
Exploring geology in Holyhead

[Original illustrated Geomôn web page](#)

This page details a Geotrail through Holyhead from the Fish Dock to Breakwater Quarry. Exploring geology in Holyhead will consider both the solid bedrock and the use of various rock types for building and construction around the town. Text and all images by John Conway.

Holyhead / Caergybi is an ancient town, its name in Welsh suggesting a Roman presence combined with a Welsh saint. More recent history starts with the arrival of the A5 trunk road from London and the establishment of a major port for communication with Ireland and the commercial development of the town. Our walk starts at the extreme eastern edge of the harbour and extends to the top of Holyhead Mountain (Mynydd Twr in Welsh) but you can start and stop wherever you please. Grid references (SH) are given but may not be exact in the town

The starting point is in Doc Fach ['the small dock'] also known as the old Fish Dock (shown on the OS maps as South Pier) [SH 254 826] where the tall seawall is made of local green schist, including some fascinating pieces showing variations in lithology and deformation. This rock started life as mud on the deep ocean floor over 500 million years ago, somewhere close to the south pole. Over time, that part of the earth's crust has moved progressively north to where we are now. The mud became compressed into shale, then subjected to intense pressure as two continental masses collided, it was metamorphosed to schist. Green schist takes its name from chlorite, a flaky mineral like mica but with a greenish colour. The rock around Holyhead was named "New Harbour schist" by Edward Greenly, the first geologist to map Anglesey in detail at the beginning of the twentieth century, after exposures near Porth y Felin by the Breakwater.

Photo: New Harbour green schist [see webpage](#)

Do be careful around here with the paraphernalia of fishing and all the debris from people working. The harbour walls are constructed from large blocks of Carboniferous limestone quarried over on the east coast of Anglesey. So too are the cap stones on the seawall in which you can see a variety of the usual fossils in various places.

Photo: Carboniferous limestone in the dock wall [see webpage](#)

Bollards are also of limestone, some of which are considerably rutted from mooring ropes dragged across them.

Photo: Bollard showing grooves from ropes [see webpage](#)

Return along the road towards town and turn right down to the seafront known as Turkey Shore. Look at the lower steps at the far end [SH 251 826], the top couple of metres are of typical Cornish (probably Dartmoor) granite (with large creamy feldspar phenocrysts and small black biotite crystals set in a matrix of grey glassy quartz) but below the main structure, it is Carboniferous limestone as are the bollards. You'd never know there was a dry dock here before it was filled in to make the lorry park!

Photo: Dock walls of Cornish granite [see webpage](#)

Look across the Harbour towards the lighthouse and notice the Admiralty Arch which officially marks the end of the A5 matching the Marble Arch in London at its beginning. The Arch, offices, lighthouse and various other buildings are of Carboniferous limestone. Black Guillemots nest in the holes of the wall beneath the old Lighthouse.

Photo: Carboniferous limestone is used extensively in the construction of the dock and associated buildings [see webpage](#)

Retrace your steps and continue walking along the road towards the station; all the walls around here are green schist and there is a big exposure on the left [SH 250 822] just before the Skinner Memorial on the hill above. The native rock does vary in character from the extremely contorted, finely laminated schist to more blocky, darker coloured rocks like

here — this is due to varying amounts of sand in the original muddy sediment.

Photo: Rock exposure below Skinner's memorial [see webpage](#)

Photo: Skinner memorial [see webpage](#)

There are two houses on the left just before the road junction, one in use, the other, Plas Altran has just been renovated, both built of the local schist [SH 249 821]. Note the architectural details using a yellow cross-bedded sandstone which is far easier to cut and dress to shape than any of the local schists. There are many buildings around Holyhead built by the Stanley family of Penrhos using this stone and architectural style.

