# 4A Geological Introduction

The geology of this area features in one of the British Geological Survey's 1.25,000 scale maps of classical areas of British geology as '**The Shelve Ordovician Inlier**'. The small hamlet of Shelve about 5 kilometres South West of Snailbeach gives its name to this geological feature.

An **Inlier** is an area in which ancient rocks are exposed at the surface, surrounded by rocks of younger origin.

Rocks of **Ordovician** age were laid down some 500 million years ago. This geological period is named after an ancient Welsh tribe, the Ordovici, who inhabited the area in Wales where these rocks were first described.

Shelve lies on the axis of an anticline (upfold) in the Mytton Flags, the rocks in which the Snailbeach lead veins are found. Flagstones are, as the name implies, rocks which can be split easily along the bedding planes and to be used for paving. They are thinly bedded sandstones and shales, with shiny flat grains of mica clearly visible on bedding surfaces.

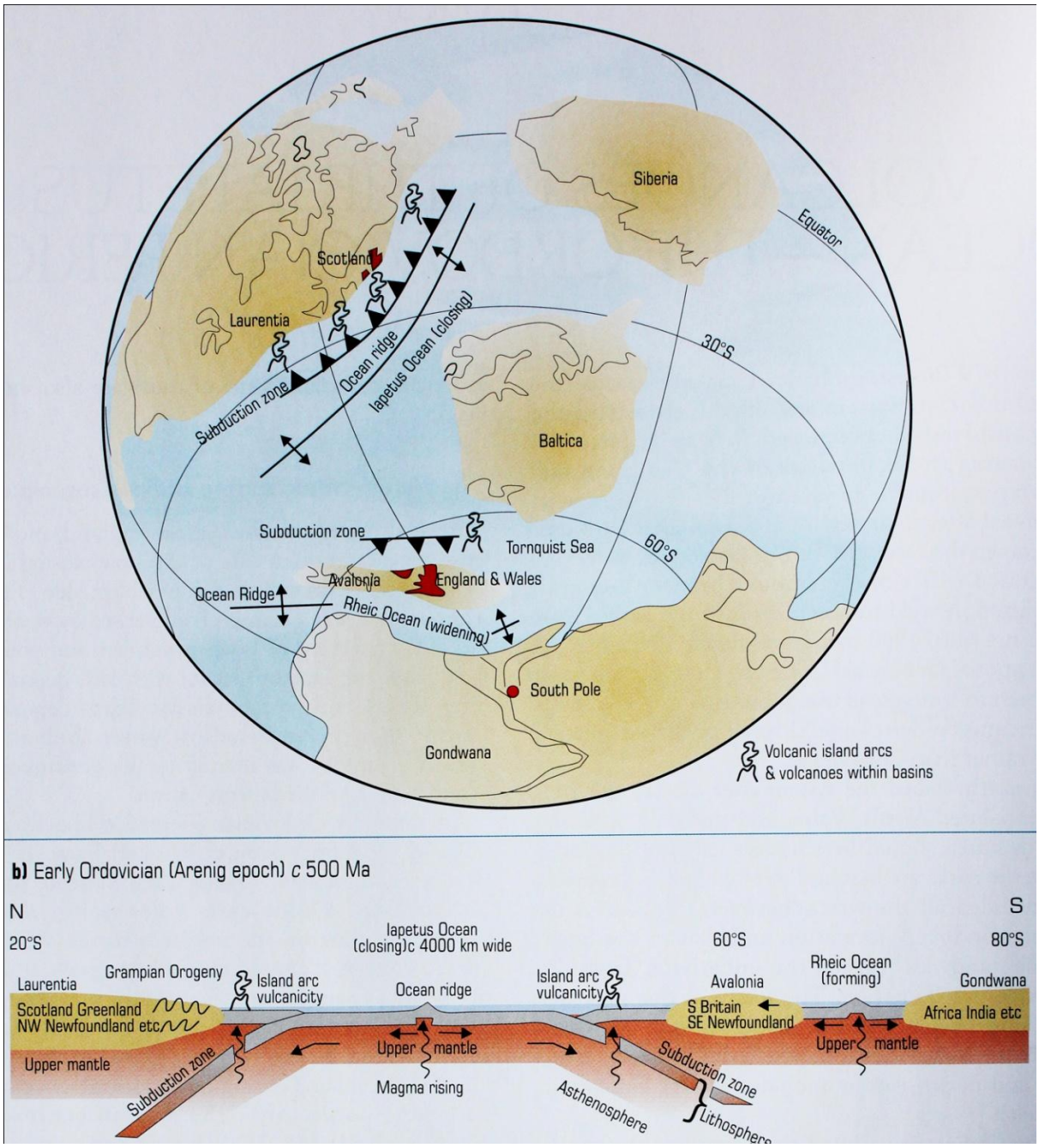
The ancient rocks of the Inlier are the eroded stumps of ancient mountains. They have contributed to the designation of the Shropshire Hills as an area of outstanding natural beauty, of which the Stiperstones form the most significant ridge.

