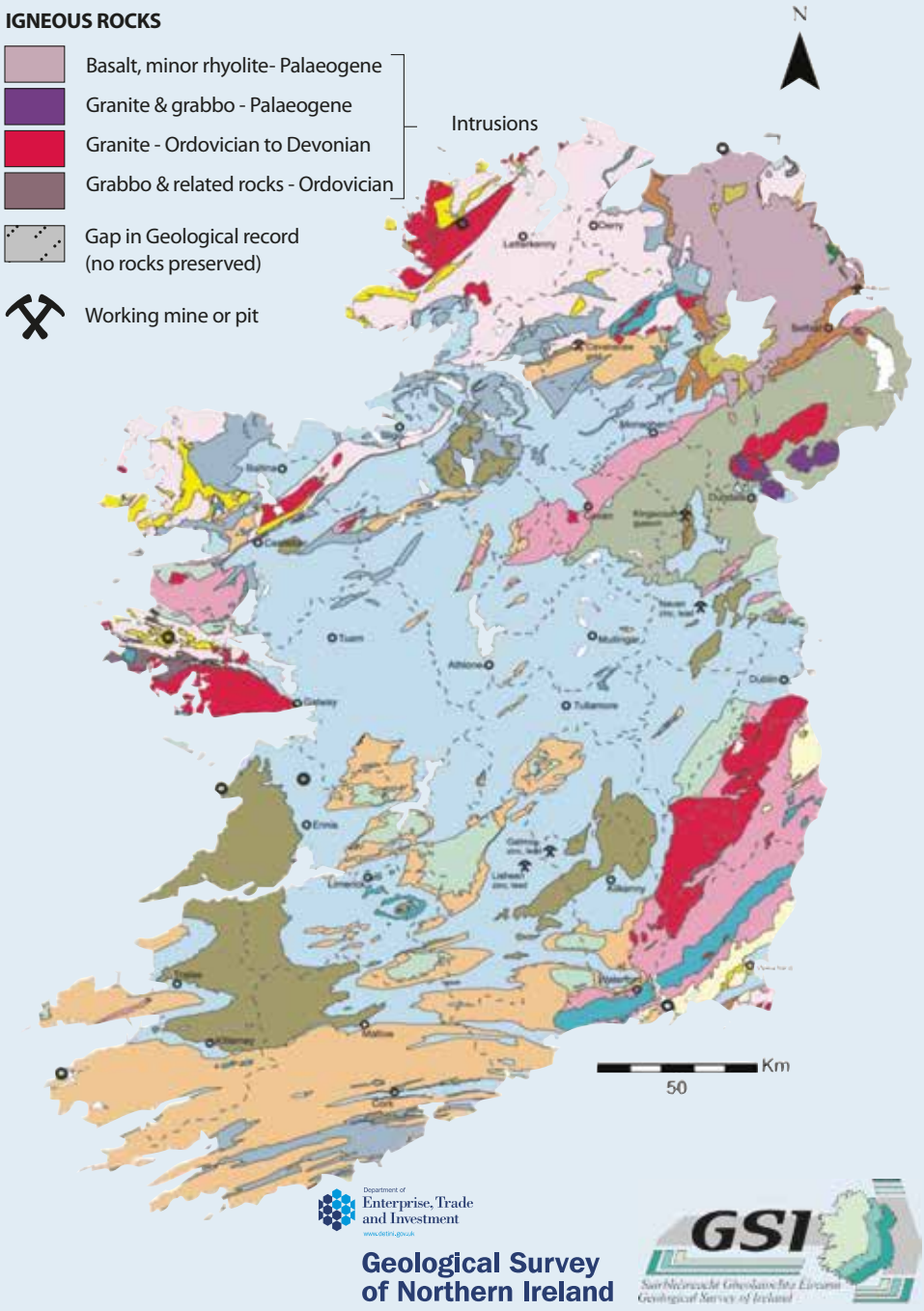
ASIA
PACIFIC OCEAN
INDIAN
OCEAN
AUSTRALIA
Ordovician (450
million years ago)

The Geology of Ireland Today



Department of Enterprise, Trade and Investment
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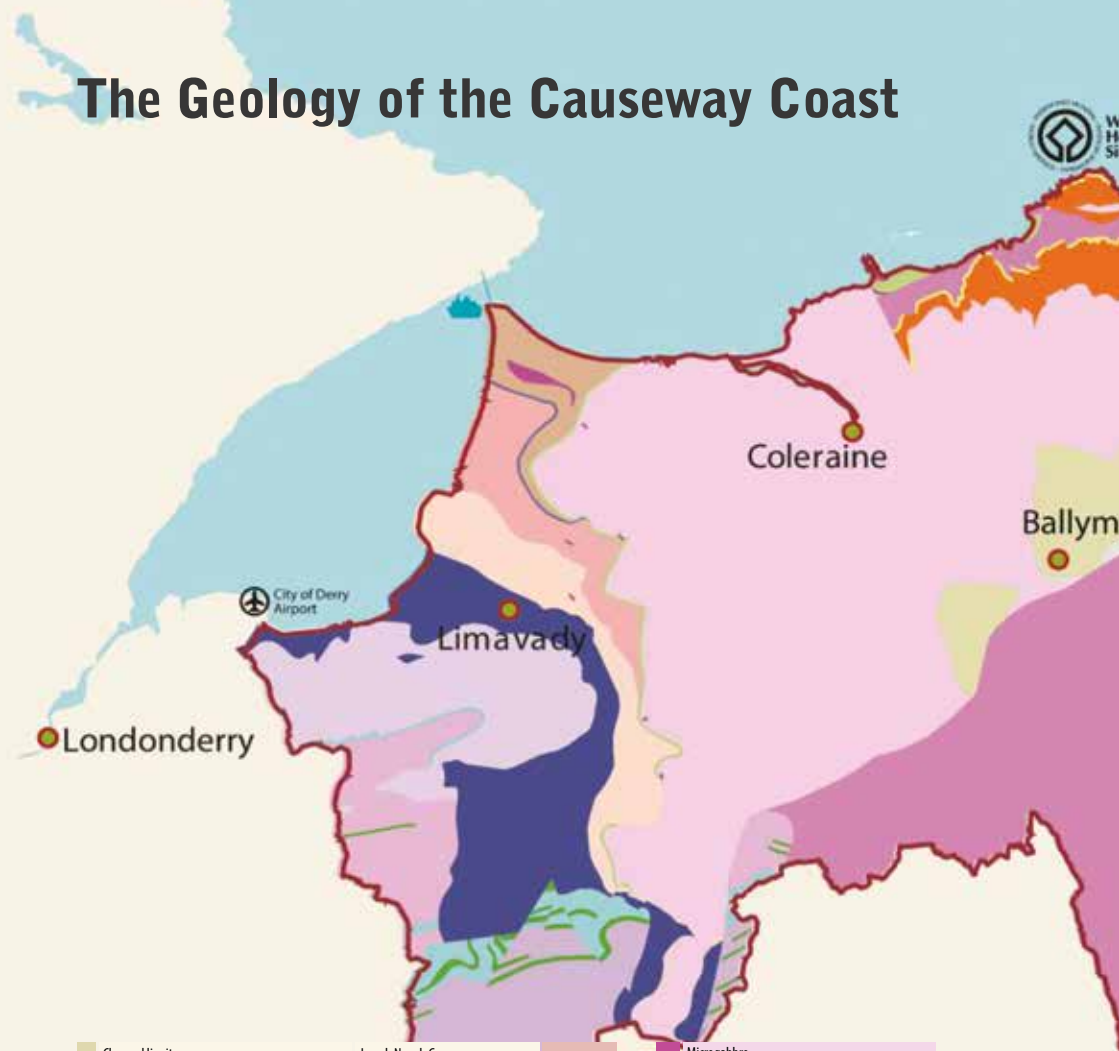
Geological Survey of Northern Ireland

