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# Knockan Crag

**Ascent** — about 100 metres

**Difficulty** — fairly easy on good path, one short steep climb

**Duration** — about 1 hour round trip

**Start** — grid reference [NC 188 092]

This is a short, circular walk that takes you along the Knockan Trail, past the Moine Thrust, and introduces you to some of the rocks that make up most of the Assynt area. In good weather the panoramic views from the cliff top are fantastic. The path is well maintained and the walk is fairly easy, although there is one short steep section. A small part of the trail is also suitable for wheelchairs.

Start at the Knockan Crag car park and walk towards the visitor centre, stopping at the 'Knockan Puzzle'. This short section of stone wall represents Assynt geology in a nutshell, with the different rock types arranged in the order in which you see them near Knockan. At the base lie the ancient, black and white striped Lewisian Gneiss, followed upwards by red-brown Torridonian Sandstone. Above that is the Cambrian Quartzite; the lower, white, cross-bedded Basal Quartzite is followed by the Pipe Rock, with white pipes in a pink quartzite. On top of the Pipe Rock lie the brown-grey Fucoïd Beds, the speckled Salterella Grits, and the grey Durness Limestone. Overlying the limestone are the dark coloured Moine Rocks, and herein lies the puzzle; the Moine Rocks are actually twice as old as the limestone. Sedimentary rocks are always laid down in a succession of layers, with the oldest rocks at the bottom and the youngest rocks on top. So, how can much older rocks sit on top of younger rocks?

The Moine Thrust is the reason why so many geology students visit Assynt. But what is a thrust? When two continents collide, the rocks at the edges of the continents are squeezed and crumpled, leading to the formation of a mountain range.

As the layers of rock deep within a mountain range are squeezed, they eventually break, and thick slices of rock slide over each other. The surfaces along which the rocks slide are called thrusts, and the moving slices of rock above the thrusts are called thrust sheets.

Picture a snow plough, clearing the streets: as the plough moves the snow, slabs of old snow are thrown over younger snow in front, and this is exactly what happens in mountain ranges. So as two continents plough further into each other, one thrust sheet after another develops, and older rocks are thrust over younger rocks. Long after the mountain range has disappeared, thrusts can be recognised because of this sequence of older rocks on top of younger. The rocks at Knockan once lay deep within the ancient Caledonian Mountain range, and the Moine Rocks are separated from the younger Durness Limestone below by the Moine Thrust.

From the Knockan Puzzle, pass through the visitor centre and carry on up the trail. You pass a small quarry, where the potassium-rich rusty brown Fucoïd Beds have been quarried for fertilizer. Some boulders of Pipe Rock containing excellent examples of worm burrows are on display here. The Pipe Rock is exposed slightly lower down the slope below you.

Climb up to the signposted Moine Thrust [1] [NC 19109 09451], where you can bridge 500 million years with your hands. At the base of the cliff is the 500 million year old Durness Limestone, which is here weathered to a pale, creamy colour — although the freshly cut surfaces set in the path are a dark grey shade. In contrast, the cliffs above you are made from grey Moine Rocks that are about 1000 million years old. Note that there is very little lichen on the Durness Limestone, whereas the Moine Rocks are covered in lichen; few lichen species like limestone.

The confusing paradox of Knockan is that at first glance this looks quite normal, just one rock on top of another. The problem is that, as we saw at the Knockan puzzle, the Moine Rocks above the limestone are not younger than the limestone, but is twice as old! The boundary between these two rocks is not a normal geological contact but is in fact the famous Moine Thrust. The Moine Rocks have been thrust tens of kilometres from the east to their present resting place on top of the limestone. On closer inspection, the effects of this huge thrusting event can be seen in the limestone, which is full of cracks, formed as the thick pile of Moine Rocks was forced over it, more than 400 million years ago.

You can follow the line of the Moine Thrust along the cliff, just above the path, until the path reaches a set of steps. Follow the path south along the top of the cliffs. After about 50 metres there is a left turn to a viewpoint [2] [NC 19226 09536], worthwhile in good visibility. Immediately in front of the viewpoint are heathery peat hags, with scattered outcrops of Moine Rocks. This is typical Moine landscape — indeed, the word Moine in Gaelic means bog! Beyond the bog is a knoll of green grass with outcrops of grey limestone.

