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## Walk 5: Bradgate Park and Swithland Wood

Deep seas, igneous intrusions, and the Precambrian to Cambrian transition

**Ascent:** about 140m

**Distance:** 7.5km plus 3.5 (for Swithland Wood)

**Difficulty:** fairly easy on good paths

**Start:** grid reference [SK 5232 1167] (Hunt's Hill)

On this walk you will see an igneous intrusion and examples of rocks formed during an important geological transition, from the Precambrian into the Cambrian Period. Apart from its varied geology, the rolling bracken-covered heathland, ancient trees and craggy hills with good viewpoints make Bradgate Park one of the most scenic conservation areas of Charnwood Forest. Historically it is also very important, as Bradgate House was the family home of Lady Jane Grey, who was Queen of England for nine days. The geology, biodiversity and history of the park are explained at the visitor Centre. This circular walk begins at the Hunt's Hill entrance, but there are other car parks from which you can start.

From Hunt's Hill car park, ascend the path leading southwards towards the prominent viewpoint crowned by the Old John Tower.

Below the hill on the north side (1) [SK 52539 11292], the strata, consisting of material of volcanic origin (volcaniclastic) that originally accumulated on the Precambrian sea floor, are part of the Beacon Hill Formation. Narrow paths pass through the lower crags and along them the rocks have been highly polished by decades of footwear — can you spot the delicate sedimentary structure pictured over the page? Higher up, note that many individual beds and laminae look very regular and parallel-sided, but when traced along their length, to the left (east) some eventually break up and disappear — possibly this disruption occurred when earthquakes shook the sea floor.

Admire all the panoramic views around the Tower, and look for the landmarks that are marked on the toposcope. After exploring around the Tower, descend the eastern side of the hill to the floor of the valley below. Around the edges of a small pond (2) [SK 52870 11324], note the loose sandy material with locally derived Charnian rock fragments. This is a periglacial deposit consisting of 'head' formed under Arctic conditions when the area was adjacent to an ice sheet. Walk eastwards over the valley and up the slope to the tree-crowned crags in front of the Sliding Stone Enclosure. Here (3) [SK 53081 11340], a slump breccia is exposed, consisting of coarse-grained sandstone of volcanic origin in which large 'rafts' of dark grey mudstone are embedded, some with spectacular contortions (can you find the one called the 'Swiss Roll'?).

This is the Sliding Stone Slump Breccia and it represents the product of a large submarine landslide, a result of instability within water-saturated sediment that had accumulated on the slope leading down to deeper water. Walk round behind these crags (i.e. to the south) and you will see three places where the bedding sags down. Such structures could be caused by the upwards escape of water, or possibly methane gas.

Continue up the gentle slope to the south, to the edge of a small plateau (4) [SK 53161 11176] with fine views southwards to Leicester. The crags over the brow are in the Bradgate Formation.

They are turbidites and in places they form sequences showing repetitions of normal grading (page 14). Observe how the near-vertical Charnian cleavage changes in steepness (is refracted) in finer and coarser beds.

Now take a path that heads south-east, between Dale Spinney and Coppice Plantation. Explore the crags below the path that skirts the southern end of the plantation (5) [SK 54090 10899]; these exposures are in laminated siltstones and mudstones of volcanic origin; a distinctive feature is the sandy base to many of the beds. In the lower crags, facing south-westwards, the strata sag gently downwards, a structure known as a syncline or down-fold (Page 7). A little way

north, explore the foot of the bracken-covered slope down from Coppice Plantation, looking for a small clearing (6) [SK 54189 10980] with an exposure of the Hanging Rocks Formation.

This is a conglomerate, i.e. a sedimentary rock with a sand matrix enclosing abundant small pebbles of volcanic rock. It may have formed along a Precambrian shoreline established around the Charnian volcanoes as they began to die down.

From here, you have the option of diverting on to the Swithland Wood walk (below), from the Hallgates entrance to the park. Alternatively, turn southwards to continue the Bradgate Park loop and in front of Bradgate House (7) [SK 53340 10162] have a look at the youngest Precambrian rocks in Charnwood Forest. They belong to the South Charnwood Diorites, also known as 'Markfieldite', and are part of a large igneous intrusion with an unusual texture (see Walk 10).

The rock is well jointed and some fractures are coated with a pale green mineral (epidote) and the red iron oxide, haematite. The crags here also show good examples of quartz veins with slickensides (grooves), caused by the rocks grinding together during an earthquake in the very distant past.

South of here, cross a bridge and enter the small quarry where the Stable Pit Member is exposed (8) [SK 53340 10162]. These rocks appear white because they are 'clean' (quartz-rich) sandstones. They were deposited along a sandy coastline in Cambrian times, long after the Charnian volcanoes had ceased to erupt. Look for faint, dark-coloured very fine layers or laminae, that demonstrate cross-bedding, a structure typical of sediments deposited along current-agitated shorelines.

