Llanfallteg Cutting

[SN 1575 2020]–[SN 1571 2013]

Introduction

Llanfallteg railway cutting is a nationally, and potentially internationally, important section that shows the base of the Llanvirn Series. The cutting exposes a 70-m-long section through sediments of latest Arenig and earliest Llanvirn strata that are richly fossiliferous throughout; the base of the Llanvirn is marked by an influx of pendent didymograptid graptolites. It offers a much more satisfactory section at which to define the Arenig—Llanvirn boundary (Fortey and Owens, 1990b) than does the historical type locality at Llanvirn, where the section is discontinuous and the late Arenig is cleaved and altered and practically devoid of fossils.

Although Strahan *et al.* (1914, pp. 20, 28) noted the continuous section at Llanfallteg passing from the Arenig into the Llanvirn, its significance as an alternative to the unsatisfactory section at Llanvirn was overlooked until reported by Fortey and Owens (in Rushton *et al.,* 1979). It was described in detail by Fortey and Owens (1987, p. 90), who logged the faunal content of 40 m of strata spanning the boundary. Llanfallteg has become the effective boundary stratotype and has featured in discussion of the base of the Llanvirn Series at an international level (e.g. Fortey *et al.,* 1990, 1991, 1995; Mitchell, 1992; Mitchell and Maletz, 1995). Although international agreement on the base of the Llanvirn has yet to be reached, this section will remain the prime reference, important at least at a national level.

Description

The cutting along the abandoned Whitland to Cardigan railway on the east bank of the Afon Taf is immediately north of the hamlet of Llanfallteg. A 70-m-long section was cleared by the Nature Conservancy Council in November 1978 (Rushton *et al.,* 1979) to give continuous exposure of the uppermost 30 m of the Arenig Series and the basal few metres of the overlying Llanvirn. This is a sequence of soft, light-grey mudstones and shales, the surface of which takes on a characteristic vermilion colour on weathering. Fortey and Owens (1987, p. 82) named these beds the Llanfallteg Formation; no change in lithology occurs at the Arenig—Llanvirn boundary, which can be recognized only on palaeontological grounds, with the influx of the pendent 'tuning fork' graptolites *Didymograptus artus* Elles and Wood and *D. spinulosus* Perner (Figure 8.9).

The oldest beds seen crop out in the core of a small anticline [SN 1575 2020], and most of the section is occupied by mudstones belonging to the *Dionide levigena* Zone, the uppermost trilobite zone in the Fennian Stage of the Arenig Series. These dip south at 30–50° and are fossiliferous throughout. Distal stipes of *Acrograptus acutidens* (Elles and Wood) are the commonest fossils. Other graptolites include the biserial forms *Undulograptus austrodentatus* (Harris and Keble) (Figure 8.4)f, *U. cumbrensis* (Bulman) (recorded in part as '*Glyptograptus*' *dentatus* by Fortey and Owens (1987) and redetermined by Mitchell (1992)), *Glossograptus acanthus* (Elles and Wood) and *Oelandograptus* cf. *oelandicus* (Bulman). Trilobites are common, especially *Ectillaenus perovalis* (Murchison), *Barrandia homfrayi* Hicks, *Stapeleyella inconstans* Whittard, *Dionide levigena* Fortey and Owens, *Placoparia cambriensis* Hicks, *Ampyx linleyensis* Whittard and *Microparia teretis* Fortey and Owens. The fauna also includes abundant hyolithids and gastropods.

The Llanvirn portion of the Llanfallteg Formation crops out only in a small quarry at the southern end of the cutting [SN 1571 2013]. Most of the fauna listed above (with the exception of *U. cumbrensis*) ranges into the Llanvirn, where it is accompanied by the incoming of the pendent didymograptids that mark the base of the *artus* graptolite zone (Figure 8.9). Thin bentonites occur in the quarry, offering potential for radiometric age determination at this important level.

