THE GEOLOGY OF THE CASTLETON AREA

Leader: Dr. F.M. Taylor — Sunday, 2nd July, 1967

A geological excursion to the classic Carboniferous area of Castleton had been planned ever since the Society's Geological Tour of the Southern Peak on Sunday 2nd May 1965 (Taylor 1966) and the Kinderscout Excursion (Wilcockson 1967). Some 43 members and their friends attended this excursion, which was undertaken entirely on foot. The route and the distribution of the principal rock types are shown on the accompanying map (Text-figure 1).

Many authors have contributed to the geology of the area since Shirley's controversial paper of 1940 appeared. The following acount is indebted to Shirley, Parkinson (1965, and other papers), Wolfenden (1958), Ford (1965), Eden and others (1964) and Sadler (1964), for stimulating interest in this area and these references will enable members to delve more deeply into the literature of the area. An excursion guide to the area was prepared by Downie (1960) as part of the Geologists' Association series of geological guides. Since the excursion took place an excursion handbook for the Sheffield region has been published (Neves and Downie, 1967), containing a guide to the Castleton reef belt by Stevenson. This book provides an invaluable guide to the geology of Derbyshire and Yorkshire.

The excursion began whilst driving on the coach towards and beyond Castleton where the Carboniferous palaeogeographical features which would be seen in detail during the tour were pointed out (see Text-figure 1) and the following series of rocks was listed, to be seen in detail later:-

TABLE 1

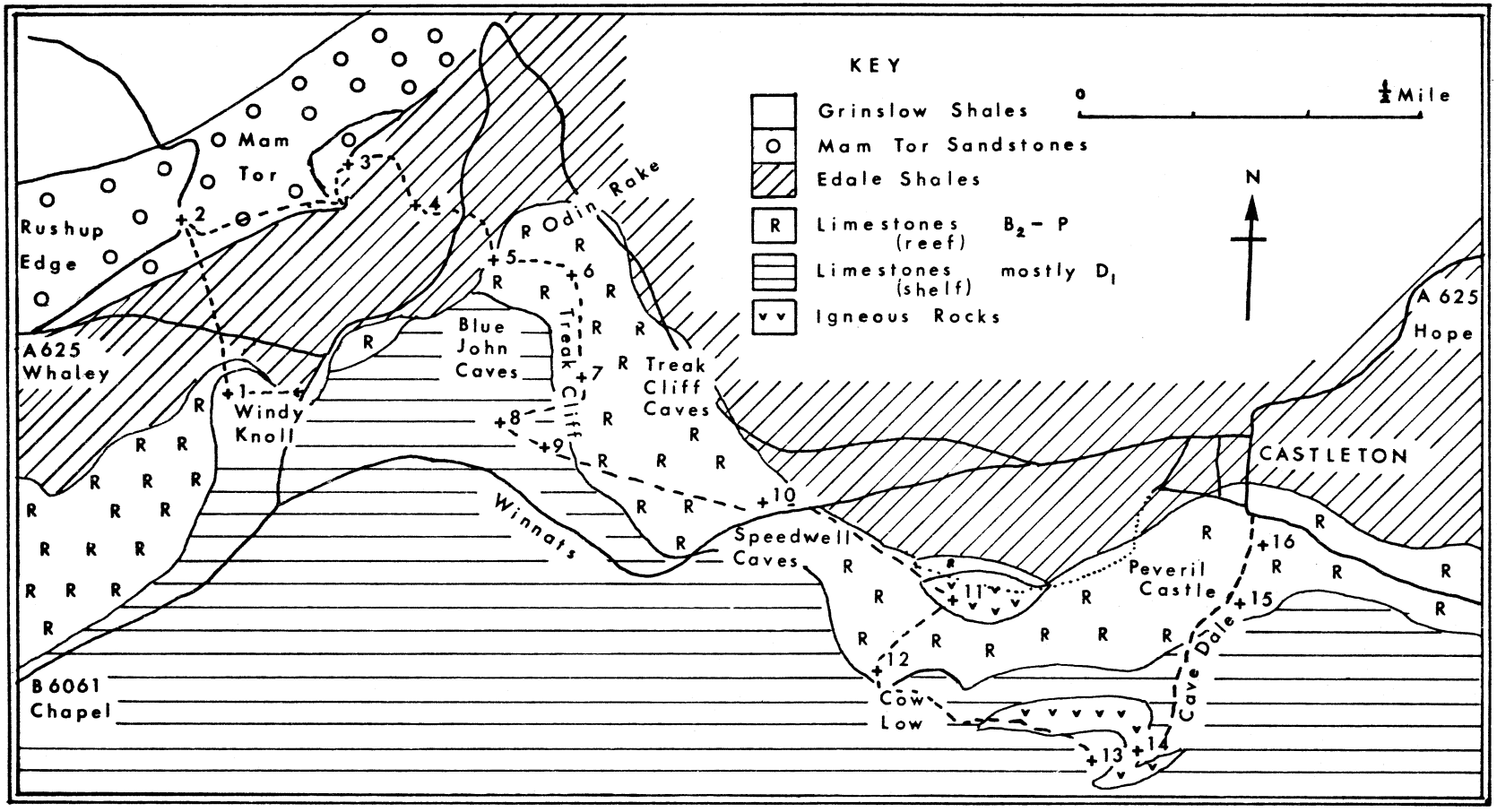
Millstone Grit Series (lower part) (Zones R, H and E)