By measuring the direction of dip of the cross-bedding, geologists can determine the direction the water was flowing that deposited the beds, but several readings are needed.

On the west side of the quarry is a small notch with, at its base, an exposure of a narrow dyke. This small igneous intrusion of quartz diorite may be of Ordovician age, perhaps an offshoot of the Mountsorrel igneous rocks seen on Walk 6.

After rejoining the main path by Bradgate House, turn westwards along the Newtown Linford Gorge. Branch southwards off the main path and follow the smaller one by the Pheasantry Enclosure. At (9) [SK 53209 09937] look across the River Lin to a small quarry exposing Triassic strata of the Mercia Mudstone Group.

These rocks are red (see also, Walk 2), a pigmentation caused by iron oxides that formed in the desert conditions that prevailed here about 240 million years ago. Because of their clay content they were quarried for brick-making and this site provided the bricks for Bradgate House. you can see well-defined near-horizontal bedding, in contrast to the steep dips of local Charnian strata. The pale grey-green beds are silty or sandy and contain calcium and magnesium carbonate or dolomite. They represent the deposits of flash floods and temporary lakes caused by episodes of torrential rainfall within the Triassic desert. Retrace your steps and continue westwards along the gorge. The crags to your right are all of the South Charnwood Diorite. Near to the Newtown Linford car park ascend the slope leading northwards, across the South Charnwood Diorites outcrop up to the crest of Tyburn Hill. A major fault, a fracture and displacement of rocks forming the Earth's crust, crosses here (10) [SK 52363 10536]. If you explore the east side of the footpath you should see exposures of South Charnwood Diorite just to the southeast of Tyburn Hill and, northwards across the fault, strata of the Bradgate Formation (bedded tuffs). Complete this walk by taking the path via the War Memorial, back to Hunt's Hill.

The Swithland Wood branch of this walk can either commence at Hallgates (11) [SK 54228 11363], or in another car park within the wood itself (12) [SK 53429 11565]. From (12) follow the path along the edge of the wood, cross a small brook and go up the other side. When the crest of the slope is gained, take one of the small paths leading off to the left. Climb over large heaps of slate-makers waste, just like in the Welsh slate quarries. Close to the wooden fence around the main quarry, known as the 'Great Pit' (page 44), there are good exposures showing quarried slate of the Swithland Formation (13) [SK 53902 12132].

The slates originated as silts and muds that accumulated on a sea floor that covered Charnwood Forest in Cambrian times. Because they are so fine-grained, they responded to mountain-building pressures by developing a regular, very closely spaced cleavage (Page 7). This enabled the rocks to be easily split and to be used as roofing slates for many of

the buildings you will see in Charnwood Forest (Page 44). Do not attempt to cross the fence into the quarry, but catch good glimpses of the Great Pit as you walk around the fence.

The main footpath can be followed to The Brand, where another disused quarry on private land can be viewed from the roadside (14) [SK 53883 13025]. Alternatively, follow the circular path round the eastern part of the wood.

## Figures

(Figure 96) Walk 5: Bradgate Park and Swithland Wood. Map.

(Figure 47) The Old John Tower—a famous Charnwood landmark.

(Figure 48) Delicate lamination with sandstone 'load' structure on the path at locality (1).

(Figure 49) Left: The 'Swiss Roll'.

(Figure 50) Sag structure. The top beds are unaffected—they were deposited after the sag had occurred.

(Figure 51) Graded beds and refracted cleavage.

(Figure 52) Where to find the Hanging Rocks Formation. View from the path north-east of the Visitor Centre.

(Figure 53) Small pebbles are typical of conglomerate in the Hanging Rocks Formation.

(Figure 54) Diorite exposure in front of Bradgate House.

(Figure 55) Cross-bedded sandstone at Stable Pit.

(Figure 56) Stable Pit showing the location of the dyke.

(Figure 57) Here in Swithland Wood the Swithland Formation has been quarried.

(Figure 58) The 'Great Pit' at Swithland Wood.



