

Curious markings on bedding surfaces

SIR – In view of the special interest now being shown in the degree of consolidation and lithification reached by sediments, in particular cases, before deformation by folding, it is perhaps opportune to recall the curious markings on bedding surfaces described a long time ago, and to reassess their significance.

The markings were found to occur sporadically on bedding surfaces of shale in the Aberystwyth Grits formation. This formation is splendidly exposed along the coast in the neighbourhood of Aberystwyth, Wales, and it was at localities on these cliffs that the finds were made in 1926 and 1929. After the *Geological Magazine* containing the first paper had reached Leningrad I had a letter describing the discovery of a solitary similar occurrence in a Mesozoic formation in Transbaikalia, made in 1926. This I duly reported in 1928.

These two formations, one in western Wales and the other in the heart of northern Asia, surely cannot be so exceptional in their lithology and in their sedimentary and structural history as to be the only ones in the world to contain these highly distinctive, tell-tale markings, yet I have not seen mention of any further occurrences during the last 50 years.

The markings are described and illustrated in the 3 papers mentioned above and cited at the end of this letter. They are bent, angular, and hooked traces, those of the several sets varying in size from about 10 to 50 cm in overall length; slightly grooved and lighter in colour than the rest of the surface and varying greatly (in any one set) in degree of accentuation. They are irregularly scattered and may overlap. Each surface on which the markings have been found is practically plane over the part exposed (a few square metres on average) and is smoothed or polished or even striated, and dips according to the fold-structure at the locality. The surfaces evidently represent upper surfaces of deposition of mud.

In each set the marks are variations on a basic pattern and in some sets there are signs of more than one pattern; but they do not vary uniformly, the rate of variation being very different at different parts of the surface.

On removing a flake of shale overlying a marked surface (where this was possible) there was found, with one exception, a thin film of clay separating the two surfaces. In the one case, however, there was some sign of counterpart ridged marks on that overlying surface. The grooved marks nevertheless have every appearance of having been produced by the grinding along them of some small projection.

A rather strange feature of these occurrences is the presence of graptolites (*Monograptus*) on some of the marked surfaces, and in one case a small brachiopod (*Eocoelia*). Graptolites occur only very locally in the Aberystwyth Grits and brachiopods are extremely rare. A most important point about these fossils is that they show no sign whatever of having been scraped along the surface, nor are they distorted in any way.

At the well-known locality for certain species of *Monograptus*, Cefn Hendre quarry on the hill above the town, the graptolites are also found chiefly on bedding surfaces that have a polished appearance, and the fossils are quite undisturbed. None of the peculiar markings, however, have been found on these surfaces (Challinor, 1949).

At the time of the original descriptions of the curiously marked surfaces it was assumed that the special features were produced entirely by tectonic forces operating long after the consolidation of the strata, but it now appears more likely that the 'polishing' and 'marking' of them was the result of a slithering between bedding surfaces while the rock was still plastic.

References

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