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## Fron Road (Cefn-Cerig Road)

[SN 776 334]–[SN 775 323]

### Introduction

This site comprises a series of roadside exposures and disused quarries in the southern part of the international type area for the Llandovery Series. More than 500 m of strata are intermittently represented in a discontinuous section extending from Fron Lodge at the northern end to the farm of Cefn-cerig at the southern end. The locality has been referred to in the literature either as the Fron Road or as the Cefn-cerig Road; Cocks *et al.* (1984, figs 2, 4) recorded this section as their transect d3 (Figure 3.24). The exposures along this road (Figure 3.27) provide the best-available sequence in the southern Llandovery area through strata referred to by Jones (1925) to his Upper Llandovery (C<sub>1</sub>–C<sub>6</sub>) division. In their revision of the stratigraphy of the Llandovery area, Cocks *et al.* (1984) erected three formations to replace the numbers and letters used by Jones for this part of the sequence: the Rhydings, Wormwood and Cerig formations. The lower beds belong to the Aeronian Stage, as defined by Cocks *et al.* (1984), and the upper beds are referable to the Telychian Stage. The Telychian Stage was first proposed by Cocks *et al.* (1970), with its base defined in roadside exposures on the Fron Road at [SN 7743 3243], where a bioturbated sandstone is underlain by light-grey siltstone; this level coincides with the base of the Wormwood Formation and is equivalent to the base of the C4 division of Jones (1925). Cocks *et al.* (1984), however, subsequently revised the base of the Telychian Stage, moving it to near the top of the Wormwood Formation and selecting as the stratotype a section in an old quarry west of the Fron Road at [SN 7742 3233]. The base of the stage as defined here is regarded as approximately coincident with the base of the *turriculatus* graptolite biozone.

This site is generally important as a reference section for upper Llandovery stratigraphy in the type area, and is of special importance for its inclusion of the stratotype section for the base of the Telychian Stage.

### Description

The beds throughout the section generally dip SSE, at angles of 54–80°. The oldest beds, belonging to the top of the Coldbrook Formation (equivalent to the upper Goleugoed Formation farther south in the Llandovery area and to the Trefawr Formation of the northern Llandovery area), outcrop on the east side of the road at [SN 7759 3326] to [SN 7759 3318]. These are silty mudstones with occasional micaceous sandstones that have yielded graptolites, including *Climacograptus rectangularis*, *Monograptus triangulatus fimbriatus*, *Glyptograptus (Pseudoglyptograptus) vas*, *G. incertus*, *G. tamariscus tamariscus*, *Diplograptus magnus*, *Petalograptus minor*, and *Orthograptus cyperoides* (Cocks *et al.*, 1984); this assemblage is representative of the *magnus* Biozone.

The Rhydings Formation is present in intermittent exposures along 630 m of the road south of the entrance to Fron Farm; the true thickness of the formation is about 400 m in this area (Cocks *et al.*, 1992). The rocks are sandy mudstones and muddy sandstones, generally moderately well sorted. Apart from *Monograptus* sp., graptolites have not been reported from the formation in this section, but brachiopods do occur; the fauna in a small disused quarry at [SN 7755 3304] has been referred to the *Clorinda* benthic community, while that found in the roadside opposite Rock Farm at [SN 7754 3295] to [SN 7757 3283] is representative of the *Pentamerus* benthic community (Cocks *et al.*, 1984). Higher in the section at [SN 7749 3257], light-grey siltstones near the top of the Rhydings Formation again contain *Clorinda* Community brachiopods, including *Dicoelosia alticavata*.

The Wormwood Formation crops out along the road as far as Cefn-cerig Farm (Figure 3.27); the thickness was given by Cocks *et al.* (1992) as 70 m, although other publications give a thickness in excess of 100 m (Cocks *et al.*, 1984; Cocks, 1989). The best exposures are in the upper beds, particularly well displayed in the old quarry [SN 7743 3232] just to the west of the road and a little to the north of the entrance to Cefn-cerig (Figure 3.27). The lithology comprises siltstones, muddy siltstones and sandy siltstones, mostly bioturbated. The Aeronian–Telychian stage boundary is defined within a prominent 29 cm thick bioturbated siltstone bed with calcareous nodules (Cocks *et al.*, 1984, figs 65–67; (Figure 3.28)).

