Agassiz Rock

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Highlights

The striated rock surface at Agassiz Rock was first recognized by Louis Agassiz in 1840 to have been eroded by glacier ice. The site is historically significant for its part in the development of the glacial theory in Scotland.

Introduction

Agassiz Rock [NT 254 702] is located on the south side of Blackford Hill in Edinburgh. It is principally of historical interest as a striated rock surface that was associated with the early development of glacial theory in Scotland. In addition, Agassiz Rock represents an important landmark in geological conservation, being one of the earliest Quaternary sites recognized as requiring safeguarding. The site has been referred to in a number of papers (Rhind, 1836; Milne Home, 1840, 1846, 1847a; Buckland, 1841a; Maclaren, 1841, 1842a; Fleming, 1859; Panton, 1873; Brown, 1874; Peach *et al.,* 1910; Mitchell and Mykura, 1962). It was included in field excursions of the 1948 International Geological Congress in Britain (International Geological Congress, 1948) and, in addition, it features in the itineraries recommended by Geikie (1901), Campbell (1951) and Waterston (1960).

Description

Agassiz Rock is located on the south side of Blackford Hill where an andesite cliff has been undercut to form a shallow cave, the rock surfaces of which are grooved and striated like the overhanging cliff (Figure 17.2). Early descriptions of the site include those of Rhind (1836) and Milne Home (1840). The former explained the grooving by molten rock falling on a bed of sand and retaining the moulded impression of its surface; the latter in terms of marine submergence. However, it was on 27 October 1840 that the site attained its fame when it was visited by Louis Agassiz. A few weeks earlier, Agassiz had delivered a paper at a British Association meeting in Glasgow in which he argued that all the northern parts of Europe, Asia and America were formerly covered with a mass of ice (Agassiz, 1841a). Although it is not recorded in the abstract of his paper, Agassiz apparently alluded to the former existence of glaciers in Scotland (Anon, 1840; Maclaren, 1840). After the meeting he departed on a tour of Scotland to investigate the field evidence (Davies, 1968a, 1968b). In the course of this journey, accompanied by William Buckland, he found many striking and convincing traces of former glaciers. When he visited Edinburgh he was taken on a tour to search for glacier markings on the south side of the city by a group of Edinburgh geologists, including Charles Maclaren, then editor of *The Scotsman*. Agassiz was doubtful about some of the features initially shown to him, but on seeing the cave at Blackford Hill is reputed to have exclaimed 'That is the work of the ice' (Maclaren, 1841, 1842a; Cox and Nicol, 1869).

The striations at Agassiz Rock form part of a local assemblage of features that indicate ice moving eastwards across the area (Figure 17.3). Blackford Hill itself is a crag and tail, 1.5 km long, with deep erosional grooves on both its north and south sides, comparable to those around Edinburgh Castle Rock (Sissons, 1971). A smaller superimposed crag and tail occurs at Corbie's Craig south of the hill top, and to the east clast fabric measurements in the main drift tail also conform with ice flowing to the east (Kirby, 1969b).

In the Edinburgh area, a prominent theme in many of the earlier 19th century accounts is the recognition of the overall easterly movement of the agent responsible for the superficial deposits and bedrock striations (Figure 17.4). Typical lines of evidence included the disposition of crag-and-tail forms (Hall, 1815; Maclaren, 1828, 1866); the transport of erratics (Milne Home, 1840, 1871, 1874a, 1874b; Nicol, 1848; Fleming, 1859; Campbell and Anderson, 1909); deformation and overfolding of strata to the east (Milne Home, 1840, 1871; Fleming, 1859; Brown, 1874); bedrock striations and moulding (Imrie, 1812; Hall, 1815; Maclaren, 1828, 1842b,, 1866; Milne Home, 1840; Fleming, 1847, 1859; Chambers, 1853; Miller, 1864; Henderson, 1872; Richardson, 1877a, 1877b; Goodchild, 1896); and striations on stones in till (Milne Home, 1840;

Maclaren, 1849; 1866; Miller, 1864, 1884; Henderson, 1874). Miller (1884) produced the first map showing the pattern of striations on bedrock and till clasts. Further instances of striations and movements of erratics are given by Peach *et al.* (1910a), and Peach (1909) described the classic Lennoxtown essexite boulder train (see also Shakesby 1978, 1979, 1981). More recently Burke (1968, 1969) has quantified some of the evidence for these ice-movement trends, and Sissons (1971) has described the strong imprint of glacial erosion in central Edinburgh.

