EXCURSION

Millstone Grit of South Derbyshire

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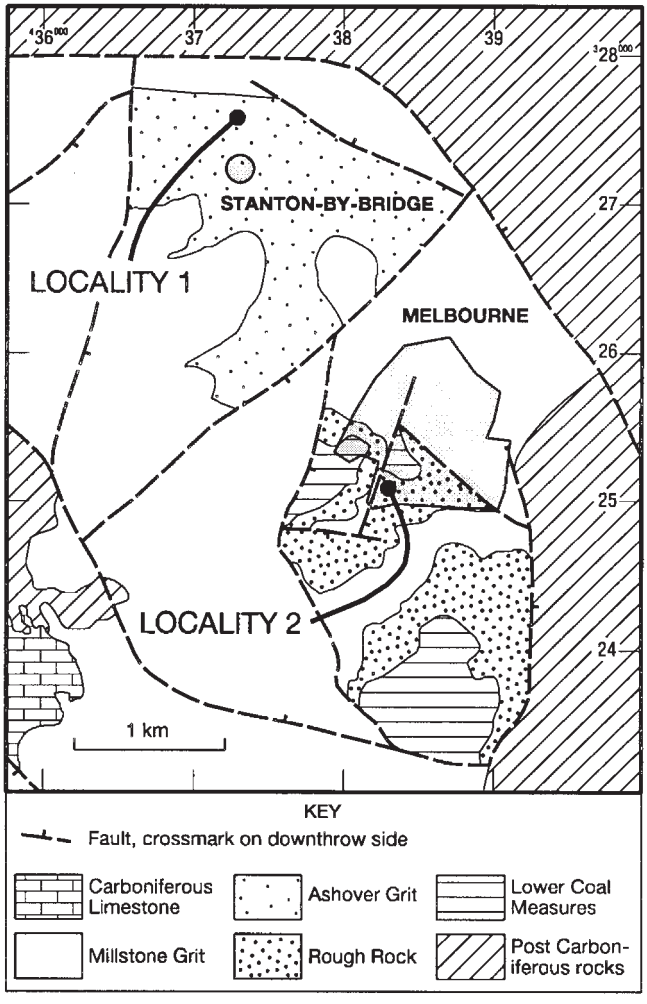
The purpose of this excursion was to examine exposures of the inlier of Namurian strata, at Melbourne in South Derbyshire. This inlier has received very little attention from past workers. It was briefly described by Fox-Strangways (1905, 1907), who identified three subdivisions; an upper series of fine-grained, thin bedded sandstones; a middle series of massive, coarse, yellow, brown and red grits; a lower series of coarse conglomeratic beds. He noted that tracing the beds any distance was difficult and made no attempt to correlate the grits with those in North Derbyshire, nor did he give any indication of age. Mitchell and Stubblefield (1948) noted that the Dawsons (Carver's) Rocks inlier was probably the Rough Rock, citing evidence from a brick pit at Worthington in support. Here, marine Namurian beds were proved with a fauna suggesting a horizon a little below the Rough Rock. Kellaway and Horton (1963) noted a Marsdenian fauna from boreholes near the Staunton Harrold Reservoir and the Subcrenatum Marine Band, defining the base of the overlying Langsettian (Lower Coal Measures), was mapped at outcrop just to the south of Melbourne. This identified the presence of the Rough Rock. Ford (1968) noted Arnsbergian shales in the Ashby Borehole, sited just west of the Namurian inlier. Monteleone (1973) reported an E1 (Pendleian) age for the beds at Diminsdale, based on palynology, but gave no details of the assemblage. Fulton and Williams (1988) suggested the inlier was of Kinderscoutian to Yeadonian age.

