Farleton Knott

[SD 54 79]

Highlights

Farleton Knott is a prominent limestone hill with large expanses of spectacular pavements across its summit and flanks. These have a great variety of limestone pavement types and a range of solutional features reflecting the different aspects, slopes, minor structural features and sparse drift cover on the site.

Introduction

Farleton Knott stands 200 m above its surrounding lowland, east of Morecambe Bay (Figure 3.1). The hill is a fault bounded inlier of limestone which lies within the block faulted zone of limestone outcrops on the south side of the Lake District uplift. The massive, fossiliferous limestones are Holkerian and Asbian, equivalent to the Great Scar Limestone in the Pennines. There is no caprock on the hill, and the cover of drift and soil is thin and variable; the outcrop was all scoured by Pleistocene ice from the north.

The pavements of Farleton Knott have been referred to in much of the literature on the northern glaciokarst (Sweeting, 1966, 1972, 1974), the clints and grikes have been subjected to morphometric analysis (Goldie, 1981; Rose and Vincent, 1986c), and there have been further studies on details of the pavement morphology (Vincent and Lee, 1981; Vincent, 1981, 1982).

Description

The limestone landforms vary considerably across Farleton Knott, reflecting both the changing geological structure and the geomorphic history, especially beneath the invading Pleistocene ice sheets. There is no surface drainage on the hill, as all rainfall sinks almost immediately, to emerge from springs around the perimeter; there are no known caves large enough to enter.

Farleton Fell forms the northern end of the Knott (Figure 3.2), and its north-facing slope is well fractured beneath a blanket of talus. Pavements are formed on the south-facing slope, and those near the crest are steeply inclined, with small clints, on beds which dip 14–20° south into a small syncline. South of the fold axis, the pavement is nearly horizontal, and well developed with good rectangular clints and numerous transported limestone boulders on protected pedestals. Clints average 2.75 m long and 1.05 m wide, reflecting the fracture patterns of the folded and faulted limestone, and grikes average 1.2 m deep, reflecting bed thickness (Goldie, 1981). The solutional details on the sloping limestone include kamenitzas and solutional ripple marks, some akin to trittkarren. Runnels are poorly aligned on the smaller clints, but larger clints to the west have runnels with stronger downslope alignment.

The limestones at Holmepark Fell, on the southwest side of Farleton Knott (Figure 3.2), dip at 3–8° south-west, and were strongly scoured as Pleistocene ice swept downhill. These pavements are the most smoothly scoured of all on the Knott; they are prominently runnelled by large rundkarren with rounded floors and sharp rim contacts to the pavement surface. The downdip edges of the pavements are more closely runnelled by smooth rundkarren, characteristic of a pavement edge which was once covered by soil and vegetation. They are the least dissected of the Farleton Knott pavements, with average clint dimensions of 3.15 m by 2.32 m (Goldie, 1981). This area also has many transported limestone boulders which are the remains of glacially plucked scars. At its southern end, much of the outcrop on Clawthorpe Fell has been quarried away, but an 'island' of pavement survives with excellent large clints, deep convergent rundkarren and many kamenitzas; it is gaining a new cover of vegetation now that it cannot be grazed by sheep (Figure 3.2). Very large clints on surviving pavements south-west of the quarry have gently sloping tops scored by rinnenkarren runnels up to 15 m long.

On the south-east side of the Knott, Newbiggin Crags (Figure 3.2) is important for its beautiful, nearly horizontal pavements, with outstanding networks of rundkarren (Figure 3.4). The more massive limestone beds form very striking edge scars, 2–3 m high, scored by fine vertical solution grooves and with fallen blocks below. The large rectangular clints, many up to 2 m across, are scored by spectacular rundkarren systems with deep runnels converging down the gentle dip. North of Newbiggin Crags, the outcrops are poorly runnelled as much of the original fretted surface bed has been artificially removed.

Interpretation

Standing well above surrounding lowland, Farleton Knott received the full impact of Pleistocene ice flowing south from the Lake District. On the north face the limestone was broken and ground down by the ice under pressure, while the more gentle lee slopes facing south were plucked and scoured — to leave the bare rock slabs subsequently fretted by solution. Some blocks of limestone were transported and dumped as erratic boulders on the pavements; many of these now stand on pedestals of limestone, which have been sheltered from direct rainfall. It is unlikely that any features survive unmodified from before the Devensian glaciation.