GSI
Suirbhéireacht Ghéolaíochta Éireann
Geological Survey of Ireland

ERA	AGE	PERIOD	MAP COLOUR	MAIN ROCK TYPES	ENVIRONMENTS
CENOZOIC	1.8	Quaternary*			Ice Age : Ireland covered and shaped by ice.
	65	Palaeogene		Clay	Lake and Swamp: Mid Palaeogene clays and lignite deposited in large lake *(the precursor to Lough Neagh).*
				Basalt	Volcanoes: Vast amounts of basalt lava flood NE Ireland during Early Palaeogene.
MEZOZOIC	144	Cretaceous		Chalk	Shallow 'Chalk Sea'; Pure limestone deposited in late Cretaceous shallow sea, probably over whole of Ireland.
	203	Jurassic		Shale & Limestone	Sea basins: Mud and limestone depositied in early Jurassic shallow sea in NE, while rest of Ireland is land. Thick accumulations of sediment as today's offshore basins form.
	250	Triassic		Sandstone 'New Red Sandstone'	Desert: Red sandstone formed in arid desert dumes and playa lakes. Evaporate (salt & gypsum) in hypersaline lakes.
PALAEOZIC	298	Permian			River deltas & swamps: Sand and mud deposited in large river delta systems advancing into sea. Coal formed in hot swamps.
	354	Caroboniferous		Sandstone & Shale	
				Limestone Volcanic rocks in above	Tropical sea: Limestones depostited in warm tropical sea
				Sandstone & Shale	Advancing sea; Sand and mud deposited in shallow sea advancing from south to north over eroded Devonian mountains.
	410	Devonican		Sandstone 'Old Red Sandstone'	Mountains & rivers; Red sand and mud deposited among semi-arid mountains by large river systems. Subsiding basin in SW receives vast thickness of sediment
	440	Silurian		Sandstone & Shale Sandstone & Shale	Ocean basin: Sand and mud deposited in narrow ocean basin and continental margins as lapetus closes.
	495	Ordovician		Shale & Sandstone Basalt & Rhyolite in above	Ocean depths and Ring of Fire: Sand and mud deposited in deep ocean by turbidity currents. Ring of volcanoes around ocean formed above subduction zones.
	545	Cambrian		Sandstone, Slate & Quartzite	Shelf sea: Sedimentary rocks deposited on continental shelf in SE
Precambrian				Schist, Gneiss & Quarzite	Ancient continents: Ireland's oldest rocks formed 1800 - 1900 million years ago as igneous intrusions; metamorphosed to gneiss by Grenville mountain building. Sedimentary rocks (Dalradian), including deposits of global ice age, formed at rifting continential margin in NW.

