Dolyhir and Strinds quarries

[SO 243 580]

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Introduction

The Old Radnor Inlier offers the last westward glimpse of the Precambrian basement to the Midlands Microcraton, before it re-appears near Carmarthen, some hundred kilometres to the south-west (Pharaoh and Gibbons, 1994). Working quarries in the inlier have, for at least the last 100 years, provided fine sections through sedimentary rocks now assigned to the Longmyndian Supergroup, together with their unconformable cover of Silurian limestone and mudstone. This GCR site (Figure 5.18) therefore displays the best exposures of Longmyndian strata outside the type area of the Long Mynd, itself represented by the preceding sites of this chapter.

Early observers (Murchison, 1854) saw the rocks of the inlier as the conformable lower part of the local Silurian sequence. The recognition by Callaway (1900) of the unconformable relationship of the Silurian on older rocks that resemble the Longmyndian of Shropshire established the true significance of the Old Radnor Inlier.

The Dolyhir and Strinds quarries expose rocks providing an important window into the basement geology of southern Britain, framed by clear stratigraphical relationships with younger overlying Silurian rocks. Further quarrying activity guarantees fresh exposure for scientific work, and a changing transect through complex three-dimensional lithological and structural relationships.

Description

The Old Radnor Inlier lies 5 km north-west of the town of Kington e.g. (Figure 1.1), (Figure 5.1), and is centred on the village of Old Radnor [SO 250 591]. The inlier is about 3 km long by 1 km wide, and is elongated NE–SW parallel to bounding faults of the Church Stretton system (Figure 5.18)a. The north-eastern end of the inlier is dominated by Precambrian rocks but includes, to the north-east of Old Radnor, a fault-bounded sliver of Wenlock-age Dolyhir Limestone. In the south-west, the Precambrian rocks are overlain by the limestone at a gently west-dipping, though fault-affected, unconformity. The limestone passes westward again into Wenlock mudstones of the Coalbrookdale Formation at a poorly exposed and supposedly conformable contact. These mudstones crop out sporadically in the low ground around the inlier. The contacts, apart from those in the west, are assumed to be faulted (Garwood and Goodyear, 1918), although direct evidence of faulting can now only be seen in the Weythel Brook south of Dolyhir [SO 243 577]. The internal faults of the inlier record predominantly strike-slip movement (Woodcock, 1988). To the east lies the fault-bounded sliver of the Stanner–Hanter Intrusive Complex (see the Hanter Hill GCR site report).

Woodcock and Pauley (1989) have divided the supposed Precambrian rocks into two formations. The Strinds Formation occupies most of the outcrop area of the inlier. It is dominated by fine- to medium-grained micaceous sandstone, usually pale greenish grey, but in places purplish or brownish grey. The sandstone is generally massive, and bedding is commonly obscured by brecciation. Where bedding is visible in the Strinds Formation it is steep and NE–SW striking. Horizons containing tabular rip-up clasts of red mudstone occur sporadically. More common are units of clast-supported conglomerate of two compositions. The 'grey conglomerates' of Garwood and Goodyear (1918) comprise well-rounded clasts of vein-quartz with subordinate purple rhyolite and mica-schist. Their 'red conglomerates' contain a high proportion of purple rhyolite and reddened quartzite. Holgate and Hallowes (1941) matched clasts of granite and quartz-porphyry with similar lithologies in the Stanner–Hanter Complex to the east.

The Yat Wood Formation crops out in a NE–SW strip, the observed contacts of which are faults against Strinds Formation rocks ((Figure 5.18)a). The Yat Wood Formation contains three facies. Laminated or massive pale green siltstone, thinly laminated grey and green-grey mudstone, and green-grey fine-grained sand stone. The sandstone beds tend to be intercalated in packets within the finer-grained facies. The sandstone lacks the red rhyolite grains, mudstone rip-ups and abundant mica of the sandstone in the Strinds Formation. Many sandstone beds are massive, but normal grading and ripple cross-lamination occur rarely. The thinly laminated mudstones contain organic-walled microfossils or cryptarchs (Woodcock and Pauley, 1989) similar, but not identical, to material from the Lightspout Formation of the Stretton Group in Shropshire (Peat, 1984a).

Geological relationships in the inlier are best exposed in three quarries (Figure 5.18)b,c,d, detailed descriptions of which are provided by Woodcock (1988, 1992, 1993). The northernmost Gore Quarry ([SO 256 592], (Figure 5.18)b) mostly reveals highly brecciated Strinds Formation, with Yat Wood Formation exposed on its southern flank. Both formations are better seen in the south-western quarries that comprise the GCR site.