Photo: Plas Altran [see webpage](#)

Photo: Detail of cross bedded sandstone used in Plas Altran [see webpage](#)

Detail of cross bedded sandstone used in Plas Altran

Turn left at the roundabout and then right to cross the bridge over the railway, the walls along here and down the private road [SH 247 820] to the old station / ferry terminal are built of a mixture of blocks of carboniferous limestone and coarse sandstone together with a reddish cross-bedded sandstone (possibly Runconr sandstone but unconfirmed) — presumably all from somewhere along the North Wales railway line from Chester.

Photo: Mixture of Carboniferous and Triassic rocks used in walls on approach road to the station [see webpage](#)

Then turn right at the lights, walk along the street, crossing to the war memorial [SH 246 823] which is made from Cornish granite with large creamy feldspar phenocrysts and small black biotite crystals set in a matrix of grey glassy quartz. It seems strange that Cornish granite was used when so many monuments and official buildings use carboniferous limestone but perhaps they wanted something more special, or possibly longer lasting ?

Photo: War memorial [see webpage](#)

Photo: detail of Cornish granite used in war memorial [see webpage](#)

The surrounding small cobblestones are typical of the various granites in the Trevor and other Lleyen quarries. When you get a chance to view the Lleyen peninsula from the west coast of Anglesey, or even visit, you will see a chain of rounded, near conical, hills which are granite intrusions, each of a slightly different character. There are innumerable quarries which used to produce kerb stones, setts (4 or 6 inch cubes used as cobblestones) and building stone.

Photo: cobblestones of various granites probably from Lleyen quarries [see webpage](#)

Take the left fork up Market Street and then keep right [SH 246 824] along the 'pedestrianised' section. Holyhead is not renowned for exotic building stones like some prosperous cities but there are still some to be found. But firstly, cross the Millennium Bridge towards the station where there are some interesting artistic slate structures.

Photo: Slate "art" [see webpage](#)

...and there's a good view up and down the old harbour from this new Bridge [once again the harbour is built of Carboniferous limestone].

Photo: general views of harbour [see webpage](#)

Looking back towards the town, the outstanding fine building is Stanley House [SH 247 825], constructed of local green schist again with the yellowish sandstone for window frames (but not visible from Market St).

Photo: Stanley House, built of local green schist with yellowish sandstone [see webpage](#)

In the small carpark below there are examples of gabions — wire cages fill with stones — acting as ballast to prevent any slippage of the hillside. These are a useful alternative to big boulders where there is a supply of smaller stones which by themselves would not be heavy enough to support the hillside.

Photo: Gabions [see webpage](#)

Back on Market Street, the pavement is made of modern sawn sandstone slabs. Originally such paving would have been flagstones [thinly bedded sandstones splitting naturally and common in the Pennines] or maybe local slate, but these are imported.

Photo: sandstone slabs as paving slabs [see webpage](#)

On the right, not many along our route, but a common sight in streets of terraced houses — slate doorsteps, here with those tell-tale reduction spots. These are greenish spheres or ovoid shapes where something, often a bit of organic debris, caused the iron in the mud to change colour [reduction]. They are very useful to structural geologists because the deformation of the original sphere to an oval or disc shape shows how the sediment was compressed during metamorphism.

Photo: reduction spots in slate doorstep [see webpage](#)

The Citizens Advice Bureau has a facade of made of polished bioturbated limestone — this is a common type of limestone on the coast around Moelfre-Benllech. Invertebrates or arthropods (worms or shrimps) burrowing through the soft sediment left either burrows, tubes or little mounds of chewed up sediment [think of lug worms at the present day] which were preserved as the sediment hardened to rock.

Photo: bioturbated limestone [see webpage](#)

When seen in the natural state the rock looks as though its been squeezed out of a giant tube — but when polished it takes on an interesting mottled appearance.

Photo: bioturbated limestone [see webpage](#)

Mia Bella has cladding [thin slabs of decorative rock stuck to the front of a building] of the 'blue pearl' larvikite. This is a type of granite quarried in southern Norway which is very popular as a decorative cladding to shop fronts.

