

Research Experience Placement (REP) Scheme 2026

Supervisor Project Proforma

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| Project title: | Using spectroscopy to understand hydrothermal alteration in samples from Iceland |
| Host Institution: | The Open University |
| Project supervisor (name, department): | Julia Semprich, School of Environment, Earth and Ecosystem Sciences |
| Project enquiries (supervisor email): | julia.semprich@open.ac.uk |
| Co-Supervisor, if any (name, department): | Susanne Schwenzer |
| Proposed start date and weekly hours: (please note project must be of 6 weeks duration) | Week 13 July (or after) 36 hours |
| Please provide a short paragraph or couple of sentences summarising the project to encourage potential applicants to apply (max 75 words): | |
| This project will use a field spectrometer to characterise and compare hydrothermal minerals in basalt samples collected from an extinct volcano in Iceland as an analogue to understand fluid-rock alteration and the implication for habitability on Early Earth and other rocky planets, specifically Mars. You will be working in the interdisciplinary community of AstrobiologyOU where we address scientific, governance and ethical challenges associated astrobiology and related space missions. | |
| Project description (max 700 words, 1-2 figures may be included): Proposed projects must: | |
| <ul style="list-style-type: none"> • Have a clearly defined objective • Be within the science remit of NERC • Be feasible for a student to complete within the timescale of the placement • Include more than purely a computer/modelling component i.e., some element of fieldwork, data collection, activity to give an understanding of the wider context including participation in lab/team meetings, networking, and training etc. • Give scope for thought and initiative on the part of the student and should not use the student as a general assistant • Be based at an eligible UK research organisation (remote placements from within the UK are also an option for enabling inclusivity) | |
| Hydrothermal systems can develop in areas within the Earth's crust where fluids coexist with either a magmatic or impact-induced heat source. Due to the presence of fluids, elevated temperatures, and the availability of chemical potentials during mineralisation, hydrothermal systems have been proposed as potential environments for life's origin on Earth, and on other terrestrial planets such as Mars. However, the geological record of hydrothermal systems on Early Earth has been erased by plate tectonics and we rely on studying younger analogue systems to better constrain hydrothermal environments and their importance for habitability. | |

Hydrothermal alteration of rocks occurs in many stages and on different scales (Fig. 1), and a range of analytical and model techniques is required to understand their complexity. We have collected a range of samples from hydrothermally altered basalts in the Geitafell central volcano, Southeast Iceland. The objective of this project is to collect mineral spectra of these samples using a field spectrometer at the Open University, to identify various alteration phases and to compare them to data sets from Mars. Using spectroscopy is particularly relevant for Mars since many of the hydrothermal areas are not accessible by rovers but we do have spectroscopic data from orbit. This project will start with a literature review on hydrothermal systems and spectroscopy to understand the range of minerals that can be identified in the mineral spectra. In the following week, you will be looking at the sample collection in more detail and get an introduction to thin section microscopy. After having a good understanding of the samples, you will be using a field spectrometer to take mineral spectra of the basaltic host rocks and the various veins. This will be followed by data processing and analysis and a comparison of the different samples. This data will then be compared to existing data sets for Mars and potentially other hydrothermal areas. Finally, a report and presentation outlining the major findings will be produced.

We will have weekly meetings to report on progress and discuss challenges and planning the next step. There will also be an opportunity to attend seminars/meetings of the wider research groups, visit some of the lab spaces at the Open University and engage in outreach activities.



Figure 1: Field photograph from the Geitafell volcano in Iceland showing a network of different sized veins within basaltic rocks.

Alt text: Photograph from the field showing vein networks within basalt in Iceland.

Project timeline:

The project is designed for six weeks. The schedule below is indicative and may change depending on project progress:

Week 1: Literature review on hydrothermal minerals and spectroscopy

Week 2: Familiarisation with the samples (thin section microscopy)

Week 3: Data acquisition with the field spectrometer

Week 4: Data analysis and processing

Week 5: Comparison to spectroscopic data from Mars

Week 6: write up and presentation

Candidate requirements:

You should have a background in geosciences with some knowledge in mineralogy and petrology to be able to characterise the spectra.
You should also be able to be at the Open University for several days to study the samples and use the field spectrometer for data acquisition (some of the other tasks can be done remotely).

Background reading and references:

Pirajno, F. (2008) 'Hydrothermal Processes and Mineral Systems', *Springer*, Heidelberg.
Farmer, J. (2000) 'Hydrothermal systems: Doorways to early biosphere evolution'. *GSA Today*, 10, pp. 1-9.

To be completed by institutional CENTA PoC

I confirm that:

- The host institution takes responsibility for selecting a suitable undergraduate student and ensuring and confirming their eligibility under the NERC REP student eligibility criteria.
- This REP project falls within the NERC remit, is of suitable quality and meets the REP research project criteria.
- Appropriate supervisory arrangements are in place.
- The application processes used will be inclusive and accessible.
- Reasonable adjustments will be made for students that need them whilst undertaking placements.
- The placement will be carried out in accordance with all applicable ethical, legal and regulatory requirements including but not limited to relevant provisions of the General Data Protection Regulation, the Data Protection Act 2018, the Bribery Act 2010, the Fraud Act 2006, the Equality Act 2010 and the Modern Slavery Act 2015.
- The host organisation takes responsibility for identification, protection and exploitation of any intellectual property rights arising from the work.
- All facilities, agreements about access and collaborations necessary for the work will be obtained before the work commences and can be ensured through the period of the work.
- All costs awarded by NERC for the REPs will be used and accounted for appropriately.
- A report of the project by the student will be submitted no later than one week after the end date of the placement or Friday 25th September 2026, whichever falls first.
- A PhD interview (where possible) will be offered to all students who have completed a



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REP within the CENTA Doctoral Landscape Award.

Signed: *Julia Sprick*

Date: 01/04/2026

Position: Research Fellow