EXCURSION

Field excursion to Ramshaw Rocks and Chrome Hill

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As it turned out, this excursion, advertised as "Chrome Hill and The Roaches", was not as ambitious as the title implies for it would have been impossible to do justice to both of these fine areas in one day. Fortunately, most of the 60 or so members and friends attending must also have read the itinerary in the circular before packing their sandwiches and waterproofs and realised it wasn't to be the gruelling marathon a clamber along the Roaches *and* an ascent of the Chrome Hill would have become.

En route to Ramshaw Rocks, the first objective, the coach took us for some eight miles along the summit of the long broad ridge of Morridge. This major feature, on the western limb of the north-south trending Mixon-Morridge Anticline, is formed by the combined resistant effects of a number of sequences of thinly bedded protoquartzitic turbidite siltstones and sandstones of Pendleian to Arnsbergian age (Namurian E_1-E_2), collectively known as the Minn Sandstones. At a suitable vantage point about halfway along the ridge (SK 0288 5961), the party briefly left the coach to view what must be one of the finest and most instructive landscapes in England for illustrating the inter-relationship of geology and scenery. In particular, to the north-west lies the southerly culmination of the Goyt Syncline (formerly known as the Goyt Trough), the longest and most clearly defined of all the major north-south trending folds that involve the Carboniferous rocks between the Derbyshire Dome and the Cheshire Plain. Before the view was obscured by the first heavy shower of the day, the feature that best reveals the synclinal culmination was pointed out. This comprises the craggy escarpments of the Roaches Grit forming the rim of the synclinal basin at the Roaches, Hen Cloud and Ramshaw Rocks. These face west, south and east respectively. At this viewpoint it was also suggested that members tried to imagine what this view would have been like some 20,000 years ago when the Devensian ice sheet would have extended from the slope just below, across the Cheshire Plain, to the western horizon.

The structure, stratigraphy and drift geology are also well illustrated by the geological maps of the area published by the British Geological Survey, namely the special 1:25 000 sheet SK06 (The Roaches and Upper Dove Valley) and the 1:50 000 sheet 111 (Buxton).

As our coach approached Ramshaw Rocks on the A53 Buxton-Leek road some of the party caught a glimpse of the famous Winking Man. This is not exactly what the name suggests but a trick of the light passing, apparently momentarily, through a hole in one of the outstanding buttresses, silhouetted against the sky when seen from a moving vehicle.

Leaving the coach on the A53 (0192 6193), a short walk took the party to the foot of the crags of Ramshaw Rocks where it was explained that from early Namurian (Pendleian, E_1) times river deltas had prograded from a general northerly direction into the Pennine region depositing thick sequences of coarse feldspathic sand to form successive formations of the Millstone Grit Group. However, it was not until late Kinderscoutian (R_{1C}) times that the first feldspathic sand reached this area of north-east Staffordshire. These earliest deposits took the form of turbidites at foot of the slope of the delta that deposited the Kinderscout Grit. Furthermore, it was not until the middle of the Succeeding Marsdenian Stage in R_{2b} times that the river channels of another great delta, prograding from the south-east but probably having its ultimate source far to the north, finally reached the region to deposit the Roaches Grit, a full fluvial-delta sequence.

The full sandstone-dominant sequence is estimated to be about 400m thick in the Roaches area (Aitkenhead *et al.*, 1985, fig. 33). It mostly comprises the Five Clouds Sandstones of mainly turbidite facies deposited in fans at the foot of the delta slope and the Roaches Grit itself, mainly of fluvial delta top facies.

The sedimentology of the crags before us had been studied by Dr Colin Jones (1980) who here recognised two major coarse sandstone lithofacies. These comprise

'giant cross-bedding in solitary sets' which can be up to 20m thick, and beds with faint lamination revealed by bands of small quartz pebbles which tend to occur at the bases of channels with well marked erosion surfaces. The main stop was at a point where such an erosion surface was well displayed at the base of a channel cut into giant cross-bedding from an earlier channel-fill (Fig. 1; see also Jones, 1980, pl. 2, fig. 1).