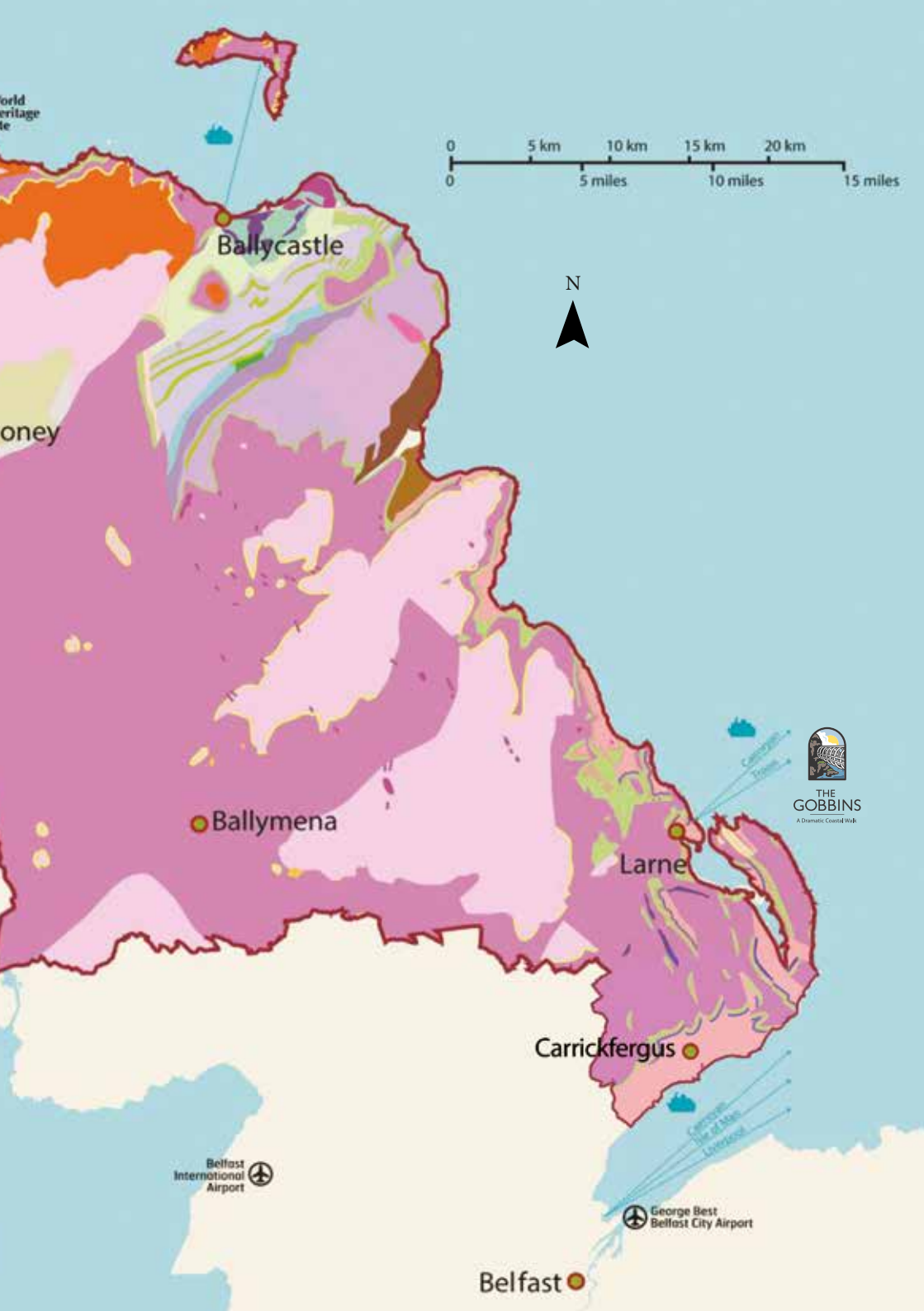
Not to scale

The Geology of the Causeway Coast



Clay and lignite	Lough Neagh Group	Palaeogene
Mudstone and conglomerate	Dunaghy Formation	
Basalt	Upper Basalt Formation	
Bauxite clay	Interbasaltic Formation	
Columnar basalts	Causeway Basalt Formation	
Basalt	Lower Basalt Formation	
Chalk and flints	Ulster White Limestone Formataion	Cretaceous
Grey mudstones	Waterloo Mudstone Formation	Jurassic
Mudstone	Penarth Group	Triassic
Mudstone	Mercia Mudstone Group	
Red sandstone, mudstones & conglomerates	Sherwood Sandstone Group	
Sandstone, siltstone and mudstone	Millstone Grit	Carboniferous
Limestone	Carboniferous Limestone Series	
Sandstone, conglomerate and mudstone	Barony Glen Formation	
Conglomerate and sandstone	Cross Slieve Group	Devonian
Metamorphosed sandstone, mudstone & siltstone	Runbay Formation	Dalradian
Limestone	Torr Head Limestone	
Metamorphosed sandstone, mudstone & siltstone	Murlough Bay Formation	

Microgabbro	
Rhyolite	
Grandiorite	
Metamorphosed lavas and tuffs	
Andesite	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Larne
THE GOBBINS
A Dramatic Coastal Walk
Carrickfergus
Belfast International Airport
George Best Belfast City Airport
Belfast

Key Geological Exposures along The Gobbins Cliff Path


Landslip
Differential weathering seen near The Gallery
The Tunnel
Landslip
sh layers seen
Sandy Cave
an 'O' War
The Gallery
Gordon's Leap
The Aquarium
Man 'O' War
The Gobbins Cliff Path
0
50
100
200 Meters
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0.05
0.1
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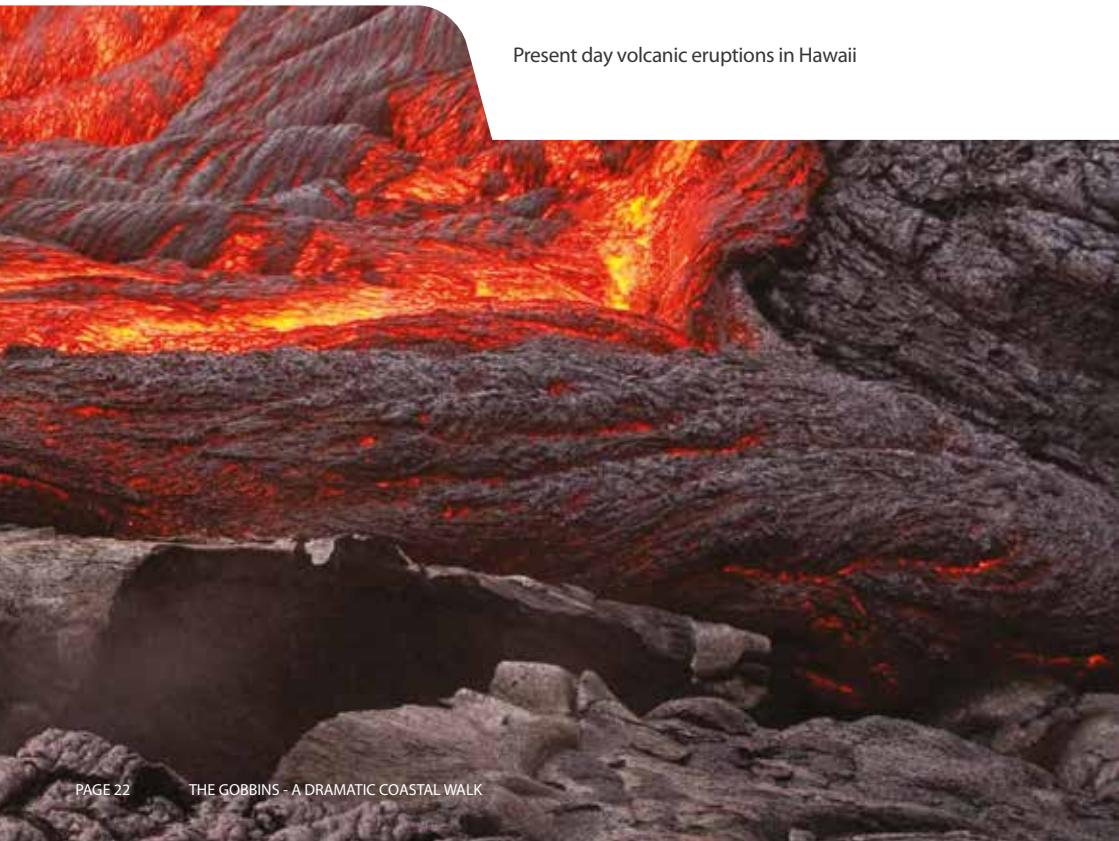
Geology along The Gobbins Cliff Path

The dramatic Gobbins Cliff Path winds around almost vertical basalt sea cliffs up to 60m (196ft) in height. Basalt is a common extrusive igneous rock with a fine crystal structure. An extrusive igneous rock forms as magma erupts at the surface. Basalt usually forms when lava cools relatively quickly at the Earth's surface, creating small interlocking crystals that are not visible with the naked eye. When magma (lava which hasn't reached the surface) cools more slowly within the Earth's crust, it tends to produce rocks with coarser crystals e.g. dolerite and gabbro. The chemical composition of these rocks is very similar to basalt; however the slower cooling allows larger crystals to develop and gives the rocks a different appearance.

The basalt that gives rise to the dramatic cliffs on the East Coast of Islandmagee are relatively common in North Antrim. They formed as part of a series of huge fissure eruptions that created the impressive Antrim Plateau which extends from Cave Hill outside Belfast to Binevenagh Mountain in the north-west of County Londonderry. Fissure eruptions simply mean that as seafloor spreading continues at the mid-Atlantic ridge large cracks opened in the Earth's surface, and through these cracks lava flooded onto the surface.



Present day volcanic eruptions in Hawaii

Cretaceous white limestone at Portmuck Bay to the north of The Gobbins Cliff Path - NIEA

Near the Gobbins there is evidence for the type of landscape that existed before these basalt rocks came to dominate. At the south end of the site older marine sedimentary rocks are visible. These rocks are some 200 million years old and provide us with evidence of the climate and landscape during the late Triassic and early Jurassic Periods, when this part of Ireland would have been located under a warm shallow sea. The impressive Ichthyosaur fossil found at Waterloo Beds in Larne dates from this period.

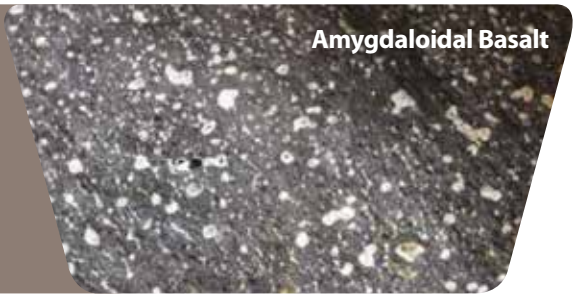
Overlying the older marine sediments is younger Cretaceous limestone. These rocks formed over 70 million years ago when this part of Ireland was located under a warm shallow 'chalk sea', rich in marine life, which upon death formed thick deposits of calcite from the remains of marine organisms. Exposures of this limestone can be seen to the south of the site and in the vicinity of Portmuck Bay. The same limestone can be seen along the Antrim Coast Road between Larne and Carnlough.

