

THE PERMO-TRIASSIC/UPPER CARBONIFEROUS  
UNCONFORMITY AT SWANCAR FARM,  
TROWELL MOOR, NOTTINGHAMSHIRE

by

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Summary

The occurrence of Mottled Sandstones overlying, unconformably, well jointed brown sandstones, micaceous siltstones and shales, at an old quarry near Swancar Farm, Trowell, Nottinghamshire, is considered to be an example of the local Permo-Triassic/Upper Carboniferous unconformity as yet undescribed. The base of the Permo-Triassic rocks, in this area can now be extended further to the west in a small down-faulted block.

Introduction

During the search for sandstones containing barite in the area west of Nottingham, the disused quarry (SK 491393), 400 metres west of Swancar Farm, on the east side of the Nottingham Canal, was examined in detail. The discovery of an unconformity in the south east face of the quarry is the subject of this paper. The most recent publication on the area is the 6 inches to 1 mile map, Geological Survey Sheet, SK 43 NW (Dunham 1969) which follows Gibson (1910) and Shipman (1889) and does not show the presence of red beds or the unconformity in this quarry.

The south-east face of Swancar Quarry

The following sequence of rocks is exposed in the south-east face of Swancar Quarry. (text-fig. 2).

Mottled Sandstones	Soft, dark red and yellow mottled, fine-grained sandstones. Coarse, friable, buff sandstone up to 10 cms. thick.	} Up to 13 metres exposed.
----- Unconformity -----		
Lower Coal Measures, above the Low Main Coal.	Hard brown micaceous medium-grained sandstones with a weathered top, up to 4 metres exposed. Purple and green micaceous siltstones and shales 1 metre Hard brown micaceous sandstone, 1 metre Purple and green micaceous siltstones and shales. Up to 1 metre seen.	} Up to 7 metres exposed.





Figure 1 The small fault at the north-east corner of the south-east face of Swancar Quarry. Well jointed Coal Measure sandstones can be seen below the fault; soft red and yellow sandstones above.



Figure 2 South-east face of Swancar Quarry showing the unconformity, marked by inverted 'V's. Note the cross-bedded Permo-Triassic sandstones above and the massive Coal Measure sandstones below.



The upper set of beds are lithologically similar to the lowest beds seen in the old Bramcote sand quarry (SK 501389), on the west side of Coventry Lane and are considered to be the Mottled Sandstones of the local Permo-Triassic sandstone sequence. The age of the lower set of beds is in doubt, for the Clifton Fault (text-fig.1) separates the rocks of the south-east face from Coal Measures sandstones seen elsewhere in the quarry and lithologically the two quarry faces are dissimilar. The ground immediately to the north of the quarry was investigated and eventually excavated, as an open-cast coal site and the occurrence of the Three-Quarter Coal and the Low Main (Tupton) Coal, with wash-out structure, and the Tupton Sandstone were proved by the National Coal Board. South of the Clifton Fault these sandstones and coals are faulted to the west, as shown on the Geological Survey map (Dunham 1969). The whole of the Swancar Quarry is shown on this map in a sandstone above the Three-Quarter and Low Main Coals. As drawn on text-fig.1, the Clifton Fault or possibly one of its subsidiary branches is thought to pass through the north-east corner of the quarry hidden by debris and slip material at this point, but the fault will affect the age of the sandstones underneath the unconformity on the south-east face. So far we have no evidence to prove their stratigraphical position, but consider that the rocks will be above the Tupton Sandstone.

The Mottled Sandstones are predominantly red but with yellow streaks and patches and are without pebbles. The sequence commences with a thin but persistent bed of friable buff sandstone, often containing a yellowish mineral, not yet identified, encrusting the sand grains. Weathered grains of galena may be found in sand filled cracks in the top surface of the Coal Measures sandstone below. Barite cement results in less friable sandstones occasionally. The coarse sandstone passes upwards into typical fine-grained red sandstones with marl partings only a few mm. thick and coarser sandstones lenses somewhat variable in thickness and grain size. The sandstones are strongly current bedded, (Plate 11 fig.2) and at least six ripple-marked surfaces have been noted. Barite is present in the coarser sandstones resulting in the presence of much harder thin seams of sandstone, variable in thickness and lateral extent, which stand out as small ledges on the weathered quarry faces, (Plate 12 fig.2). Where the marl layers are well developed, the Mottled Sandstones have a laminated appearance.