Before the party left this locality, Dr Aitkenhead invited Dr Bill Read to say how he saw the Roaches Grit in terms of the concept of sequence stratigraphy, the subject of his recent lecture to the Society and of an even more recent publication (Read, 1991). Dr Read pointed out that for several decades it has been accepted that the cyclical alternations of deltaic sand and marine mud that characterised Millstone Grit deposition were mainly due to eustatic sea level oscillations. The Roaches Grit was deposited in a major turbidite-fronted delta which prograded during a eustatic lowstand and which closely resembled the 'lowstand systems tracts' of the sequence stratigraphy concept (Posamentier and Vail, 1988).

After a lunch stop at Earl Sterndale, the coach took us to Dowel Farm (also known as Dowall Hall). From here, for the remainder of the afternoon and with the kind permission of the farmer, Mr Bill Etches, we were to look briefly at the Dowel Dale and then walk over Chrome Hill. Before setting off, a brief account of the general geological setting was given; this is also described in the BGS memoir covering the Buxton district (Aitkenhead *et al.*, 1985) and is covered by the published BGS geological maps, especially the 1:25 000 sheet SK06, which shows a cross section that includes Chrome Hill and Dowel Dale. The area lies at the western margin of a Dinantian carbonate shelf or platform that reached its acme of growth during Asbian times.

The platform is founded on a basement high and is thought to have been built up during an epoch of generally rising sea level, largely by the accumulation of calcareous sand. This was derived locally from the abundance of lime-secreting organisms that lived in the clear, warm and well oxygenated tropical waters. Being self-generating, the platform, especially in Asbian times, developed steep margins on which lime mud paradoxically accumulated and an assemblage of organisms existed that was even more abundant and varied than on the platform. These contrasting facies were described in a classical paper by Wolfenden (1958) and it was largely his interpretation that formed the basis