Strinds Quarry [SO 242 579], (Figure 5.18)c is the type area for the Strinds Formation, which is exposed in the lower faces below the excavated unconformity surface with the Dolyhir Limestone. The basal conglomerate to the limestone, containing Strinds Formation fragments, is exposed in a pocket along the south-eastern contact between the Dolyhir Limestone and Strinds Formations ((Figure 5.18)a). North- or NNE-striking faults, mostly with strike-slip slickensides, cut both the Precambrian and Silurian rocks, but pervasive brecciation is restricted to zones in the Strinds Formation. The small disused quarry at [SO 241 581], formerly referred to as Dolyhir Quarry (Garwood and Goodyear, 1918), also exposes Strinds Formation unconformably beneath Dolyhir Limestone.

The present Dolyhir Quarry [SO 244 584], (Figure 5.18)d, a northward extension of the former Yat Wood Quarries of Garwood and Goodyear (1918), contains Yat Wood Formation, faulted against the Strinds Formation in its south-east corner. Rapid working of this quarry changes the detailed exposure from year to year. The Wenlock unconformity is well exposed (Figure 5.19), with pockets of the basal conglomerate lying along it. The Yat Wood Formation dips moderately WNW, with good sections usually exposed near [SO 245 584]. Woodcock and Pauley (1989) provide a lithologic log of a typical section. NNE-striking faults cut both the Wenlock and underlying rocks in this quarry.

Interpretation

Early published interpretations of the Old Radnor area (Murchison, 1854) considered the oldest rocks of the inlier to be Silurian — in both Murchison's and modern usage — and to underlie conformably the Wenlock-age limestone. Callaway (1900) demonstrated an unconformity beneath the limestone, and a lithological similarity of the older rocks to the better-known Longmyndian of Shropshire. Garwood and Goodyear (1918) supported this correlation, and specifically a match with the sandstone and conglomerate of their 'Bayston Group'.

The subdivision of the Longmyndian within the inlier (Woodcock and Pauley, 1989) has prompted a more detailed correlation with the type area. The predominant Strinds Formation is still correlated with the Bayston–Oakswood Formation of the Wentnor Group, interpreted by Pauley (1986, 1990a,b) as the deposits of a braided alluvial system (see also, the Hawkham Hollow GCR site report). The Yat Wood Formation is more tentatively correlated with parts of the underlying Stretton Group. The filamentous microfossils in the Yat Wood Formation urge a correlation with the Lightspout Formation, interpreted as the deposits of an alluvial floodplain. However, a match with the alluvial facies of the Synalds Formation or with the pro-deltaic facies of the Burway Formation is also considered possible (Woodcock and Pauley, 1989). The sandstones in both the Strinds and Yat Wood formations are rich in lithic fragments, like those of the type Longmyndian, suggesting derivation from an undissected magmatic arc.

The detailed correlations of the Strinds and Yat Wood formations with the type Longmyndian are important in establishing their possible Precambrian age. Local stratigraphical relationships only constrain the age of these formations to before the earliest Wenlock, the age of the Dolyhir Limestone. A smaller inlier of supposed Longmyndian rocks at Pedwardine, 15 km northeast, is associated with Tremadoc rocks, but any