Brachiopods occur throughout the Wormwood Formation, and Cocks *et al.* (1984) listed taxa from several localities, including the quarry (Figure 3.29). A particularly fossiliferous horizon just below the base of the Telychian provided the highest records of *Eocoelia intermedia* and *Stricklandia lens progressa*, although these occur only in small numbers. More abundant are *Eoplectodonta penkillensis*, *Coolinia applanata*, *Clorinda globosa*, *Pentamerus oblongus*, *Leangella segmentum* and *Resserella* sp.; this assemblage is indicative of the *Pentamerus* benthic community. Graptolites have not been found in the quarry section, but acritarchs reported by Hill and Dorning (in Cocks *et al.*, 1984) from the uppermost Aeronian include *Eupoikilofusa striatifera*, *Micrhystridium inflatum* and *Cymatiosphaera prismatica* (Figure 3.29); the absence of any of the characteristic taxa of acritarch biozone 4 suggests that the assemblage falls within Zone 3 of Hill (1974), and specifically biozone 3b of Hill and Dorning (in Cocks *et al.*, 1984). Other fossils reported by Cocks *et al.* (1984) include streptalasmid corals, encrinurid trilobites, bryozoans and pelmatozoan columnals. A conodont sample from 50 cm below the base of the Telychian has yielded a fauna that includes *Icriodella* sp. nov., *Distomodus* sp., *Pseudooneotodus beckmanni* and coniform taxa (Wang and Aldridge, 1997).

To the south of the quarry, beds low in the Cerig Formation can be seen in the roadside opposite Cefn-cerig farm [SN 7747 3227]. These mudstones have yielded diverse brachiopods of the *Clorinda* benthic community, including *Eocoelia curtisi* and *Stricklandia laevis*. Other fossils listed by Cocks *et al.* (1984) include bryozoans, favositid corals and trilobites, but no graptolites have been found at this locality. The acritarch assemblage contains *Deunffia monospinosa*, *D. furcata* and *Domasia bispinosa*, definitive of acritarch biozone 4 (Hill and Dorning in Cocks *et al.*, 1984). At another locality [SN 8546 3841], Cocks *et al.* (1984) recorded the graptolite *Monograptus runcinatus* near the base of the Cerig Formation, indicating that this horizon should be placed in the lower half of the *turriculatus* graptolite biozone.

## Interpretation

Environmental interpretations of the strata exposed along the Fron Road were given by Cocks *et al.* (1984). The graptolite-bearing mudstones of the upper Coldbrook Formation suggest deposition rather farther from the sediment source than apparent in the coeval Goleugoed and Trefawr formations to the southwest and north-east. The sandier facies of the Rhydings Formation indicate an open marine shelf setting, perhaps between delta lobes, with changing water depths indicated by the fluctuating brachiopod-dominated benthic communities. Cocks *et al.* (1984) suggested that a general slight shallowing might be indicated by the development of a *Pentamerus* benthic community; the more intensive bioturbation evident in this formation suggests better oxygenation of the sea floor, perhaps linked with increased oceanic circulation. A further transgressive pulse may be shown by the distribution of the Cerig Formation, which shows open marine sedimentation over the whole Llandovery area, with *Clorinda* community faunas developed.