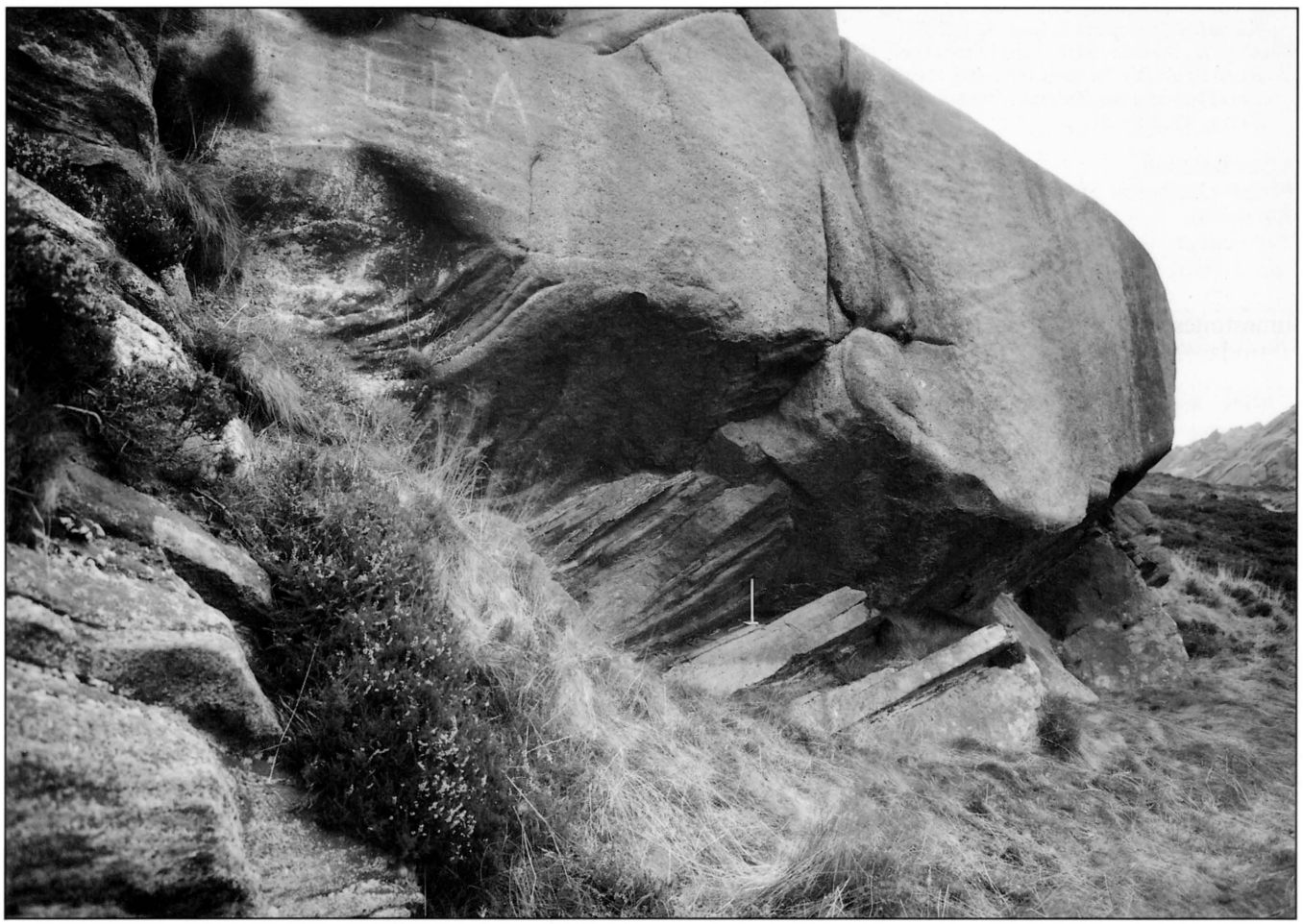


Fig. 1. Roaches Grit at Ramshaw Rocks showing a well-marked erosion surface at the base of a faintly laminated sandstone channel fill cut into large-scale cross bedding of an older channel fill. British Geological Survey photograph L1226 previously published by Jones (1980, pl. 2, fig. 1). Reproduced with permission of the Director, British Geological Survey, NERC; and of the Yorkshire Geological Society.

for the afternoon's excursion. The Geological Survey has used the term 'apron reef' for the fossiliferous fine-grained limestones of the marginal facies that are part of the formation now known as the Bee Low Limestones. The apron reef includes the reef and fore-reef limestones of Wolfenden (1958), who found that, as the reef is approached from the platform side, there is an increase in the proportion of well-rounded grains in the well-bedded shelf calcarenites. Nearer the reef, bedding becomes increasingly ill-defined, the grain size diminishes and the fossil content becomes more abundant and diverse. The reef itself forms only a small and discontinuous part of the apron reef. It consists of wall-like masses, up to 24m high and 9m wide, of micritic limestone comprising, according to Wolfenden (1958), a framework of stromatolitic algae supporting encrusting bryozoans and sponges. This facies passes laterally into the fore-reef limestones which have an even more abundant and varied fauna and a well marked but rather irregular bedding with a steep dip towards the basin. Geopetal infillings of shell cavities have been used to show that these dips are largely depositional. From this it follows that the present day fore-reef dip-slopes approximate to the original submarine slopes.

