Pentland Hills, Torphin Quarry-White Hill-Bonaly Tower - an excursion

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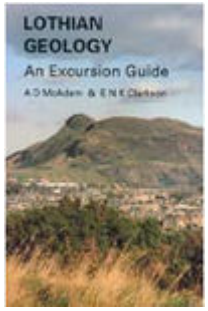

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By W. Mykura. From: Lothian geology: an excursion guide. Edited by A D McAdam and E N K Clarkson. 1996

Pentland Hills. Torphin Quarry - White Hill - Bonaly Tower

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Contents

Introduction

The Pentland Hills are made up of Lower Old Red Sandstone lavas and sediments with a core of Silurian rocks. The latter are generally steeply dipping and are exposed in three inliers known as the North Esk Inlier (p. 174), the Bavelaw Castle Inlier and the Loganlee-Craigenterrie Inlier. The Lower Old Red Sandstone lavas consists of ten groups of lava flows **(Mykura 1960. pp. 131-155)** which include olivine-basalts, andesites, trachytes, dacites and rhyolites, as well as acid and basic tuffs. They attain a thickness of over 2000 m in the north, but thin rapidly to the south. Near the southern end of their outcrop up to 600 m of Lower Old Red Sandstone conglomerate and grit are present between the lavas and the underlying Silurian strata. Upper Old Red Sandstone, composed mainly of pink sandstone, rests unconformably on an eroded and undulating land surface of the older rocks. It forms the East and West Cairn Hills in the south-western part of the range but near the northern end of the Pentlands, at Torphin Hill, it is very thin and in places completely overlapped by basal Carboniferous beds.

The present topographic pattern of the Pentland Hills was initiated in the Tertiary era, and was later modified by the Highland ice which overwhelmed the area in Pleistocene times. Thus some of the Pentland passes, such as the Cauldstane Slap and the Bore Stane, are sited on the beheaded courses of Tertiary rivers which drained to the south-east, while other major through-routes were formed as late-glacial drainage channels carrying meltwaters from the north-west slopes of the range into the Midlothian Basin.

The itinerary forms the basis for two half-day excursions from Edinburgh.

