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The geomorphology of the Stiperstones area

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When looking at the shape of any ground, its geomorphology cannot be divorced from the general pattern of landscape evolution. Therefore the South Shropshire Hills form part of the general pattern which occurs across Britain as a whole.

During the early Tertiary the landscape was undergoing a great deal of change. Chalk had been deposited over very wide areas and there was exceptionally high sea level, the reason for which is not clear. Consequently deep water deposits were laid down over the chalk. 60 million years ago there was a return to normality as that sea withdrew from this area, away from large areas of chalk. During high sea level it is thought that much of the chalk was planed off to low level.

In the Miocene in Britain there were large areas of dry land with a warm dry climate and chemical weathering. At that time continental drift brought Antarctica into the South Pole region, introducing a cold period during which geological reduction of sea level was exacerbated by climatic reduction. As a result the landscape was suffering from two events in the later Tertiary and into the Quaternary: it was suffering incision of valleys down to lower sea levels as well as rapid erosion of valley systems due to the growth of ice sheets. Because of the emphasis on valley incision, many of the old land surfaces lie on the crests of hills forming plateau surfaces.

Today there are both glaciated and non-glaciated landscapes. In the glaciated areas there are heavily glaciated uplands, but the remnants of the old surfaces remain although deeply cut into by valleys. The lowlands have been scoured by glaciers and have had material dumped on them. In non-glaciated areas there is valley incision without the brutal influence of glaciation. Remnants of the old tropical landscapes appear on tops of such places as Dartmoor and The Downs, where there is evidence of tropical weathering disturbed by periglaciation.

During this period there was tilting in which the west was rising and Cardigan Bay was collapsing. This produced maximum erosion of younger rocks in the west, but their preservation in the east. In the mid Tertiary the landscape was an African-type plain tilted west to east. This tropical plain was subject to chemical weathering arising from high temperature, heavy rainfall and high evaporation rates. Igneous rocks in particular are affected by this. On Dartmoor chemical weathering of the granite took place through the joints. During the Ice Age when periglacial conditions prevailed, the resulting fine weathered material was washed out through mechanical freeze/thaw weathering, leaving only the 'bare bones'.

Characteristic of Wales are plateaux at about 2000 feet, deeply dissected by valleys and isolated uplands of hard rocks up to 3000 feet. In Shropshire upland surfaces of the Longmynd are up to 1500 feet. The Cotswolds stand at about 1000 feet and on the Chalk Downs, there are high level surfaces at 600-700 feet. Because of lowering sea level the weaker rocks have been eroded out and the harder rocks stand out as lines of hills.

The Shropshire Plain is a structural basin filled with soft Permo-Triassic sandstone which had been eroded from the underlying older and harder rocks. The view from Caer Caradoc shows this situation well with Precambrian, Longmyndian and Uriconian overlooking weaker Cambrian shales, Ordovician sandstone and Silurian sandstone forming a succession of scarp systems, which in turn overlook the Permo-Triassic basin.

It is notable that some of the ramparts of Caer Caradoc use rocks from elsewhere because that on the summit was too rotten. Is this rotten state the result of tropical chemical weathering?

The Stiperstones area comprises ribs of land formed by strong rocks where the incision of valleys has eaten out the weaker rocks, so it conforms to the general national model. But some questions arise, for example why are the crags only on the summit and not along the whole outcrop of the Stiperstones Quartzite? Why don't the valleys conform to the norm – why, for example, is Hope Valley so narrow? Essentially the answers require us to look at the drainage pattern and the relationships between Ordovician and younger rocks.

The south and north of the area are in different drainage systems. The northern system descends very quickly to the Shropshire Plain and has dug itself in very deeply. The southern system drains to the head-waters of the River Teme and, since it has a lower angle, it takes longer to reach the Plain at Bishops Castle which is higher than the Shropshire Plain, and so it is less deeply incised. The northern drainage system has been more aggressive in wearing back slopes and therefore the landscape is not merely worn down, but also worn back. In addition ice damming has caused overflow of water across the watershed leading to capture of streams across the watershed.

In this area the hill tops were not glaciated. Normally it would be expected that in the Anglian if not the late Devensian glaciation, the ice would override the hills, but it went round them. Consequently the outcrops of very strong rock were subjected to severe periglacial conditions and erosion of surrounding weaker material, producing the tors on the Stiperstones ridge. Glacial overflow channels caused water to flow at higher levels than it would normally do. There should therefore be old overflow channels from previous glaciations which did not operate in later glaciations.

Most of the changes that have taken place have been on the valley slopes, while the tops are left virtually unchanged. The south-facing slopes in particular suffer greater erosion because of increased freeze-thaw action. On the top, the tors have been shattered by frost and boulders spread out on the slopes. These have been loosely sorted into stripes and polygons.

At Pontesbury the outcrops suggest that the Upper Carboniferous was deposited on an eroded landscape. Can we assume that all the erosion of valleys and hills was done in the last 5 million years or is something more ancient being presented to us? Where strong and weak rocks occur together, there may be old erosion surfaces, once buried by surrounding weaker rocks, now revealed again through erosion. This could be an important feature when considering that when the Shropshire Plain was laid down, the South Shropshire Hills were being eroded so that their lower slopes became buried by erosion material from higher up.

The distribution of coal, which has been well studied and analysed, shows coal swamps around St. Georges Land, which included the Shropshire Hills. Most Coal Measures were deposited north of the Shropshire Hills and only the Upper Coal Measures were deposited against an eroded surface of the Shropshire Hills. So, as the Stiperstones plunge underneath the Carboniferous at Pontesbury, is this showing an exhumed sub-Carboniferous surface? Are there rocks at Nills Hill Quarry showing evidence of anything washed down from overlying Carboniferous rocks?

In Silurian times there was also a large land area, but the deposition of the Llandovery is irregular. After certain earth movements affecting the Stiperstones, there was erosion and the next rocks deposited were of Llandovery age. Many of the Lower Silurian rocks in the eastern Longmynd, east of the Stretton Hills and Wrekin, show grits formed by erosion of underlying rocks, which are recognisable in the pebbles. Studies show that the Silurian covered an eroded landscape is the Longmynd-Stiperstones area. As these rocks erode back, is a sub-Silurian surface being revealed? Is there, for example, an exhumed Silurian sea cliff above Callow Hill Quarry? The Silurian forms low ground around the Stiperstones, but there are also patches in hollows on the higher ground.

So the Stiperstones area is a very complex landscape and the problem is sorting out what forces are contributing to it. The closer one looks, the more forces that can be found.

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