Photo: larvikite [see webpage](#)

By the entrance to the churchyard [SH 246 825] there is a memorial (made of limestone of course) but the seating is granite with wonderful xenoliths. These 'foreign stones' are bits of surrounding rocks which broke off and became incorporated in the molten magma as it was emplaced but which didn't actually melt into the granite; sometimes they appear as dark blobs, sometimes we can see the original rock details.

Photo: Cross by entrance to churchyard [see webpage](#)

Photo: xenolith ('foreign stone') inclusion in granite on the structure above [see webpage](#)

St. Gybi's church [SH 247 826] is an interesting construction; the main porch is a fine grained yellowish sandstone showing cross bedding in some blocks, but there are also some pinkish blocks [presumably New Red Sandstone from the Chester region. Most of the body of the church is local rock [ie schist etc] but the corners are dressed blocks of a very coarse Carboniferous conglomerate. In the lower part of St Gybi's churchyard there is an exposure of the green schist bedrock. Note that the church sits inside the old Roman fort whose walls remain.

The 'North and South Wales Bank' is of the same yellow sandstone, as is the National Provincial Bank.

Photo: doorway of National Provincial bank [see webpage](#)

Tudor Owen Solicitors has used a greenish, coarse, slate — too low grade to split for roofing slates but of a grade often used for slabs, lintels or decorative work, e.g. fireplaces or, as here, for cladding.

Photo: Tudor Owen Solicitors building with slate cladding [see webpage](#)

Sometimes the sulphur from organic matter has combined with iron in the mud during metamorphism to form pyrite crystals with a nice example on one of these slabs.

Photo: pyrite crystals in slate [see webpage](#)

The approach to the Market Hall [SH 246 826] has granite kerbstones and steps.

Photo: approach to Market Hall [see webpage](#)

This magnificent building is constructed mainly from local schist but has pink, cross bedded sandstone architectural features — corners, arches, windows and door frames.

Photo: decorative features of Market Hall [see webpage](#)

Further along Market St, on the left, is the former police station [SH 246 827] and law court.

Photo: Old police station [see webpage](#)

Constructed of roughly dressed bioturbated limestone for window and doorframes, main walls constructed of fine-grained pale grey igneous rock. These building blocks display conchoidal [curving shell-like] fracture which is diagnostic of very fine grained structure and rapid cooling so probably quarried from the margins of an intrusion.

Photo: conchoidal fracture on igneous rock [see webpage](#)

Follow the road down to join Victoria St, turn left and a little further along come to Chippy Chippy [SH 248 827] which is clad in garnet quartz gneiss (perhaps the most exotic rock of all in Holyhead?) above a very fine black basic igneous. Gneiss is a much higher grade metamorphic rock than schist, indicating much higher temperatures and pressures during its formation. Both these rocks are imported.

Photo: Chippy chippy [see webpage](#)

Photo: Detail of garnet crystals in the gneiss [see webpage](#)

Continue to the corner, Marine Square, [SH 249 828] and turn left onto Prince of Wales road to see a set of ornamental tall grey stone pillars (limestone of course) where you can see fossil corals on some.

Photo: ornamental pillars of limestone, somewith fossils [see webpage](#)

On the first monolith labelled Traeth Newry if you look carefully the small black speckles are very small broken crinoids there are couple reasonable size crinoids cross sections are quite a few bivalves and other shells.

Photo: fossils [see webpage](#)

They stand on a pavement of sandstone flags, some with ripple marks others with various trace fossils.

Photo: ripple marked sandstone slabs [see webpage](#)

Continue along Prince of Wales road — by the turning down to Porth Tom Hughes [SH 248 830] is a rough pillar of limestone bearing a plaque.

Along the grass verge on the right hand side of the road there are a series of small pillars of a grey, very fine grained igneous rock showing conchoidal fracture (curving fractures like flint). Such a fracture pattern indicates extremely fine grain, almost glassy, due to rapid cooling. This is almost certainly quarried on the edge of the intrusion.

