THE GEOLOGY OF THE WYE VALLEY AND THE FOREST OF DEAN: A FIELD MEETING REPORT

Leader: Paul L. Hancock

Saturday, 5th June - Sunday, 6th June 1971

The purpose of the excursion was to examine the geology of the Wye Valley and the Forest of Dean, with a special emphasis, at the request of the Society, on the Old Red Sandstone. In the region covered by the excursion the general succession of solid formations, including principal lithologies, is after Welch and Trotter (1961), Allen (1964) and Gayer and Stead (1971):

	Maximum thickness in metres
JURASSIC	
Lower Liassic (clays and thin limestones)	15
TRIASSIC	
Rhaetic (clays, shales and thin limestones)	8
Keuper	
Keuper Marl (red and green mudstones)	91
Dolomitic Conglomerate (conglomerates and breccias)	9
-------- major unconformity --------	
CARBONIFEROUS	
Upper Coal Measures	
Supra-Pennant Group (mudstones, sandstones and thin coals)	335
Pennant Group (sandstones with subordinate mudstones and thin coals)	244
Trenchard Group (conglomerates, sandstones, and thin coals)	107
------- minor unconformity --------	
Carboniferous Limestone Series	
Drybrook Sandstones (sandstones) passing south into Drybrook Limestone (fragmental limestones and calcite mudstones)	213
Whitehead Limestone (limestones, calcite and dolomite mudstones)	46
-------- minor unconformity --------	
Crease Limestone (dolomitised oolitic and crinoidal limestones)	30
Lower Dolomite (dolomitic limestones)	122
Lower Limestone Shale (crinoidal and oolitic limestones, shales)	67

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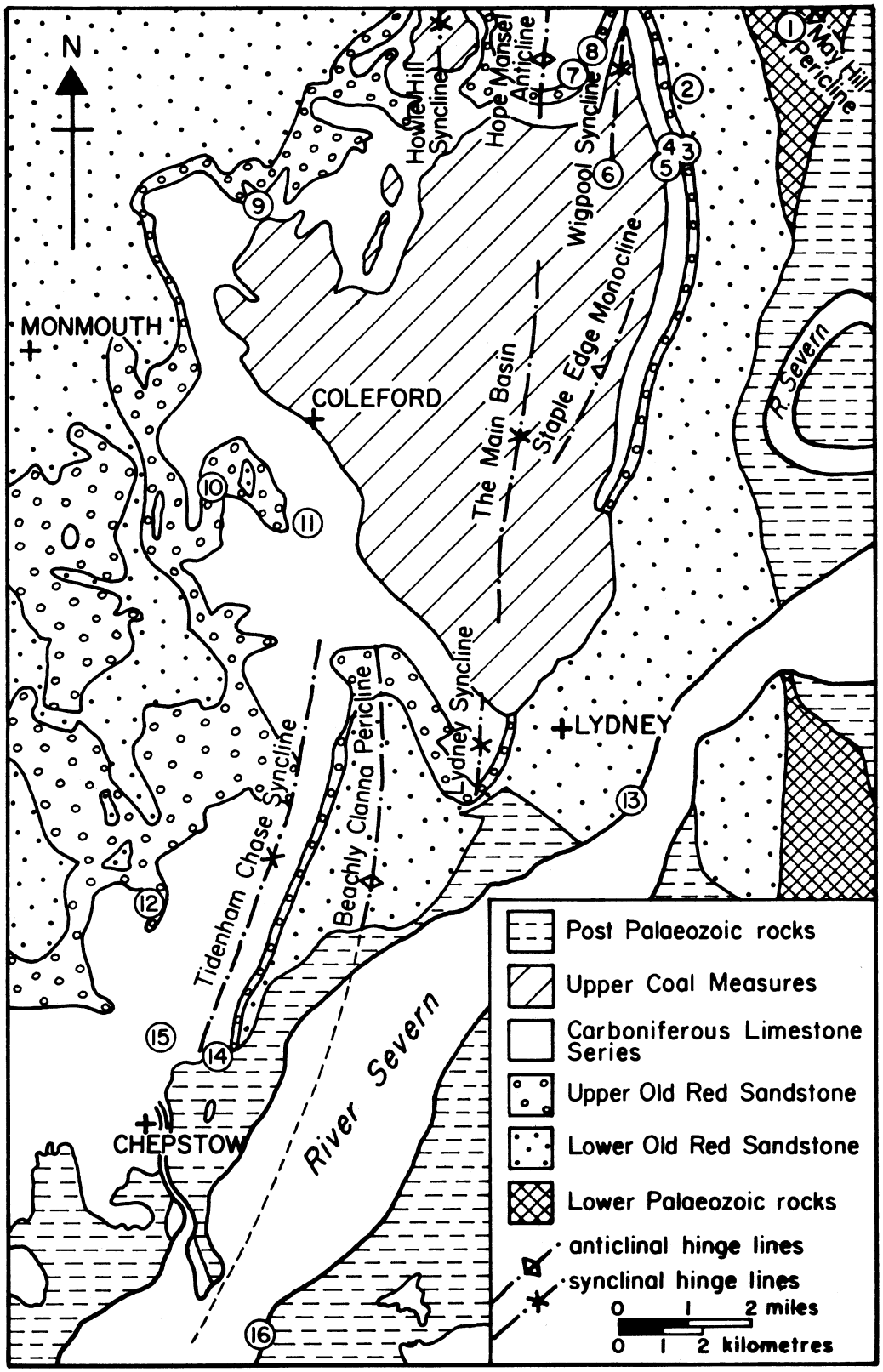
N
MONMOUTH
COLEFORD
LYDNEY
CHEPSTOW
Howle Hill Syncline
Hope Mansel Anticline
Wigpool Syncline
Staple Edge Monocline
The Main Basin
Lydney Syncline
Beachly Clanna Pericline
Tidenham Chase Syncline
Noy Hill Pericline
R. Severn
River Severn
Post Palaeozoic rocks
Upper Coal Measures
Carboniferous Limestone Series
Upper Old Red Sandstone
Lower Old Red Sandstone
Lower Palaeozoic rocks
anticlinal hinge lines
synclinal hinge lines
0 1 2 miles
0 1 2 kilometres

