Excursion 19 Boyleston Quarry

Key details

Author	D.S. Weedon
Themes	Examination of the nature and relationship of three Clyde Plateau lava flows: collection of minerals, mainly of hydrothermal origin present in amygdales and veins of basalt in spoil-heaps within the quarry: glacial topography viewed from a vantage point above the quarry.
Features	Columnar jointing: bole weathering: vesicles: erosional channel showing graded bedding; minerals particularly of the zeolite group.
Maps	O.S. 1: 50 000 Sheet 64 Glasgow B.G.S. 1: 63 360 Sheet 30 Glasgow
Terrain	The extensive quarry floor is generally flat, but some scrambling is necessary when searching for minerals on the spoil heaps. The main quarry face is unstable and should not be approached too closely. Also, the quarry floor to the SE is flooded and marshy and should be avoided.
Distance	Boyleston Quarry, Barrhead is within easy driving distance and of Glasgow, lying some 10 km. (6 miles) to the SW. A half-Time day should be adequate to visit the quarry, examine the lavas and to collect representative minerals.
Access	At present there is no prohibition of access into the quarry, but this might change in the future. The quarry [NS 492 598] lies to the west of the B774, NW of Barrhead. Travelling from Barrhead on the B774 pass under the railwaybridge and take the fourth turning to the left, Quarry Road. Cars should be parked at the bottom of the track leading up to the quarry. The track is rough, but ingress is easy on foot. (SSSI)

Introduction

Formed from a large excavation near the base of the Clyde Plateau Lavas the quarry has been disused for many years, but is still accessible by a rough track from a local road in Barrhead. At the present time it is not prohibited to the general public and indeed is quite popular with the local youth.

At the top of the path the view is of an extensive old quarry floor extending towards a three-sided vertical face, in which individual lava flows may be distinguished (Figure 19.1). The quarry face is some 20 m high and should not be approached too closely. Indeed, apart from studying the individual lava flows and their characteristics from a distance, it is unnecessary to hammer the main faces, as lava and mineral collecting and examination of the contact relationship of the lower two lava flows is much more productive within the main quarry floor.

Locality 1 The contact of lowermost lavas

The contact of lowermost lavas (1 and 2) can be studied in the mound within the quarry floor, to the north of the quarry face towards its eastern side (Figure 19.1). Only the topmost 1.5 m of the bottom lava is exposed, appearing as a highly vesicular reddened surface, indicative of bole weathering: both vesicles and arnygdales are present, the latter containing mainly calcite and quartz. The contact with the base of the overlying lava (number 2) is readily descernible, as the latter is non-vesicular but rich in veins of calcite, analcime and prehnite and upwards quickly becomes dense and greenish-black in colour. The absence of vesicles and amygdales at the upper contact implies that here there was no overturn of the advancing front of the second lava flow as it overwhelmed the earlier.

Locality 2. The centre of Lava 2

Viewed from a distance the eastern end of the quarry displays the massive nature of the centre of the second lava by its well-developed columnar jointing. The lava is dark-green in colour and the jointing is vertical. The jointing, which is typical of many of the thicker Clyde Plateau lavas, is formed by contraction during cooling at right angles to the upper and lower surfaces. As the lava flows are nearly horizontal, the joints are vertical. Native copper occurs somewhat rarely along the joint planes: it also occurs as disseminated flecks throughout the basalt groundmass , again not commonly. The lava is of the Dalmeny type but in hand-specimen micro-phenocrysts seem to be infrequent. However, when viewed in thin section it can be seen that pseudomorphs after olivine occur quite frequently: also in thin section can be seen a tendency towards a trachytic (flow) structure due to the alignment of the groundmass feldspars.

Locality 3 A vesicular top of Lava 2

A vesicular top of Lava 2 can be seen at this part of the quarry, above the massive centre described at the previous locality. The vesiculation results from originally dissolved gases 'boiling off' and escaping upwards through the cooling liquid and becoming trapped at the top as the surface lava rapidly congealed. The resulting cavities and fissures have been subsequently filled with a variety of minerals, here mainly calcite. Also at this locality can be seen a red-brown bed, flaggy consolidated volcanic ash, lying directly above the vesicular top of the lava.