Whilst the basalt that overlays the Cretaceous white limestone at the Gobbins is abundant across County Antrim, the basalt at Hill's Port near the start of the path is quite special. It is what is known as amygdaloidal basalt. When lava cools, gases are trapped forming small bubbles within the rock. If there is sufficient gas this creates relatively large bubbles or vesicles within basalt rock. This is particularly common at the top of a lava flow because gas bubbles will always rise and become trapped by the rapidly solidified top surface of the lava flow. Over time the small vesicles are filled with minerals precipitated from fluids within the rock forming amygdales. Amygdales are simply vesicles that are filled with minerals. At the Gobbins the vesicles in the basalt have been filled with an impressive array of silica based zeolite minerals, one of which -

Vesicular Basalt

This example of vesicular basalt does not contain any mineral deposits. The gas bubbles have not been infilled by minerals.

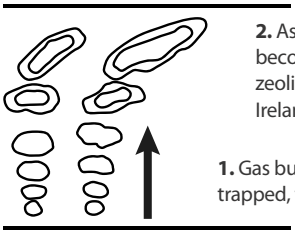
In contrast, the vesicles in basalt along the Gobbins Cliff Path have been infilled by mineral deposits, giving the rock a spectacular speckled appearance.



Amygdaloidal Basalt

Formation of Zeolites at the Gobbins

3. Over time minerals from the surrounding rock have precipitated out and occupied these gas bubbles giving a speckled apperarance. These white minerals are know as zeolites.



2. As the top of the lava flows, the bubbles become elongate. This forms flow or tube zeolites. This is one of the best locations in Ireland to see these.

1. Gas bubbles form in cooling lava where they become trapped, forming vesicles (a bubbly texture).

Gobbinsite - is named after the location where it was first discovered! None of the minerals are economically valuable .

Amygdaloidal Basalt near Wise's Eye on the Gobbins Ciff Path

Examples of some zeolite minerals found in the amygdaloidal basalt at the Gobbins and elsewhere in County Antrim. Zeolite is a term used for a particular grouping of minerals found as amygdales. They can tell us information about eruptions such as the depth of a lava pile and the temperature.

Gobbinsite is named after the Gobbins where it was first recorded as a new mineral in 1982. This mineral is also recorded at the Giant's Causeway and in Mont Saint-Hilaire, Canada. It is chalky white to brown in colour and similar in hardness to steel.

Gmelinite - is an uncommon mineral first recorded by David Brewster from the University of Tubingen, Germany in 1825 and named after Christian Gmelin, a German chemist and mineralogist. Gmelinite is known to occur at the Gobbins and Little Deer Park Quarry in Glenarm. Outside N. Ireland it is recorded in Italy, Kazakhstan, Australia and the USA. Gmelinite is orange to pink in colour and similar in hardness to steel.


Gmelinite


Analcime

Analcime - occurs frequently in basalt. Its is usually white or colourless and similar in hardness to cobalt.

Chabazite - is quite a common mineral, very closely related to Gmelinite. It is peach or white in colour and similar in hardness to steel.


Chabazite

Cowlesite - is a rare mineral, first recorded in Oregon, USA in 1975. It is known to occur in the USA, Canada, Russia and Iceland. It is colourless or white and similar in hardness to Calcium.

Gonnardite - is a common mineral first recorded in France in 1896. It is known to occur at sites across the globe. Gonnardite is white in colour and similar in hardness to enamel.

Heulandite - is a common mineral, known to occur across the globe. It is white to beige in colour and similar in hardness to platinum.

Levyne - is an uncommon mineral, only found in cavities within basalt. It was first recorded in rocks from the Faroe Islands; but is known to occur at sites across the globe. It is colourless or white and similar in hardness to iron.

Mesolite - is a relatively uncommon, white or colourless needle like mineral found across the globe. It is similar in hardness to volcanic glass (obsidian). Spectacular needle sprays are found in Skookumchuck Dam, Washington State, USA.

Did you know?

That a number of minerals have been discovered in, and take their name from locations throughout County Antrim e.g.

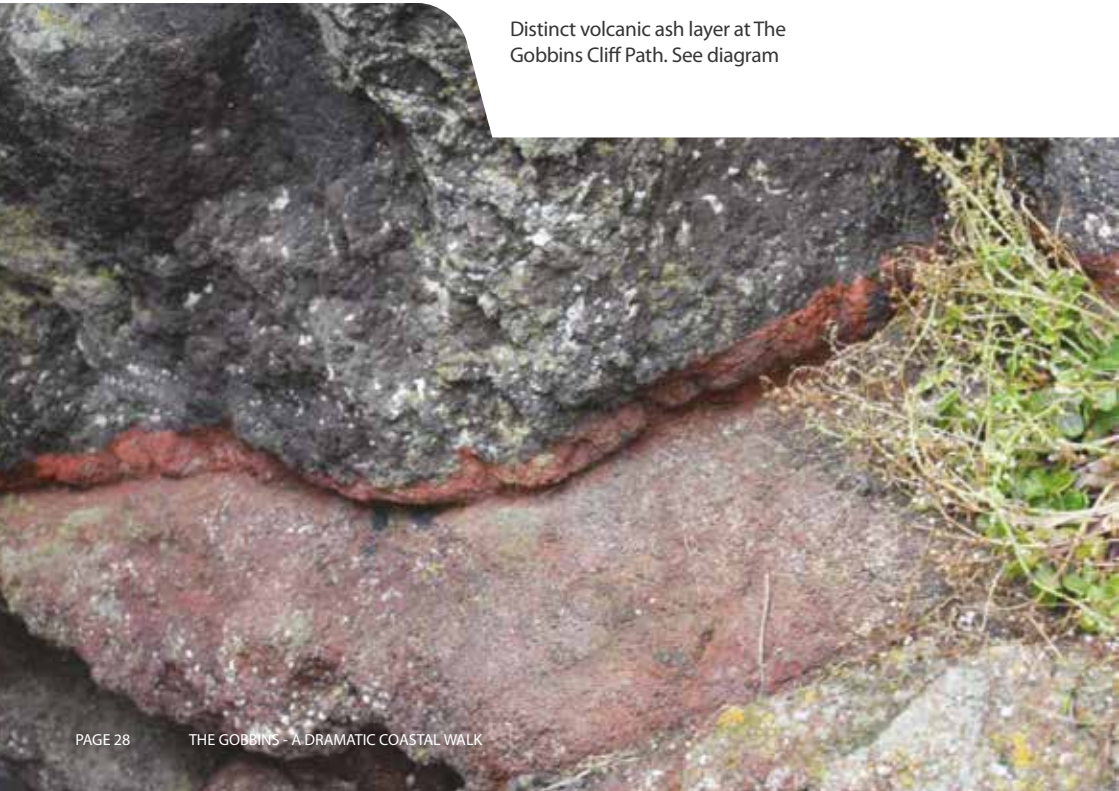
- Scawtite was first discovered at Scawt Hill above Ballygally by C.E Tilley in 1929. It is a clear, colourless, prismatic mineral which formed when solutions from a nearby magma source en-riched limestone with silica, magnesia, iron oxides and alumina.