Geological structural has influenced much of the geomorphic variety at Farleton Knott. Several faults extend across the site, and are responsible for topographic breaks including low scars, small structural depressions and dry valleys. The largest structural valley lay along the fault on the southern margin of Holmepark Fell, and was partly floored by pavements, until it was completely removed by the quarry (Figure 3.2). The pavements at Newbiggin Crags are the best of the many on Farleton Knott which show a rectangular pattern (Figure 3.3), influenced by the dominant north-west and north-east orientated joint sets (Moseley, 1972). A third set of north-south joints creates some triangular clints, and influences some runnel patterns.

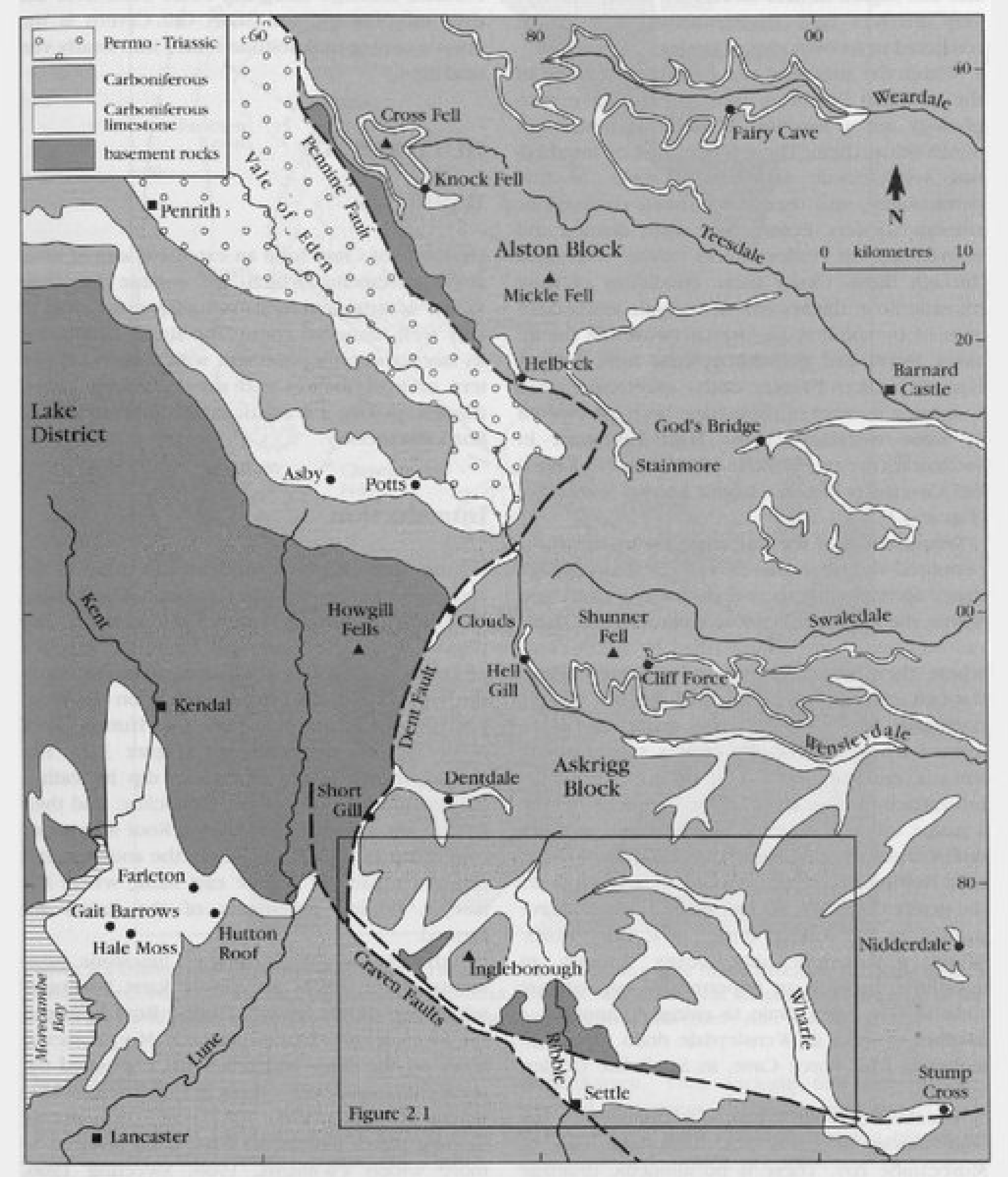
The great variety of runnel types, dimensions and patterns on the Farleton Knott pavements reflects contrasts in the limestone lithology, structure, slope, aspect, glacial history and vegetation history between individual locations. Grike mor-phometry at Holmepark Fell revealed a bimodal distribution in histograms of grike widths, suggesting that the group of narrower grikes may be postglacial, while the group of wider grikes inherited a component of preglacial opening (Rose and Vincent, 1986c); it was estimated that about 72 mm of grike opening has taken place since the Devensian glaciation. The same data revealed lower proportions of wide grikes than at comparable pavement sites at Underlaid and Longtail Woods, near Morecambe Bay, which may indicate less glacial scouring at Holmepark Fell than at the other sites. However, morphometric data for the whole of Farleton Knott (Goldie, 1981) suggest that Holmepark Fell was probably the most scoured part of this particular hill. Trittkarren occur on sloping pavements which have probably remained free of soil and vegetation since deglacia-tion (Vincent, 1983). Around snow patches on Farleton Fell, contemporary processes are largely confined to intermittent freeze-thaw action on the cutter-strewn slopes. Meltwater infiltrates through the limestone cutter, and this helps the karstic hollows to deepen beneath the snow; the hollows are thus polygenetic (Vincent, 1982).