Locality 4. Bedded volcanic ash

Bedded volcanic ash features prominently at this most interesting face in the quarry (Figure 19.2) ; it is perhaps unique within the exposures of the Clyde Plateau Lavas. In essence, it illustrates beautifully the periodicity of the local volcanism. The interface between the top of Lava 2 and the overlying Lava 3 is clearly visible (Figure 19.2) and two features are immediately apparent: the top of Lava 2 is not flat but undulating, and one down-warp is pronounced and filled with bedded material. These are erosional features and it is readily apparent that there has been a break in volcanicity in this area of sufficient duration to allow fairly extensive weathering of the underlying Lava 2 to take place. The undulations are erosional channels and the sediment laid down within them shows evidence of graded bedding, indicating river action. The sediments within the channel are entirely of volcanic material, as might well be expected within a wide-spread province of early Carboniferous volcanicity. It has been noted that volcanic bombs, present within the channel sediments, have disturbed the bedding by impact, implying that volcanicity was still proceeding in the vicinity while fluviatile deposition was taking place. It is also noteworthy that scree derived from the outwash channel vicinity has yielded well-formed crystals of augite and olivine.

Locality 5. Outcrop at the NW side of the quarry

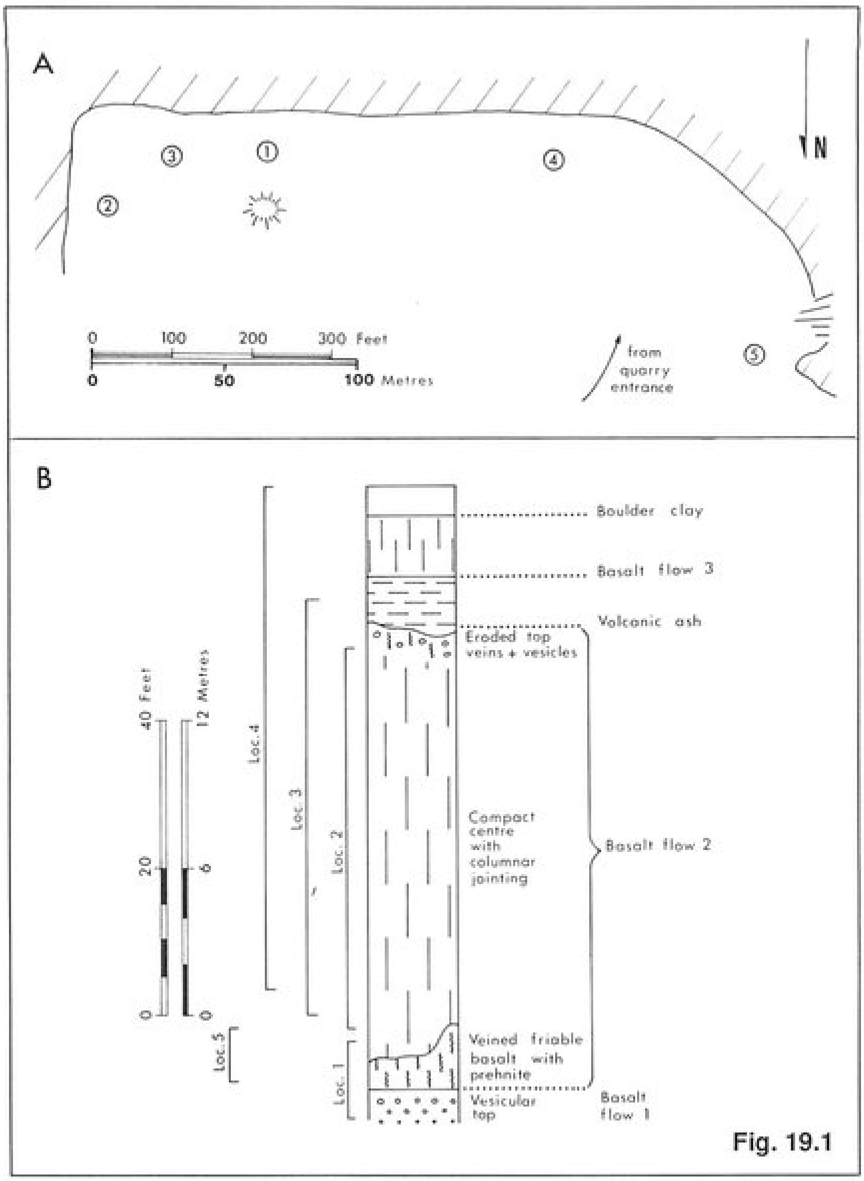
An outcrop at the NW side of the quarry (Figure 19.1) is part of the Number 2 lava flow in which there is fairly extensive mineralization. The cavities and fissures present contain calcite, analcime and malachite: prehnite is also common towards the bottom of the exposure.