Figure 1

	Maximum thickness in metres
DEVONIAN (OLD RED SANDSTONE)	
Upper Old Red Sandstone	
Tintern Sandstone Group (sandstones and siltstones)	152
Quartz Conglomerate (conglomerates and sandstones)	30
- - - - - - - - major unconformity - - - - - - - -	
Lower Old Red Sandstone	
Brownstones (sandstones and conglomerates)	838
St. Maughan's Group (sandstones and siltstones)	442
Raglan Marl Group (siltstones and sandstones)	518
Downton Castle Sandstone (sandstones and siltstones)	15
SILURIAN	
Ludlow Series	
Upper Ludlow Beds (calcareous mudstones and thin limestones)	91
Aymestry Limestone (limestones and calcareous mudstones)	30
Lower Ludlow Beds (calcareous mudstones and thin limestones)	152
Wenlock Series	
Wenlock Limestone (limestones)	107

Older beds are exposed in the core of the May Hill pericline but were not visited. Figure 1 shows the outline geology of the area and the approximate positions of the localities.

The dominant structures in the area are a series of approximately N - S trending folds (Fig. 1), developed during several phases of earth movements (Welch and Trotter, 1961). Major intra-Carboniferous movements caused the break between the Drybrook Sandstone and the Upper Coal Measures, and resulted in many of the present day westerly verging asymmetrical folds in the Carboniferous Limestone Series and the Old Red Sandstone. Gayer and Stead (1971) suggest that the folds were westerly facing, en-echelon monoclines prior to the folding of the overlying Coal Measures. Folds initiated during the intra-Carboniferous movements include the Hope Mansel anticline, the Wigpool syncline, the Lydney syncline, the Clanna-Beachley pericline and the Tidenham Chase syncline. The relatively open structure known as the Main Basin, which contains the principal outcrop of the Coal Measures, was formed during later Variscan movements which occurred before the Triassic and after the deposition of the Coal Measures. Most of the dips in the Main Basin are shallow except along the Staple Edge monocline where some beds are nearly vertical. Although the hinge lines of the intra-Carboniferous and the post-Coal Measures folds are approximately parallel, they are not necessarily coincident. For example, near Lydney the trough of the Main Basin is about 600 m east of the trough of the Lydney syncline. The resulting unconformity is clearly displayed on the map (Fig. 1). At the same time as the Coal Measures were being folded some of the intra Carboniferous folds were being accentuated. Post-Triassic movements were relatively minor and resulted in gentle dips. Triassic and Jurassic rocks are now preserved in basins elongated along NNE lines.

