Evolution of life in the Precambrian and astrobiology

Prerequisites / Requirements:

GEOS710/920

Supervisors / Research Group / Project Partners:

Supervisor: Prof. Simon George Simon.George@mq.edu.au
Co-Supervisor: Dependent on project
Organic Geochemistry

Project Description:

Organic geochemists are developing new ideas about the evolution of life during important time intervals in the Precambrian, including during the climate perturbations in the Neoproterozoic and around the Great Oxidation Event (GOE). The GOE led to a greater oxygen content in the atmosphere and oceans. We have been working on the Neoproterozoic in China (PhD of Jiayi Ai) and Pilbara rocks deposited just before the GOE at 2.7Ga (PhD of Yosuke Hoshino). Stromatolites were abundant, and may hold a record of the early evolution of eukaryotes. Additionally, in 2012 very clean scientific drilling obtained cores through key sequences with unweathered material suitable for the geochemical search for biomarkers (PhD of Carl Peters). We have a large collection of so far un-analysed stromatolites, and plenty of so far un-analysed unweathered shale/carbonate material that is suitable to construct a masters project around assessing hydrocarbons compositions in bitumen 1 and bitumen 2 fractions, and looking for biomarkers relevant to constraining what type of life existed prior to the GOE. This project is high risk but high potential reward, and should be combined with a lower risk related project.

Alternatively, an MRes student could work on the organic geochemistry group collaboration with Prof Martin van Kranendonk at UNSW (Australian Centre of Astrobiology), which at the moment has a focus on Mars-analogues on Earth, as a way of informing future Mars-sampling missions, including Mars 2020. Jointly supervised PhD student Bonnie Teece has been working on the El Tatio hot springs, which she has shown to include a biomarker record of cyanobacteria preserved in sinters. There is the possibility to join this team and also work on some of the Mars-analogue material we are collecting.

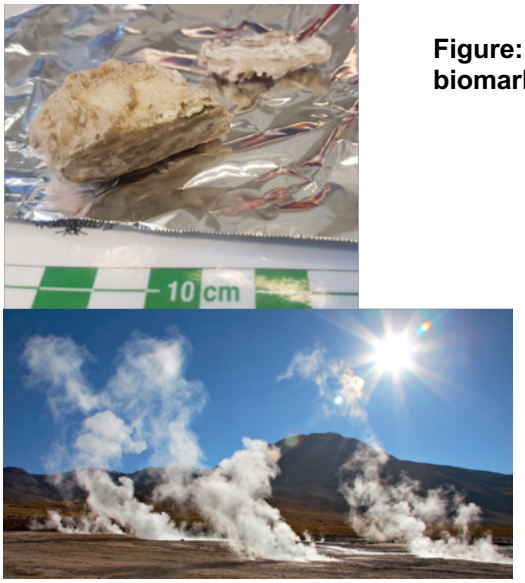

Figure: El Tatio hot springs, Chile: sinter contains cyanobacterial biomarkers (Teece et al., unpublished data)