The landforms on Farleton Knott have been extensively affected by human activities. I a rge areas of Newbiggin Crags, the central part of the limestone pavement area, and parts of Holmepark Fell have displaced clints, rough bedding plane surfaces and veneers of rubbly debris, all of which result from the removal of the top layer of solutionally fretted clints (Goldie, 1981). On the low plain east of Newbiggin Crags, grass regrowth has been encouraged on the rough, artificially stripped limestone surfaces, and only small isolated clints now remain exposed.

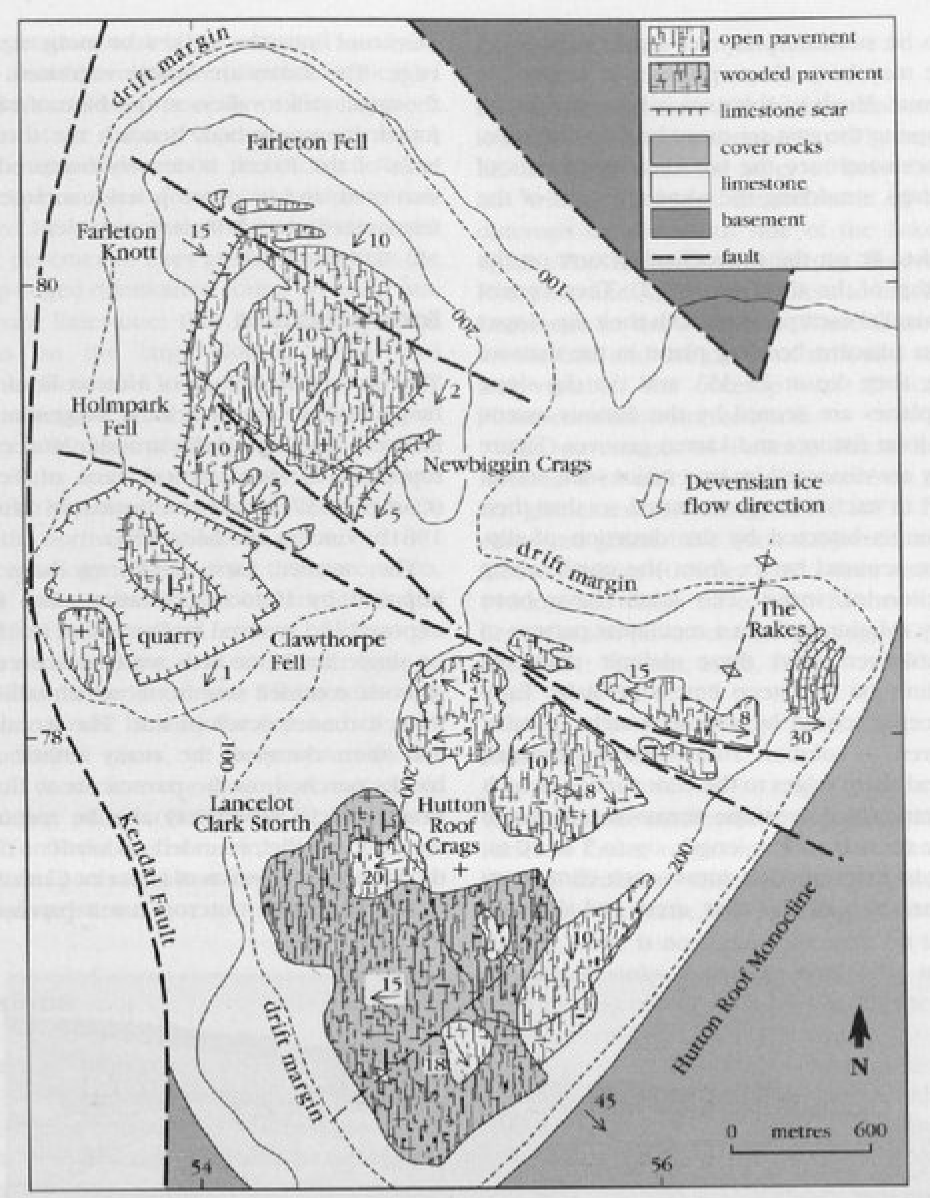
Conclusions

The surface of Farleton Knott has a number of excellent limestone pavements, whose morphology exhibits considerable variety. This reflects contrasts in surface slope, geological structure and exposure to scour by Pleistocene glaciers. The spectacular, square cut, clint fields and deep runnels on the pavements of Newbiggin Crags are of national importance and international repute.

