Belfast Hills

GEOLOGY

Belfast Hills Partnership

There are a huge number of places that you can go to explore the geological heritage of the Belfast Hills. A number of publicly accessible sites are:

Palaeogene basalt
Palaeogene dykes and sills
Cretaceous limestone and sandstone
Jurassic mudstone and limestone
Triassic mudstone and sandstone

Divis and Black Mountain

Owned and managed by: National Trust
Grid reference: J266742

Divis Mountain (meaning Black ridge) and Black Mountain are just two examples of sites that get their names from the geology, in this case from the Palaeogene black basalt that they are both composed of. Black Mountain has been the site of a quarry for many years where the basalt extracted is crushed and used for road stone due to its hard-wearing properties.

Belshaw's Quarry

Owned and managed by: NI Environment Agency
Grid reference: J229671

An old white limestone quarry, Belshaw's displays the Cretaceous limestone with the Palaeogene basalt immediately above. There is also a small outcrop of Triassic mudstone beneath the limestone. This site is outside the boundary of the Belfast Hills. It does however represent the entire geological succession of the area and is deemed to be of exceptional importance.

Colin Glen Forest Park

Owned by: NI Environment Agency
Managed by: Colin Glen Trust
Grid reference: J285705

This beautiful woodland haven takes you on a walk through geological time. As you walk upstream alongside the Colin River you will pass the entire range of rocks that make up the Belfast Hills from the Triassic to the Palaeogene.
For more detailed information on the geology of Colin Glen Forest Park, please see the on-site visitor centre that has a great display on the rocks and fossils of the park.

Carnmoney Hill

Owned by: Newtownabbey Borough Council
Managed by: Woodland Trust
Grid reference: J341825

One of many Palaeogene volcanic plugs, Carnmoney Hill stands proud from the landscape because the molten rock or magma that once fed this volcano has now solidified and is more resistant to weathering and erosion than the surrounding rocks.

Cave Hill Country Park

Owned and managed by: Belfast City Council
Grid reference: J329793

The iconic cliffs above Belfast are made up of layers of Palaeogene basalt that formed as a result of volcanic activity just under 60 million years ago. Each layer of basalt represents an individual lava flow and if you look carefully you will see signs of weathering that occurred in between each flow in the form of a rust-red layer of laterite.

Ligoniel Dams

Owned and managed by:
Ligoniel Improvement Association
Grid reference: J295775

Translated as Lag an Aoil' meaning 'hollow of the limestone' is named due to the naturally occurring depressions that form in the top of limestone due to its soluble nature. Whilst there is no longer much Cretaceous limestone visible, the geology is responsible for the vast array of plants that enjoy the calcium-rich soil.

Belfast Hills GEOLOGY

Geological Code of Conduct

Please help us to look after the geological heritage of the Belfast Hills and **NEVER** damage or remove any rocks or fossils from the outcrops. All of the rocks have been here for millions of years so please leave them for future generations to enjoy.

Leaflet content prepared by the Geological Survey of Northern Ireland. For further information on the general geology of the Belfast Hills please contact:

The Geological Survey of Northern Ireland at www.bgs.ac.uk/gsni or visit the Earth Science Conservation Review website at www.habitas.org.uk/escr

Belfast Hills Partnership

Belfast Hills Landscape Partnership

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An Agency within the Department of the Environment www.doeni.gov.uk

NIEA Northern Ireland Environment Agency www.nienvironment.gov.uk

LISBURN CITY COUNCIL

Newtownabbey Borough Council

Antrim Borough Council

Department of Enterprise, Trade and Investment

Geological Survey of Northern Ireland

Land of Fire

The final part of the Belfast Hills geology story is from the Pleistocene epoch (the first part of the quaternary period) that began 2.6 million years ago.

The major change in climate during the Pleistocene period is commonly referred to as the Ice Age. In fact, ice was only present for relatively short periods of time but its impact on the landscape cannot be underestimated. Although no rocks were formed during this time, the ice shaped and sculpted the landscape that we see today and has been the single greatest erosive force on the planet.

Ice-masses, often thousands of metres thick, moved over the entire landscape eroding and re-depositing vast amounts of material.

The area wasn't completely barren though and the remains of some Pleistocene giant mammals have been found in a number of locations. These have included teeth of the woolly mammoth that would have thrived in the tree-free environment of the Ice Age. Antlers of the massive Irish deer (also known as the Irish elk) have also been found, and with a span of just under 4 metres these are the largest of any known deer, extinct or not.