Interpretation

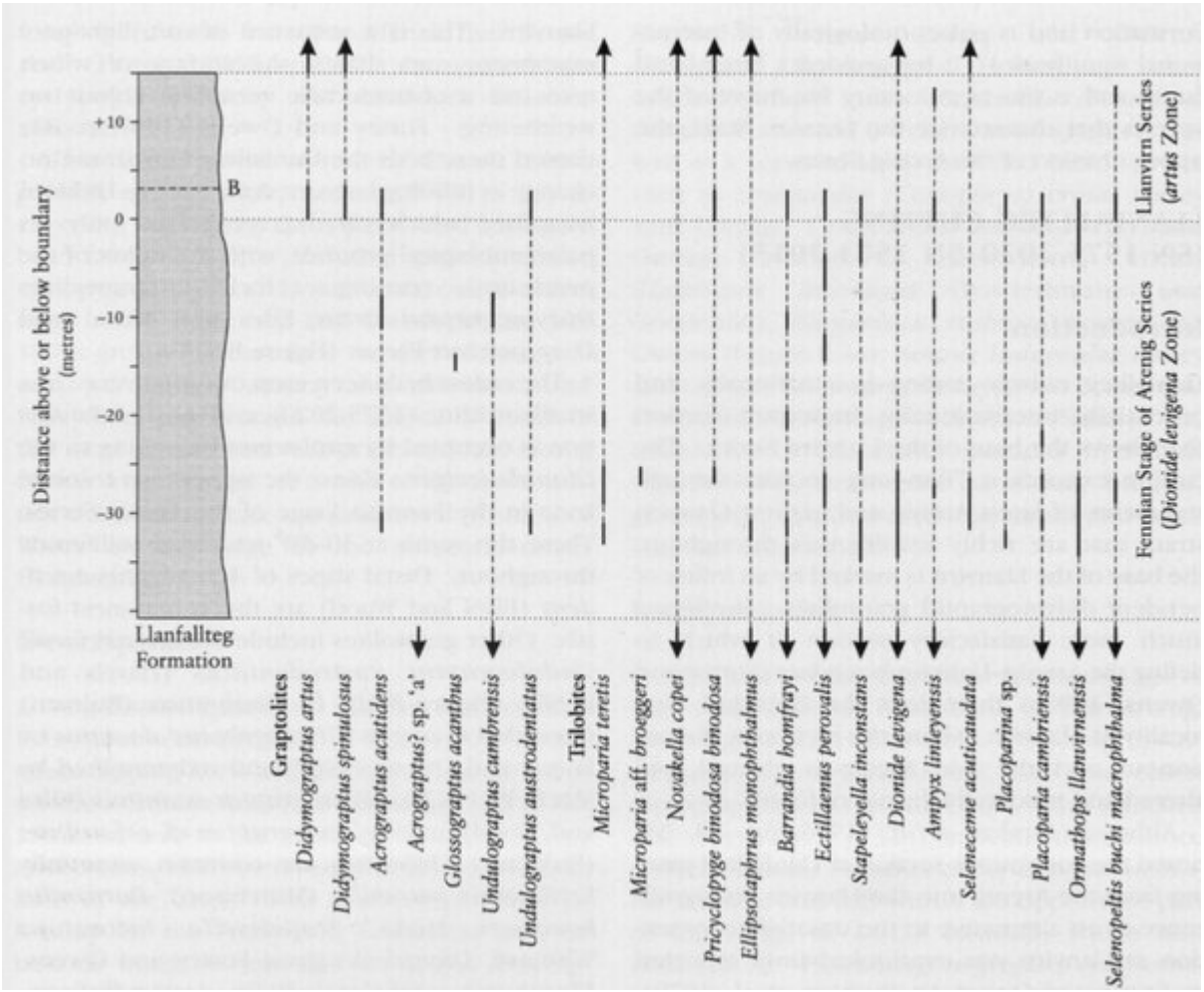
The Llanfallteg Formation here and elsewhere contains faunas that contrast with those of the underlying Pontyfenni Formation, the changes being attributed to a world-wide regression (possibly eustatic in origin) occurring at the end of Arenig time (Fortey and Owens, 1987, p. 105; Fortey *et al.,* 1990, p. 122). Although cyclopygids persist into the Llanfallteg Formation, much of the atheloptic fauna that characterizes the Pontyfenni Formation, notably at Pontyfenni (see site report), disappears, to be replaced by species with normally-developed eyes, such as *Barrandia homfrayi* Hicks.

Fortey and Owens (1987) and Fortey *et al.* (1990) have argued that the base of the *D. artus* Zone should be adopted as an international standard for the base of the Lianvirn Series, and this section takes on importance for this reason. The *artus* Zone can be recognized over much of the Gondwanan region, including South China and Australia, but because the diagnostic fauna belongs to a relatively inshore biotope, as described by Cooper *et al.* (1991), Mitchell and Maletz (1995) considered it unsuitable as an international standard, for which they preferred the use of pandemic biserial graptolites (*Undulograptus austrodentatus* and others) to characterize an earlier horizon, within the Fennian. Although biserial graptolites are abundant at Llanfallteg, all belong to the upper part of the *U. austrodentatus* Biozone of Mitchell and Maletz (1995). Whichever level is eventually preferred, the Llanfallteg section will remain critical for understanding the regional geology and as a datum for peri-Gondwanan areas.