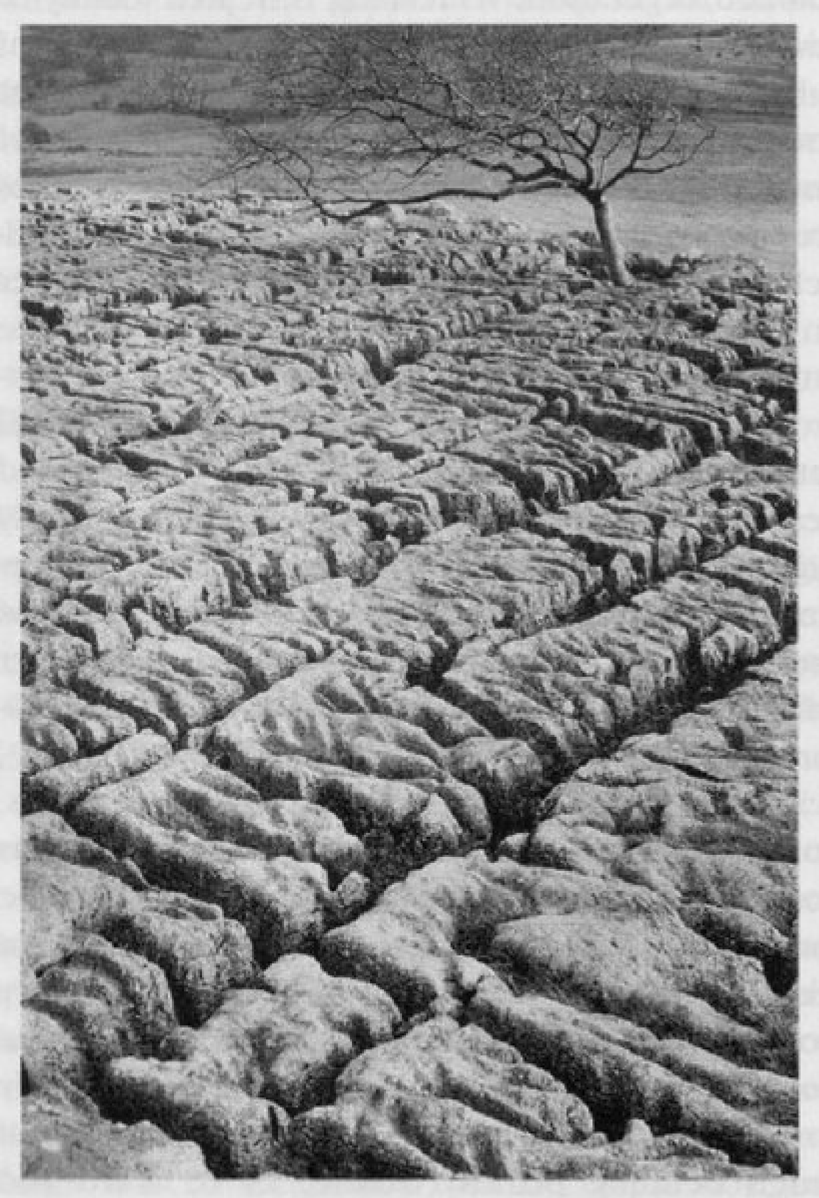
References



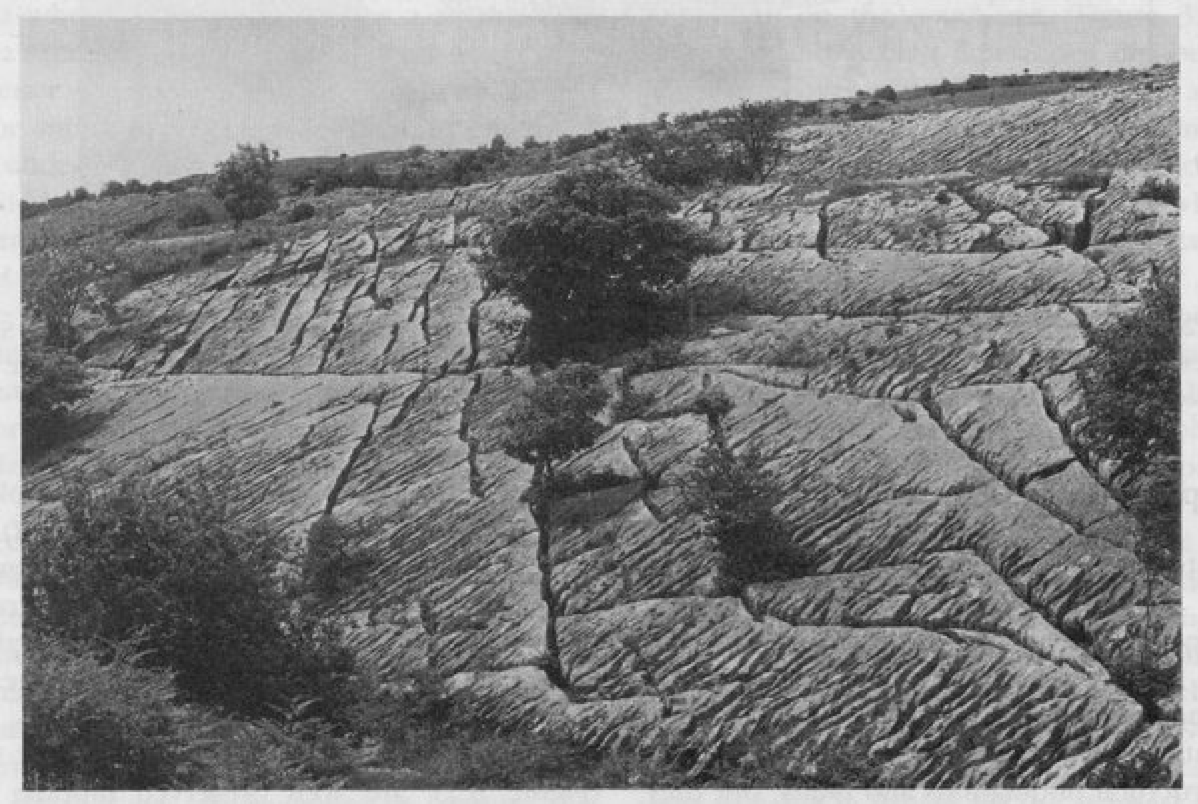
(Figure 3.1) Outline map of the karst regions in the northern Pennines, with locations referred to in the text. The other Carboniferous rocks are the non-carbonates of the Orton Group and Yoredale facies of the Dinantian, and the Namurian, but they include thin bands of limestone with lesser karst features not shown on this map. The Carboniferous limestone includes the Dinantian Great Scar Limestone, the Yoredale limestones with significant karst, and the Main or Great Limestone of Namurian age. The basement rocks are Lower Palaeozoic non-carbonates. Details and locations in the southern Dales are shown in (Figure 2.1).



(Figure 3.2) Outline map of the limestone hills of Farleton Knott and Hutton Roof Crags. Basement rocks are Silurian mudstones. Cover rocks are the Brigantian and Namurian Bowland Series. The drift margin marks the edge of the thicker glacial till which covers most of the lowland around the limestone hills (partly after Moseley, 1972).,



(Figure 3.4) The excellent pavements with square clints deeply scored by rundkarren on Newbiggin Crags. (Photo: A.C. Waltham.)



(Figure 3.3) The distinctive inclined limestone pavements of the Rakes above Hutton Roof, with the deep rinnenkarren raking down the diamond-shaped slabs between the joint-guided kluftkarren. (Photo: A.C. Waltham.)