SATURDAY 5th June

About 25 members and friends assembled at 11.00 am in Huntley village. After a brief introductory talk from Dr. Hancock the party drove west to the first locality.

1. Hobbs Quarries, Longhope (SO 695195)

The Wenlock Limestone is exposed in a series of quarries on the western limb of the May Hill Pericline, and according to Lawson (1955) comprises three divisions:

upper limestone - irregularly bedded, fragmental, ferruginous limestones;

nodular beds - thin-bedded, nodular limestones and calcareous shales;

lower limestone - thin-bedded limestones with ballstone structures.

About 100 m south of where the lane from Dursley Cross to Longhope crosses the crest of a minor hogback ridge, the party examined the lower limestone division. The dip of the Wenlock Limestone is about 25° to the west, but in the quarry the uniformity of this dip is masked by the presence of several masses of reef limestone called ballstones by Lawson (1955). They are exposed in the lower part of the quarry face, while directly above them the bedded limestones are arched. Hobb's Quarries are famous for the abundance of fossils which they contain. Despite the overgrown state of the quarry some members made collections from the talus slopes; specimens of *Atrypa*, rhynchonellids, *Favosites*, *Calymene* and algae were found.

From Hobb's Quarries the party returned to the main A40 road and proceeded to Longhope for lunch.

2. Wilderness Quarry, Mitcheldean (SO 672185)

About 43 m of beds belonging to the Brownstones dip steeply to the west in this quarry on the eastern limb of the Wigpool syncline. The sequence comprises six completely exposed, and two partly exposed, fluviatile cyclothems which have been described by Allen *et al* (1968). Each cycle commences with an erosional surface which is overlain by sandstones which grade up into siltstones interbedded with thin, fine-grained sandstones. The fine-grained top of the cycle is terminated by the erosional base of the succeeding cyclothem. The easily accessible second cyclothem, the base of which is about 2 m above the top of the extensive green bedding surface forming the eastern quarry face, is described in detail by Allen (1964). Members examined this and other cyclothems, and noted excellent examples of red and green colouration, intraformational conglomerates, flat and cross-bedding, parting lineation, current ripple marks, bioturbation features, suncracks, pedogenic limestone concretions and erosional channels. In addition to the sedimentological features, the presence of a fish bed was also an incentive to visit the quarry. The fish bed is a fine-grained sandstone, 14 to 25 cm in thickness, within the fifth cyclothem. Abundant fragments of the pteraspid *Althaspis leachi* indicative of an Upper Dittonian age, have been found, and also some of the articulated thelodont *Turinia pagei* (Allen *et al*, 1968). Despite an exhaustive and sometimes hazardous search members were able to find only a few small fish scales.

3. Former Point Inn, Plump Hill, Mitcheldean (SO 663171)

Adjacent to the site of the former inn westerly dipping beds of Quartz Conglomerate are visible at the start of a path. The rocks are mainly pebbly sandstones containing well-rounded clasts of quartz. They are overlain by sediments of the Tintern Sandstone Group. The party were able to examine these green sandstones and siltstones in small exposures which were available as a consequence of the recent demolition of the inn. The party then walked about 150 m up the hill to a quarry just north of the road.

4. Quarry in Lower Dolomite, Plump Hill, Mitcheldean (SO 662172)

In this quarry members examined fine-grained dolomitic limestones belonging to the Lower Dolomite, and collected calcite crystals from veinlets. Dr. Hancock pointed out that many of the bedding surfaces are stylolitic, a specimen of one showed the stylolite to be filled by about 1 mm of red, hematite-rich material. The stylolitic form of many of the bedding surfaces may be responsible for obscuring the steep westerly dip; the more noticeable discontinuities being a set of easterly dipping strike-joints.

5. Edge Hills Sand Quarry, Mitcheldean (SO 661168)

The brightly-coloured sandstones and shales of the diachronous Drybrook Sandstone are exposed dipping moderately west about 300 m south-west of the previous quarry. The Drybrook Sandstone sediments in the quarry have been dated by Sullivan (1964), using miospores, as Lower Visean. They were being deposited at the same time as limestones were being laid down elsewhere in the South-West Province. The 43 m of strata comprise alternating sandstones and shales. A shaly coal is visible just west of a minor fault in the southern quarry face. The party examined the succession and detailed features such as rootlet beds, bioturbated sandstones, and ripple marks. There was some discussion about the significance and position of the Edge Hills Coal and accompanying strata of suggested Lower Westphalian age (Sullivan, 1964).