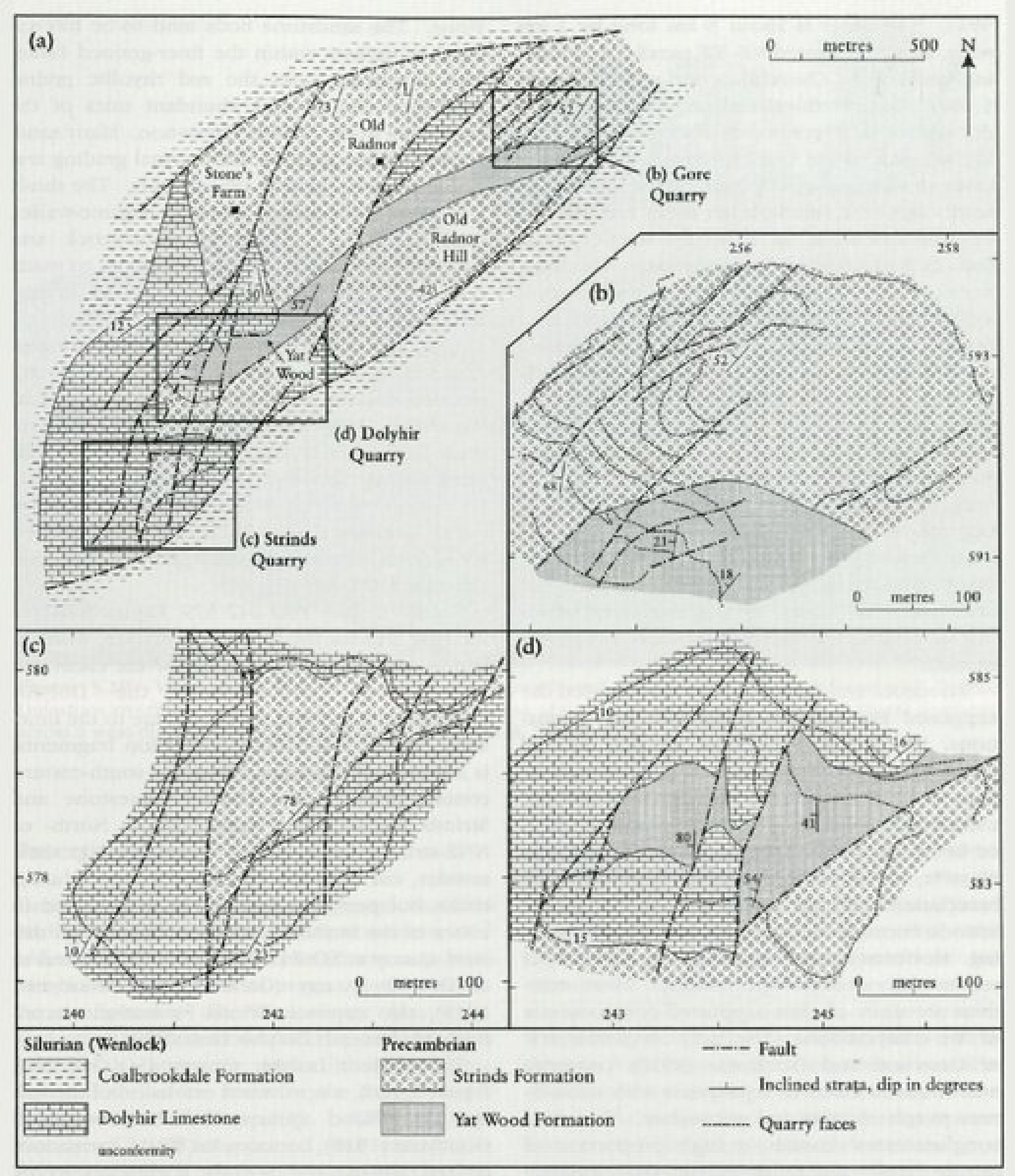
original unconformity between these two units has been replaced by a thrust (Boynton and Holland, 1997). The stratigraphical relationships of the Shropshire Longmyndian are also complex, as discussed in the introduction to this chapter, but it is probable (Pauley, 1990a,b, 1991) that at least one of its fault-detached components — the Willstone Hill Conglomerate — is unconformably overlain by Lower Cambrian strata.

The structural setting of the Old Radnor Longmyndian is also relevant to discussion of its probable age. Mapping by Kirk (1947, 1951, 1952) clarified Garwood and Goodyear's (1918) view of the inlier as a fault-bounded basement block along the Church Stretton Fault System. This is the same setting as that demonstrated by Holgate and Hallowes (1941) for the adjacent Stanner–Hanter Inlier, which contains plutonic rocks yielding an Rb-Sr isochron age of 702 ± 8 Ma (Patchett *et al.,* 1980). Holgate and Hallowes' (1941) identification in the Old Radnor Inlier of derived clasts from the Stanner–Hanter Complex suggests that the local Longmyndian is younger than this age. Woodcock (1988) showed that the internal faults, and by inference the bounding faults, of the Old Radnor Inlier record dominantly strike-slip displacement, mostly of post-Wenlock, probably Acadian, age. A gravity survey by Coster *et al.* (1997) suggests that the faults that bound the inliers of high density rock, particularly of the Stanner–Hanter ridge, cannot be vertical, but must converge at depth to isolate relatively small masses of Precambrian rock at a high structural level.