Bavelaw Castle to Loganlee Reservoir

Torphin Quarries : Basalt Lavas, Boles, Baryte Veins

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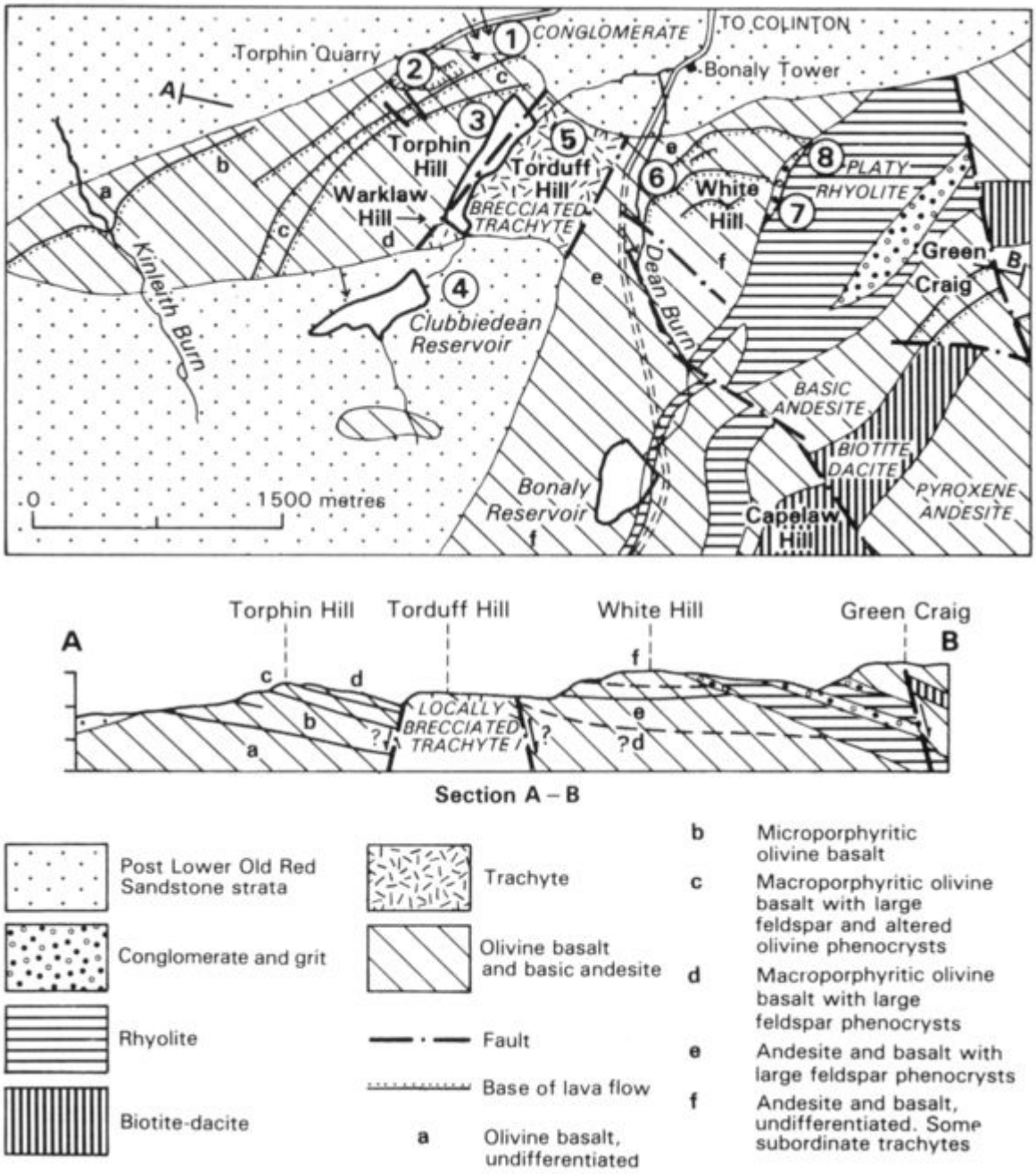
The excursion is concerned with the Lower Old Red Sandstone basalt, andesite and trachyte lavas and intercalated sedimentary rocks which form the Pentland Hills. It also provides an opportunity to collect a number of vein minerals, particularly baryte.

Access is by Lothian Region Transport bus to Torphin Golf Club, and then 500 m walk to Torphin Quarry. Cars and private buses can be taken to the quarry entrance, where parking space is available. It is advisable to get permission from the quarry operators to enter Torphin Quarry. At the time of writing the faces in the working quarry are loose and dangerous, and special care should be taken at all times. Walking distance is 6 km; time 3 hours.



Pentland Hills - Torphin to Bonaly Tower excursion map

1. Torphin: Conglomerates

The road to Torphin Quarry passes to the north of a grassed escarpment with poor exposures of pink calcareous conglomerates containing subangular pebbles of various Pentland lavas, as well as quartz and quartzite. The age of this conglomerate has been taken as Upper Old Red Sandstone, but a temporary exposure 360 m to the south-east has shown that typical Lower Carboniferous sediments occur very close to the post-Lower Old Red Sandstone unconformity in this area. It is therefore quite likely that the conglomerate is of Lower Carboniferous age, and that the lavas of Torphin Hill and White Hill may have formed an 'island' above the plain of deposition until well into Carboniferous times.

2. Torphin Quarries: Basalt Lavas, Boles, Baryte Veins

The lavas of Torphin Quarries form part of the Warklaw Hill group of olivine-basalts. This is the lowest group in the known portion of the Pentland Hills succession and can itself be divided into four

distinctive groups of flows **(a-d, of route-map**). The basalts exposed in the quarry belong mainly to group b, with some flows of group c near the top of the south-east face.