The Coal Measures rocks are well jointed sandstones, micaceous siltstones and shales. The sandstones are more compact and buff to brown in colour, contrasting with the red sandstones above. In hand specimen the Coal Measures sandstones appear to be without barite, but small grains may occasionally be found in the rocks immediately below the unconformity. In thin section, feldspar can frequently be seen and is a distinguishing mineral. The micaceous siltstones and shales form a contrasting unit (Plate 11 fig.1), the abundant mica producing a fissile rock. The finer grained rocks are frequently coloured red, green or purple, a common alteration phenomenon of Coal Measures rocks close to the Permo-Triassic unconformity.

#### The unconformity

The exact line of the unconformity, in the quarry face, is difficult to see from a distance and does not photograph well. (Plate 11 fig.2). There is no basal breccia or conglomerate visible in the quarry face, although blocks of breccia, unfortunately not in place, were seen near the lane adjacent to Swansea Cottages (SK 490393). The unconformity is marked by a thin friable sandstone which transgresses the underlying hard sandstone. The latter has a weathered top and is discoloured in places although not to the same extent as the finer-grained siltstones and shales below. The unconformity was also seen in a temporary exposure behind Swansea Cottages. Here the soft red beds were deposited in a small, steep-sided channel eroded into the hard sandstone.

#### Red beds east of the quarry

In an effort to trace the Mottled Sandstones eastwards from the Swancar Quarry across fields and a small valley, to link up with outcrops mapped on Stapleford Hill (SK 498387), test pits were dug to sub-soil and rock depths, on a 10 metre grid basis. The occurrence of barite in red flaggy sandstones, below soil level was taken to indicate the outcrop of the Mottled

