Dr Joshua Shea

Department of Earth Sciences, University of Cambridge
Postdoctoral Research Associate

Cambridge, United Kingdom
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Current Position

Postdoctoral Research Associate with Prof. Olivier Shorttle — Nov. 2023 – present
Department of Earth Sciences, University of Cambridge — United Kingdom

- Characterising carbon cycling and volcanic degassing processes in Earth's mantle using high-precision SIMS analysis, developing methods for concurrent carbon and δ^{13}C measurements in basaltic glasses using SIMS.
- Applied thermodynamic phase equilibria modelling to understand mantle melting on Mars, providing insights for sample return campaigns and planetary evolution processes.

Education

Doctor of Philosophy in Earth and Planetary Sciences — 2022
Macquarie University — Sydney, Australia

Master of Research in Earth and Planetary Sciences — 2018
Macquarie University — Sydney, Australia

Bachelor of Science major Geology, minor Geography — 2016
Macquarie University — Sydney, Australia

Key Research Expertise

I specialise in carbon cycling and degassing processes in planetary mantles, using high-precision SIMS analysis and experimental petrology to understand mantle melting from Earth's volcanic systems to Mars. My work combines thermodynamic modelling with high-pressure experiments to investigate how deep Earth processes influence planetary surface environments and volatile cycling.

Selected Publications

Summary: My work has accrued 78 citations since 2019 and a h-index of 5.

Shea JJ, Soderman CR, Teece BL, Weller OM, Barge LM, Shorttle O. *under review*. Mantle melting on Mars with applications for sample return. *Earth and Planetary Science Letters*.

Shea JJ, Ezad IS, Lanati, AW, Foley SF. *2022*. The Eastern Australian Volcanic Province, its primitive melts, constraints on melt sources and the influence of mantle metasomatism. *Earth-Science Reviews*; 233, 104168

Shea JJ, Hughes CE, Bindemann I, Blundy J, Brooker R, Botcharnikov R, Cartigny P, EIMF, Gaetani G, Kilgour G, Maclennan J, Monteleone B, Neave DA, Shorttle O. *2025*. Improved Precision and Reference Materials for Stable Carbon Isotope Measurement in Basaltic Glasses using Secondary Ion Mass Spectrometry. *Geostandards and Geoanalytical Research*.

Chen C, Förster MW, Ezad IS, **Shea JJ**, Shcheka SS, Jacob DE, Foley SF. *2025*. Sulfide-rich continental roots at cratonic margins formed by carbonated melts. *Nature*, 637, 615–621.

Shea JJ, Foley SF, Dalton H, Lanati, AW, Phillips D. *2024*. Mid-Jurassic intraplate volcanism at Bokhara River, and insight into metasomatism in the lithospheric mantle of the Thompson Oregon, eastern Australia. *Australian Journal of Earth Sciences*; 71.

Shea JJ, Foley SF. *2019*. Evidence for a Carbonatite-Influenced Source Assemblage for Intraplate Basalts from the Buckland Volcanic Province, Queensland, Australia. *Minerals*; 9(9):546

Major Funding

Total funding secured: approx. GBP 533,000 | * denotes in-kind funding

Principal Investigator:

Effect of CFSE on 3d-transition metal partitioning in olivine GBP 10,500*
Direct access to the IMF - NERC scientific support and facilities 2025

Pressure treatment of lithium-phosphate olivine cathodes GBP 3,800
Enhancing Research Culture EDIA Summer Internship - Wellcome Trust 2023

Geochronology of the eastern Australian leucitite suite AUD 15,000*
National Argon Map - AuScope 2021

Deciphering the potassic magmas of eastern Australia AUD 10,000
Victorian Division, Geological Society of Australia 2020

Named Collaborator:

Volcanic gas chemistry for eruption forecasting: CI: Dr Ery Hughes NZD 1,150,000
Endeavour Fund – Smart Ideas (MBIE, New Zealand) 2025–2028

Previous Positions

Postdoctoral Research Associate with Dr. Simon Hunt Sep. 2022 – Nov. 2023
Department of Materials, University of Manchester United Kingdom

- Conducted high pressure experiments under stress applicable to mantle convection and developed machine learning workflows for XRF and EDS spectral data processing.

Doctoral Candidate with Prof. Stephen Foley Sep. 2019 – Sep. 2022
Department of Earth and Planetary Sciences, Macquarie University Australia

Technical Skills

Mass Spectrometry: SIMS, ToF-SIMS, LA-ICP-MS, Solution-ICP-MS
Microscopy & Analysis: SEM, EPMA, XRF, EBSD, Raman Spectroscopy
Experimental: Piston-cylinder, Multi-anvil apparatus, Gas-mixing furnace

Teaching Experience

Demonstrator & Supervisor, Earth Sciences 2024 – present
University of Cambridge United Kingdom

- Demonstrate classes up to 30 students across Part IB, II, and III courses covering igneous petrology, mantle processes, and planetary sciences
- Conduct weekly supervisions for small groups (<4 students), providing feedback on essays and problem sets

Award & Recognition

A. H. Voisey Medal 2024
Geological Society of Australia, NSW Division Early-career Earth scientist

Mentoring & Leadership

Primary Supervisor: Wellcome Trust EDI Summer Intern; **Associate Supervisor**: Henry Royce Undergraduate Research Intern. **PhD Mentoring:** Two PhD students (Manchester, Liverpool) in high-pressure experiments and geochemical analysis. **Committee Service:** ECGAP Member & NSW General Committee (Geological Society of Australia); PDRA Forum Committee (Manchester).