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Life in terrestrial hydrothermal systems: analogues for Mars?

Martin Lee*, and Darren Mark (SUERC, East Kilbride)
*Martin.Lee@Glasgow.ac.uk

Life requires a favorable environment in which to evolve and thrive. Our understanding of what constitutes a favorable environment has expanded rapidly in recent times. Hydrothermal systems encompass a range of environments, which share three essential components – heat, rock and liquid water (e.g., hot springs in Yellowstone National Park, black smokers at mid-ocean ridges). Although particularly hostile have been shown to support a varied and abundant ecosystem. Life is not inevitable in hydrothermal zones, but the abundance of energy and nutrients available are the reasons that hydrothermal systems have been suggested that life may have originated and evolved at a hydrothermal vent type system. Furthermore, the existence of hydrothermal systems is not limited to Earth, they are also evident on other planets (e.g., Mars). Evidence for such systems can be found in meteorites (e.g., nakhlites) that have fallen to Earth.

Data suggest that hydrothermal systems are likely to have been common in the high-heat regime of the Archaean. Hence understanding the evolution of an Archaean hydrothermal deposit is of high-value. We propose to develop a detailed understanding of the evolution and development of such a deposit using cutting-edge petrographical techniques (University of Glasgow) complemented by isotope geochemistry (SUERC). The North Pole Dome (NPD), a region in the centre of the East Pilbara of Western Australia is unusual because it is overlain by relatively well preserved 3.5 billion year old Warrawoona Group basalts. These rocks have been hydrothermally altered and contain some of the earliest signs of life on Earth (microfossils and stromatolites) and as such represent an ideal natural laboratory for us to characterise. The NPD is also an ideal Mars analogue especially for the nakhlites due to its basaltic volcanic nature, its similar age to the southern highlands of Mars and the existence of analogous hydrothermal suites of minerals.

This project offers a suitably qualified candidate the chance to do fieldwork in Australia looking at some of the oldest known rocks on the Earth. Working with PI Lee and co-Pi Mark they will have the opportunity to work with state-of-the-art kit and develop a potentially high-impact project that has true potential to answer some fundamental questions.

Application procedure and deadlines

To be considered for PhD studentships to be held in the School of Geographical and Earth Sciences (GES), suitably qualified candidates should apply via the website of the College of Science and Engineering (http://www.gla.ac.uk/colleges/scienceengineering/graduateschool/prospectivestudents/essentialinformation/). Closing dates for University and research council funded

studentships will be in early in the new year, as stated on the GES studentships page: http://www.gla.ac.uk/schools/ges/research/postgraduate/.

Non- English speakers must meet the University's English language requirements. Candidates for NERC studentships should also meet the NERC's requirements for both academic qualifications and residential eligibility. For more information go to http://www.nerc.ac.uk/funding/application/studentships and please note that *non-UK European Union citizens will be awarded fees only by NERC.*

For informal enquiries about the research projects please contact the relevant supervisors. Information on the GES graduate school and the application process can be obtained from Mrs Jean McPartland, the assistant to head of the School (Jean.McPartland@glasgow.ac.uk).