It should be emphasised that when hammering this or any other exposure within the quarry, the greatest care should be exercised and protective goggles should be worn. The fresh basalt is very fine-grained and tough and thus splinters when hammered. It is, of course, tempting to 'open up' new exposures, but often the weathered rocks present in the spoil heaps will break more readily and diligent searching can reveal quite large cavities in which the minerals were deposited.

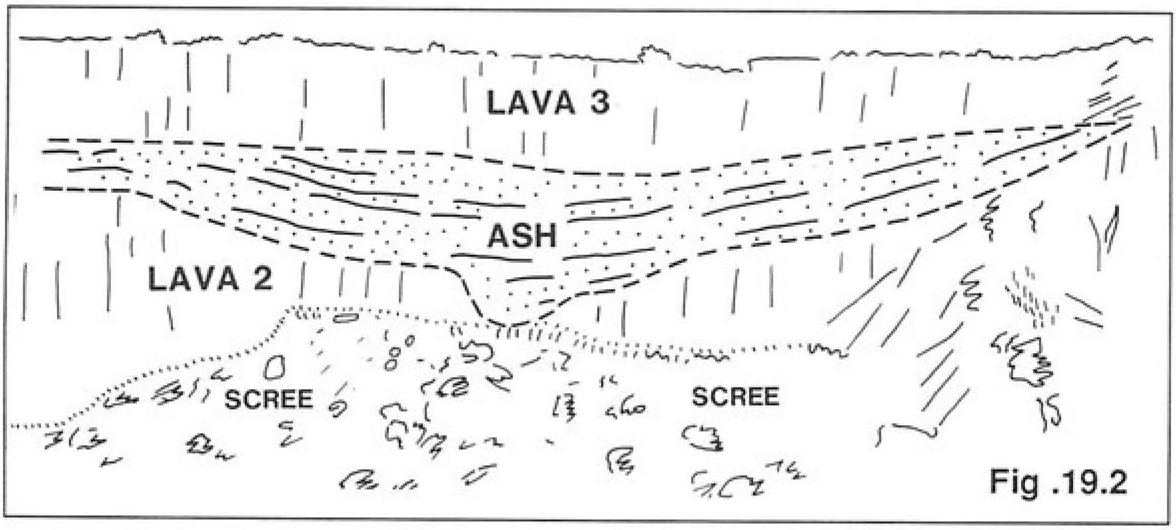
The probable origin of these minerals is the late-stage hydrothermal alteration of the lavas. The hot waters, charged with carbon dioxide, altered the high-temperature silicate minerals present in the lava and re-deposited lower temperature carbonates (particularly calcite) and hydrous silicates mainly of the zeolite group. Some of the minerals present, for example native copper, may have been of primary magmatic origin: other copper-bearing minerals such as malachite, a copper carbonate, are probably of secondary, hot water derivation.

There is a fine collection of zeolites and other minerals from various localities in the local Clyde Plateau Lavas displayed in the Hunterian Museum, within the main building of Glasgow University. It is open to everyone and a visit there would simplify identification of the minerals you have collected.

Before leaving , if the visibility is reasonable, it is well worth the effort to follow the old road to the top of the quarry, to look at the surrounding countryside. Here, one is standing on the eastern termination of the basalt outcrop; the junction of the Clyde Plateau Lavas and the overlying Upper Sedimentary Group extends generally westwards from this point. Looking NE towards Glasgow, one moves up through the Carboniferous succession to the Carboniferous Limestone Series. Apart from the contrast of the higher terrain formed by the basalts and the lower relief of the softer Carboniferous sediments, the most striking feature is in the more immediate foreground and is dominantly of glacial origin. A series of elongate mounds (drumlins), with their long axes parallel, indicate that moulding of glacial material has occurred with the passage of an ice sheet. This is a fine example of 'basket of eggs' topography, the shallower slopes of each mound indicating the direction in which the ice was moving. Which direction was that?



(Figure 19.1) Plan view and section of Boyleston Quarry showing the approximate positions of Localities 1–5.



(Figure 19.2) Sketch section, from photographs, of the erosional channel in the upper surface of Lava 2.