Recent mapping by the British Geological Survey and an appraisal of cored boreholes in the area has provided new evidence for the Namurian stratigraphy (Ambrose, 1997, in prep; Ambrose and Carney, 1997; Carney et al., 2001a, b). The boreholes have proved several marine bands and identified the Rough Rock, Chatsworth and Ashover Grits. These grits have in turn, been mapped out at the surface. They have been worked for building stone in several places and this excursion visited two of these quarries, one in the Ashover Grit and one in the Rough Rock

The Millstone Grit sandstones have traditionally been regarded as deltaic in origin; the Ashover Grit was deposited by a major braided river complex, probably flowing across a delta top. Sediment, rich in feldspar grains and derived from a northerly source, was deflected to the NNW along the Widmerpool Gulf by a landmass which lay to the south. This landmass, variably referred to as 'St George's Land', 'Midland Barrier', 'Wales-Brabant Island/Barrier', 'Midland Landmass/Massif', is also thought to have supplied sediment in the early Namurian. Heavy mineral studies show two sources of sediment in the Millstone Grit of south Derbyshire. In the Melbourne Borehole, the lowest grits and the Chatsworth Grit were all derived from a southerly source, while the Ashover Grit and Rough Rock were derived form a northerly source. The same pattern was seen in the Worthington Borehole but with some suggestion of mixed sources in the Ashover Grit (Hallsworth, 1998). Palaeocurrent measurements taken from some sandstones show currents mainly to the north and northwest, with some to the west and northeast.

Locality 1 was at a quarry in the Ashover Grit at Stanton by Bridge. This quarry provided the stone used to build the bridge across the River Trent, here, linking it with Swarkstone on the north side of the river. The Ashover Grit crops out extensively around Stanton by Bridge where it is a single sandstone which is at least 33 m thick. To the east and southeast, the Ashover Grit splits into more than one sandstone bed. Its correlation with the Ashover Grit of the Melbourne Borehole is based on the presence of common, coarse, angular, pink K-feldspar grains; the sandstones above this level at



Outline map of the geology of the Melbourne area, showing the two localities visited.

outcrop and in the borehole are all devoid of pink feldspar.

The grit is well exposed in two quarries at Stanton by Bridge and has been worked in several others (which are now overgrown). It exposes about 8 m of buff to grey, fine- to very coarse-grained, poorly sorted, cross-bedded sandstone, which is commonly pebbly. The pebbles comprise rounded quartz and angular to subangular pink feldspars. Alternating coarser and finer foreset laminae with rapid upward fining are seen in some beds. Individual sets vary from 0.3 to 1.2 m thick and many have erosive bases with pebbly lags. Palaeocurrent data collected from here and a nearby quarry showed dominant trends to the north, northwest, and west with minor variations to the southwest, south, northeast and east.

Locality 2 was a quarry on the south side of Melbourne. The quarry, which provided much of the building stone used in the town, exposes about 15 m of the Rough Rock, which forms the uppermost bed of the Millstone Grit. Recognition of this sandstone as the Rough Rock is based on evidence from earlier mapping carried out in 1963, prior to the construction of the Staunton Harrold reservoir. The Subcrenatum Marine Band was identified at outcrop (Kellaway and Horton, 1963) overlying the sandstone and marking the base of the overlying Lower Coal Measures (Langsettian).

The main face exposes a uniform sequence of buff, with some red or orange-brown staining, fine- to medium-, locally coarse-grained sandstones. The sandstones are almost exclusively planar cross-bedded with sets generally 0.5-1.0 m thick. Locally there are thinner sets and in parts of the quarry, there are at least three thick sets 2.0, 3.55 and 4.0 m thick. No parallel-lamination is exposed. Some parts of the quarry expose large-scale trough cross-bedding, seen only in the lower beds. These bedforms are not persistent on any one level and pass laterally into planar cross-bedding. The sets are up to 1 m thick and 3-4 m wide. The recognition of trough cross-bedding may be a function of accessibility as the upper beds are not readily visible or are absent.

In some of the sets, clearly defined coarser (coarse- to very coarse-grained) and finer laminae are present, indicating grainflow and grainfall processes respectively. Bottom sets are well developed in many of the sets and bases may be planar or gently undulating; some have a basal pebbly lag, consisting of angular to well rounded granules and small pebbles up to 20 mm in diameter, of vein quartz and pink feldspar. The bottom sets of some units are also coarser. The upper of the two thick sets shows clearly defined rapid fining upward cycles 1-4 cm thick. In the uppermost beds, climbing ripple lamination is locally developed. Palaeocurrent measurements taken from planar forsets and trough axes show flow directions varying from WSW to NE.

The only other palaeocurrent data from the Rough Rock in this area has been published by Fulton and Williams (1988), from the outcrop at Carver's Rocks, to the west of the present area. They show a distinct bimodal distribution to the west and northwest. Bristow (1993) considered the Rough Rock to have been deposited by a braided river on a delta top.

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