*National Forest — Forest walks.*



*The Old John Tower—a famous Charnwood landmark.*



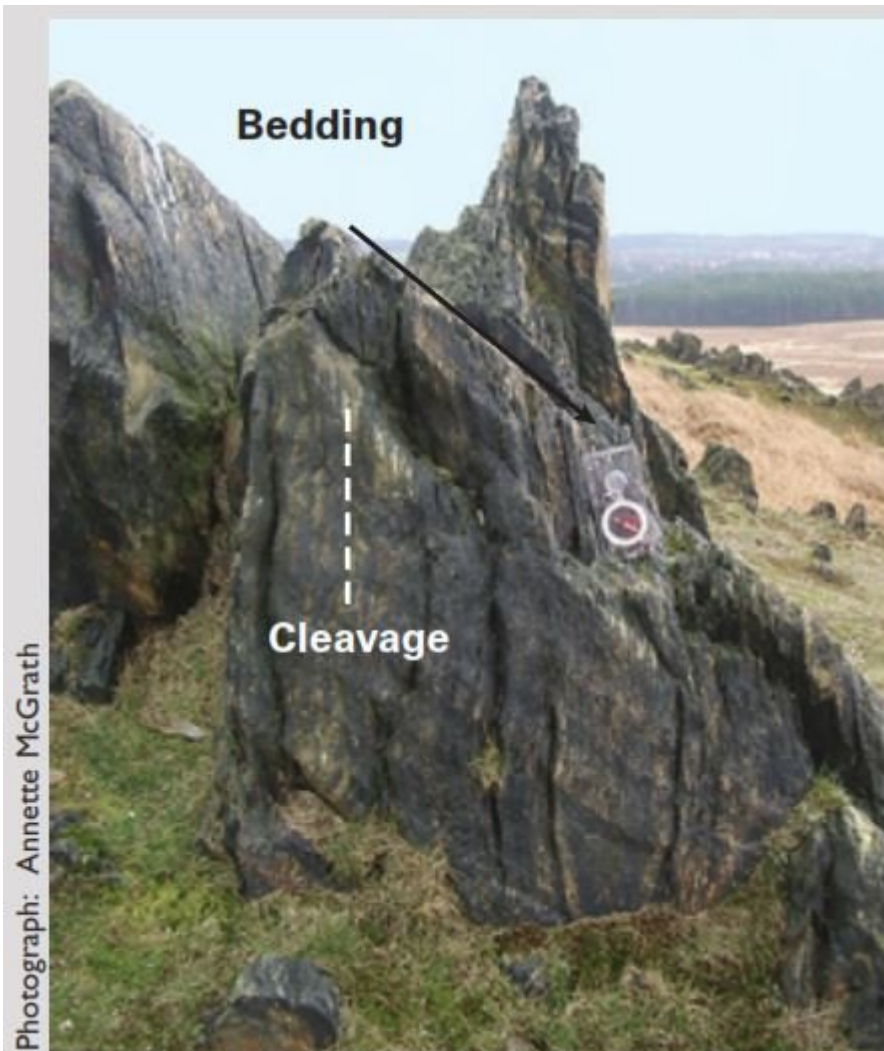
*Delicate lamination with sandstone 'load' structure on the path at locality (1).*



*Left: The 'Swiss Roll'.*



*Sag structure. The top beds are unaffected—they were deposited after the sag had occurred.*



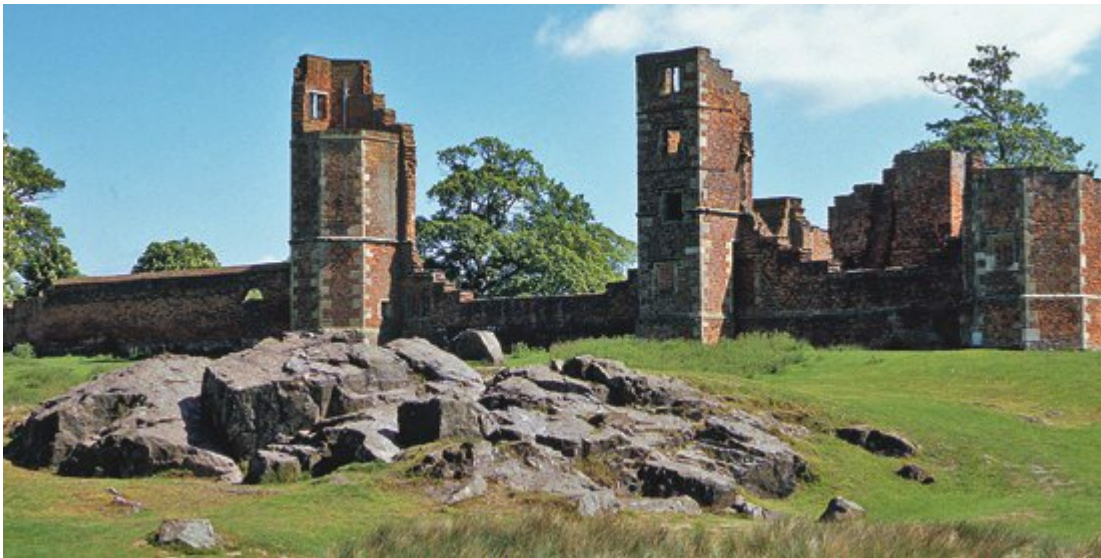
*Graded beds and refracted cleavage.*



*Where to find the Hanging Rocks Formation. View from the path north-east of the Visitor Centre.*



*Small pebbles are typical of conglomerate in the Hanging Rocks Formation.*



*Diorite exposure in front of Bradgate House.*



*Cross-bedded sandstone at Stable Pit.*



*Stable Pit showing the location of the dyke.*



*Here in Swithland Wood the Swithland Formation has been quarried.*



*The 'Great Pit' at Swithland Wood.*