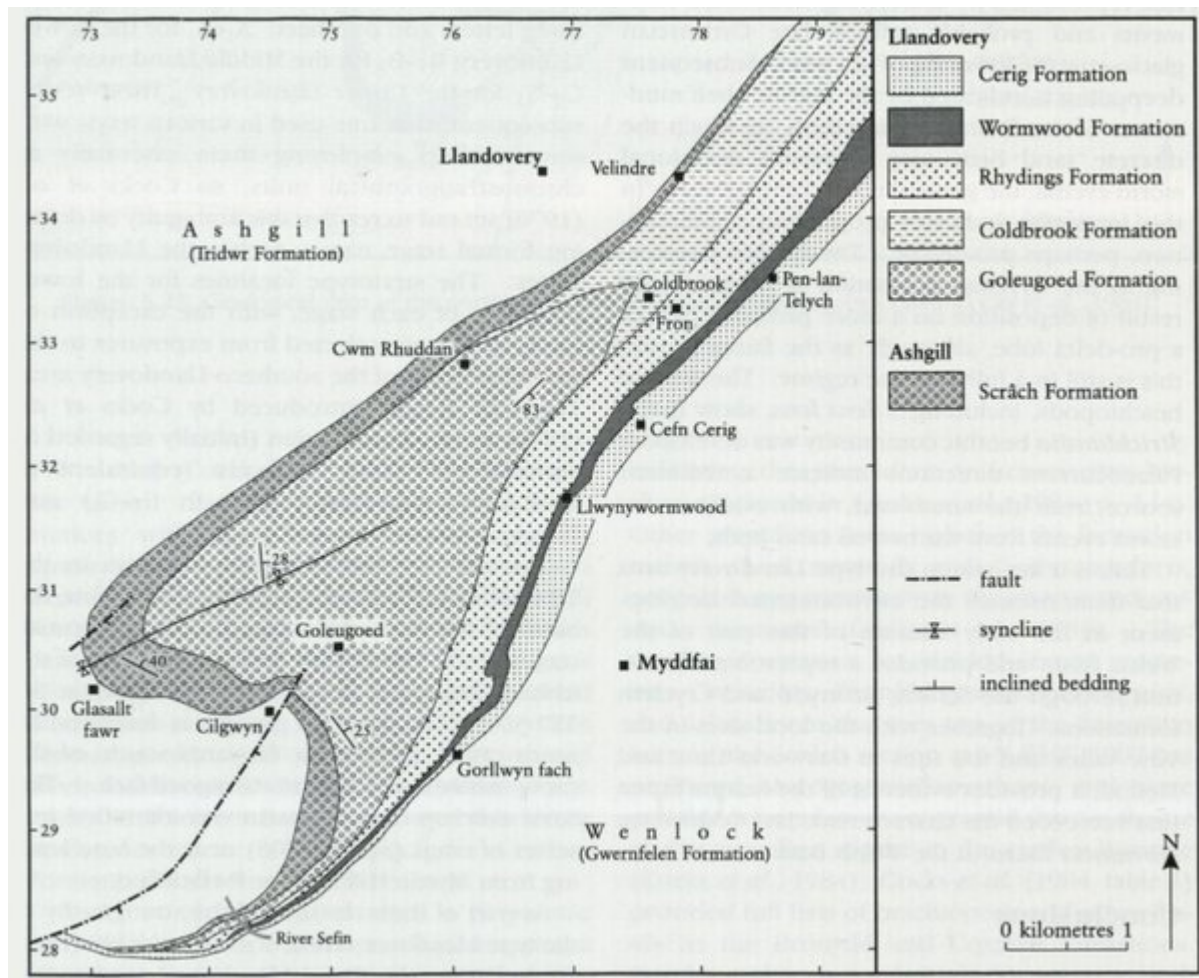
This site provides key evidence for the sedimentological and environmental development of the type Llandovery area in the later half of the Llandovery Epoch. Combined with the sites in the Cilgwyn-Ydw Valley area, it provides almost complete coverage of the stratigraphical succession in the southern part of the Llandovery type area. In combination with the other sites throughout the Llandovery region it allows interpretation of the depositional events that shaped this area of the southern Welsh Basin. It also provides a record of the changing biota of the basin during this interval, especially with respect to the shelly benthos. It is complemented by the Coed Glyn-môch Track section in the northern Llandovery area, which displays a comparable section through the Rhydings, Wormwood and lower Cerig formations; the general thickness of these formations is lower in the northern area than at Fron Road.