- Larnite was first discovered at Scawt Hill by C.E Tilley in the 1920s. It is white to grey in colour and has a similar hardness to titanium and uranium.

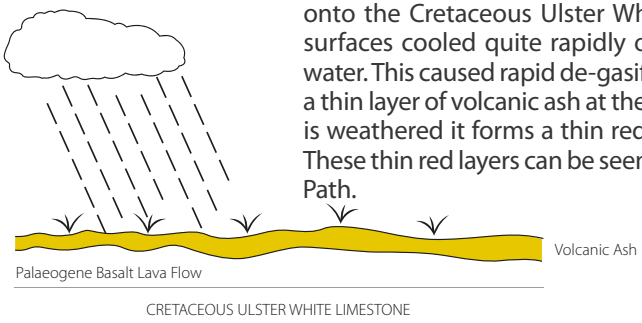
- Portlandite is a mineral first identified in its natural form at Scawt Hill. This mineral received its name as it is a mineral formed during the production of Portland Cement.

- Garronite was identified in 1960 by George Walker, a mineralogist and geochemist from Northern Ireland. Garron Plateau is identified as the international type locality for this mineral.

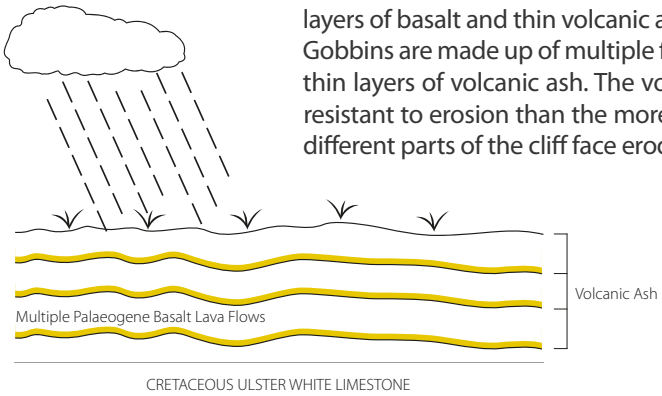
- Gobbinsite was first recorded as a new mineral by Rab Nawaz (Department of Geology at the Ulster Museum) and John F Malone.



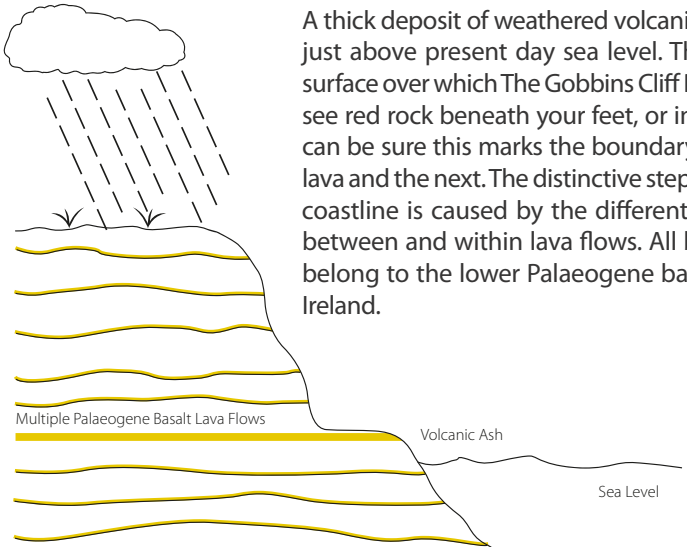
Distinct volcanic ash layer at The Gobbins Cliff Path. See diagram



At the beginning of the Palaeogene, basaltic lava flooded onto the Cretaceous Ulster White Limestone. The upper surfaces cooled quite rapidly on contact with air and/or water. This caused rapid de-gasification of the lava, forming a thin layer of volcanic ash at the top of the flow. Where this is weathered it forms a thin red layer between lava flows. These thin red layers can be seen all along The Gobbins Cliff Path.



Overtime further basalt lava flows buried the preceding layers of basalt and thin volcanic ash layers. The cliffs at the Gobbins are made up of multiple flows of basalt divided by thin layers of volcanic ash. The volcanic ash layers are less resistant to erosion than the more solid basalt. This means different parts of the cliff face erode at different rates.



A thick deposit of weathered volcanic ash has been eroded just above present day sea level. This forms much of the surface over which The Gobbins Cliff Path winds today. If you see red rock beneath your feet, or in the cliff sections, you can be sure this marks the boundary between one flow of lava and the next. The distinctive stepped appearance of the coastline is caused by the different rates of erosion both between and within lava flows. All basalts at the Gobbins belong to the lower Palaeogene basalt series in Northern Ireland.

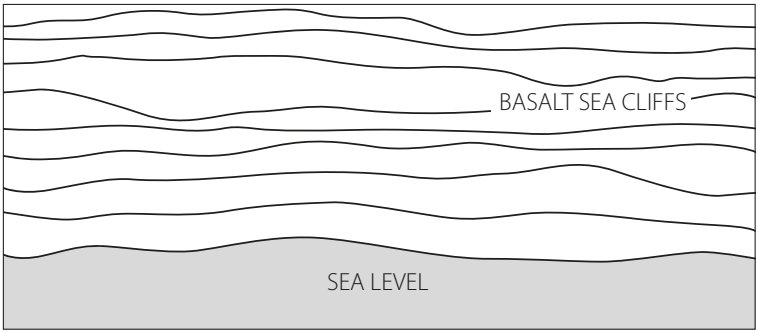
At some points along the path you can easily spot where individual basalt lava flows have been exposed to weathering and coastal erosion. Wave erosion has been more effective at different levels within each lava flow. This probably reflects the rate at which the lavas cooled. At the top and bottom of each flow, hot lava came into contact with air and cooler rocks. This resulted in more rapid cooling and a finer crystal structure, whilst the basalt in between took longer to cool and has a larger crystal structure and weathers more quickly. When you see distinct banding like this, it is known as differential weathering.

There are very few places along the coastline were visitors can see such a spectacular cross section within a fault formed cave. As this section of the cliff faulted, the two basalt surfaces were exposed to extreme frictional forces that created a thick bed of Fault Breccia which is more easily eroded by the sea. Breccia is a name given to broken rock fragments held together by some form of matrix. In this case this has been formed due to tectonic activity. The nature of the composition of Fault Breccias make it relatively easy to weather and errode.

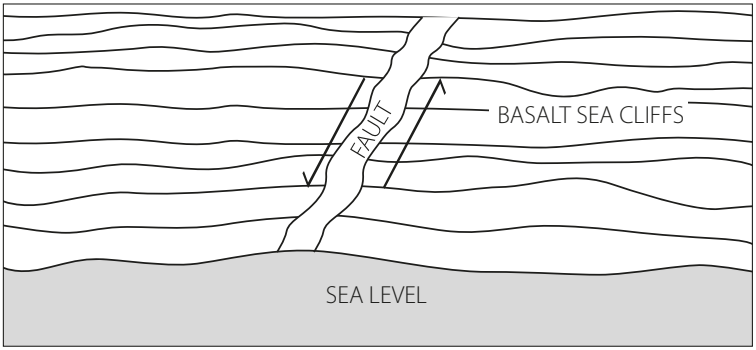
Did you know?