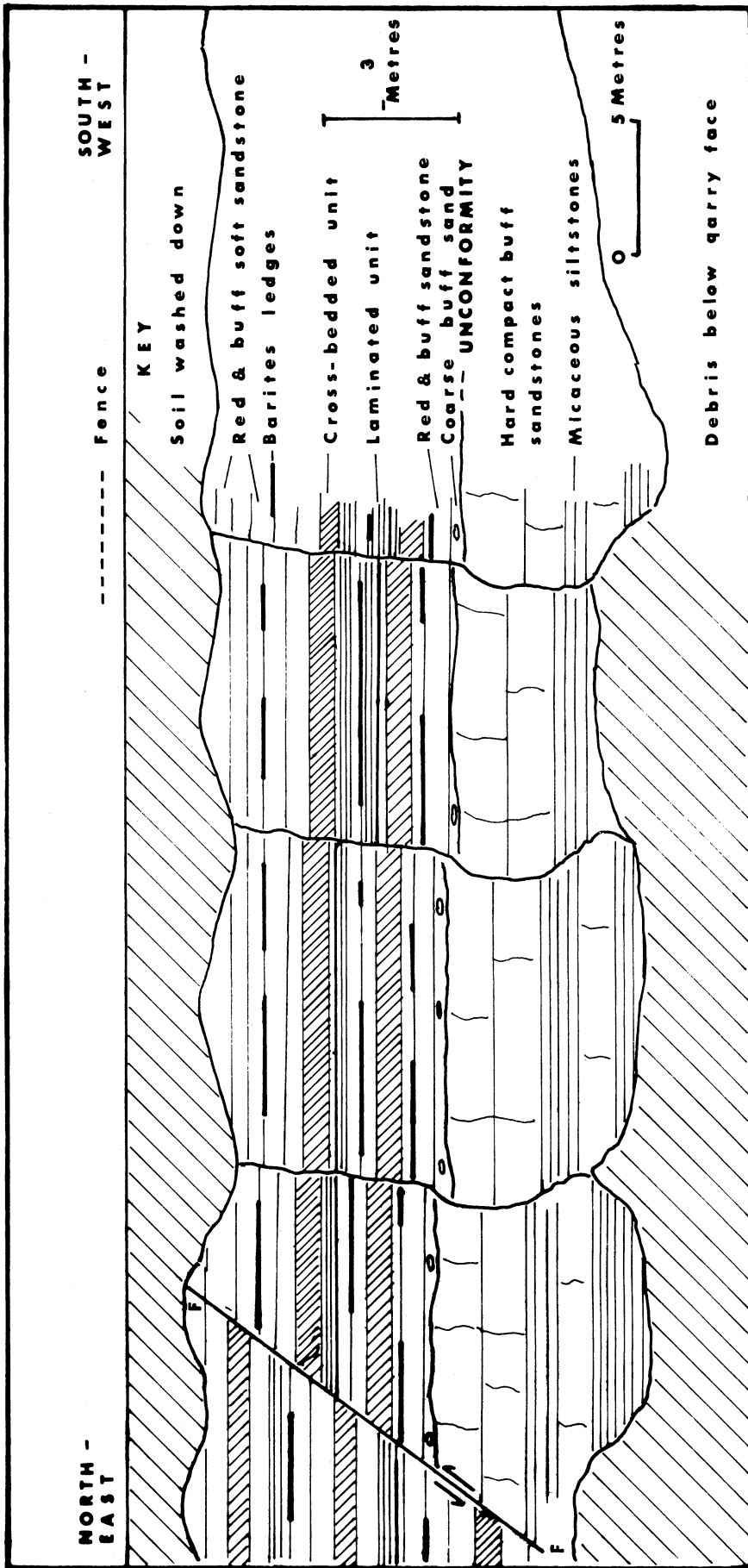


Figure 2. Diagram representing the succession in the south-east face of Swancar Quarry, showing the position of the unconformity and the lithological contrasts above and below it. The rock layers above the unconformity are thin and are not drawn to scale.

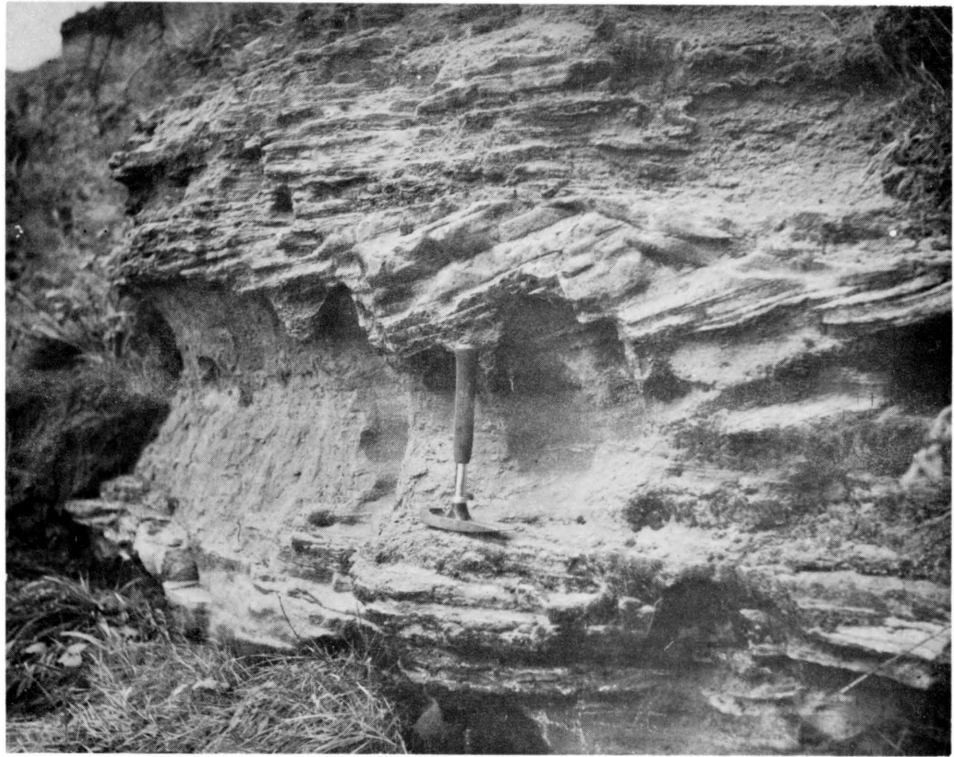


Figure 1 Old quarry face (SK 493392) in yellow cross-bedded sandstone, with prominent ledges cemented by dolomite and barite.



Figure 2 Swancar Quarry. South-west end of south-east face showing red and yellow mottled sandstones with ledges of harder rock cemented with barite.