## Conclusions

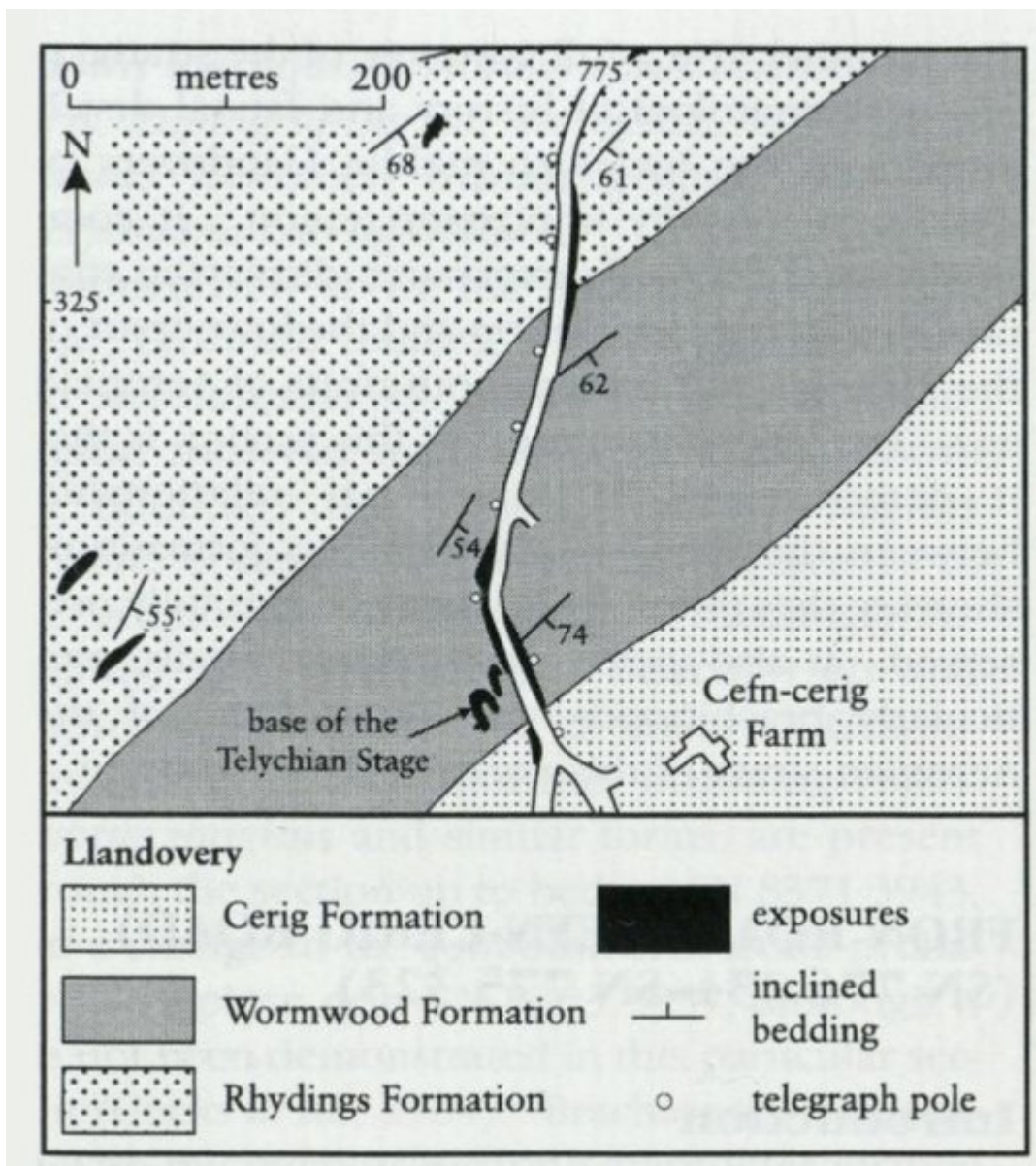
This is a section of international stratigraphical importance in the Llandovery type area because it includes the global reference locality for the base of the Telychian Stage of the Llandovery Series. It also provides the most complete exposures available through the upper part of the Llandovery Series in the southern part of the type area. The roadside and small quarries intermittently expose a sequence from the upper part of the Coldbrook Formation, through the Rhydings and Wormwood formations, and into the lower beds of the Cerig Formation. Brachiopods are common through much of the succession, and evolutionary changes in species of *Eocoelia* and *Stricklandia* help to delimit the base of the Telychian Stage. Changes in sediment type and faunal assemblages can be used to interpret the changing depositional regimes within this early Silurian marine shelf environment. This is a key site nationally for understanding the

development of upper Llandovery stratigraphy, sedimentology and biotas, and is of major conservation value as an international reference section.

