

## Excursion to EDINBURGH 11 June 2011

Leader Dr Colin MacFadyen

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participants22

We met at the Floral Clock in Princess Street. Ahead of us we could see the geology to be investigated. We approached the Mound where a bronze relief displayed the Geomorphology of Edinburgh Castle and the surrounding area, with strong evidence of crag and tail. Our attention was drawn to the National Gallery which held sandstone from Cragleith and Hailes Quarries, two of the many that provided the sandstones for the expansion of Edinburgh in the 19<sup>th</sup> century.

Edinburgh is built almost entirely of creamy local sandstone from Cragleith Quarry. The city was fortunate in its architects and planners, who built with vision, grace and good sense. Much of Edinburgh architecture is of classical design and the Georgian architecture of the New Town stands comparison with that of Bath.

Princess Street Gardens is a glacial hollow which was carved by glaciers. The softer sediments of Carboniferous and Tertiary which surrounded Castle Rock to a great height was also enveloped by the weight of the ice which had travelled from West to East across the Midland Valley. This formed Waverley Gorge later to become a marshy lake, filled hollowed and drained to be reclaimed for Princess Street Gardens. We climbed part of the hill leading to the castle to view hummocked ground, evidence of the dumping by glacial retreat. The last retreat was 15,000 years ago; in all four glaciations had occurred. Edinburgh old town developed round Castle Rock and down glacial crag and tail features of the Royal Mile. Evidence of ice carved striations and polished rock were viewed from a road running directly below Castle Rock, about twelve feet above ground level.

At this point we viewed a wire mesh strengthening the rock face and covering the basalt leading down from the castle. This was placed to protect rock fall which has occurred recently.

Castle Rock is now recognised as the eroded remains of a volcanic pipe which cooled as a circular vertical plug of dolerite. The magma had cut through the Ballagan Beds of sedimentary sandstone with evidence of chilled margins, this could be best viewed from 'Granny Greens Steps'. On walking further round the basaltic exposures hexagonal features could be seen tilting horizontally. An excellent view of Castle Rock with the Ballagan Bed exposures could be seen from the Grassmarket. The city fathers of earlier days planted vegetation where the basalt ended and the Ballagan Beds began which helped to prevent rocks bouncing on to the Grassmarket.

After lunch we visited Hutton's grave in Greyfriars churchyard to pay homage to 'The Founder of Modern Geology', whose observations gave him an insight into the earth's process.

We moved on to Hutton's memorial garden constructed in 2001 by Edinburgh University which marks the site of the house and garden of James Hutton [1726 – 1797] at St John's Hill. The garden contains five boulders. Two boulders from Glen Lilt with granite veins penetrating the country rock. The three other are conglomerate from Dunblane and are full of fragments of older rocks, demonstrating the continuity and cyclic nature of the geological process. James Hutton's Theory.



The surface of the Earth is constantly being eroded and the products deposited in the sea. Hutton believed the sediments were then compressed, folded and uplifted sometimes with volcanic activity, for the cycle of erosion to resume. He also said the earth's processes of the past were similar to those acting at present, and that the slow cycle was capable of repeating itself. The result, 'therefore of our present enquiry is that we find no vestige of a beginning – no prospect of an end.'

Heading towards Calton Hill we witnessed Fish Fossil of Orcadian type [350 - 390Ma] Middle to late Devonian within the Caithness Flagstones. The fish living in these basins were primitive, whose anatomy and evolution were studied by Hugh Miller, the Cromarty stonemason, who published the first account of the Old Red Sandstones in 1841. The paving stones are tough well bedded grey and buff flagstones used on many pavements in Edinburgh.

On reaching Calton Hill we climbed steps and on arriving near the top we viewed lower lavas and tuff which had emanated from a vent in Arthur's Seat volcano. Calton Hill is a displaced part of Arthur's Seat. A fault lies between Arthur's Seat and Calton Hill, as Edinburgh was subject to violent earthquakes which occurred 250 Ma and these fractured the strata along major faults. This could be the cause of the displacement. We viewed the pyroclastic sequence comprising thirteen flows of well defined tuff. Lower flows are basalt and ankaramites of Dunsapie and Craiglockhart type which also occur to a lesser extent on Calton Hill.

We climbed to the top of Calton Hill which was a pleasant way to end our visit, giving a view of the Forth Estuary and the skyline of Edinburgh. The vote of thanks was given by Robin Painter on a most enjoyable sojourn through Edinburgh.

*Photos Dr. C. MacFadyen*

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