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# Llanfawr Quarry

[SO 066 617]

## Introduction

Llanfawr Quarry, east of Llandrindod ('4' in (Figure 8.25)), is important stratigraphically and palaeontologically because it exposes the youngest well-dated beds of the Ordovician succession in the Builth–Llandrindod Inlier. The strata are referred to the basal Caradoc *Nemagraptus gracilis* Biozone, and some horizons are richly fossiliferous, yielding a varied and well-preserved fauna of trilobites, graptolites, molluscs, brachiopods, ostracods and conulariids. This quarry has long been a well-known collecting ground, and fossils from Llanfawr are represented in most museum collections and in many teaching collections in Britain.

The quarries in this area, and particularly the 'Middle Quarry' of Jones and Pugh (1948), were opened up to extract the dolerite that intrudes the shale in this area; the latter is well exposed in the sides of the 'Middle Quarry'. The dolerites were included on the original Geological Survey Maps, published in 1850, but no detailed descriptions of the rocks at Llanfawr were published until those of Elles (1940) on the sedimentary rocks and of Jones and Pugh (1948) on the dolerites. Elles listed the fossils present and described a new trilobite species, *Ampyx* (now *Cnemidopyge*) *bisectus*. In more recent years, the trilobites (C.P. Hughes, 1969, 1971, 1979), graptolites (R.A. Hughes, 1989), ostracods (Jones, 1986–1987), brachiopods (Lockley and Williams, 1981) and cephalopods (Evans, 1994) have been revised. The geology was described briefly by Baker and Hughes (1979) and is included on the British Geological Survey (BGS) 1:25 000 map of the Llandrindod Wells Ordovician inlier (Earp, 1977) and the 1:50 000 Rhayader sheet (BGS, 1993). On the latter, the BGS introduced the lithostratigraphical term 'Llanfawr Mudstones Formation' to supersede the *N. gracilis* shales, *H. teretiusculus* shales and the topmost *D. murchisoni* shales in the Builth–Llandrindod inlier; this term was formally defined in the accompanying memoir (Davies *et al.*, 1997).

## Description

Quarry working at Llanfawr ceased long ago. In the Middle Quarry, the largest of the three originally present, the lowest (easternmost) leaf of dolerite is overlain and underlain by shales. Removal of the dolerite has exposed, on the south-east side of the quarry, a large dip surface of the underlying shales that is inclined at 32° to the WNW. The shales overlying the dolerite can be seen near the track of the old tramway near the mouth of the quarry, where they have been baked and metasomatized for up to a metre above the contact, and the dolerite shows a chilled margin. Near the centre of the south-east face of the quarry there is a small plug of dolerite that Jones and Pugh (1948) interpreted as a feeder to the dolerite laccolith.

The dark-coloured, flaggy shales and blocky mudstones exposed on the south-east face are richly fossiliferous and have yielded abundant well-preserved fossils, of which the commonest is the trilobite *Trinucleus fimbriatus* Murchison. Other trilobites include *Homalopteon radians* (M'Coy), *Platycalymene duplicata* (Murchison), *Ogygiocarella debuchii* (Brongniart), *Nobiliasaphus powysensis* Hughes (type locality), *Cnemidopyge bisecta* (Elles) (type locality) and *Telaemarrolithus intermedius* Hughes (type locality). Revision by R.A. Hughes (1989) of the extensive list of graptolites given by Elles (1940) led to a substantial reduction in their number: Hughes listed *Nemagraptus gracilis* (Hall), *N. cf. subtilis* Hadding, *Dicellograptus cambriensis* Hughes, *D. salopiensis* Elles and Wood, *Dicranograptus brevicaulis* Elles and Wood, *Normalograptus brevis brevis* (Elles and Wood), *Cryptograptus* ex gr. *tricornis* (Carruthers) and *Glossograptus hincksii fimbriatus* (Hopkinson). Other fossils include brachiopods (*Tissintia* sp. and lingulates), bellerophonid gastropods, the orthoconic nautiloid *Allumetcoeras oneratus* Evans (type locality) and the ostracod *Conspicillum bipunctatum* (Jones and Holl).

## Interpretation

This quarry shows the highest exposed parts of the Llanfawr Mudstones and is the type locality of the formation. The strata represent the youngest dated part of the Ordovician succession in the Builth–Llandrindod Inlier, the basaltic Trelowgoed Volcanic Formation that overlies it being undated. The *gracilis* Zone is well represented by the large mixed trilo-bite-graptolite fauna. The graptolites include species characteristic of the lower half of the zone: *Dicellograptus salopiensis*, *Dicranograptus brevicaulis*, *D. irregularis* and *Nemagraptus subtilis*. Higher levels in the *gracilis* Zone, such as are developed in the Spy Wood section (see site report) in the Shelve area, are apparently not represented. The trilobite fauna includes several species that are larger than, and differ from, those from the Rorrington Formation in the Spy Wood section.