The basalts of group b are black and fine-grained, with small reddish phenocrysts of olivine pseudomorphed by iron oxide and iddingsite. In thin-section their groundmass contains much alkaline feldspar and they have a trachytic texture. The characteristic feature of the group is the thickness of its two lowest flows. The lowest, which rests on a band of tuff, is up to 18 m thick and is locally flow-brecciated near its top. The second flow which is the flow principally worked in the quarry, attains a thickness of nearly 30 m and is non-vesicular throughout. It is overlain by a prominent bed of waterlain tuff, composed largely of small rounded clasts of weathered basalt. The higher lava flows, seen in the upper face of the quarry, are much thinner and have weathered tops which pass upward into pebble-beds of weathered lava debris. This suggests that these flows were undergoing rapid weathering and some active erosion shortly after their formation. The flows of group c. which are best examined near the summit of Warklaw Hill, are highly vesicular and are composed of macroporphyritic basalt with phenocrysts of altered olivine and feldspar in roughly equal numbers. Note: part of the northern quarry is now filled in, and the lower part of the original section is no longer exposed.

The faces of Torphin Quarry are cut by a number of small faults and joints. Some of these are lined with coarsely crystalline baryte and calcite. Good specimens of platy baryte, including cockscombe spar are to be found. Many lava blocks lying in the quarry are highly amygdaloidal and some amygdales contain chalcedony and agate.

3. Torduff Reservoir: Basalt Lavas of Lower Old Red Sandstone, Glacial Features

The highest flows of the Warklaw Group (group d) are well exposed on the roadside on the west bank of Torduff Reservoir. They are usually 3 to 4 m thick and highly amygdaloidal throughout. The purplish-grey basalts are macroporphyritic, with phenocrysts of altered feldspar measuring up to 5 mm predominating over the smaller altered ferro-magnesian phenocrysts. In the road-cutting 45 m west of the waterman’s cottage a number of veins and irregular masses of siltstone and mudstone are found near the top of a flow; these appear to be filling cracks and cavities in the lava.

Torduff Reservoir lies in the valley formed by a north-east trending fault. In late glacial times this valley formed part of a drainage channel which was cut during the final stage in the northward retreat of the ice-sheet from the Pentland Hills.

4. Clubbiedean Reservoir: Upper Old Red Sandstone Sediments

The unconformity between Lower and Upper Old Red Sandstone lies close to the south end of Torphin Reservoir. Sections of Upper Old Red Sandstone are seen in the burn between the two reservoirs and also close to the road. The sandstone contains a number of thin cornstone (caliche) horizons, which represent fossil soils (pedocals) developed during long periods of reduced deposition in a tropical climate. Outcrops of cornstone occur on the hillside south-east of the track, but the area is fenced off from the public.

5. Torduff Hill: Trachyte Lava of Lower Old Red Sandstone

Torduff Hill is formed of pale-grey fine-grained trachyte, which closely resembles the trachyte of the Braid Hills near Edinburgh. It is locally flow-banded and there are a number of well-defined belts which have been brecciated in a manner suggesting flow-brecciation. The field evidence suggests that this trachyte is separated from the lava groups on either side by faults, and it seems likely, though not certain, that Torduff Hill forms a structural horst.

6. White Hill: Basalt and Andesite of Lower Old Red Sandstone

The lavas forming the crags of White Hill belong to the Bonaly group, which consists of feldspar-phyric olivine-basalts and pyroxene-andesites in its lower part, and of non-porphyritic andesites with one thin flow of trachyte in its upper part. The lower olivine-basalts and andesites are well exposed in the Dean Burn. The upper non-porphyritic flows are seen on White Hill, where they form prominent trap-features, slightly modified by glacial scour.

7 and 8. White Hill Plantation: Rhyolite and Conglomerate of Lower Old Red Sandstone

The Bonaly basalts are overlain by the rhyolites of the Bell\'s Hill and Howden Burn group. On the north-east slope of White Hill a thin conglomerate with pebbles of greywacke, chert and some basic lavas separates these two groups (7). This conglomerate, as well as the overlying rhyolite, can be traced by several outcrops north-eastwards downhill through White Hill plantation (8). It can here be demonstrated that the conglomerate rests on the truncated edges of the higher flows of the Bonaly group. It is not suggested that a period of earth movement intervened between the eruption of the andesites and the overlying rhyolite: a period of erosion with steep valleys cut into the latest lava flows can be the cause of an angular unconformity of this type.

Return by Bonaly Castle to Colinton.

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