Photo: small pillars of very fine grained igneous rock [see webpage](#)

Photo: detail of conchoidal fracture [see webpage](#)

After the turning down to the Maritime Museum [SH 245 931] there is a polished slab of a dark igneous rock with black and creamy white crystals celebrating the visit by the royal family in 1958.

Photo: A little further on four blocks of Holyhead quartzite surround an anchor, commemorating the wartime bond with Royal Netherlands navy. [see webpage](#)

Photo: Holyhead quartzite blocks in memorial to Dutch navy [see webpage](#)

From here to the end is a discontinuous line of blocks of limestone with rectangular rebates and two holes. The slabs supported rails and predate the use of sleepers. They were used in the quarry and along the track to the Breakwater. There is an example in the Breakwater museum area with a chair still in place.

Photo: Stone fish plates (rail chair supports) predating the use of sleepers [see webpage](#)

Photo: example from Gloucester docks showing these stone fishplates in situ (J. Conway) [see webpage](#)

Further along we come to a memorial [SH 243 832] to the loss of two ships, Connemara and Retriever, consisting of a large limestone bollard from the old harbour (we saw several on Fish Dock and Turkey Shore) indicative of "home" for the two ships and two blocks of granite from the port of Greenmore, Co Louth in Ireland.

Photo: Memorial [see webpage](#)

Photo: granite blocks from the port of Greenmore, Co Louth [see webpage](#)

In front of this memorial is a bench of limestone to the memory of John Cave, photographer.

Photo: memorial to John Cave, photographer. [see webpage](#) [see webpage](#)

The steps down to the sunken garden are the same pale grey igneous rock we saw earlier. If you walk along the sea front you can see various exposures of the New Harbour green schist whilst most of the gravel on the shore are fragments of the Holyhead Quartzite.

Photo: Next we pass the Marina [SH 241 833], built on an area reclaimed from the sea by tipping a mass of limestone blocks — many of those fronting the area are the muddy black limestone with gigantic brachiopods. [see webpage](#)

Photo: brachiopod fossils by the Marina [see webpage](#)

By the lifeboat station on the approach to the Marina is a memorial consisting of an old anchor and two blocks of Coedana granite. This is to the sailing ship Zebu which sank off the Breakwater, was towed in and dismantled in the harbour May 2021. The Coedana granite is an intrusive igneous rock quarried around Gwalchmai but some minor veins can be seen on the beach near Rhosneigr.

Photo: Memorial to the Zebu which sank in May 2021 [see webpage](#)

The road to Breakwater Park turns off left opposite the road down to the marina and curves round behind the Boathouse pub — it is in fact the old railway track to the quarry. We carry on down the hill past the boatyard noting the old railway bridge on your left [SH 239 832]. The arch vault is of blocks of limestone but the bridge abutments are made of a range of available rocks, schist, limestone, sandstone and the grey conchoidal igneous rock. On the right hand side of the road

there are re-used cobblestones, again a mixture of granites.

Photo: Follow this road, getting narrower as it goes passed a lovely exposure of the New Harbour green schist on the right — shot through with white quartz veins. [see webpage](#)

Photo: New Harbour schist exposure on road to Breakwater [see webpage](#)

This 'road' reduces to a path passed Soldier's Point [SH 235 836] — the old house built originally for the resident architect of the Breakwater, turned hotel, but now derelict. The 'gateway' and many of the walls and ornamental towers have superb examples of the highly contorted schist.

Photo: Soldiers Point — walls of greenschist with quartzite pebbles for decoration [see webpage](#)

Turn left down to the Breakwater [SH 238 839] — the upper level is constructed from massive dressed blocks of Carboniferous limestone; you can find a wonderful selection of corals and brachiopods in many of the blocks.

Photo: dressed limestone blocks Dressed limestone blocks. Holyhead breakwater [see also webpage](#)

Photo: colonial coral — lonsdalea [see webpage](#)

Photo: solitary (horn) coral — dibunophyllum [see webpage](#)

The lower level is constructed from enormous roughly dressed blocks of Holyhead quartzite. The whole structure sits atop a huge, wide embankment of quartzite boulders tipped from an overhead railway on stilts. There is an excellent information display up in the quarry.

