



14 February 2012

**Attention of: Emma Drew**

**Invoice To:**

University of St Andrews  
Scottish Oceans Institute  
East Sands  
St Andrews  
Fife  
KY16 8LB

**Invoice for:**

Dr Tony Prave  
Masts Small Grants Award Scheme: £500

**Payable to account:** AES5 Pravex

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Tony Prave'.

Dr Tony Prave

**Report for MASTS Small Grant Award Scheme: The advent of animals: sponge-like organisms from 700-800 million year old ancient marine rocks**

Support from MASTS was requested in order to meet two main objectives: (i) perform two weeks of fieldwork examining Neoproterozoic (ca. 1000-542 Ma) strata in the Death Valley region of California, USA; and (ii) investigate the potential for collaborative research with geobiology groups at Caltech, UC-Santa Barbara and Harvard. This Report summarises the outcome of that work.

**Death Valley Fieldwork:** Mapping was completed in two key areas, the Saddle Peak Hills and the eastern Kingston Range, enabling construction of a complete transect through the Cryogenian-Ediacaran succession in Death Valley (Fig. 1; and, by correlation, to numerous sections worldwide). The transect included strata recording the ca. 700-635 Ma Snowball Earth glacigenic and related geobiospheric events. Importantly, we were able to confirm that: (i) an occurrence of VSMs (vase-shaped microfossils), previously interpreted as a faunal assemblage linked temporally to the timing of the Snowball Earth glaciations (e.g. Corsetti *et al.* 2005. Proc. Nat Acad. Sci.), is in fact part of the pre-glacial succession thereby raising strong doubts about the veracity of models using those fossils as evidence for pre-Phanerozoic biospheric evolution; and (ii) three, not two, major glacigenic episodes mark this part of the Laurentian craton (i.e. N America), which calls into questions the utility of these deposits as proxies for constructing global chronostratigraphic correlations.

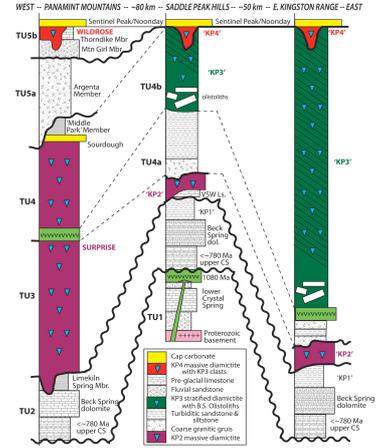


Fig. 1. Proposed Cryogenian units, Death Valley.

**Collaborative research.** Three geobiology research groups were visited to discuss potential collaborative research. The outcomes were:

**Caltech.** Prof W Fischer has agreed to do nanoSIMS analyses to determine elemental distributions and isotopic compositions on ca. 750 Myr old enigmatic structures that appear to be multicellular in origin (Fig. 2).

**UC-Santa Barbara.** Prof. J Cottle has agreed to do LA-PIMMS U-Pb zircon geochronology on two samples that would provide maximum age constraints for the Pahrump Group rocks in Death Valley; these rocks contain the geological record documenting the Neoproterozoic development of the SW margin of Laurentia.

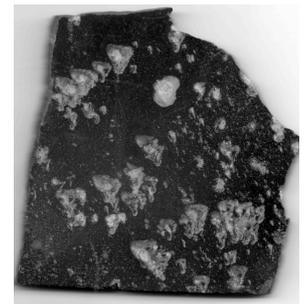


Fig. 2. Triangular-shaped features of unknown biological affinity.

**Harvard.** Prof F Macdonald and his research group have agreed to collaborate on developing an integrated stratigraphic framework incorporating their work in the Canadian-Alaskan Cordillera with my work in the SW USA (Fig. 3).

The data generated from these collaborative studies will be used or future multi-institutional grant proposals and collaborative manuscripts.

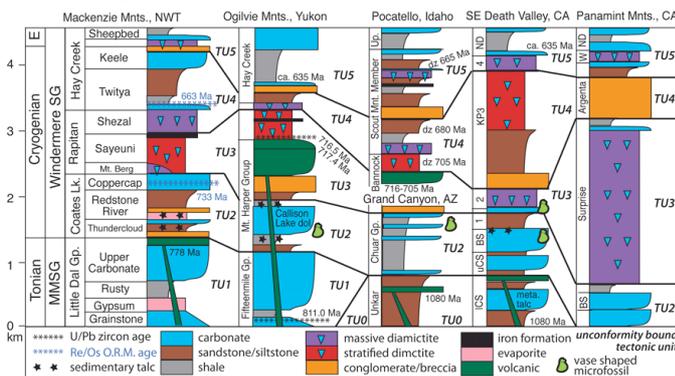


Fig. 3. Proposed Neoproterozoic correlations across western Laurentia.