| **Geological Period** | **Age of rocks in millions of years** | **Typical rocks of this area** | **Events producing rocks** |
|---|---|---|---|
| Carboniferous | Around 300 | Coal Measures at Pontesbury | Equatorial swamps, deltas and shallow seas |
| Devonian | Before 350 | Not represented here | Mountain ranges |
| Silurian | Before 400 | Shales on an erosion platform | Low lying land and shallow seas |
| Ordovician | Before 440 | Volcanic rocks and mudstones | Volcanoes making islands in the ocean |
| | | Mytton Flags | Shallow sea |
| | | Stiperstones Quartzite Fm. | Sea with sandy deposits |
| | | Habberley Shale Fm. | Sea with muddy deposits |
| Cambrian | Before 500 | Not represented here | Unknown |
| Pre-Cambrian | Before 550 | Sandstones, mudstones and some conglomerate | Coastal deposits of all kinds |

The oldest rocks in the area, of Pre-Cambrian age, come to the surface around Wentnor. They are bounded by ancient tear faults, possibly showing the boundary of plates in the earth's crust which were moving sideways past each other. Volcanic deposits give an indication of the violent earth movements of the time. A similar geological environment is found today in the East Indies, where volcanoes and tsunami mark the enormous instability of the crust.

During that time what is now England and Wales formed part of the ancient huge continent of Gondwanaland, which included South America, Africa, India, Antarctica and Australia. This super

continent was located around the South Pole. England and Wales, on the edge of this continent, were at about 60 degrees south of the equator.




**The Earth at the time the Mytton Flags were deposited, from *The Geology of Britain* by Peter Toghill**

The oldest Ordovician rocks of this area were laid down as a small part of the supercontinent of Gondwanaland broke off and moved northwards. Initially the break in the continent would resemble the East African Rift Valley. Later, as the continent divided, the sea would invade, producing a feature like the modern day Red Sea. The new continental fragment, named Avalonia (after the Avalon Peninsula in Newfoundland where these rocks are also found) moved northwards over the next 60 million years to a latitude of about 30 degrees south. This would indicate a rate of movement of about 4.5 cm per year, which is comparable with the speed of modern earth movements, such as the opening of the Atlantic Ocean.  Shallow water sediments in Shropshire mark

the beginning of this period. Land lay to the South East, and a vast ocean to the North West. The sandstones laid down in shallow water would recrystallise because of the pressure of earth movements to produce the Stiperstones Quartzites. Above these deposits, in slightly deeper waters, siltstones and shales were laid down. These would form the Mytton Flags, which split easily along their bedding planes, and show a shiny surface rich in reflective mica crystals. The waters then deepened further, and mudstones were deposited, interbedded with volcanic deposits later.

The northwards migration of Avalonia continued throughout the Silurian period. The ocean became narrower and eventually the micro continent collided with the continent of Laurentia, which is represented today by Scotland, Greenland and most of North America. The collision resulted in a violent phase of mountain building, known as the Caledonian Orogeny. Scotland, Wales and Northern England were mountainous, whilst only Devon and Cornwall continued as marine basins. The Mytton Flags at Snailbeach, which were folded at this time, are almost vertical around Snailbeach. At this time England, Wales and Scotland were at the Equator.

By the end of the Devonian period the mountains had been eroded to sea level, and this area was once again flooded by the sea. The Carboniferous period is marked by two events which would have economic significance around Snailbeach.

1 Volcanic activity was coming to an end. As the last remaining liquid from underground magma passed through fissures in the rocks, it deposited minerals rich in Lead, Barium and Zinc. The rising super heated fluids found their easiest passage through the sandstones and siltstones of the Mytton Flags, which dip steeply to the west around Snailbeach. The underlying (i.e. to the east) Stiperstones Quartzites have no significant mineralisation, and the overlying mudstones were equally impervious to the rising fluids.

2 At the surface in Carboniferous times was a wide area of swamp, occasionally invaded by the sea, where tree ferns flourished in the equatorial climate. Their rotting remains produced the Coal Measures which would one day be exploited by the owners of the Snailbeach Mine to provide fuel for pumping the mines and for smelting the ore. They were fortunate in having a small mine near Pontesbury, but would later purchase coal from further afield.

The last earth movements which contributed significantly to the present landscape occurred some 50-60 million years ago. The ancient rocks were once more exposed at the surface. Most recently the dramatic features of the Stiperstones area were enhanced by frost shattering of the quartzites during the ice ages of the last tens of thousands of years.

At the surface, largely hidden by vegetation, the white Calcite and Barytes associated with the Galena (lead sulphide ore) of Snailbeach vein appeared at the surface at around 240 metres above sea level, running approximately for a kilometre East - West along the southern side of the Snailbeach valley. It is here that Galena was discovered over 2,000 years ago, and mining began. It would prove to be rich throughout its extent in the Mytton flags, and was explored to well below sea level.