Geophysical Research Abstracts,
Vol. 11, EGU2009-1109, 2009
EGU General Assembly 2009

Highly elaborate putative microfossils from 3.02 Ga chert, Pilbara Craton: indications of cell division?

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Diverse microstructures have recently been reported from the Archean sedimentary succession now assigned to the Farrel Quartzite (3.02 Ga) at the Mount Grant and Mount Goldsworthy area, Pilbara Craton, Western Australia [1]. A highly probable to possible biogenic origin of the four major morphological types (thread-like, film-like, spheroidal and lenticular to spindle-like) has been inferred from indigenousness, syngenicity, sedimentary origin of the host chert, size distribution, composition, evidence of flexible and/or breakable walls, apparent taphonomic features and the presence of colony-like aggregations. This result is supported by new geochemical and paleontological lines of evidence [2, 3] in addition to the continued accumulation of data about located specimens (more than 2000) and discoveries of similar structures from new and remote localities. The cumulative data provide reliable fossil evidence for Archean life. On the other hand, some fundamental problems remain unresolved: for example: (1) Does the morphological diversity actually correlate to the biotic diversity? (2) What is the significance of the size of many of the structures larger than 20μm and occasionally up to 80μm along the major axis? (3) Can we explain some structures and occurrences that appear to be unusual as Archean fossil records in the biological context? In this study, we refer to these problems and address ourselves particularly to the issue of elaborate structures morphologically similar to reproducing cells and resting spores, proposing a new systematic classification scheme that will aid in eventually establishing a taxonomy of the microstructures.

[1] Sugitani et al. (2007) Precambrian Research 158, 228-262.
[2] Oehler et al. (2008) 39th Lunar and Planetary Science Conference, 1303pdf.
[3] Grey and Sugitani (2008) Abstract for WSAMF2008.