EXCURSION TO THE DINANTIAN CARBONATES OF THE WIRKSWORTH - CRICH AREA

Leader: Paul H. Bridges — Sunday, October 14, 1979

The purpose of this excursion was to unravel some of the evidence for the conditions of carbonate deposition and diagenesis on the southern and eastern margins of the Derbyshire limestone platform during Brigantian (late Dinantian, D2 - P2) times.

Coal Hills Quarries (disused); Wirksworth SK 286553 (Tarmac Roadstone Ltd.)

The party of about 60 first visited a fine 'reef knoll' complex developed in the Cawdor Limestone (Walkden *et al.* 1979). The area was lightly shrouded in autumn mist. Close examination of one 'knoll', approximately 40 m in diameter at its base and 6 m high, showed it to be composed of crudely bedded skeletal wackestones locally passing into lenticles of skeletal grainstones and patches of intraclast and fenestral rudstones (text-fig. 1). The fauna largely consisted of small, thin-shelled productids with their delicate spines preserved, disarticulated crinoid columnals and numerous fenestellid bryozoa. Micrographs of the fenestral rudstones showed that the former system of highly irregular cavities with productids and fenestellids had been infilled by a radial-fibrous cement. The term carbonate mound was preferred to 'reef knoll' in order to avoid the implication that the shelly benthic fauna formed a skeletal framework in a manner similar to modern patch reefs.

Just 80 m to the north, members of the party investigated the well bedded limestones which had formed on the lee side of the carbonate mound. Thickly bedded units of coarse skeletal grainstones and rudstones alternated with more thinly bedded, finer grained and more bituminous units of limestones. The skeletal grainstones and rudstones were composed of highly comminuted and abraded thick-shelled gigantoproductids and crinoids. Micrographs showed that in some instances the outer laminated part of gigantoproductid shells, with well developed pseudopunctae, was intact, but in most fragments, this layer had been removed by abrasion leaving a thick (up to 1 cm) inner layer of coarse prismatic spar. The bituminous limestone yielded specimens of gigantoproductids with the valves still articulated together. Micrographs revealed the presence of numerous endothyrid foraminifera. One crinoid calyx was also discovered.

It was suggested that the finer grained, bituminous limestones represented the host substrate for many of the gigantoproductids, while the skeletal grainstones and rudstones represented shell debris which had been heavily and repeatedly reworked before being finally deposited in the environment to the lee of the carbonate mounds.

Hopton tunnel Sk 265547 (High Peak Trail)

After lunch, and with visibility much improved, the party made a brief visit to the exposures of Matlock Limestone situated on the High Peak Trail. Well bedded skeletal grainstones with nodular development of chert were traced westwards into heavily dolomitized and partially silicified carbonates. Micrographs showed that the dolomite varied from finely to coarsely crystalline, but relics of the former shell debris could generally be discerned. Cryptocrystalline and microcrystalline quartz were developed as small and irregular patches. It was uncertain whether the dolomitization had been caused by upward moving fluids accompanying late Carboniferous mineralization, or by downward moving brines associated with desiccating playa lakes developed in Permo-Triassic times.

Cliff Quarry (disused section) Crich SK 345553 (Owners: Butterley Aggregates; access-Crich Tramway Museum)

Finally, the party travelled to see the finely exposed Matlock Limestones at Crich (Smith *et al.* 1967). The lower part of this sequence of well bedded limestones showed a distinctive pattern of sedimentation. The succession included a series of units ranging from