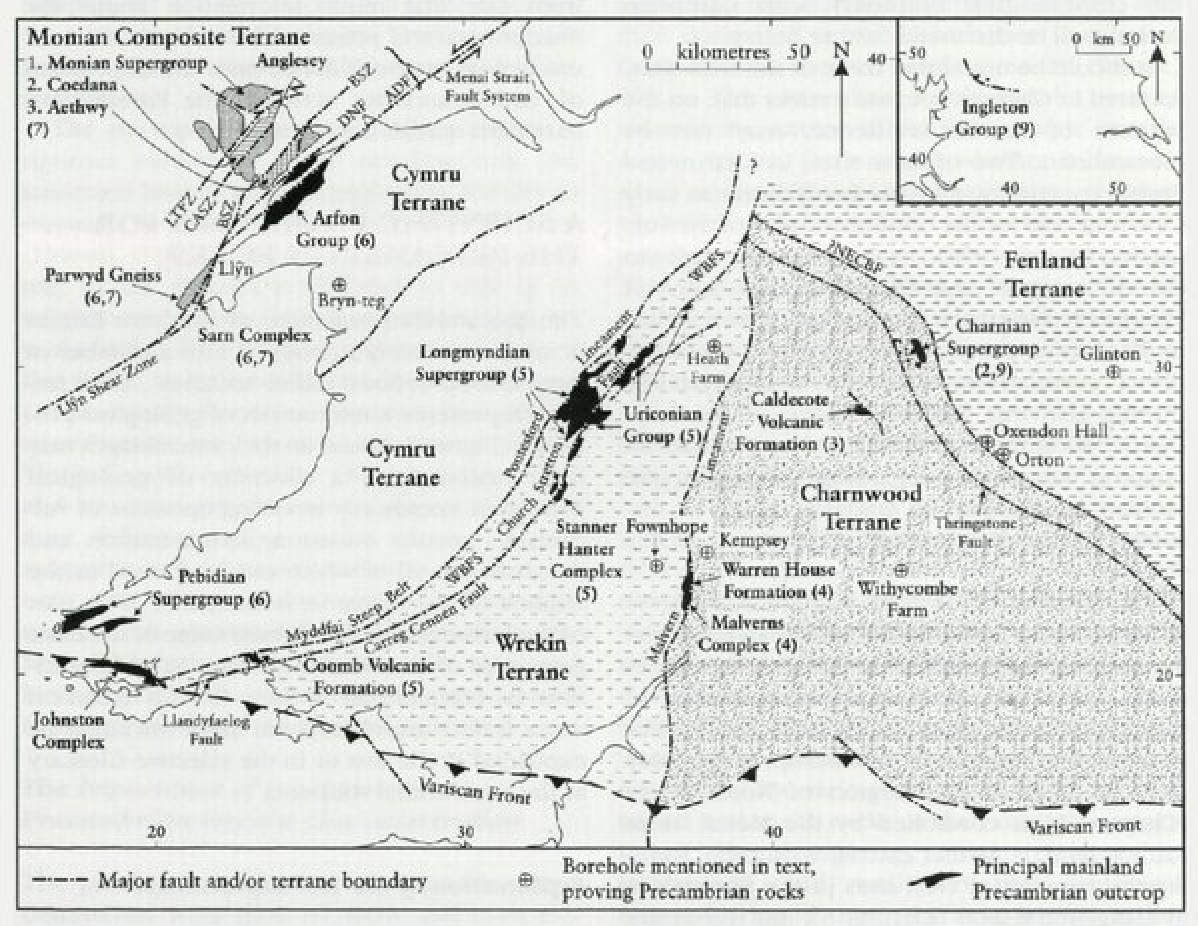
Conclusions

The Dolyhir and Strinds quarries provide the most instructive exposures in the Old Radnor Inlier, a lozenge of old rock caught up along the major Church Stretton Fault System. The unconformity with the overlying Wenlock (middle Silurian) rocks is magnificently displayed in former and currently active quarries, showing that the older rocks had been tilted and deformed before the Silurian strata were laid down. The older rocks can be subdivided into two formations, both of which can be matched with rocks of the late Precambrian Longmyndian Supergroup of Shropshire. The Old Radnor Inlier provides a rare view of the old basement rocks of the Welsh Borderland, and is a crucial link between the larger Precambrian outcrops of Shropshire and south-west Wales.