Sandstones. In many places the soil was brown, sandy in part, clayey elsewhere and probably derived from weathered Coal Measures, the result of downwash from the higher ground north of the Clifton Fault, not of tipping during open-cast excavation, since we were assured by the National Coal Board's records of the site and by Mr. R. Moss, owner of Swancar Farm, that no such tipping had occurred in that area. These excavations showed that the Clifton Fault lies a few metres south of the line chosen by the Geological Survey Officers (Dunham 1969) and is in line with the north-east corner of Swancar Quarry.

South and south-west of Swancar Farm, red beds are clearly indicated by soils containing fragments of red flaggy sandstone with barite, which also appears as a rubbly or nodular component of the soil due to its insolubility. Barite cemented flaggy sandstones with thin interbedded grey-green clays were exposed in a trench excavated for a mains water pipe-line, (Nottingham Water Department, River Derwent Abstraction Scheme) excavated in 1968. Further excavations on the site have revealed the presence, at the junction of a red clay overlying yellow sandstone, of a fibrous mineral similar to gypsum in crystal form, which on subsequent analysis, proved to be barite.

An old quarry (SK 493391) south of the canal, exhibits a sequence of current bedded soft yellow sandstones (Plate 12 fig.1), cemented in part by dolomite. Small scale asymmetrical ripple marked surfaces, with dessication cracks are visible. On the north side of the Nottingham Canal the same beds were noted beneath red sands with barite in a recent trial bore-hole for the proposed route of the M. 42, Birmingham - Nottingham Motorway. Similar beds close to the Clifton Fault were seen in a now in-filled quarry (SK 495392) south of Swancar Farm. Finally, red beds with barite have been located in the nearby railway cutting (SK 494392).

Dolomite is not unknown from the lowest horizons of the Mottled Sandstones and was used by Swinnerton (1948) and others as evidence for the Upper Permian age of the rocks. The lithology and colour of the sandstones in the old quarry south of the canal is so unlike anything else in the area as to suggest possible age differences or de-colourisation by frictional heat from adjacent fault planes.

The stream at Field Farm, (SK 495389) flows in a small drift-filled valley, which separates the Swancar Farm area from the main outcrops on Stapleford Hill. At its lowest possible position, on Stapleford Hill, the unconformity is still too high topographically, to be joined directly with that north of the stream and a fault is therefore inferred between the two outcrops. A fault, in approximately the correct position was encountered in old workings in the Kilburn Coal and is shown on the old Geological Survey, six inches to one mile, map (Gibson 1910). This fault was also seen in the trench excavated for the mains water pipe just north of the railway line.

#### Faulting

The three faults described from the Swancar area, the Clifton Fault, a small fault a few metres to the south, and the fault forming the southern boundary of the Permo-Triassic outcrop, can be traced eastwards to the new Bramcote Sand Quarry, (SK 504387) on the east side of Coventry Lane and further east across Wollaton Vale to Nottingham University (Taylor 1965). Exploratory investigations from the sand quarry, fix the Clifton Fault along the lane leading to Moor Lane Farm (now a Restaurant). There are four closely spaced, vertical faults in the north-east corner of the quarry, which together are the equivalent of the one seen in Swancar Quarry (Plate 11 fig.1) although here, small adjustment faults can be seen to leave the main structure. The southern boundary fault of the extended Permo-Triassic outcrop can be traced across the northern flank of Stapleford Hill and was located towards the southern end of the new Bramcote Sand Quarry, where it is located within the Pebble Beds outcrop. In the lower part of the quarry, the fault seemed insignificant, with a fracture zone only 50 mm. wide and no visible displacement. At higher levels in the quarry and further to the east, the fracture zone was more extensive, over 5 metres wide, mineralised, and in the centre, there was a well developed fault breccia. The fault has now been traced across the top of the quarry for a distance of over 50 metres. The throw of the fault, as shown by the displacement of a bed

of pebbly sandstone containing large marl fragments was 6 metres. The main fault plane showed vertical slickensides. A further fault, 13 metres north of the above fault, displaces the same bed, vertically, 1.7 metres.

### Conclusions

With the discovery of red beds in the Swancar Quarry area, the outcrop of Permo-Triassic rocks can now be extended approximately 700 metres west of the main outcrop on Stapleford Hill, in a downfaulted block. The unconformity of the red beds on local Coal Measures is well displayed in Swancar Quarry.

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