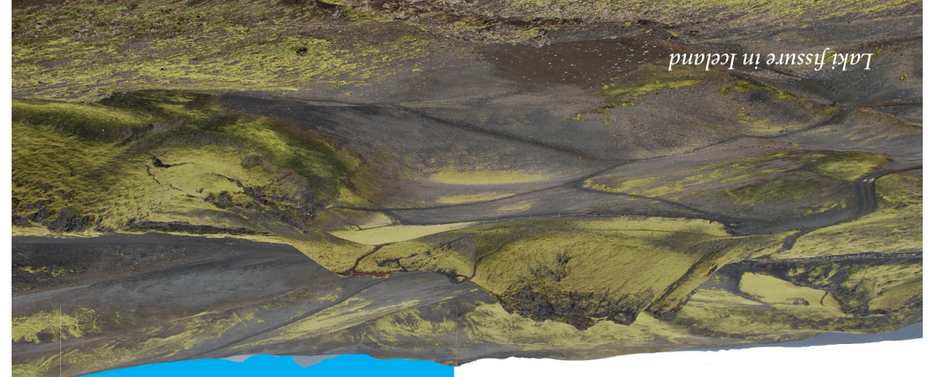
Artist's impression of a woolly mammoth

The uppermost layer of the Belfast Hills' 'cake' is similar to the icing in that it is the most dramatic layer. Following on from a mass extinction, the beginning of the Palaeogene (also known as the early part of the Tertiary) period was literally explosive! The continent of North America was moving away from Europe and this resulted in tearing and stretching the Earth's crust. This led to widespread volcanic activity, the evidence of which is beautifully preserved all the way across the Belfast Hills.

The tearing of the Earth's crust created linear eruptions or fissures up through which lava spewed out and covered the entire landscape. It is these successive flows of lava that make up the layers of basalt of the uppermost escarpment of the Belfast Hills. In other cases, the volcanic eruptions were from a single volcano and the remains of these volcanic plugs can be seen dotted across the landscape.

This fiery landscape with violent eruptions and the accompanying earthquakes that shook the entire area is hard to imagine. However, it is because of this violent past that the Belfast Hills exist because the resulting basalt that formed as the lava cooled has acted as a protective barrier to the underlying rocks. It has also had the added effect of 'cooking' the white limestone beneath making it harder than its counterparts elsewhere.

The best places to see the Palaeogene rocks are Belshaw's Quarry, Cave Hill Country Park, Divis Mountain, and Carnmoney Hill.



Lava fissure in Iceland

Crystal Clear Seas

The next layer of the Belfast Hills' 'cake' formed during the Jurassic period that took place from 200 to 145 million years ago. The beginning of the period is marked by a rise in sea-level that led to the majority of the landscape being covered by a shallow sea. The climate was warm and humid, and any land that was exposed would have been well vegetated.

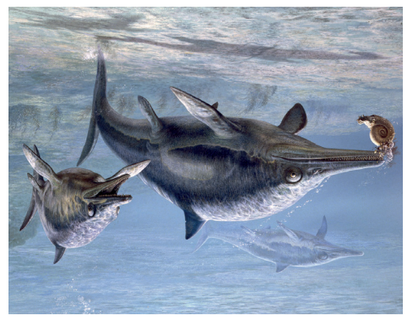
The rocks that resulted from this rise in sea level are mostly grey mudstones, known as Lias Clay, and limestones. These rocks are amongst some of the most fossiliferous in Northern Ireland and include fossils of coiled-shell ammonites, sea urchins, sea-shells, and even some remains of huge marine reptiles including ichthyosaurs and pleiosaurs.

The Jurassic rocks make up the second layer, or the 'jam' of the 'cake'. This is rather appropriate as the mudstones from this period are notoriously soft. Due to their high clay content they can absorb lots of water so after heavy rain it is said that they have the consistency of toothpaste. It is these rocks that underlie the cliffs of the Antrim Coast Road and this is the reason that there are lots of landslides after heavy rain, as the rocks above simply 'slip off'.

Although the Jurassic period is commonly associated with dinosaurs, there have never been any dinosaur fossils found in Northern Ireland. This is partly because the majority of the area was covered by a sea during that time so dinosaurs simply couldn't live here, but it is also because a great deal of the Jurassic rocks have been removed by weathering and erosion. However, that's not to say that dinosaur fossils won't be found here!