6. Quarry east of Nailbridge (SO 647163)

In this quarry, about 1.5 km west-south-west of the Edge Hills Quarry, subgreywackes of the Pennant Group dip gently south-south-east close to the core of the Wigpool syncline. The higher units are flat-bedded and generally show parting lineation while some of the lower units comprise cross-stratified channel fill. Some surfaces of the large smooth joints display plumose marks and, at right angles to them, concentric rib marks. Plumes indicate a rapid rate of crack formation and are orientated parallel to the direction of fracture propogation.

7. Euroclydon, Puddlebrook (SO 643187)

In the narrow road cutting members were able to see about 80 m of sandstones and siltstones of the Tintern Sandstone Group dipping moderately south-east on the western limb of the Wigpool syncline. The Lower Limestone Shale crops out at the extreme eastern end of the section. From the cutting the party descended the hill along the road for a further 300 m.

8. Bailey Gate, Puddlebrook (SO 643190)

At the roadside there are bluffs of easterly dipping conglomerates and sandstones of the Quartz Conglomerate which forms the steep escarpment. A level is reputed to have been driven from near here to work gold in the Conglomerate (Welch and Trotter, 1961).

9. Symonds Yat Rock (SO 563161)

This famous vantage point is a bluff of gently dipping Lower Dolomite high above an entrenched meander of the Wye. At the view point members observed the scenery and its relation to the underlying geology. From Symonds Yat the party dispersed, mainly to their hotel in Gloucester.

SUNDAY 6th June

10. Newland (SO 551092)

The party reassembled just below the village in the floor of an abandoned and entrenched meander of the Wye. It is thought that the early Wye flowed over a wide flood plain developed on a surface which is now at about 600 ft (183 m). During its subsequent history, it has been entrenched and several meanders abandoned, the one at Newland being at a maximum about 400 ft (127 m) above the present level of the Wye (Welch and Trotter, 1961). Although the length of the loop is about 8 km, the separation at its neck is only about 400 m. From where members were standing the steep valley sides cut in the Tintern Sandstone Group and the Lower Limestone Shale were visible looking south. The flat floor of the valley which is 200 m wide contains only a small stream.

11. Clearwell Scowles (SO 577081)

In the Scowles members collected specimens of hematite and iron-coated dolomite crystals from the Carboniferous Limestone. The ore is generally thought to have been derived during Permo-Triassic times by the weathering of iron bearing minerals in the former cover of Coal Measures. Downward percolating waters transported the iron in solution until it reached a favourable host rock, such as the relatively open-textured Crease Limestone, where mineral replacement occurred.

12. Road section south of Tintern Abbey (ST 535997 to 537993)

About 400 m south-east of the Abbey recent widening of the A466 road, has exposed a new section which displays the passage from the continental, red and green sandstones and siltstones of the Tintern Sandstone Group into the grey marine limestones of the Lower Limestone Shale. Members found at least one limestone, about 2 m in thickness, interbedded with red and green siltstones within the upper part of the Tintern Sandstone sequence. A similar Tintern Sandstone succession containing two limestone bands is described by Welch and Trotter (1961, p. 56) from a stream section about 1 km west of the road. In the cutting the rocks dip gently into the core of the Tidenham Chase syncline. After collecting specimens members returned to the Abbey for Lunch.

13. Lydney Harbour cliff section (SO 652015 to 654019)

About 140 m north of the entrance to the harbour a continuous river section in folded Lower Old Red Sandstone rocks commences. The first exposures, and most of those on the foreshore, are of red and green siltstones and fine-grained sandstones belonging to the Raglan Marl Group, which Allen (1971) interprets as a mainly intertidal sequence. Many of the siltstones contain pedogenic limestone concretions, which in some beds are sufficiently plentiful for the rock to be called a limestone. A concretionary bed first seen in the core of an asymmetric syncline about 90 m north of the start of the section is thought to be the equivalent of the *Psammosteus* Limestone which marks the top of the Raglan Marl Group (Welch and Trotter, 1961, p. 38).
Dr. Hancock pointed out that although the concretions are irregular, many possess a long axis which is orientated approximately perpendicular to the bedding on the gently dipping limb of the fold, and, as a consequence of strain, at an acute angle to the bedding on the steep limb. The concretions were probably precipitated from carbonate-rich ground waters when there was exposure during the dry seasons of an arid or semi-arid climate.

