

Research Experience Placement (REP) Scheme Project

The REP scheme offers funding to support summer placements for undergraduate students studying quantitative disciplines *outside of NERC's scientific remit*, during which they will undertake research within the environmental sciences.

Project Supervisors:

Christian Schroeder , University of Stirling
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Project Title:

Energy availability for chemosynthetic autotrophs in extreme environments

Project Description:

<p>This project will investigate the energy available for chemosynthetic autotrophic microorganisms by calculating the thermodynamics of electron donor and terminal electron acceptor redox couples. More specifically, the project will focus on those systems where iron minerals take on the role of electron donors or acceptors. Iron minerals play an important role in the biogeochemistry of many environments which display extreme conditions, for examples hydrothermal systems (hot), subglacial systems (cold), deep subsurface (pressure), salt lakes (high salinity) or acid mine drainage systems (low pH). These conditions affect the energy available from redox couples</p>
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<p>The objectives for this project are:</p>

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| <ol style="list-style-type: none">1. Determine potential redox couples on the basis of minerals and chemical species identified in different extreme environments (literature research).2. Use thermodynamic databases/simulation software to calculate Gibbs free energies for the redox couples at standard conditions.3. Calculate the changes in Gibbs free energy under one or a combination of extreme conditions (pressure, temperature, pH, salinity, etc.) |
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<p>The project will thus constrain the physical limits for microbial life in extreme environments. It will inform ongoing and future research in iron (bio)geochemistry on Earth and Mars in our research group. The project would clearly benefit from the skill set of a maths, computing, physics or engineering student.</p>
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<p>The project can be carried out remotely should the current Covid-19 crisis still prevent students and/or staff from being present on campus over the summer.</p>

Project Timeframe:

6 weeks