Global sea levels have risen and fallen many times throughout history. Following the last glaciation in Ireland about 13,000 years ago, sea levels rose rapidly and were once much higher than they are now. However, as the weight of the ice was removed from the land it started to rise through a process known as isostatic rebound. This meant that sea levels fell relative to the land. The northern half of Ireland is actually still rising very slowly today.

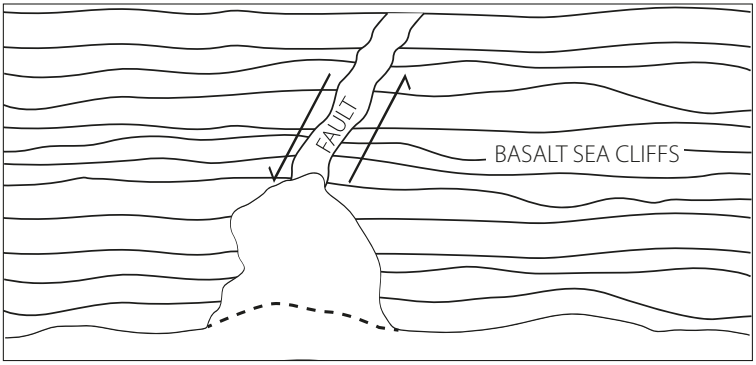
Differential Weathering at the Gobbins Cliff Path.



At some stage in the past sections of the Gobbins Cliffs have faulted. Two faces of basalt have moved past each other and the extreme forces have shattered the basalt to form Fault Breccia. This is quite a brittle rock and less resistant to erosion.



In the past when sea levels were higher wave action exploited the weakness of this fault, removing rock to form a cave. Rounded clasts or boulders within the cave indicate sea levels were once much higher. The sea is now around 3 metres below the level of the cave today.

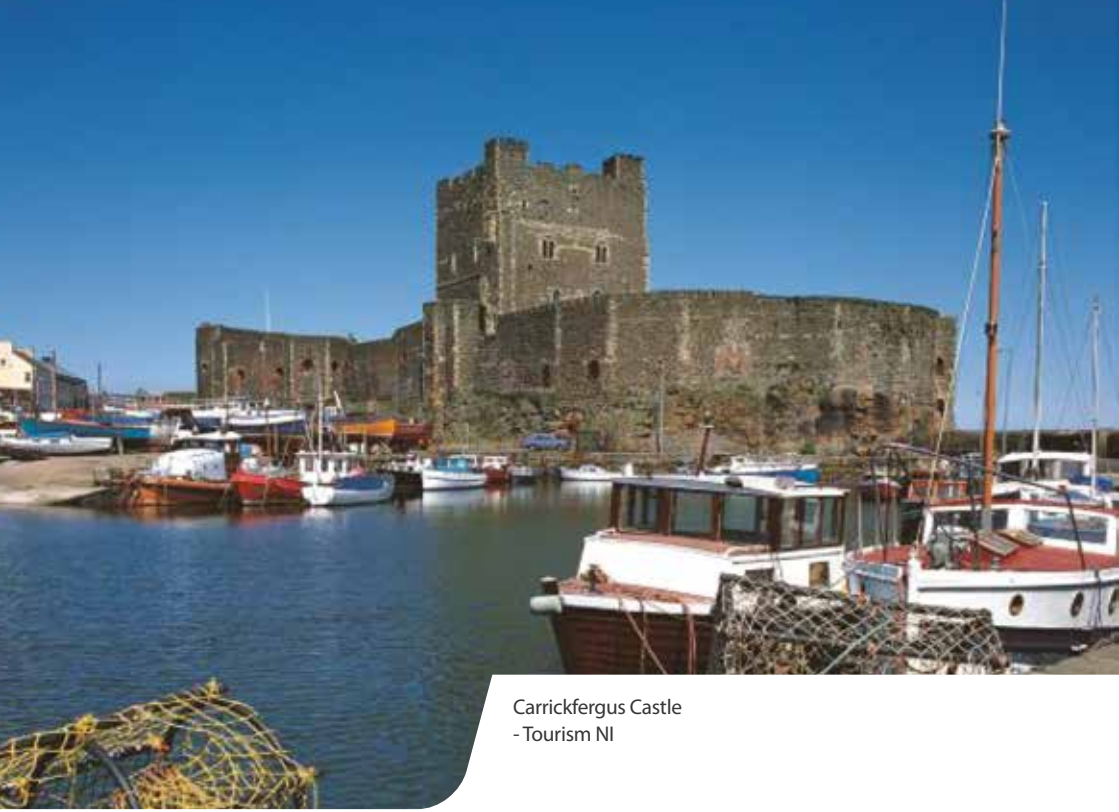


If you go inside the cave and look at the ceiling, you can see up to 1 metre of Fault Breccia. This is a very distinctive band or rock in the ceiling of the cave. It indicates the line of the fault within the cliff.

This fantastic aerial image of the Gobbins Cliffs was photographed from a helicopter as part of the Northern Ireland Environment Agency's regular assessment of Areas of Special Scientific Interest (ASSIs). The Gobbins Cliffs are designated as an ASSI for their scientifically important geology and wildlife. This image shows a significant rockfall or debris flow near the end of the path.

This rockfall is likely to have taken place quite a while ago. It tells us a lot about the history of this area. Towards the end of the last glaciation huge ice sheets were retreating and melting. As they melted sea levels rose significantly and the newly exposed basalt sea cliffs were subject to coastal erosion. This over steepened many cliffs along this stretch of coast creating instability and resulting in significant rockfalls. Where the toes of these rockfalls are subject to coastal erosion today slope failures can still be very active. The Gobbins Cliff Path has been engineered to meander around this rockfall.

Whilst sea levels initially rose at the end of the last glaciation they have since fallen. When the weight of ice was removed from the land it began to rise up relative to sea level. This has left many coastal erosion features such as caves stranded higher up the cliff.



Carrickfergus Castle
- Tourism NI

Influence of geology elsewhere in Mid and East Antrim

Carrickfergus Castle

To the south of the Gobbins lays the town of Carrickfergus with it's famous castle. The Castle is an icon in the local landscape and it's prominent defence position along the coastline is thanks to the underlying geology.

Around 55 million years ago, during the Paleogene Period, magma was forced into the existing mudstone rock. This formed a dolerite intrusion.

The magma baked the mudstone making it harder than normal. This baked mudstone and dolerite are more resistant to erosion than the surrounding rock. That is why the land on which Carrickfergus Castle is built juts out to sea. The castle itself was built using local basalt by John de Courcy in the 1180s.

