Fossils-Stromatolite-Saf Saf, Morocco-Cretaceous age, 145-65 million years ago

These accretionary structures formed in shallow water by the trapping, binding and cementation of sedimentary grains by biofilms (microbial mats) of microorganisms, especially cyanobacteria (Riding 2007). Fossilized stromatolites provide ancient records of life on Earth by these remains.

Stromatolites are a major constituent of the fossil record of the first forms of life on earth dating to 3.7 billion years ago in Greenland (Nutman et alii 2016).

They peaked about 1.25 billion years ago (Allwood et all 2009) and subsequently declined in abundance and diversity (McMenamin1982), and by the early Cambrian they had fallen to 20% of their peak due to grazing animals of the Cambrian revolution (Bengtson, S. 2002; McNamara 2009).

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The ≈3,450-million-year-old Strelley Pool Formation in Western Australia contains a reef-like assembly of laminated sedimentary accretion structures (stromatolites) that have macroscale characteristics suggestive of biological influence. However, direct microscale evidence of biology—namely, organic microbial remains or biosedimentary fabrics—has to date eluded discovery in the extensively-recrystallized rocks. Recently-identified outcrops with relatively good textural preservation record microscale evidence of primary sedimentary processes, including some that indicate probable microbial mat formation. Furthermore, we find relict fabrics and organic layers that covary with stromatolite morphology, linking morphologic diversity to changes in sedimentation, seafloor mineral precipitation, and inferred microbial mat development. Thus, the most direct and compelling signatures of life in the Strelley Pool Formation are those observed at the microscopic scale. By examining spatiotemporal changes in microscale characteristics it is possible not only to recognize the presence of probable microbial mats during stromatolite development, but also to infer aspects of the biological inputs to stromatolite morphogenesis. The persistence of an inferred biological signal through changing environmental circumstances and stromatolite types indicates that benthic microbial populations adapted to shifting environmental conditions in early oceans.

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