Many of these features are well displayed around Dowel Dale and Chrome Hill. However, the details of the limestone facies could only be elucidated by the sort of study that Wolfenden (1958) made, involving the examination of large numbers of samples in thin section or etched surface. Indeed, the limestone crags exposed on the west side of Dowel Dale are generally coated with lichen. Nevertheless, at one point (0759 6751) the wall-like form of the algal reef could be seen overlain by bedded limestones, indicating that vertical reef growth had ceased and the shelf limestones had prograded over the top. Further down the dale (0754 6751), the irregular steeply inclined bedding in the fore-reef limestones is visible and members soon discovered the abundantly fossiliferous nature of this facies by examining loose fragments. Many of these had been deeply etched by humic acids from the enclosing soil before being released by erosion to fall to their present resting place at the foot of the crag. Nearby, at the base of the slope, a large tree had been uprooted revealing an exposure of dark grey weathered shaly mudstone. This was taken as a strong indication that the broad amphitheatre before us is floored by these mudstones which are almost certainly of early Namurian age. The geological map (Figs 2, 3) showed this amphitheatre to be largely surrounded by fore-reef limestones, probably near original submarine slopes on the north and east sides but complicated by faulting and folding on the south and west sides. Later, from half way up the northern slope of Chrome Hill, the deeply embayed topography of the platform margin could be easily seen and it was recalled that Hudson (1931) had first recognised that the topography was pre-Namurian and had been exhumed by the erosion of the relatively soft, unconformably overlying mudstones. However, it was the work of Wolfenden (1958), followed by Broadhurst and Simpson (1967), on the margin at the opposite side of the platform at Castleton, that led to the conclusion that the fore-reef slopes are largely original. This was further refined at Chrome Hill by the discovery by Timms (1978) that brachiopod communities at various levels on the fore-reef slope are each associated with a particular relative water depth.

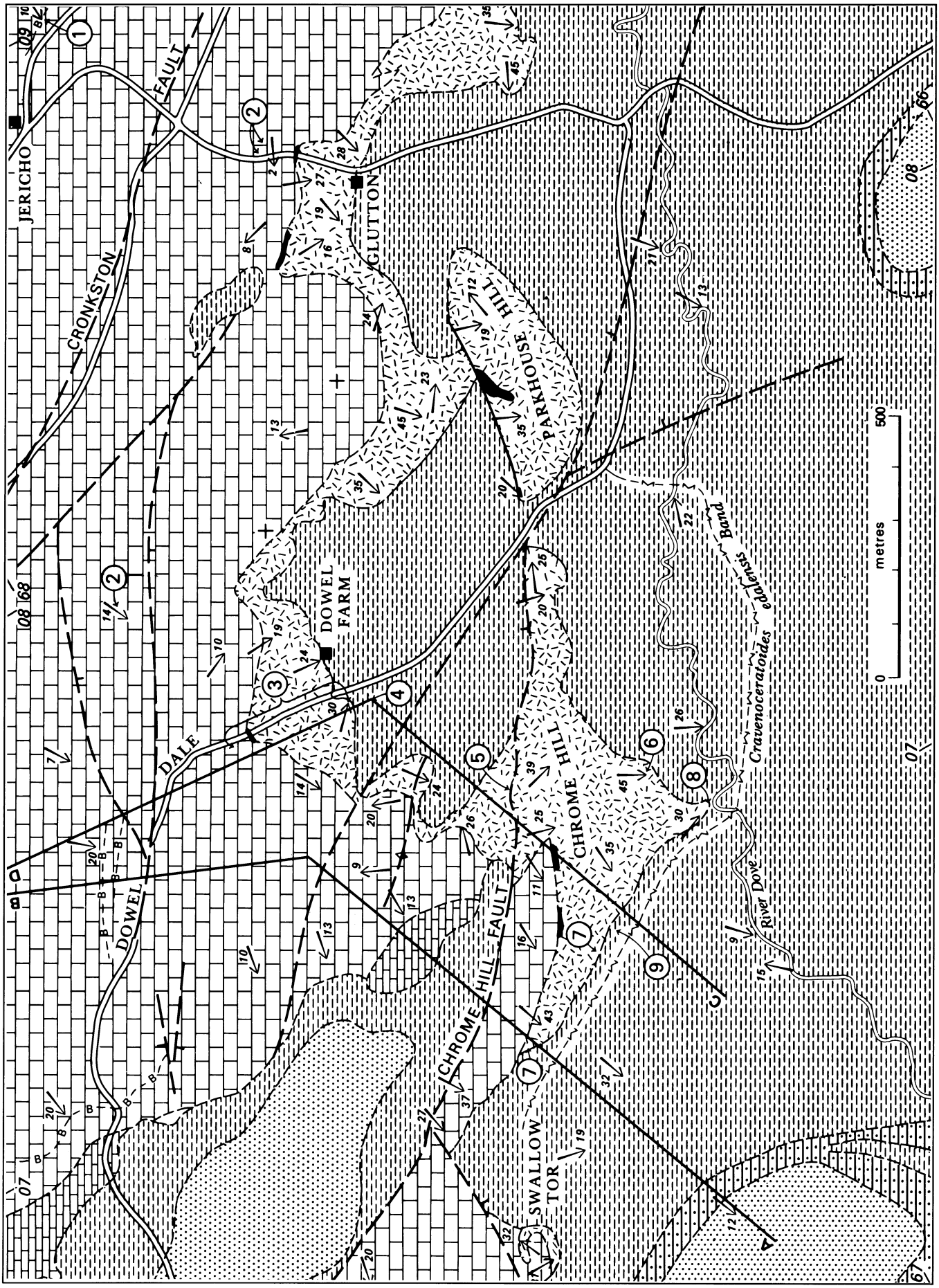
Half way up Chrome Hill at the foot of the steepest part of the north face, the party examined the mineralised fault plane of the Chrome Hill Fault, studded with small aggregates of galena crystals. Nearby, further along the line of the fault to the west (0712 6738), there is evidence of old diggings, presumably for lead, with bare patches of poisoned earth. One larger boulder of breccia contained small crystals of purple-pink fluorspar. Looking east, the line of the fault can easily be discerned along the foot of the north face of Parkhouse Hill. Beyond, a line of pits up the fore-reef slope flanking the east side of the Glutton embayment shows that the line continues as a mineral vein, apparently without fault displacement.