- *Reticuloceras gracile* marine band
- Kinderscout Grit Group
- Grindslow Shales
- Mam Tor Sandstones and Shales
- Marine beds with *R. reticulatum* and *R. inconstans*
- Edale Shales including marine beds containing *Cravenoceras*, *Hudsonoceras* and *Homoceras*

Unconformity

Carboniferous Limestone Series

Back reef or Shelf limestones (Zones D_2 and D_1)	Reef limestones (Zone B_2)
Millers Dale Beds	Lateral equivalents of these
Lower Lava	beds at Treak Cliff
Chee Tor Limestones incl. *Davidsonona septosa* bed near the top	Cow Low nick and Castleton



Text-figure 1 The Distribution of Carboniferous Rocks in the Castleton area.

The Localities Visited

1. Windy Knoll Quarry (SK 127830) Members of the Society were set down from the coach close to Windy Knoll Quarry and joined by others who had arrived by car. The D_1 Limestones here occur close to the unconformable junction of these limestones with the Edale Shales. Water, draining from higher ground has entered a cave at Windy Knoll and formed the extensive underground drainage system which extends from Giants Hole, a little further to the west, to Castleton. The cave is now dry and in the past has yielded mammal remains.

In the quarry face two ancient, almost vertical fissures (neptunian dykes) are filled with blocks of limestone cemented with dark coloured limestone. At the top of this face a rubbery mass of elaterite can be seen, which is all that remains of a crude oil pool trapped beneath the impervious Edale Shales (Taylor, 1966, Pl. 17). The rest of the quarry is made up of D_1 limestones containing Palaeosmilia murchisoni, Lithistrotion sp. Syringopora sp. Davidsonina sp. and numerous giganto-productids.

From Windy Knoll, the party walked to Mam Nick, a low col between Mam Tor and Rushup Edge to see higher beds of the Namurian.

2. Mam Nick (SK 124833) At the sides of the road cutting a few feet of the Mam Tor Sandstones and Shales are exposed. On the west side there occurs a small normal fault, downthrown to the south. A view across Edale to the Kinderscout Plateau can be obtained through the col.

From Mam Nick the party walked across to the foot of the face of Mam Tor.

3. Mam Tor (SK 130835) The east face of Mam Tor is a large slip surface. The slip material can be seen extending eastwards towards Castleton, and the main Castleton - Whalley Bridge road (A 625) is built across it. The lowest sandstones exposed exhibit many slump structures. In addition to convoluted bedding, there are blocks of shale caught up in the sandstones. The upper surfaces of all the beds are eroded. Looking up the face (beware of falling stones) some of the lower surfaces of the sandstones can be seen to project out of the cliff. On these surfaces various load and groove casts can be seen aligned in an approximate east-west direction. Examples of these bottom structures can be found on the scree slope below the face. Ripple-marks may also be seen.

On the north side of the slip face a small fault cuts obliquely through the cliff, possibly a continuation of that noted above (locality 2).

4. Moving down towards the main road, the beds are seen to become finer-grained, and darker in colour. The shales may contain lamellibranchs and flattened goniatites. Certain horizons are seen to be made up of blocky sandstones, others, nodules of shaly-limestones. The latter, called bullions, often contain goniatites.