Interpretation

Although Agassiz Rock does not bear the distinction of being the first site in Scotland to have been recognized as the product of land ice, it was nevertheless of considerable significance (Buck-land, 1841a; Davies, 1968a, 1968b), since the striations under the overhang could not have been produced by marine-drifted icebergs, the hypothesis of many contemporary geologists to explain such phenomena. Nor could they have been formed by debris-laden catastrophic deluges or floods as suggested by Hall (1815) in order to explain striations on nearby Corstorphine Hill, because of their close parallel arrangement over short distances.

Nevertheless, Milne Home (1846, 1847a) and Fleming (1859) were not convinced of the glacial origin of the striations at Blackford Hill and other localities around Edinburgh. The former persisted with the diluvial hypothesis, and the latter explained them as a local phenomenon associated with the Braid Burn. Geikie (1863a), however, in his important exposition on the evidence for former glaciers in Scotland clearly established that striations, including those at Blackford Hill, were the product of land ice. Brown (1874) also believed the striations to be glacial but considered that a large landslip had brought the striated rock to its present position.

Subsquent references in the literature to Agassiz Rock (Panton, 1873; Peach *et al.,* 1910a; Mitchell and Mykura, 1962) acknowledge the historical significance of the site, although critics have suggested that some of the striations may in fact be tectonic slickensides (Mitchell and Mykura, 1962).

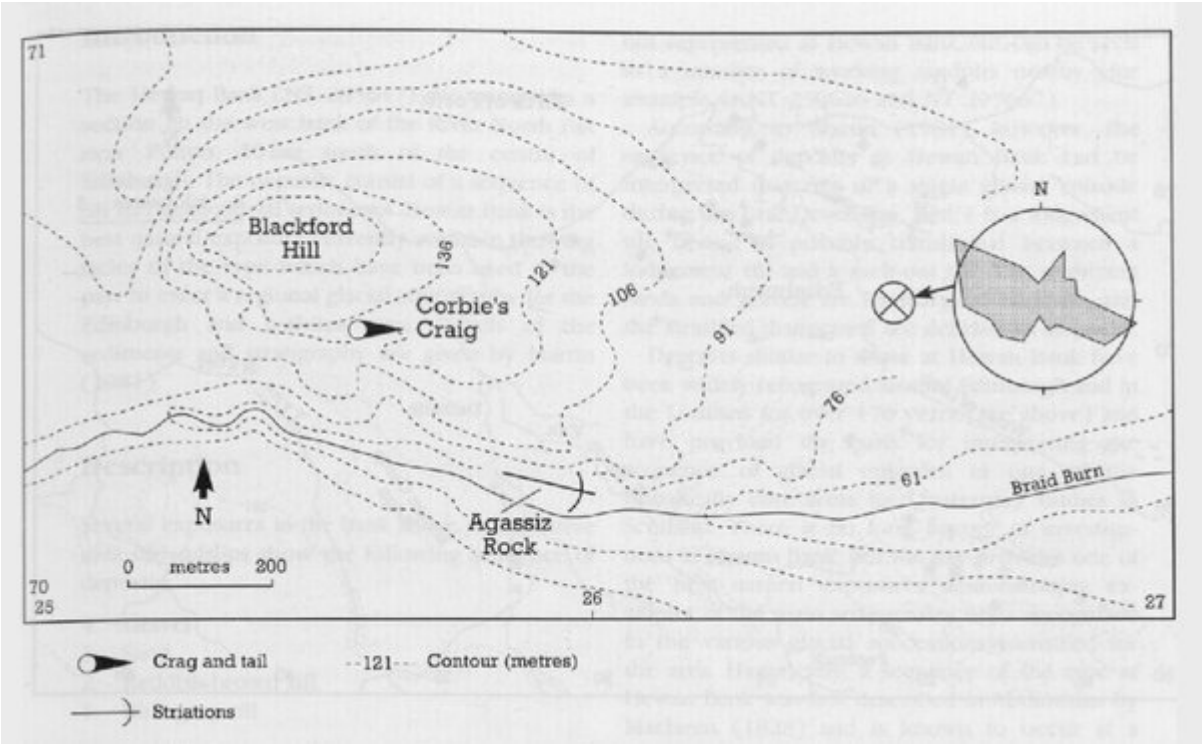
Agassiz Rock is a site of considerable historical interest as one of the classic localities that played a significant part in the development of glacial theory in Scotland. Its striated rock surface was among the first of such features to be recognized as the product of glacier ice by Louis Agassiz in 1840. It is also significant in another historical context, being one of the first geological sites recognized to require practical measures to ensure the preservation of its interest. In 1908 the Council of Edinburgh Geological Society successfully negotiated with Edinburgh Town Council to place a railing around the site and erect a memorial tablet (Watson, 1934). The railing and tablet are now dismantled, but it is planned to restore the plaque to mark the significance of the site.