After walking a short distance to the west, the party could see further evidence of the succession of younger strata on the downthrow (or hangingwall) side of the Chrome Hill Fault. The low hill immediately to the north is largely composed of dark beds of the Monsal Dale Limestone of Brigantian age. Close by at its foot, a doline or sink hole has formed at the edge of the limestone outcrop where acidic waters have drained off the area underlain by the impervious Namurian shaly mudstones. Higher up the slope to the north-west, gorse bushes and dry stone walls built of dark grey brown sandstone show that the ground there is capped by the lowest sandstones in the Namurian sequence, the Longnor Sandstones.

At this point, there was some discussion of the possible pre-Namurian and late Brigantian age for the main movement of the Chrome Hill Fault. The geological map indicates that this is the case, since the fault line stops at the limestone-shale boundary on either side of Parkhouse Hill, but positive proof is lacking. Most of the party opted to climb the final slope to the summit where despite the gale force wind, members lingered long enough to enjoy the extensive views down the Dove and Manifold valleys to the south, and to the gritstone moors around Axe Edge and Kinderscout to the north.

Wolfenden (1958) found that the algal reef was developed at a second higher level near the summits of Parkhouse and Chrome hills, due to prograding of the shelf limestones and a consequential southward migration of the apron-reef facies towards the basin in later B_2 (Asbian) times. On Chrome Hill, the algal reef is weathered out as a tower of micritic limestone on the north side of the ridge 60m east of the summit, but again full identification of the facies is difficult because of the lack of naturally etched surfaces.

