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# Mynydd Preseli

## Highlights

One of the finest sets of tors in Britain, Mynydd Preseli shows evidence of tor formation in response to deep tropical weathering and later denudation during the Pleistocene. The balance between Devensian Stage periglacial action and earlier weathering has been the subject of controversy.

## Introduction

Mynydd Preseli is important for an assemblage of summit and valley-side tors developed in Ordovician rhyolites and dolerites. The survival of tors as significant landscape features in the area is not fully understood, but the Preseli tors appear to have evolved, at least in part, under periglacial processes during the Late Devensian, when the area is thought to have been close to, but beyond, the maximum ice limit. Mynydd Preseli has been cited by Thomas (1923), Linton (1955) and Battiau-Queney (1980, 1984). It has also been mentioned in the wider context of the Pleistocene history of the region by Bowen (1970a, 1984), John (1971a, 1973) and Synge (1970). The debate concerning the Preseli 'bluestones' at Stonehenge was recently continued by Bowen (1980a).

## Description

Mynydd Preseli forms a linear tract of elevated country that trends east to west for about 15 km near the northern coast of Preseli. The hills, which are the highest in south-west Wales, reach a maximum height of 536m OD, and rise above the adjacent plateaux, marking the outcrop of a series of Ordovician igneous rocks of a more resistant nature than the surrounding ancient sediments (Thomas 1923; Evans 1945). The most significant rocks in the range, from a geomorphological point of view, are the dolerites that form Marchogin and Carn Meini, and the rhyolites and felsites of Foel Trigarn and Carn Alw. The dolerites have been described as 'spotty' due to the occurrence of irregularly bounded white or pink patches of plagioclase feldspar (Thomas 1923), and they are quite distinctive. The generally smooth outline of the hills is punctuated by a series of summit and valley-side tors developed in these resistant intrusive and volcanic rocks.

## Interpretation

The Preseli tors first attracted scientific attention in an archaeological context, as the possible source for the 'bluestones' at Stonehenge. Ramsay (1858) first alluded to the similarity of the 'Foreign Stones' at Stonehenge to certain igneous rocks in Pembrokeshire, and a possible Welsh source was also suggested by Moore (1865). It was not until the petrological study by Thomas (1923) that a conclusive geological connection was proved between Stonehenge and Mynydd Preseli.

In 1901, Judd put forward the theory that the 'Foreign Stones' of Stonehenge had been transported from Preseli to Salisbury Plain by ice. This mechanism found favour with subsequent workers, including, much later, Kellaway (1971) who proposed that the 'bluestones' had been transported eastwards up the Bristol Channel and onto Salisbury Plain by ice of Anglian age. Subsequently, Kellaway *et al.* (1975) used this hypothesis to invoke complete glaciation of southern England and the English Channel during an Anglian Stage glaciation, in marked contrast to the conventionally accepted extent of glacial limits proposed by other workers (for example, Kidson and Bowen 1976; West 1977; Bowen 1980a).

John (1976) also supported the agency of ice in transporting the 'bluestones' of Preseli, but Bowen (1980a) argued that the hypothesis is untenable for several reasons. First, the outcrops of dolerite are small and would not have furnished the quantity and size of material required. Second, the Irish Sea ice-sheet did not effect appreciable erosion in the area as is witnessed by the limited occurrence of dolerite erratics to the south: Griffiths (1940) showed that an erratic indicator fan of Preseli bluestone rocks could only be traced for a short distance to the Narbeth-Whitland district. Otherwise, these

rock types are unknown from the glacial deposits of South Wales (Bowen 1980a). Bowen concluded that the geological evidence was thus inconsistent with "the scenario of liberally scattered Preseli dolerite pebbles in western England awaiting prehistoric man's collection for use at Stonehenge "Bowen (1984) proposed that during the Late Devensian, the Preselis formed a topographic barrier to ice from the Irish Sea Basin, whereas the previous 'Older Drift' glaciation had surmounted them, as shown by the train of dolerite erratics stretching south to Narbeth.

The question of the origin and survival of tors as significant landscape features has attracted considerable attention in the geomorphological literature. The Preseli tors were first described by Linton (1955). He proposed that tors were formed by a two-stage mechanism, involving deep tropical weathering (Tertiary) followed by mass wasting processes (probably during the Pleistocene) — see Trefgarn report. Others, however, have maintained that tors in Britain were formed principally under periglacial conditions (for example, Palmer and Radley 1961; Palmer and Nielson 1962), and in the case of the Preseli tors, John (1973) considered there could be no doubt that their present forms had evolved, above all, in response to periglacial processes. He noted that fossil scree slopes and lobate solifluction forms were widespread, citing large accumulations of scree and large frost-shattered blocks on the flanks of several of the upstanding summits at Carn Meini (Carnmenyn), Carngogdog and Carn Alw as examples (John 1973).

Battiau-Queney (1980, 1984) has recently suggested that tors in the Preseli and Trefgarn areas were, however, formed in response to two main factors. First, evidence, particularly from Trefgarn, showed that deep chemical weathering of the land surface had occurred in a hot humid environment (probably in Palaeogene times). Second, stripping of the weathered regolith and exhumation of the more resistant tors had occurred as the result of protracted uplift along old structural axes throughout the Cenozoic, and not solely as a result of changing climatic and environmental conditions. Therefore, Battiau-Queney suggested that the tors were formed in response to slow uplift where subaerial denudation had exceeded (perhaps only locally) the rate of chemical weathering. Consequently, a sharp deterioration of climate was not required to trigger stripping of the weathered regolith; rather a closely balanced relationship between persisting local uplift and erosion offered the most conducive conditions for tor formation (Battiau-Queney 1980, 1984).

Mynydd Preseli provides significant evidence for a range of geomorphological processes that have played a major role in the evolution of the southwest Wales landscape. Recent studies have shown that the tors may have formed in response to deep tropical weathering accompanied by subaerial denudation along a slowly uplifting axis. Significant modification of the tors is thought to have occurred especially during the Devensian Stage when the area lay close to the maximum ice limit. Hence the tors reflect a long history of landscape development.

## **Conclusions**

The assemblage of tors on Mynydd Preseli is one of the finest in Britain. They provide important information about the history of landform evolution over long periods of time. Those at Carn Meini are famous because they provided the 'bluestones' for the Stonehenge monument.

## **References**