The Moine Thrust marks the dividing line between the bogs on the Moine Rocks and the grass on the Durness Limestone. To the north-west is the 'upturned boat' shape of Suilven, an imposing ridge of Torridonian Sandstone rising above a platform of Lewisian Gneiss. The peak beyond Suilven is Canisp, formed of Torridonian Sandstone capped by Cambrian Quartzite. The rocks on these mountains have not been affected by thrusting, but further to the north, you can see the massif of Conival and Ben More Assynt, which lies within the Moine Thrust Zone.

Return to the main path and follow it to the south, through cuttings in the thick peat, passing the cliff-top sculpture. In places, outcrops of a light grey, thinly banded rock can be seen in the path. This banded rock is best appreciated at Eagle Rock at the southernmost part of the circuit, where it forms a small cliff [3] [NC 18814 08643]. Look closely; the bands in the rock are generally less than a millimetre thick. This type of rock is known as mylonite, and is the geological equivalent of filo pastry. Just as the pastry is rolled out into thin sheets, so these rocks were smeared out into thin layers under intense pressure as the thick mass of Moine Rocks was thrust relentlessly from the east. From Eagle Rock, follow the trail back to the car park.

## Figures

(Figure 13) Knockan Crag. Painting of walk by Elizabeth Pickett.

(Figure 14) The Knockan Puzzle — Assynt geology in a nutshell.

(Figure 15) Formation of the Moine Thrust Painting by Elizabeth Pickett.

(Figure 16) Pipe Rock worms may have looked like this.

(Figure 17) Vertical worm burrows in Pipe Rock.

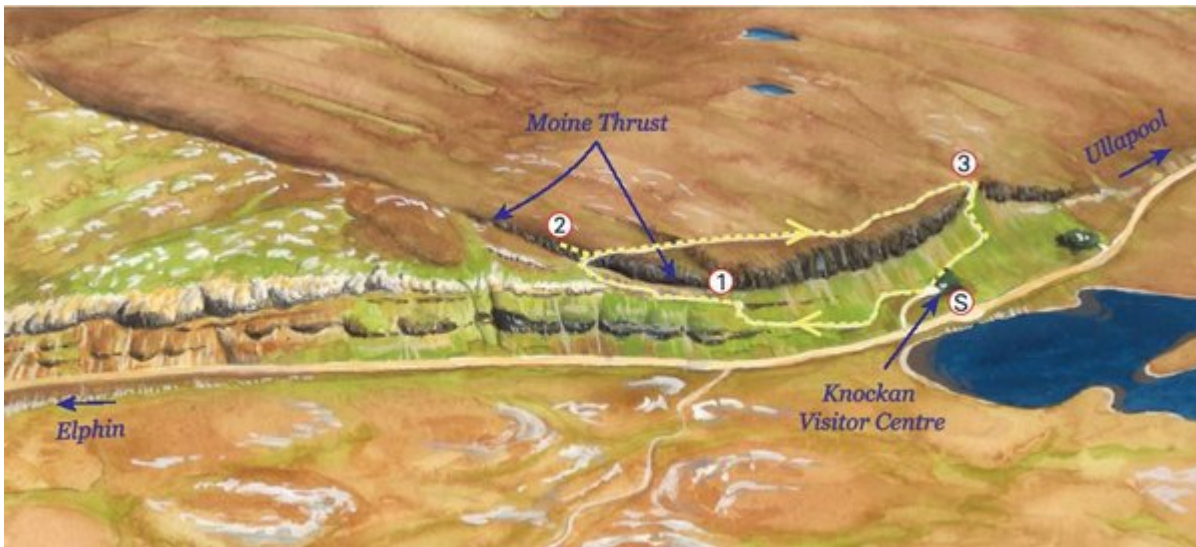
(Figure 18) Dark Moine Rocks on top of creamy Durness Limestone, separated by the Moine Thrust.

(Figure 19) The Moine Thrust.

(Figure 20) View north, towards Ben More Assynt from the viewpoint.

(Figure 21) Mylonite at Eagle Rock.