## References

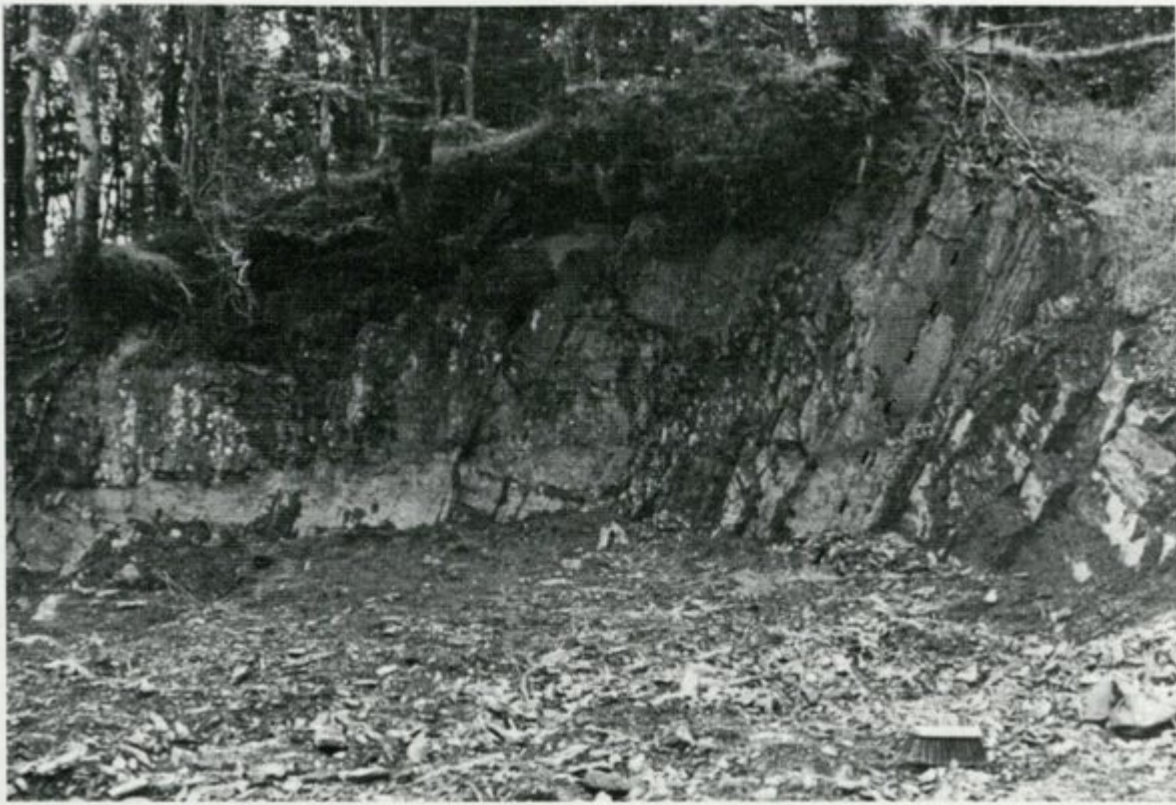


(Figure 3.24) Geological map of the southern part of the type Llandovery area (after Cocks et al., 1984).