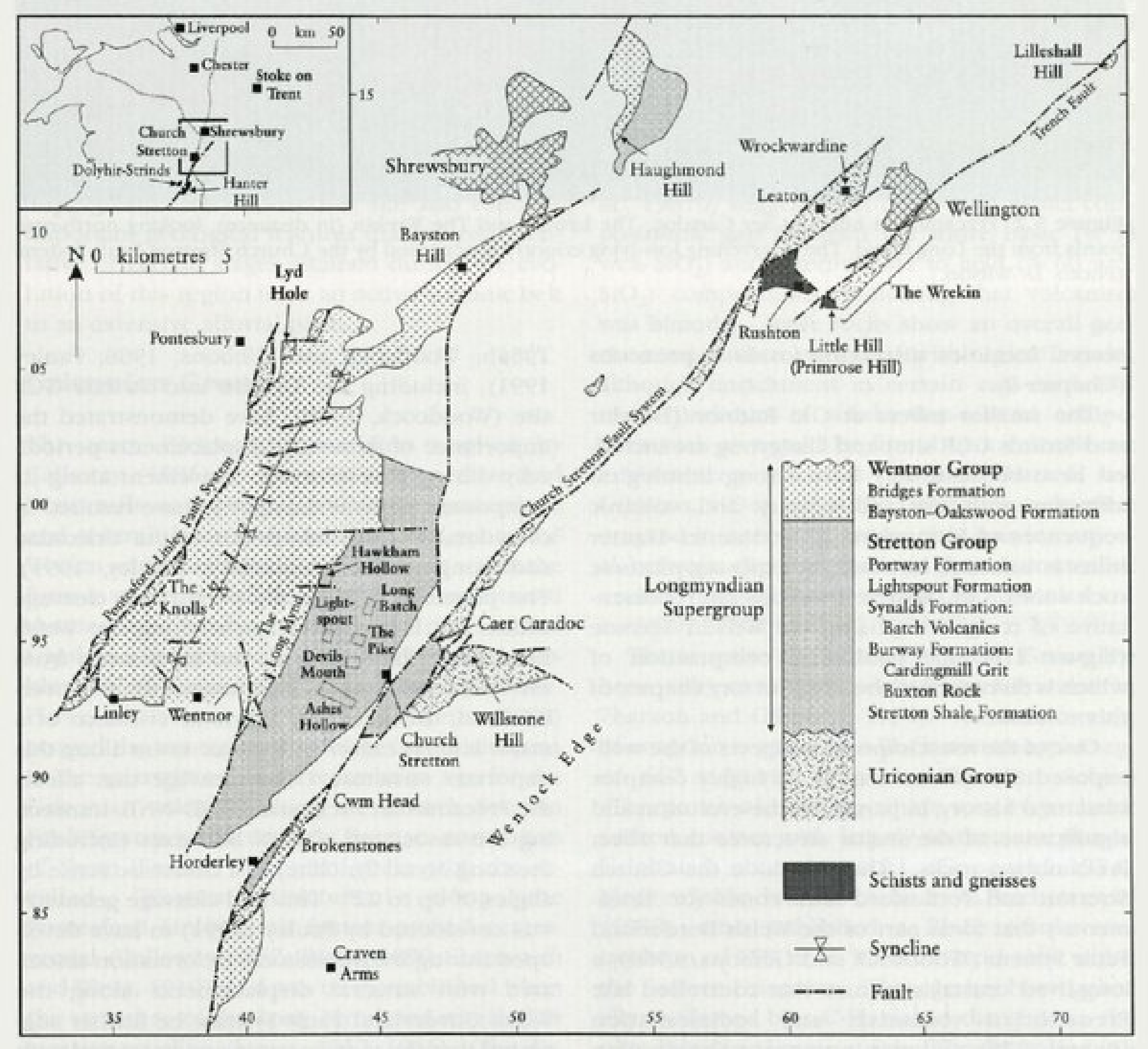
References



(Figure 5.18) Geological maps of (a) the Old Radnor Inlier and (b, c, d) the three most extensive quarries within it.



(Figure 1.1) Sketch map showing the distribution of Precambrian outcrop, and boreholes proving Precambrian rocks, in southern Britain. Note that the outcrops are labelled with the names of the principal geological units, followed by numbers (in brackets) of the chapters for the relevant GCR sites. Terrane boundaries are slightly modified after British Geological Survey (1996); Myddfai Steep Belt after Woodcock (1984a); Monian Composite Terrane after Gibbons and Horák (1990). Key: ADF, Aber-Dinlle Fault; BSZ, Berw Shear Zone; CASZ, Central Anglesey Shear Zone; DNF, Dinorwic Fault; LTFZ, Llyn Traffwll Fault Zone; ?NECBF, postulated NE Charnwood Boundary Fault. The boundary of the Midlands Microcraton basement domain is outlined by the NECBF and Pontesford-Myddfai lineament systems; WBFS, Welsh Borderland Fault System.



(Figure 5.1) Geological map of the Shropshire Precambrian outcrops (modified from Pauley, 1991), with the GCR sites indicated by bold lettering. The Radnor inliers (Dolyhir and Strinds quarries and Hanter Hill sites) are shown by the inset at top left. The location of the Llangynog site is given in (Figure 6.1).

(Figure 5.19) View across Dolyhir Quarry, looking northward from [SO 244 583]. Sub-horizontal Dolyhir Limestone overlies westward-dipping Longmyndian strata of the Yat Wood Formation. Both units are displaced across a west-dipping dip-slip normal fault. (Photo: N.H. Woodcock.)