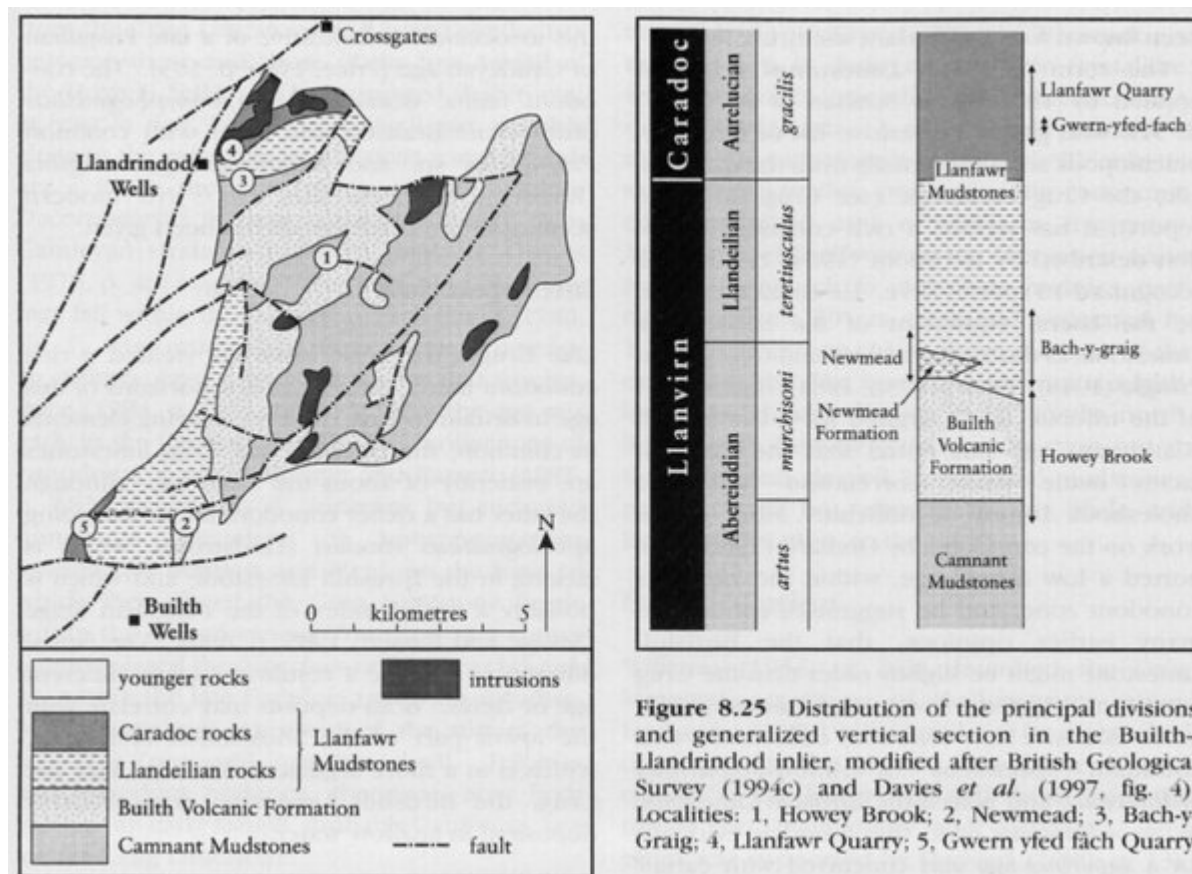
*Telaemarrolithus intermedius*, whose type locality is at Llanfawr, has been identified in the Gilfach Borehole, Llanwrtyd, where it is in the lowest representative of the *gracilis* Zone in the succession (Cave and Rushton, 1996, pp. 53, 56, fig. 6a).

Elles (1940) considered the *N. gracilis* shales at Llanfawr to represent relatively deep, quiet-water, offshore conditions, comparable to those inferred at Bach-y-graig (see site report). Evans (1994), who reached similar conclusions, considered the fauna at Llanfawr to be indicative of the Raphiophorid Community of Fortey and Owens (1978). Sheldon (1987b) suggested that the Llanfawr Mudstones were deposited in a silled basin that was deep and poorly oxygenated, though the interpretation of depth was doubted by Davies *et al.* (1997, p. 15), who favoured a distal shelf setting in somewhat shallower water.

## Conclusions

Llanfawr Quarry is an important locality. It is the most instructive locality in the Builth–Llandrindod inlier at which to examine the sediments and fauna of the *gracilis* Zone; the outcrop in the quarry is readily accessible and fossils are easy to obtain, so it is better suited for educational purposes than Gwern yfed fach, which forms a complementary section.

## References



**Figure 8.25** Distribution of the principal divisions and generalized vertical section in the Builth–Llandrindod inlier, modified after British Geological Survey (1994c) and Davies *et al.* (1997, fig. 4). Localities: 1, Howey Brook; 2, Newmead; 3, Bach-y-Graig; 4, Llanfawr Quarry; 5, Gwern yfed fach Quarry.

(Figure 8.25) Distribution of the principal divisions and generalized vertical section in the Builth–Llandrindod inlier, modified after British Geological Survey (1994c) and Davies *et al.* (1997, fig. 4). Localities: 1, Howey Brook; 2, Newmead;

3, *Bach-y-Graig*; 4, *Llanfawr Quarry*; 5, *Gwern yfed fâch Quarry*.