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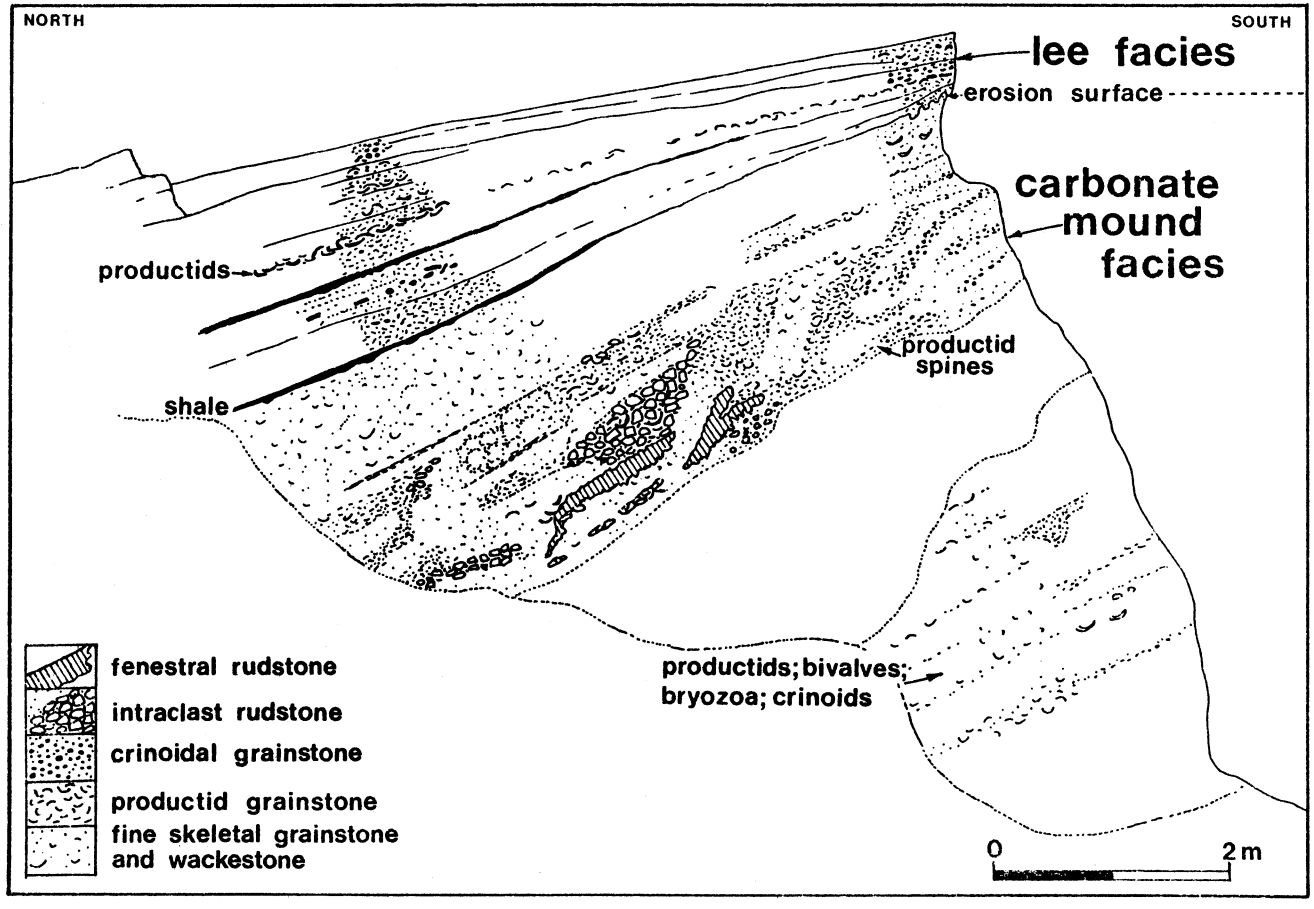

Text-figure 1: Diagram showing a section through the northern (leeward) margin of the carbonate mound in Coal Hills Quarry. Crudely bedded, fine skeletal grainstones and wackestones predominate, but they are interrupted by a conspicuous northward dipping zone characterized by irregular lenticles of coarse skeletal grainstones, intraclast rudstones and fenestral rudstones. Towards the top of the sequence coarse productid and crinoidal grainstones of the lee facies rest erosively on the carbonate mound facies.

1.5 to 4.0 m thick, each dominated in its lower part by sand grade skeletal packstone with scattered broken valves of brachiopods. Locally there were horizons of coarse skeletal grainstones. These packstones and grainstones were composed of finely comminuted productids, terebratulids, crinoid columnals, productid spines, bryozoa, ostracods and foraminifera. Most of the grains were partially micritized. However micrographs taken of peels taken from the upper parts of the units showed a higher concentration of peloids and a reduction in the proportion of identifiable skeletal debris. These peloids generally occurred as a packstone but locally they were matrix-supported and formed a peloidal wackestone, with small fenestrae of cryptocrystalline quartz. The top surface of these units was erosional and displayed an array of irregular trochoidal scoops and ridges generally 3-10 cm in relief. There were however, no laminated carbonates (reminiscent of karstic soilstone crusts) which have been discovered elsewhere in rocks of Brigantian age in Derbyshire (Walkden, 1974). From comparison with modern carbonates in Shark Bay, Australia (see Hagan & Logan, 1974) it was suggested that each unit reflects a period of gradually shoaling water. Further work in progress, was necessary to confirm this.

References

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