5. After examining some of these nodules, the party crossed the road and descended into the steep sided gully above Odin's Fissure. (SK 132833). Here the unconformable junction of the Edale Shales (E) on the D_1 Zone of the Carboniferous Limestones can be seen. The shales in this locality appear to be unfossiliferous. After a fruitless search the party climbed the opposite side of the gully and proceeded to the northern point of Treak Cliff.

6. Treak Cliff (SK 135822) This famous brachiopod locality again yielded many genera of brachiopods including Avonia, Pustula, Reticularia, Dielasma, Dictyoclostus, Echinoconchus, Martinia and Pugnax. Gastropods included Bellerophon and Euomphalus. There was abundant fenestellid and stick bryozoans. Less common fossils were trilobite pygidia of the genus Phillipsia, also one Brachymetopus cephalon and one Odontopleura pygidium. One specimen of the goniatite Beyrichoceras was found.

7. Continuing along Treak Cliff towards the Winnats, further fossil collecting was possible but the main object was to see algal limestones where concentric growths around shell fragments and coral tubes have been attributed to algae.

The high dip of these beds into the Castleton valley can be seen in a number of places and the impression of 'apron-reefs' bordering the almost horizontally bedded limestone of the shelf area behind begins to take shape.

8. On the moor just west of Treak Cliff old mine workings indicate the veins which contain fluorspar. Some very large dark blue crystals were obtained but no specimens of the real banded 'Blue John'.

9. From the vantage point of Treak Cliff, views into the steep gorge of The Winnats (SK 137827) were obtained. The steep-sided gorge, whether developed by cavern collapse, river-erosion, glacial flood-water or other means, is most impressive. Buttresses of limestone said by Wolfenden (1958) to be of algal origin increase the grandeur of the gorge.

10. At the foot of the Winnats, near Speedwell Cavern, a limestone occurs which is simply a mass of flattened and eroded brachiopod shells. The beds have recently been re-examined by Sadler (1964) who attributes them to erosion of the limestone in Carboniferous times.

From the Winnats, the party took the footpath alongside Long Cliff towards Castleton.

11. Speedwell Vent (SK 145825) Just before Cow Low nick and above the path, recently cemented scree deposits can be seen. Just beyond the nick 'scratch-holes' reveal volcanic coarse tuff fragments associated with the Speedwell Vent. The climb up to the gully, Cow Low nick, though strenuous is worth the energy expended.

12. Cow Low nick (SK 142824) On the west side of this gully, near a mineral vein, excavations reveal the remnant of an ancient cephalopod shell bank or pocket deposit. A. J. R. Allen, T. D. Ford and others have described the many goniatites obtained from this locality. Elsewhere, in the gully, additions to the brachiopod collection can be made. The steep dip of the beds towards Castleton further emphasises the reef-nature of these beds.

A short climb up the gully enables one to reach the broad platform of Cow Low and a short walk across this brings one to the neighbouring valley of Cave Dale. On this walk, note the sandy nature of the soil, which indicates the presence of weathered igneous rocks beneath. The fresh rock is exposed on the west side of Cave Dale, below prominent limestone outcrops.

13. Cave Dale (SK 148823) These limestones occur well behind the reef limestones and belong to the 'standard' or 'shelf limestone facies'. The rocks are well bedded and a coral bed can be located containing among others the massive coral Lithostrotion arachnoideum.

14. Below the limestones, good exposures in the Cave Dale igneous rocks can be examined. The greater part of the exposure, is a dark blue-grey basalt but at least one layer of coarse tuff has been seen here. It is possible that these rocks are associated with the Speedwell Vent.

15. Continuing down Cave Dale the bedding is maintained but occasional mounds of reef limestone can be seen. One of these, beneath Peveril Castle, on the east side of the dale contains another fossil shell bank or pocket deposit. This time most of the fossils are brachiopods of the genus Pugnax.

16. A little lower down the valley, reef-limestones occur again with a further opportunity for collecting brachiopods. In this locality a small mineral vein can be seen, mainly calcitic but with copper minerals also.

A few yards along a narrow passage brings one into Castleton and the end of the excursion.

The excursion shows the relationship of well bedded, shelf limestones with the less well bedded reef-limestones and suggests that the Castleton valley occupies a former basin area in front of these reefs.

The party returned to Nottingham by bus.

F.M.T.

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