Fusiform Structures in Sullavai Sandstone—Biogenic or Abiogenic?

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The late Proterozoic Sullavai sandstones and quartzites constitute the basement of Gondwana sedimentation over an extensive tract on the western margin of the Godavari basin. The present study relates to some observations made on fusiform structures (Fig. 1) in the Sullavai sandstones occurring in the stream *Sudda Vagu*, 4 km north of Chelvai (18°12′ : 80°06′) in the Warangal district, A.P.

The Sullavai sandstones in the study area strike NE-SW dipping steeply towards northwest. The basal Talchir diamictites rest on the Sullavai outcrops with a gentle dip. The sandstones are quartzitic and are characterised by the occurrence of ripple-marks trending parallel to the bedding.

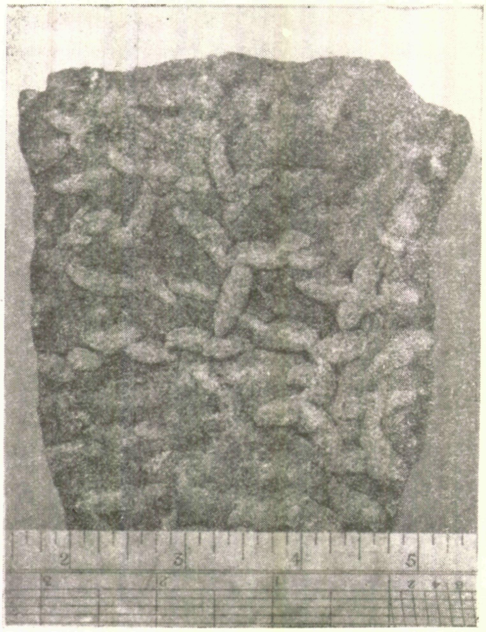

Figure 1. Fusiform structures in Sullavai sandstones.

The fusiform structures are present on a single bedding plane, about six metres below the Talchir – Sullavai contact. The spindles are mostly attached to one another, and exhibit a rough linear arrangement, while some may lie askew to the linear direction. The fusiform shape is better preserved when the spindles are discrete, but when in contact with each other the ends are blunted. The inter-connected spindles often seem to penetrate each other. The average size of individual spindle is 1-1.5 cm long, 0.5 cm wide and 1-2 mm thick. The spindles are made of mostly rounded quartz grains bound by matrix, with a little induration. These can be easily removed from the quartzitic host rock which has undergone a fair degree of metamorphism.

Structures similar in gross pattern to those just described occur widely in many geological systems including the Proterozoic, being variously regarded as biogenic (burrows, etc.) or inorganic (mud-crack fillings).

The inorganic explanation enjoys a larger patronage, for example, by Wheeler and Quinlan (1951), Cloud (1968) and Glaessner (1969). They have opined that transitions exist from seemingly discrete fusiform to more continuous casts, from these to networks of unquestioned mud-crack casts. The apparent cracking of sandy sediments, according to them, is not a real problem. The crack infillings are formed only on bedding planes which are partings between sandy layers. These cracks, different from normal drying cracks, develop under water, and may be filled from two wet sand layers enclosing a clay layer. The clay may sometimes be reduced to insignificant thickness by compaction and totally lost by weathering.

The observed features which dissociate the fusiform structures of the Sullavai sandstone from the inorganic explanation offered above are as follows: (i) There is no evidence of mud-crack in the vicinity of the fusiform occurrence; a transition between the two has been cited elsewhere as an evidence for inorganic origin. (ii) There is no pelitic layer at the bottom of the spindles. (iii) The spindles are discrete bodies easily separable from the host quartzite, and they often penetrate each other with the pointed ends. Similar structures described from the early Proterozoic Huronian quartzites have been considered by Hofmann (1967) to be of organic origin.

Thus, it is concluded here that the fusiform structures in the Sullavai sandstones are trace fossils of sand-filled worm-burrows. Trace fossil, although uncommon in the Precambrian are by no means rare. Similar occurrences of different structures are known for long in the Upper Vindhyan sandstones, which are equivalents of the Sullavai formation (Pascoe, 1968). Seilacher has argued strongly that trace fossils, generally poor time-markers, show explosive differentiation at the beginning of Cambrian (Glaessner, 1969). He considered this as particularly valuable when the Cambrian begins with transgressive sandstone deposits which are unfavourable for the preservation of body fossils. In such circumstances, he claimed, the base of the Cambrian can be extended downward on the basis of the occurrence of trace fossils.

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