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The Silurian of Shropshire

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The account of a lecture describing the Silurian sediments, palaeoenvironments and stratigraphy of Shropshire.

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BACKGROUND

Silurian rocks outcrop in Shropshire in an area around the Shelve Inlier – west of the Longmynd – and to the east of the Longmynd, an area running above and below Wenlock Edge. The Ordovician rocks of the Shelve Inlier had been folded and have a parallel strike, whereas the Silurian are flat-lying.

If the contact between the Ordovician and Silurian sequences is traced towards the north-west it can be seen that the folding took place in the early Ashgill. Also, just as the Longmynd plateau stands out today as a feature, so it probably did in former times also, at least during the early Silurian: the Llandovery.

During the early Silurian there was a large land mass covering the British Midlands with an extension through Pembrokeshire and up into south east Ireland towards Dublin. The Welsh Basin was hundreds of miles away from Scotland and Northern Ireland which were on the other side of the Iapetus Ocean.

This paper is confined to what was happening in Shropshire, but it should be remembered that this was just a small part of a much larger picture. Towards the end of the Ordovician, three quarters of the world's land mass was amalgamated into the Gondwana supercontinent which straddled the South Pole. Ice caps at the poles only occur at certain times and the late Ordovician saw one of these times. At the beginning of the Silurian, England was at about 30-35°S and it migrated north until at the end of the Silurian it was just south of the equator at 5 or 6°S and the Iapetus Ocean was closing.

EARLY SILURIAN

In the Welsh Borderlands of Shropshire can be seen the strongest effects of early Ashgill folding and the late Ashgill drop in sea level, caused by water being entrapped at the polar caps.

After this initial drop in sea level it rose again world-wide and there is evidence of a gradual spread of the sea from Wales across Shropshire into the Midlands during the Llandovery. As this sea spreads we find evidence of various kinds of fossil. The two most useful being graptolites in the deep water and brachiopods in shallower water.

Graptolites are very useful as they show rapid evolutionary change over time and can be used to give very fine zonal indications. Unfortunately the same is not true of brachiopods in general, but there are a few that do change rapidly over time and one of these is a shallow water brachiopod, *Aeocelia*, which occurs in the Upper Llandovery and Lower Wenlock, and it is possible to divide these periods into 5 or 6 time divisions. The brachiopod, *Stricklandia*, can also be used in this manner. Acretarcs, which are believed to be spore cases of some primitive algae, also show gradual changes with time. Thus, wherever one studies the Llandovery sequences there is some fossil to be found which will help with stratigraphy and pinpoint the age of the rock.

DEPTH CONTROL ON FAUNA

Work done by Fred Ziegler in the early 1960s included collecting brachiopods from mainly the southern part of the Welsh Borderlands, the Malverns, etc., and he persuaded another student, Robin Cocks, to collect Llandovery brachiopods around Shropshire.

After the two had made approaching 100 different collections they discovered the collections could be split into five main groups which represented five different fossil communities. Ziegler went on to find a sixth community which he called a "rocky bottom community", and this occurred where the Silurian was sitting unconformably on older hard substrate. This community occurs at Bog and the best examples of the fossils making up this community can be seen on the walls of an old shed at Bog.

There is more or less a continuous spectrum of fossil types that you find near the shore to the edge of the shelf environments and, although Ziegler decided upon five communities, it would have been possible to split the fossils into two or ten groups on the basis of different genera being more common at different times. These different communities can be found at localities such as Hope Quarry and the Onny River south of Wistenstow.

THE STATE OF THE LANDSCAPE DURING TRANSGRESSION

At the beginning of the Silurian, during the early Llandovery, the shelf was fairly narrow, but by the end of the Eronian the sea had spread and the Malverns stood out as a barrier in this sea. Later the sea spread even further across England as the sea level rose.

It is still debated as to whether there were any land plants during the Silurian. Some palaeobotanists claim they have found spores in marine sediments from terrestrial plants.. However, there were no soils on the land so any plants would have been little areas of moss-like growths encrusting rocks.

The land surface would have been highly oxidised, because there would have been nothing living on land to reduce the ferric iron that forms due to weathering of the rocks. Therefore, as the sea encroached across the land it was crossing a highly oxidised surface and, as a result, as the land was eroded, the hematite became mixed with the muds to give marine red beds. The occurrence of marine red beds tells us nothing about the sedimentary environment because they occur across different fossil communities. It was generally thought that red beds were terrestrial deposits, but this is not necessarily so and marine red beds can occur if the hematite is deposited and buried quickly in a marine environment before it is reduced.

At any one point in Shropshire, as the Llandovery sequence is ascended it shows deeper and deeper water but at some points, such as the Onny Valley, the first community is indicative of deep water. This would suggest that the sea was at this point for some time before any sediments accumulated.

MIDDLE AND UPPER SILURIAN

Into the Wenlock the sea level continued to rise until the top of the Upper Wenlock where there was a shallowing of the environment. The different depth-related communities of the Llandovery have their parallels in the Wenlock. However after the Lower Wenlock, *Aeocelia* and *Stricklandia* became extinct and it becomes very difficult to determine where you are in the sequence. The author has come to the conclusion that upper part of the Wenlock shows a shallowing, to be followed by a sudden deepening in the Ludlow.

In the basal Wenlock a carbonate bank appeared at Old Radnor and this indicates some irregularities in the palaeogeography. There seems to have been some movement on the Church Stretton fault at this time which was acting as a normal fault and marked one edge of the Welsh Basin. Also, the Welsh Basin seems to have been shrinking and parts of North and South West Wales were being uplifted.

At Stretton Westwood at the top of the Wenlock there are shales containing shallow water brachiopods, and it is not until 10 metres above the Wenlock Limestone that it suddenly changes to a deep water environment. However, in the Malverns it becomes deep immediately at the top of the limestone and further south it becomes deep before the top of the limestone. Thus it can either be concluded that the time at the top of the limestone is the same everywhere and it gets deeper at different times and different places or, perhaps more sensibly, that it gets deep at the same time, which would mean that the top of the limestone is older in Shropshire than it is further south.

Travelling further up the sequence, the Amestrey Limestone occurs in the middle of the Ludlow and then there is evidence of a

conformable sequence through the Downton and Ditton beds all the way through to the Devonian.

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