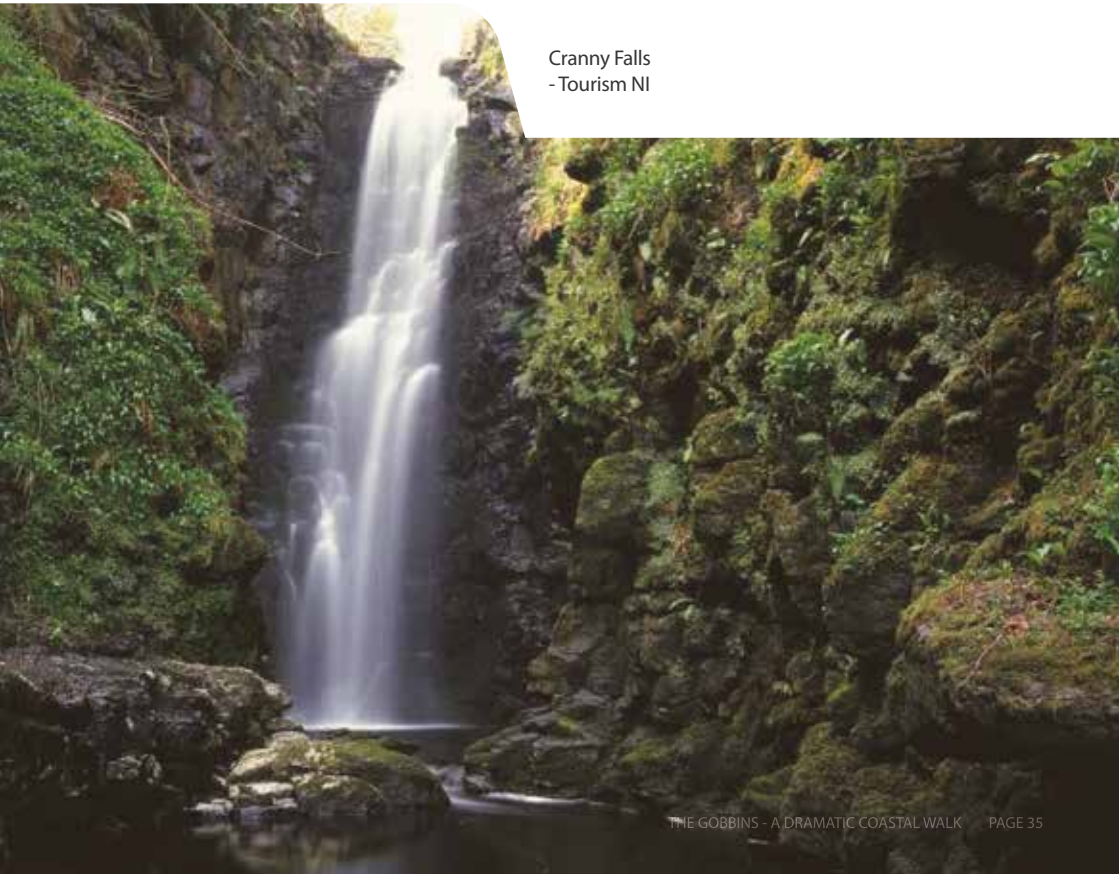
Cranny Falls

Carnlough village has a long history of limestone quarrying. Although this practice has all but disappeared, the remains of this industry are easy to see. It is possible to walk inland from the village, along a path that was once an old railway used to transport quarried limestone to the harbour.

This path is known as the Mineral Path and leads up to Cranny Falls.
This mix of dramatic natural landscape and industrial engineering can be attributed to the geology in the area. Thick layers of Ulster White Limestone formed during the Cretaceous period when the area was underneath a warm shallow sea.

This limestone was later covered by basalt lava which flooded the surface as the Atlantic Ocean began to open up. Over millions of years erosion has exposed some of this limestone.

Cranny Falls demonstrates the tough nature of basalt. As other rock types have eroded with the flow of the Carnlough River, the tough basalt has not eroded at the same rate. This has resulted in a dramatic change in height of the river, forming a waterfall.



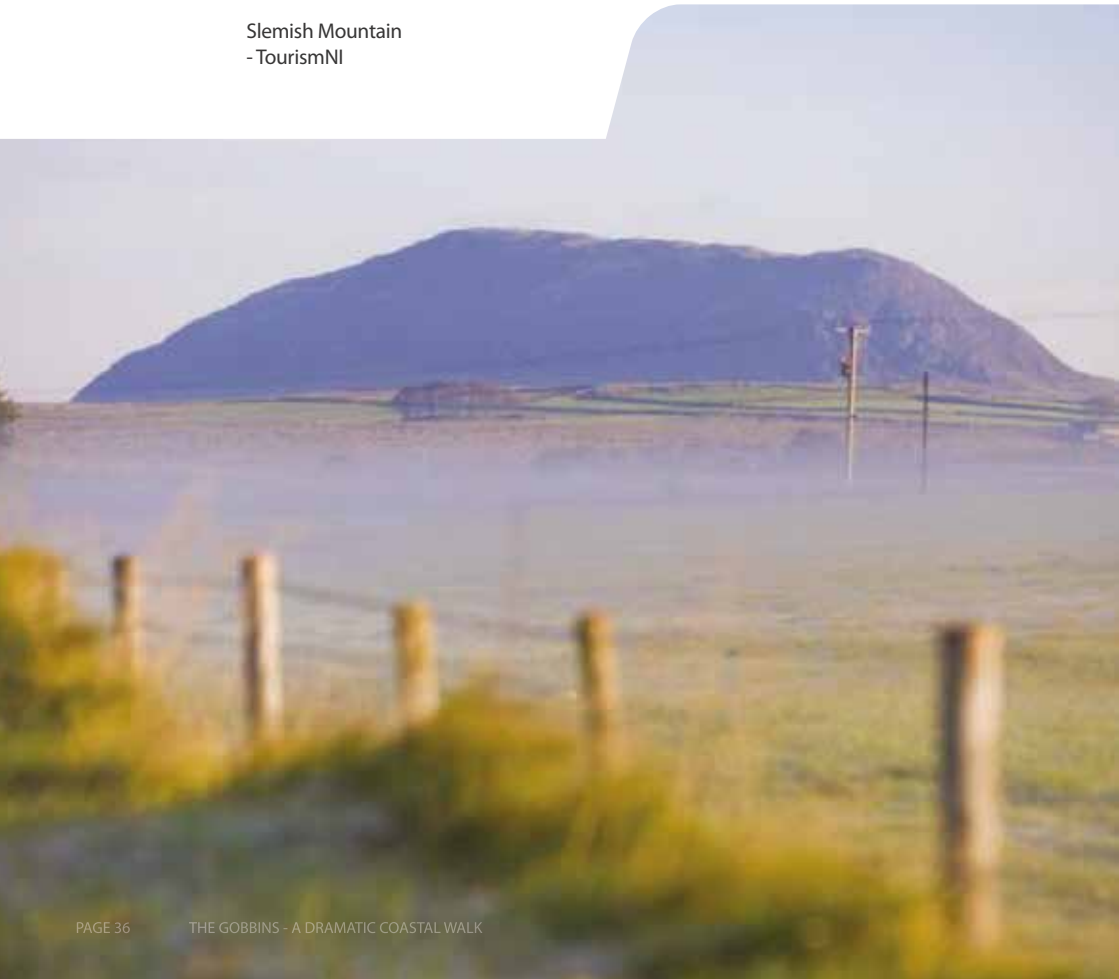
Cranny Falls
- Tourism NI

Slemish Mountain

Just outside the village of Broughshane, Slemish Mountain is an excellent example of a volcanic plug (the root of an ancient volcano). Following millions of years hidden beneath the landscape, the volcanic plug has been exposed by weathering and erosion and now stands proudly as the most dominant feature in the surrounding countryside.