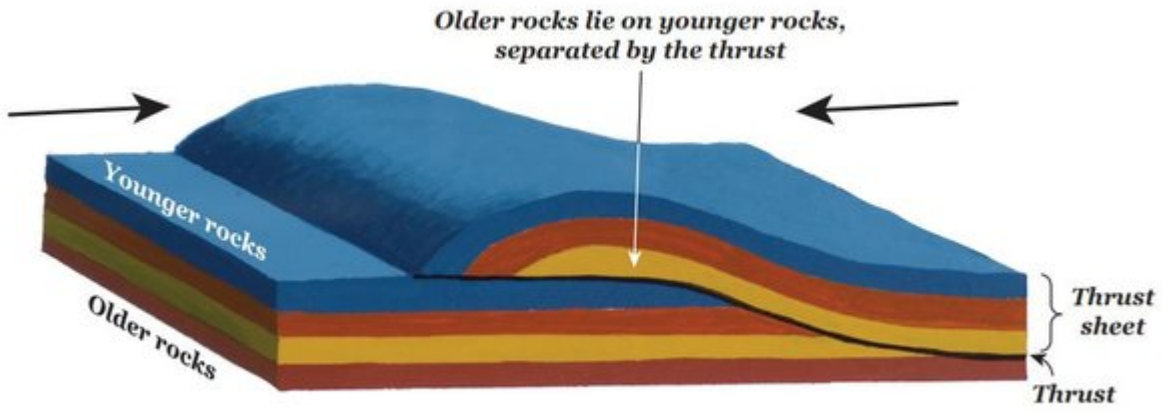
(Figure 22) Cùl Beag and Stac Pollaidh from Eagle Rock.



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(Figure 15) Formation of the Moine Thrust Painting.