From the outcrop of the concretionary limestone the party walked a further 250 m to the north, passing the core of a gentle anticline and a noticeable fault, to the start of a cliff section in a cyclothem near to the base of the overlying St. Maughan's Group. According to Allen (1964, p. 176) this fining upwards fluvial cycle, which is 8.8 m in thickness, can be divided into four members: interbedded sandstones and siltstones deposited in a tidal channel; cross-stratified, fluvial channel sandstones; interbedded backswamp siltstones and sandstones; and siltstones interbedded with minor sandstones also deposited in a backswamp which was sometimes exposed. At the base of the cycle is a scoured surface showing noticeable relief; a second scoured surface marks the base of the second member. The party examined the more accessible parts of the cyclothem and examples of internal structures such as cross-bedding, contorted foresets, ripple marks and burrows. Members also found specimens of fish spines and scales. *Traquairaspis*, indicative of a Dittonian age, is recorded by Allen (1964, p.176) from some of the lower sandstones. Low angle thrust faults disturb the sequence at the north end of the section.

14. Tidenham Quarry (ST 554955)

The worked quarry is in the Lower Dolomite and Crease Limestone which dip steeply west towards the core of the Tidenham Chase syncline. Members were reminded that the dip of the other limb, as seen at Tintern, is gentle, thus demonstrating the asymmetry of the fold and its westerly vergence. As time was limited, the limestones were not

examined in detail except to note the tectonic ripples visible in the northern face and the well-developed dip-joints. Excellent crystals of calcite from veins and cavities in the breccia of the unconformably overlying Dolomitic Conglomerate were collected from the south-western corner of the quarry.

15. Wintour's Leap, Woodcroft (ST 542963)

The spectacular 90 m high cliffs are cut mainly in the oolitic Drybrook Limestone, the Drybrook Sandstone cropping out near the base. The rocks dip about 10° to the east on the western limb of the Tidenham Chase syncline. The dip at Wintour's Leap is into the cliff, thus rendering it reasonably stable. At Wynd Cliff, on the opposite bank, the dip is in the same direction as the slope of the ground but it is less steep than the slope, and thus there has been landslipping. A remarkable crescent-shaped hook of alluvial land on the opposite bank is attributed to the combined effects of river flow and tidal scour.

From Wintour's Leap members made their way to Aust Cliff via Chepstow and the Severn Bridge. On the way it was possible to glimpse the small sharp anticline in the Whitehead Limestone adjacent to the road north of Chepstow (ST 534945), the gentle folds in the Drybrook Limestone near to the bridge over the Wye (ST 537944), and the Crease Limestone on which Chepstow Castle is sited (ST 534941).

16. Aust Cliff (ST 564890 to 565897)

This classic riverside section exposing the Rhaetic has been described by Reynolds (1946), Whittard (1949) and Welch and Trotter (1961). A summary of the succession is:

		Metres
JURASSIC	Lower Liassic	1
TRIASSIC	Rhaetic	8
	Keuper Tea Green Marl	7
	Keuper Red Marl	30
	- - - - - - unconformity - - - - - -	
CARBONIFEROUS	Lower Dolomite	

The Keuper sediments are mainly red and green silty mudstones containing some carbonate material. Beneath the upper-most 15 m of Red Marl there are discontinuous beds and veins of granular and fibrous gypsum, some of them containing calcite and celestine. Both the Cotham and Westbury Beds of the Rhaetic are cyclic (Cowie *et al*, 1965), the principal rock types being black shales and fossiliferous grey limestones. The Bone Bed at the base of the Rhaetic is thin and lenticular, nevertheless some members obtained good specimens for comparison with material collected during the Society's investigation of the Rhaetic in the East Midlands.

South of the Severn Bridge the sequence is on the southern limb of a gentle E - W trending anticline. The rocks are displaced by several faults downthrowing south. The fault nearest the bridge is still well exposed and can be seen to be a normal fault dipping south at about 60°.

The main eastern pier of the bridge is founded in the strong Lower Dolomite which occurs beneath the Triassic unconformity which rises to about sea-level at Aust. Some pockets of Dolomitic Conglomerate rest on the unconformity and can be seen in a reef just to south of the eastern pier.

After members had finished inspecting the section, Dr. Taylor expressed the Society's thanks to Dr. Hancock, who would here like to take the opportunity of thanking Mr. R. Bradshaw and Dr. B.P.J. Williams for discussing the localities with him.

P.L.H.

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