The final stop of the day was at a locality (0719 6706) at the foot of the fore-reef dip slope low on the southeast side of the hill. Here, members were able to examine a remarkable bed composed largely of gigantoproductids that rests unconformably on the fore-reef limestones. Nearby, highly discordant fabrics, some with a near-vertical alignment, suggest the presence of a boulder bed.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CRONKSTON FAULT
GLUTTON
PARKHOUSE HILL
DOWEL FARM
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CHROME HILL FAULT
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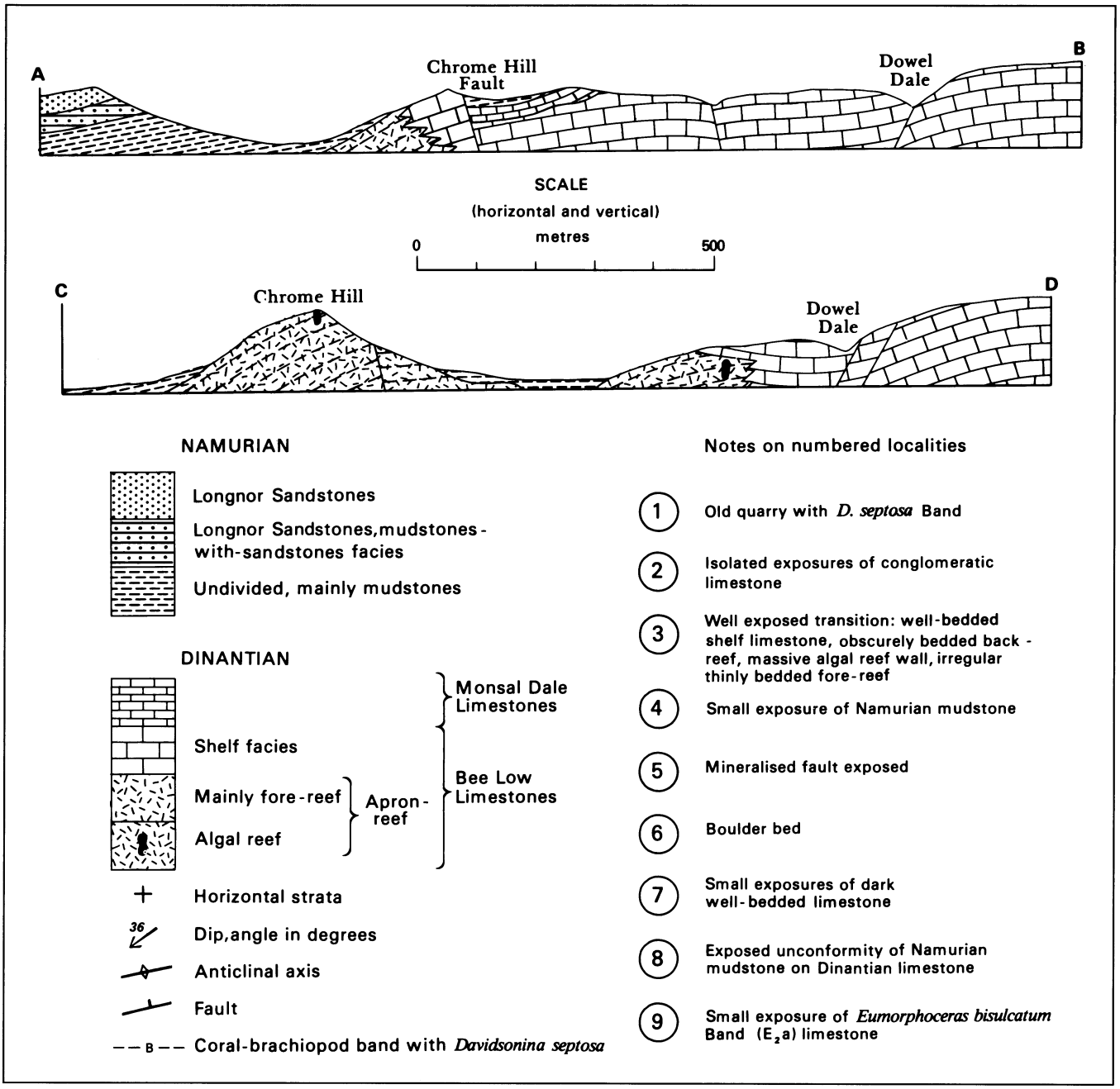

Figs. 2, 3. Geological sketch map of the Chrome Hill area, upper Dove valley (opposite page) with the key and cross sections along lines A-B and C-D shown above (this page). Localities 3, 4, 5 and 6 were among those visited on the excursion described in this article. (Modified from Aitkenhead *et al.*, 1985, fig. 9, and published by permission of the Director, British Geological Survey, NERC).

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