Conclusions

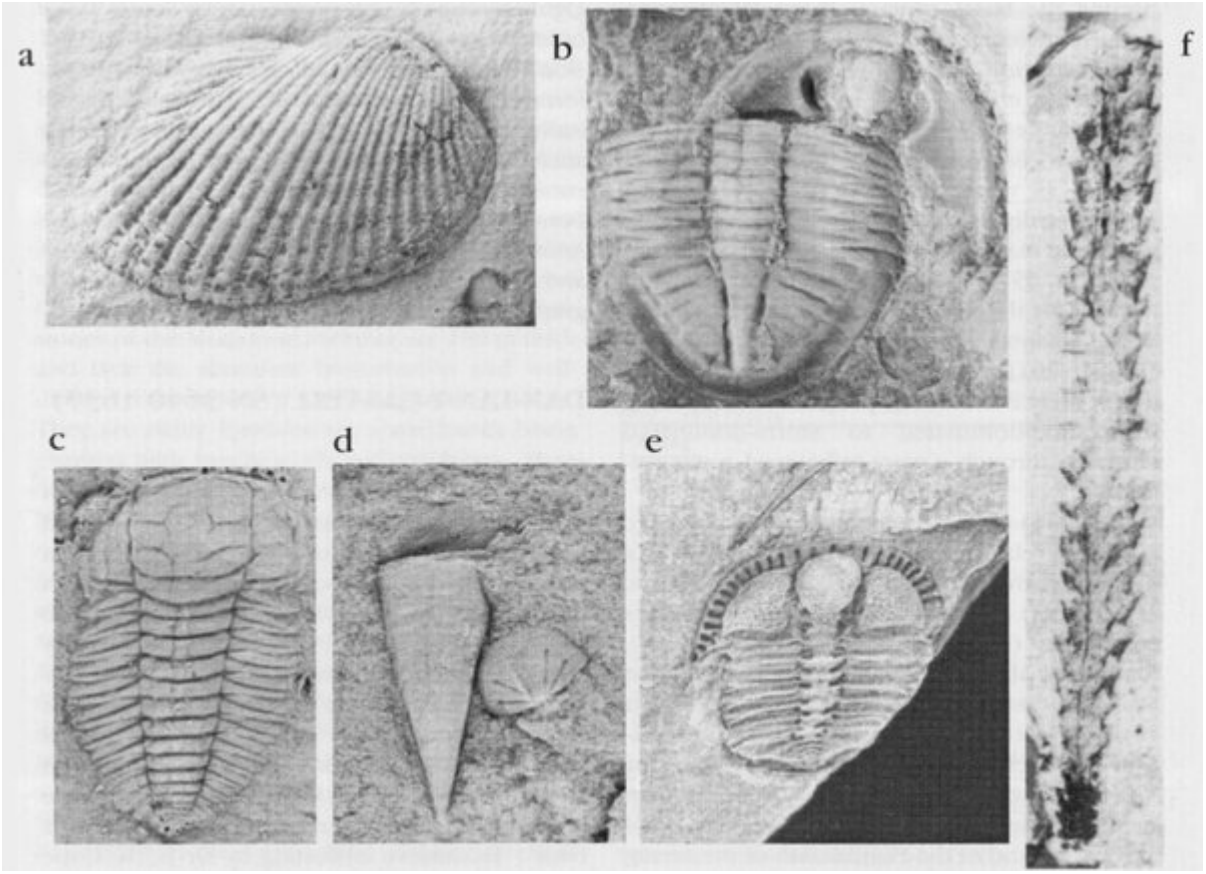
Llanfallteg Cutting is internationally important because it provides the best section at which to define the base of the Llanvirn Series and of the *artus* Zone at the base of the Abereiddian Stage. This level can be recognized internationally in the peri-Gondwanan areas. The presence of bentonite beds holds promise that an accurate radiometric date will be obtained for this level.

References



(Figure 8.9) Fossil distribution across the Arenig–Llanvirn boundary in the Llanfallteg section, after Fortey and Owens (1987, fig. 9). 'B' shows the approximate level of the thin bentonite beds. The range of U. cumbrensis is from Mitchell

(1992, fig. 7).



(Figure 8.4) Fossils from Arenig and Llanvirn sites in South Wales. (a) Falcatodonta costata Cope, x4.5, from the Bolahaul Member (Moridunian) at Dan-lan-y-castell. (b) Merlinia selwynii (Salter), x2.5, Pibwr Member (Moridunian), Glan Pibwr. (c) Portedieldia punctata (Crosfield and Skeat), x8, Cwm yr Abbey Member (Moridunian), Cwm yr Abbey. (d) Hyolithid conch and operculum, x 5, and (e) Bergarnia rushtoni Fortey and Owens, x 3.5, both from the Pontyfenni Formation (Fennian), Pontyfenni. (l) Undulograptus austrodentatus (Harris and Keble), x6, Llanfallteg Formation (basal Abereiddian), Llanfallteg.