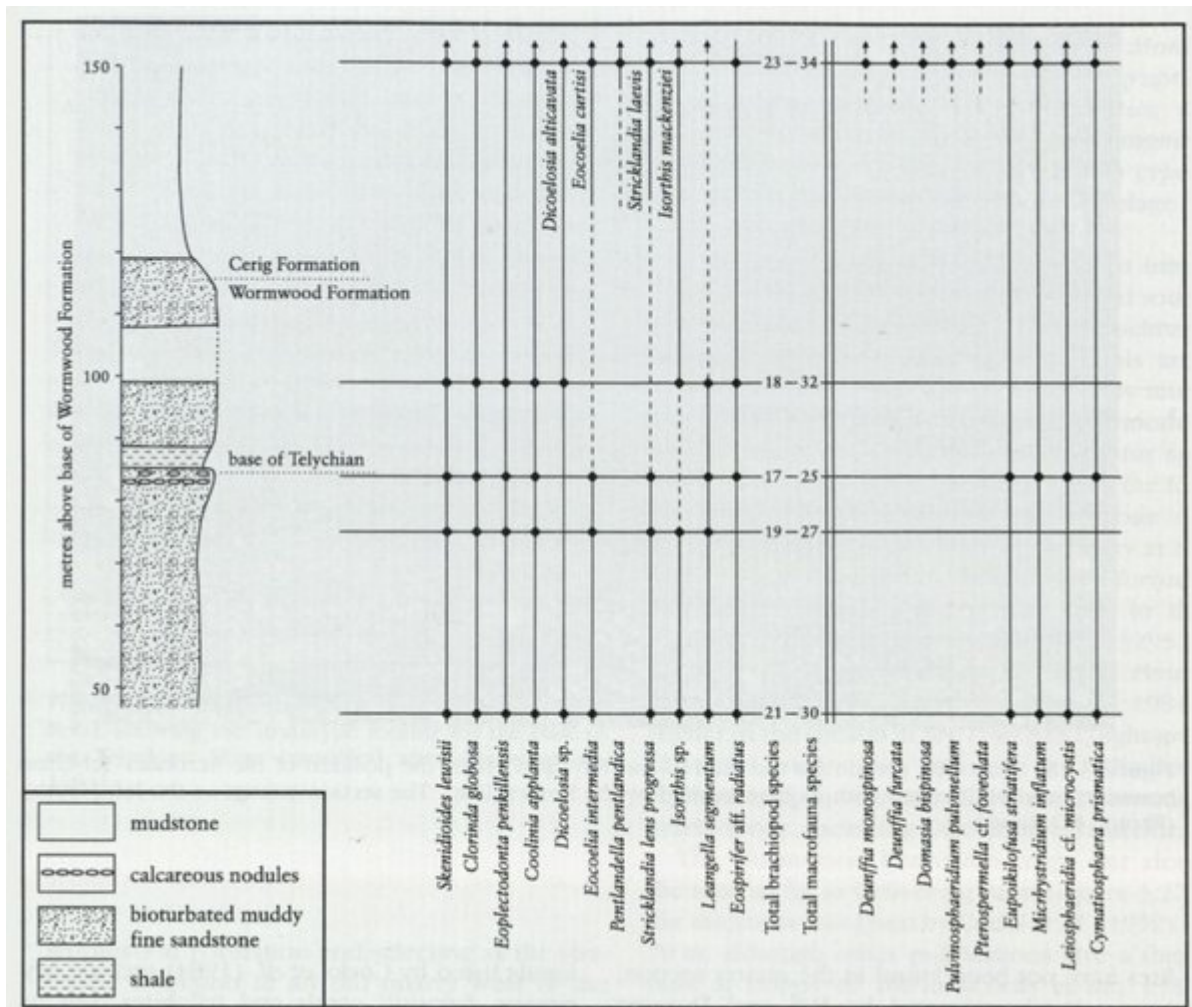


(Figure 3.27) Exposures along and around the Fron Road, showing the stratotype locality for the base of the Telychian Stage (modified after Cocks et al., 1984).





(Figure 3.28) Stratotype section for the base of the Telychian Stage; the position of the Aeronian–Telychian boundary is within the bed with its base marked by the broken line. The section youngs to the left (south). (Photo: P.D. Lane.)



(Figure 3.29) Distribution of selected brachiopod and acritarch species across the Aeronian–Telychian boundary in the Fron Road section (after Cocks et al., 1984).