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Paper Number: 822

**Archean life on land**

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Newly discovered alluvial paleosols in the 3.0 Ga Farrel Quartzite of Western Australia are thin with organic surface (A horizon) and sulfate-rich subsurface (By) horizons, like soils of the Atacama Desert of Chile, Dry Valleys of Antarctica, 3.4-3.5 Ga paleosols of the Strelley Pool and Panorama Formations (Fig. 1), and 3.7 Ga paleosols of Mars [1]. Farrel Quartzite paleosols also contain a variety of microfossils, permineralized by silica in a way comparable with another famous terrestrial locality, the Devonian Rhynie Chert [2]. Five microfossil morphotypes in the Farrel Quartzite [3] each have distinctive carbon isotopic compositions, and include a variety of spheroidal cells (*Archaeosphaeroides*) as well as distinctive large spindles (cf. *Eopoikilofusa*). Cell-specific carbon isotopic analyses of the Farrel Quartzite microfossils [4] and unusually abundant sulfate for a likely anoxic atmosphere allow interpretation of these morphotypes as a terrestrial community of actinobacteria, purple sulfur bacteria, and methanogenic Archaea. Communities of anaerobic photosynthetic sulfur bacteria promoting a distinctive acid sulfate style of weathering, were widespread on land before driven underground by the Great Oxidation Event at around 2.4 Ga.

*Figure 1: Polished slab of complete Jurl paleosol from 3.5 Ga Panorama Formation in Panorama Portal, north of Dresser Mine, Pilbara region, Western Australia. Bedded sandstone sharply overlies the massive and sand-crystal-rich paleosol above trough cross-bedded sandstone.*

#### *References:*

- [1] Retallack GJ (2014) *Geology* 42:755-758.
- [2] Retallack GJ (2014) *Palaeobotanist* 63:1-15.
- [3] Sugitani K et al. (2007) In: *Stromatolites: interaction of microbes with sediments*, Springer, Berlin, 117-132.
- [4] House C et al. (2013) *Geology* 41:651-654.

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