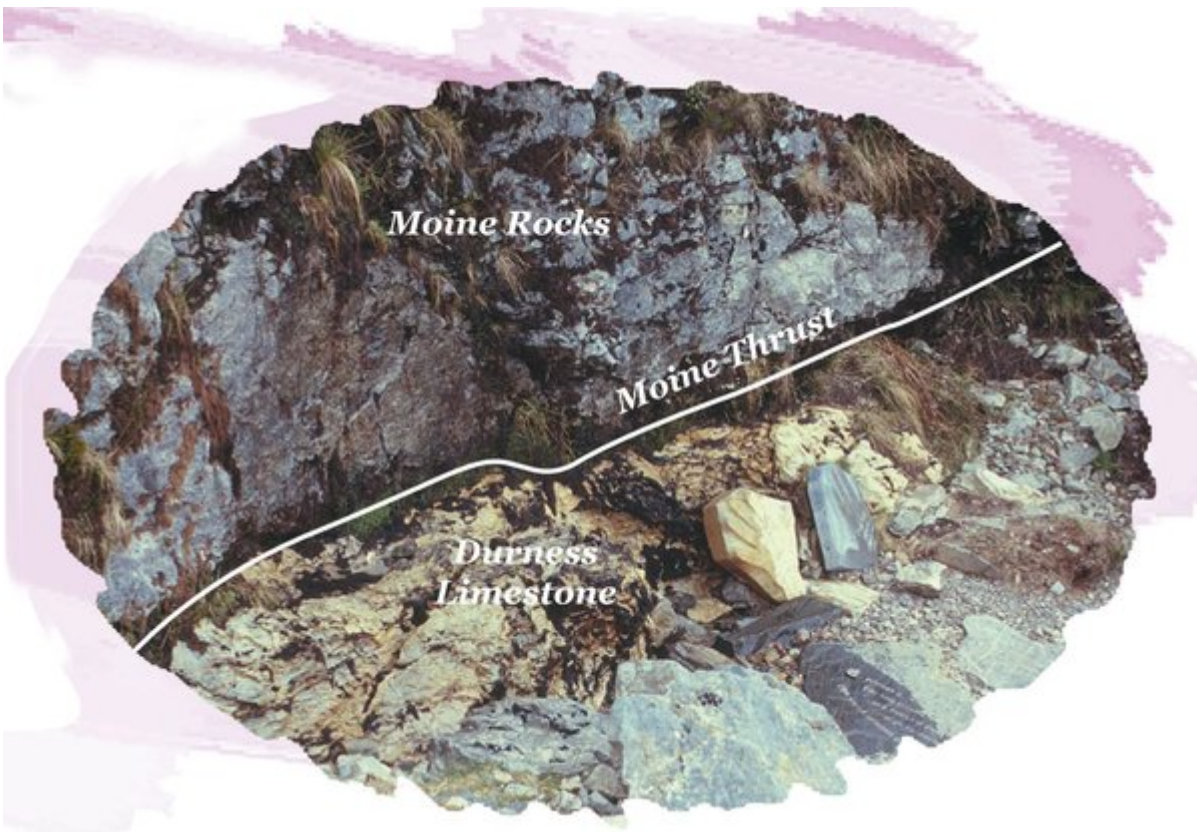


(Figure 16) Pipe Rock worms may have looked like this .



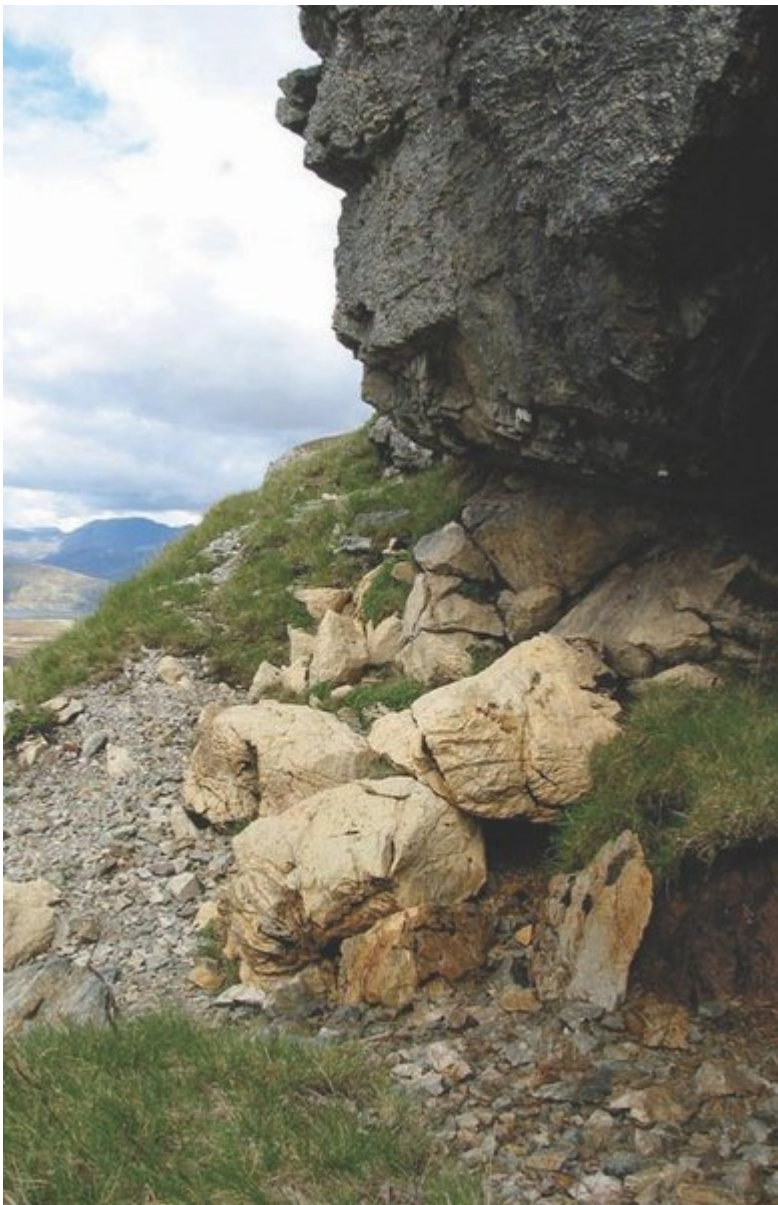


*(Figure 17) Vertical worm burrows in Pipe Rock.*



*(Figure 18) Dark Moine Rocks on top of creamy Durness Limestone, separated by the Moine Thrust.*





*(Figure 19) The Moine Thrust.*





*(Figure 20) View north, towards Ben More Assynt from the viewpoint.*



*(Figure 21) Mylonite at Eagle Rock.*



*(Figure 22) Cùl Beag and Stac Pollaidh from Eagle Rock.*