The Mighty Works of Finn MacCumhaill

The Causeway itself. The regular columns of the colonnade contrast with the irregular fracture patterns on the surface of rounded blocks from the entablature.

Pierrette and I ended volume 1, issue 5, entitled "Large Igneous Provinces", with some parting shots of the island of Staffa, in the Scottish Hebrides. By a happy chance I recently visited its Northern Irish equivalent, the Giant's Causeway, which, whatever misguided geologists tell you, was actually constructed by the giant Finn MacCumhaill (Finn McCool) on his way to a trial of strength with his Scottish equivalent. The Causeway is a much-visited tourist attraction which I last saw many years ago as a student, and having knocked around the world a bit since then I was prepared to be disappointed. When you leave the car park you cannot see the Causeway or the cliffs behind it, but when it suddenly comes into view around a corner it is all truly impressive. Not quite the gasp produced by the Grand Canyon or Lake Louise, but a sharp intake of breath nonetheless.

The Causeway is enclosed in an amphitheatre of high cliffs of piled, well-jointed basalt flows, the thickest around 30 m, with one brilliant red bole horizon to remind us that Ulster was sub-tropical in the early Tertiary. The

Basalt flows and bole horizon above the Giant's Causeway

Causeway that Finn constructed extends from the base of these flows and slopes gradually away under the waters between Scotland and Ireland. It is built of around 40,000 marvellously regular polygonal basalt columns with an average diameter of 0.45 m, mostly hexagonal but with some 4-, 5-, 7- and 8-sided columns. Many columns have surface grooves, at right angles to the long axis, known as chisel marks. As with many lava flows, this well-jointed colonnade is capped by an irregularly jointed entablature, very conspicuous on our picture of Fingal's Cave. Large boulders from the entablature have rolled down into the waters surrounding the Causeway.

The origin of jointing in basalts has been ascribed to contraction during cooling since the 19th century, and two recent papers have expanded on the details. Reiter et al. (1987) showed how the process could be modelled by the propagation of fractures from the upper and lower surfaces as successive layers become elastic, and successfully modelled the chisel marks, each of which represents an incremental fracturing episode. Two physicists, Jagla and Rojo (2002), who do not reference Reiter et al. (perhaps they didn't type 'columnar jointing' into MinAbs Online!), confirmed their conclusions and fascinatingly showed how the distribution of polygons with the observed variable number of sides can be predicted if the ordered fracture pattern develops from an initially disordered one 'at the surface of the rock'. Their hypothetical disordered fracture pattern looks to me remarkably like the surface of the blocks of entablature that Finn left lying beside his masterwork, but Jagla and Rojo do not mention this. Perhaps the entablature–colonnade boundary is an order–disorder phase transition, not something I expected to encounter when I started on this little piece!

Jagla EA, Rojo AG (2002) Sequential fragmentation: The origin of columnar quasi-hexagonal patterns. Physical Review E 65: 026203 1-7

Reiter M, Barroll MW, Minier J, Clarkson G (1987) Thermo-mechanical model for incremental fracturing in cooling lava flows. Tectonophysics 142: 241-261

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