This ancient volcano would have been active around 60 million years ago (when Europe and North America split apart) and formed as molten rock, or magma, forced its way upwards through the existing rocks. Slemish Mountain is just one of a network of sites in the area that tells the story of volcanic activity during the early part of the Palaeogene period. Whilst such activity ceased millions of years ago, the legacy of these dramatic Earth processes are still clearly visible in the landscape. Sites that began to form at the same time as Slemish, include the cliffs at The Gobbins Cliff Path, the Giant's Causeway and Causeway Coast World Heritage Site, the distinctive Binevenagh Mountain, Carrick-A-Rede, the Ring of Gullion and the Mourne Mountains.

Slemish Mountain
- TourismNI



Wildlife along the way

While we would find it difficult to live among the crashing waves and howling winds at the Gobbins many birds happily make homes on the perches and in the crevasses of the cliffs.

The cliffs which can stretch up to 60m in places are home to important sea-breeding colonies. The crashing waves and steep sided cliffs mean that birds such as Kittiwakes and Razorbills have colonised and thrived here. While other birds such as Comorant, Shag and Atlantic Puffin can also be spotted gliding here.

Nesting season for most of these breeding birds is May to August, although some species such as Black Guillemot and Fulmar, will be present at the breeding site earlier in the year. As the young mature some, such as Kittiwake and Fulmar, take flight. Others, such as young Guillemot, Razorbill and Puffin, simply throw themselves from the nest site to the join the parent birds on the sea below.

Kittiwake

Razorbills

Cormorant

Herring Gull

Shag

Puffin

Guillemot

Peregrine Falcon

Fulmar

Eider Duck

Manx Shearwater

Rockpippit

Gannet

Common Lobster

Mackrel

Cod

Limpet

Dogfish

Common Dolphin

Although much of the coast is exposed, bare, stone some plants have established themselves, especially in the higher parts and in scree slopes. The most common species in the area is the grass, red fescue while sea campion, kidney vetch and thrift also make an appearance.

Pink Thrift

Red Fescue

Kidney Vetch

Sea Campion

Further Information

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Ballymoney, BT53 8SL
Tel: +44 (0)28 2075 2100
Email: info@ccght.org
www.ccght.org

The plants and animals at the Gobbins are sensitive to disturbance, so please Leave No Trace by:

1. Planning Ahead and Preparing
2. Being Considerate of Others
3. Respecting Farm Animals and Wildlife
4. Travelling and Camping on Durable Ground (camping is not permitted at this site)
5. Leave What You Find
6. Disposing Waste Properly
7. Minimising the Effects of Fire

Further Information

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For further information about the geology of the Causeway Coast and Glens area CCGHT recommend "A Field Excursion Guide For The Causeway Coast" published by the Northern Ireland Enviroment Agency.

Whilst every effort has been made to ensure the accuracy of the information in this book, the Causeway Coast and Glens Heritage Trust wishes to emphasise that it cannot accept any liability for any errors which remain.

CAUSEWAY COAST & GLENS
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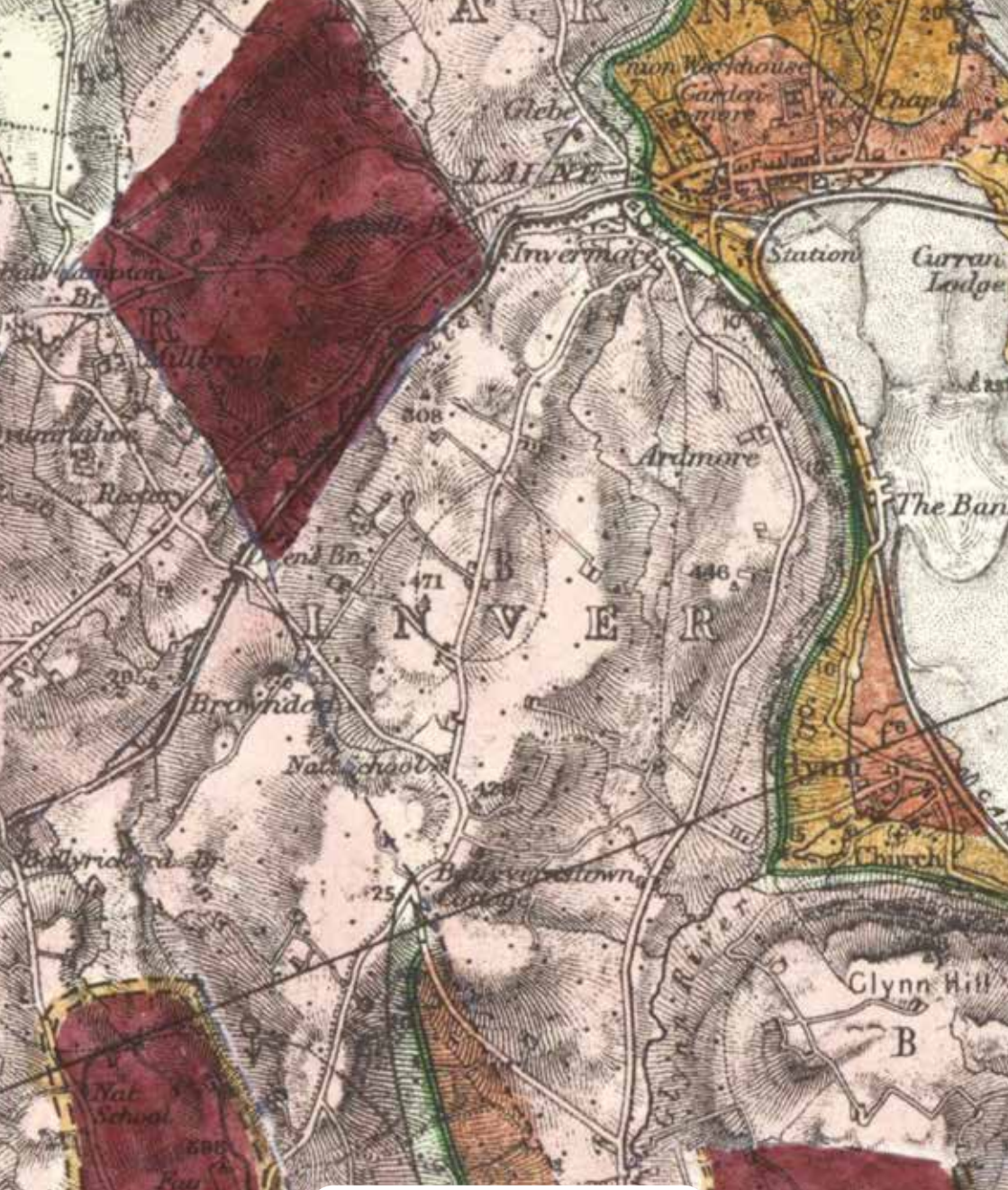
Bill Abernethy



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