Conclusion

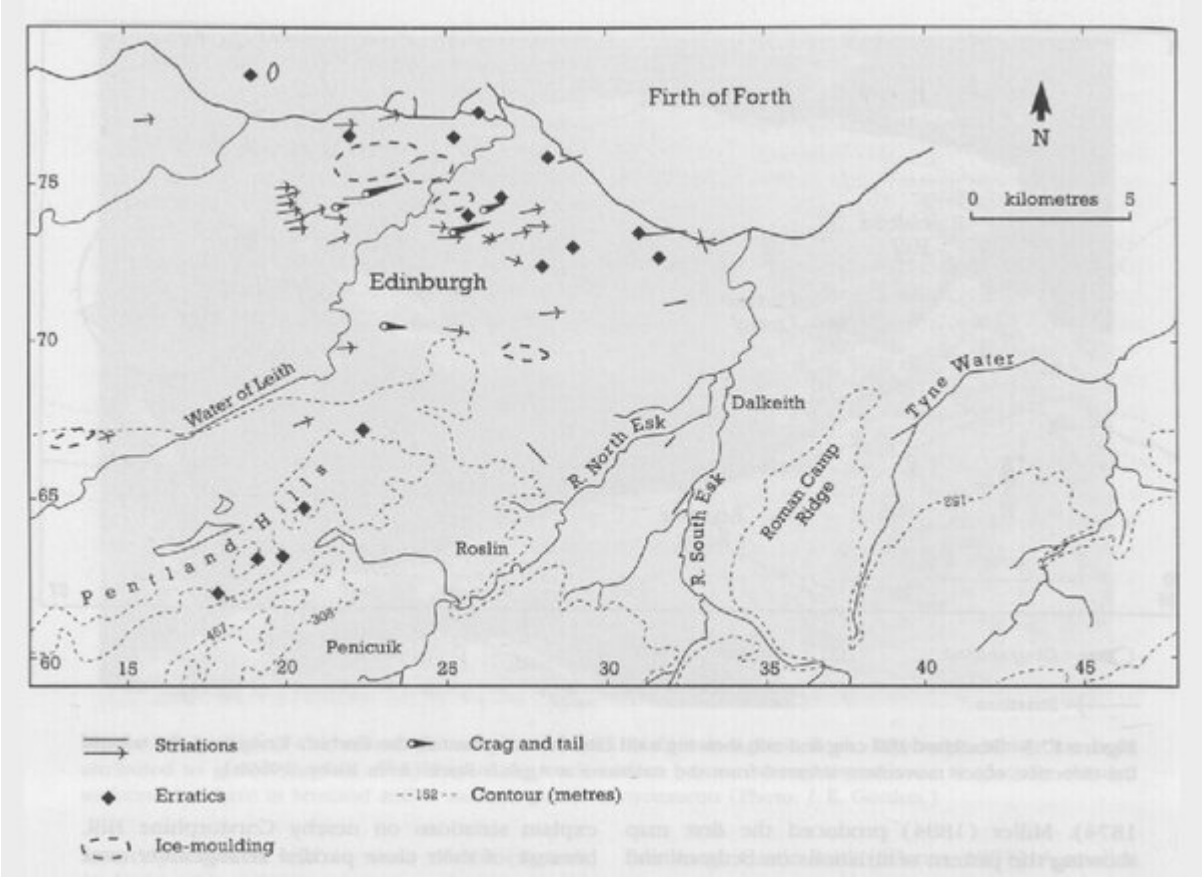
Agassiz Rock is a site of considerable historical importance. Its significance stems from its association with Louis Agassiz, one of the principal figures in the introduction of the glacial theory in Scotland. The striated rock surface was unequivocally attributed by Agassiz to the effects of the passage of glacier ice. Agassiz Rock was also one of the first geological sites in Scotland to be conserved.

References

(Figure 17.2) Part of the smoothed and grooved rock surface at Agassiz Rock, Edinburgh, which has been attributed to glacial abrasion. The form of the rock surface bears a strong resemblance to glacially abraded surfaces elsewhere in Scotland and in modern glacial environments (Photo: J E. Gordon.)



(Figure 17.3) Blackford Hill crag and tail, showing a till clast fabric in the tail, the Corbie's Craig crag and tail and the direction of ice movement inferred from the striations at Agassiz Rock (from Kirby, 1969b).



(Figure 17.4) Indicators of ice movement in the Lothians area recorded up until 1863 (from Kirby, 1969b).