The Holyhead Quartzite is a metamorphosed quartz sandstone, in places there are relict features of bedding but for the most part it is a massive featureless quartzite — often shot through with quartz veins.

Photo: massive blocks of quartzite on lower level — some of these are 3–4 metres long [see webpage](#)

Retrace your steps and take the sign posted coastal footpath down into the bay [SH 235 837]. There is a magnificent storm beach of very large stones of Holyhead Quartzite at the head of the little bay. Exposures on the right hand side of the bay are the type locality for the New Harbour green schist, and on the left side of the bay are exposures of South Stack meta-sandstone beds

Photo: Storm beach of quartzite pebbles in front of cliffs of South Stack meta-sandstone beds [see webpage](#)

Follow the coastal footpath to the Country Park in the old Quarry along the coastline known as "Rocky Coast". On the way the coast notice:

- 1) the variation in lithology in the South Stack beds [different hardness & thickness of the sandstone beds]
- 2) the overall smooth rounded surfaces, shining in the sunlight indicating glacial polishing but now being disrupted as postglacial weathering is now shattering the rock.

Photo: glacially polished surface [see webpage](#)

- 3) a number of vertical cliffs running out to sea — these are faults or thrust planes [low angle faults with some sideways movement].

Photo: fault / thrust [see webpage](#)

- 4) where the path is very narrow with a small fence [SH 232 837] to seaward as it crosses a narrow channel in the rock. Note the smoothness of both sides, and that they are mirror images of each other. Consider this: a dolerite dyke weathered out leaving this gap, whereas the quartz rich sandstones on either side are relatively immune to weathering.

Who say igneous rocks are always harder?

Photo: site of weathered out dolerite dyke [see webpage](#)

As you come level with the Country Park it is worth diverting in: view the old brickworks [SH 226 832] established in 1901 using crushed quartzite to make silica bricks and furnace linings which, together with a newly renovated visitor centre at the other end of the carpark, contain interesting displays on the history of the quarry, the brickworks, the breakwater as well as a cafe and children's playground.

Photo: brickworks [see webpage](#)

Photo: one of 8 quarries supplying stone to build the breakwater. [see webpage](#)

Continue along the coastal footpath (don't follow the rough paved track) towards Holyhead Mountain / Mynydd Twr, but do look back into Porth Namarch [SH 225 834] where the prominent seastack is the remains of a dolerite dyke. Access to the beach is dangerous and not recommended, especially as seals like to leave their pups there while they go fishing and any disturbance would be fatal.

Photo: Porth Namarch — the sea stack in the cove is the dolerite dyke [see webpage](#)

Photo: onion skin weathering leaving 'corestones' of dolerite [see webpage](#)

The coastal footpath passes through one of the quarries then curves round the side of the mountain, passing the small barrel-roofed powder magazine [SH 221 837] towards North Stack where there is a fog horn [SH 215 839] At first the path looks a little hairy but it is actually fine with fabulous views and many exposures of the varying lithology of the Holyhead Quartzite.

Photo: view along the coast towards North Stack [see webpage](#)

.....and on to South Stack lighthouse.

Photo: view from North Stack to South Stack [see webpage](#)

Around the summit is the rampart of a hillfort, and on the very top, foundations of a Roman lighthouse [SH 216 837].

Our walk has come to an end; we've explored the solid geology, various aspects of the harbour, and the town that grew up around the ferry trade and had an exhilarating costal walk to the iconic lighthouse at South Stack on its own little island Ynys Lawd.

There are various ways back to the start — from the Quarry follow the road which runs along the old railway track to the town; from the summit of Holyhead Mountain there are various paths back to the town; from South Stack you can either follow the road or return by the path that skirts around Holyhead Mountain eventually entering the old settlement of Mountain where the quarrymen and labourers lived, with small stone walled fields and terraced cottages.

Text and all images by John Conway.



Dressed limestone blocks. Holyhead breakwater.