The best place to see Jurassic rocks is Colin Glen Forest Park.

Ichthyosaur vertebrae



Artists impression of an Ichthyosaur

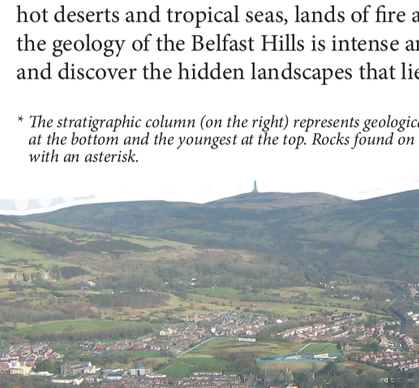
Rocks from the Cretaceous period make up the next layer of the Belfast Hills' 'cake'. This period lasted from 145 to 66 million years ago when the landmasses that we now know as Ireland was beginning to take shape and was located somewhere in the region of Southern France.

Global sea-level was higher during the Cretaceous period than at any other time in Earth's history. At its height, sea-level was 250m higher than the present day. Landmasses only accounted for approximately 18% of the Earth's surface and as a result the majority of the shallow seas were well away from any landmass and were therefore very clear.

The majority of the rocks from this period are white limestone, more commonly known as 'chalk'. This brilliant white rock formed on the floor of the Cretaceous sea primarily from the remains of a type of algae called coccolithophore. These algae prospered in the clear, calcium rich waters of the time, and when they died, their microscopically small calcite skeletons fell to the sea floor and accumulated over millions of years.

It wasn't just coccolithophores that inhabited the Cretaceous seas. One of the most common fossils found is the belemnite, a squid-like creature with a hard internal bullet-shaped shell. Sea urchins, coiled-shell ammonites and crustaceans would also have lived in these shallow seas and their remains can be found in many places.

The Cretaceous period came to a dramatic end 66 million years ago and resulted in another mass extinction when 75% of all life on Earth was obliterated, including most famously, the dinosaurs!



Microscopic algae, Coccolithophore

Artist's impression of Belemnites

The best places to see Cretaceous rocks are Colin Glen Forest Park, Belshaw's Quarry and Cave Hill Country Park.

The Big Freeze

The Age of the Sea Monsters

Foundations

The rocks of the Belfast Hills are literally the foundation of this special area. Not only do they form the solid ground that makes up the hills, they have influenced the flow of water, the types of settlement, the plants that grow there, the industry of each particular site, the place names and ultimately the people that live here.

Often concealed by the hustle and bustle of the city, the true story of the beginnings of the Belfast Hills is surprisingly easy to find once you know where to look. Telling the story of searing hot deserts and tropical seas, lands of fire and ice wastelands, the geology of the Belfast Hills is intense and dramatic, so come and discover the hidden landscapes that lie beneath your feet.

* *The stratigraphic column (on the right) represents geological time with the oldest rocks at the bottom and the youngest at the top. Rocks found on the Belfast Hills are marked with an asterisk.*

*Quaternary
Neogene
*Palaeogene
*Cretaceous
*Jurassic
*Triassic
Permian
Carboniferous
Devonian
Silurian
Ordovician
Cambrian
Pre-Cambrian

View of Cave Hill from Divis Mt

Ancient Deserts

The story of the Belfast Hills begins during a time known to geologists as the Triassic period that took place from 250 to 200 million years ago. The island of Ireland, as we now know it, was just north of the equator (15 to 20°N), similar to where Sudan is today, and experienced hot, arid, desert conditions.

If you imagine the Belfast Hills being a bit like a giant birthday cake, the bottom horizontal layer of the 'cake' is made up of rocks from the Triassic period. These are mostly seen as red or orange mudstones that formed as layers of mud on the bottom of isolated bodies of water. These bodies of water were fed by water from a sea that existed much further to the south. As the water evaporated in the intense desert heat, the levels of salt increased making them an unpleasant place to live. The resulting mudstone is fossil free and

Salt mines under Belfast Lough

its characteristic red or orange colour makes it easy to spot.

The start of the Triassic period was a desolate time, as it began just after a mass extinction that had wiped out over 90% of all life on Earth. But it was after this that planet Earth really began to change and by the time the Triassic period ended, a whole new range of creatures had evolved, including the rodent-like mammals and the dinosaurs.

The best places to see Triassic rocks are Colin Glen Forest Park and at Belshaw's Quarry.

Red mudstone at Colin Glen