

Robert Myhill

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PROFESSIONAL EXPERIENCE

2021-present	University Lecturer <i>Earth and Planetary Sciences</i>	University of Bristol
2021-present	NERC Large Grant Co-Researcher Investigator <i>Mantle Convection Constrained</i>	University of Bristol
2017-2021	UK Space Agency Postdoctoral Research Fellow <i>The thermochemical state and evolution of Mars' deep interior</i>	University of Bristol
2016	Postdoctoral Research Associate <i>Preparation for the InSight Mission</i>	University of Bristol
2015	Postdoctoral Researcher <i>Thermodynamics of core formation</i>	Bayerisches Geoinstitut
2013-2014	Alexander von Humboldt Research Fellow <i>High pressure experimental petrology</i>	Bayerisches Geoinstitut
2012	Visiting Scientist <i>High pressure experimental petrology</i>	Bayerisches Geoinstitut

EDUCATION

2012	PhD Geophysics <i>The Mechanisms of Deep Earthquakes</i>	University of Cambridge
2008	MSci Natural Sciences (1/32 in class) <i>Earth Sciences</i>	University of Cambridge
2007	MA Natural Sciences (1/36 in class) <i>Geology (plus Physics, Maths and Chemistry)</i>	University of Cambridge

GRANTS, HONOURS AND AWARDS

2021-2023	Researcher Co-investigator, MC ² NERC Large Grant (total 3.6M GBP)
2017-2020	UK Space Agency Aurora Postdoctoral Fellowship (302k GBP)
2013-2014	Alexander von Humboldt Research Fellowship for Postdoctoral Researchers
2011	Outstanding Student Poster Award, Geodynamics Division (European Geophysical Union General Assembly)
2010	The Kingsley Bye-Fellowship. Magdalene College, Cambridge
2008	The Hugo de Balsham Prize for Exceptional Academic Distinction The Harkness Scholarship (first-placed Finalist in Geological Sciences, University of Cambridge) The Huppert Prize in Geophysics
2007	The Henry Wilkinson Cookson Senior Scholarship in Natural Sciences

TEACHING EXPERIENCE

2021-2022	Lecturer in <i>Igneous Petrology</i> (University of Bristol)
2019-2020	Lecturer in <i>Non-Renewable Resources</i> (University of Bristol)
2019	Organiser, Avon Gorge Field Trip (University of Bristol)
2018	Field demonstrator, Arran Field Trip (University of Bristol)
2017	Guest lecturer on the subjects of <i>high pressure melting</i> and the <i>InSight Mission</i> (USTC, China)
2017-2018	Guest lecturer on <i>subduction</i> and <i>Mars exploration</i> (University of Bristol)
2016-2018	Field demonstrator, Avon Gorge Field Trip (University of Bristol)
2008-2011	Field demonstrator, Sedbergh Field Trip (University of Cambridge)
2009	Field demonstrator, Arran Field Trip (University of Cambridge)

SKILLS

- Postdoctoral experience in high pressure experimental petrology on melts, silicate and oxide phases, using piston cylinder and multi-anvil apparatus.
- Analytical experience includes EPMA, SEM, XRD, Mössbauer, Raman and ERDA techniques.
- Fluent in the Python programming language. Competent in C++, BASH and HTML scripting. Basic knowledge of FORTRAN and the OpenGL API.
- Over 400 hours experience with THERMOCALC, and a competent user of Perple_X thermodynamic software.
- Competent user of L^AT_EX, Microsoft and Serif Office programs.
- Experience in waveform modelling, including receiver function construction, directivity and focal mechanism analysis and relocation routines.

SELECTED COMMUNITY ROLES

- Session convener at AGU Fall Meeting on seismology (2012), mineral physics (2015) and planetary sciences (2016).
- Reviewer for *American Mineralogist*, *Contributions to Mineralogy and Petrology*, *Earth and Planetary Science Letters*, *G-cubed*, *GeoResJ*, *Minerals*, *Science Advances*, *SoftwareX* and *Solid Earth*, amongst others.
- Chapter editor for *Geochemical Perspectives*.
- Co-editor for a special volume of the Geological Society of Greece on “Tethyan Tectonics and Greek Ophiolites”, in honour of Alan Smith.
- Software maintainer and lead developer for *burnman*, an open-source mineral physics toolkit written in python (<http://geodynamics.org/cig/software/burnman/>).
- Principal developer for *ASPECT*, open-source software for mantle convection written in C++ (<http://geodynamics.org/cig/software/aspect/>).
- Code contributor to the open-source thermodynamics portal ENKI (<http://enki-portal.org/>).
- Scientific advisor to Geopark Grevena-Kozani, Northern Greece.

PUBLICATIONS

In preparation

1. Myhill, R., Cottaar, S. et al., BurnMan 1.1: A Planetary Thermodynamics and Geophysics Toolkit.
2. Myhill, R., Dannberg, J. et al., The dynamics of hydrous melting around the mantle transition zone.
3. Myhill, R., Siersch, N. et al., Water-rich aluminous post-stishovite: implications for water and low seismic velocities in the lower mantle.
4. Myhill, R. and Beyer, C., Optimal thermodynamic dataset creation applied to the Fe-Mg-Si-O system.
5. Myhill, R. et al., A retrospective on the causes on Martian seismicity.

Submitted and accepted

1. Panton, J. et al., The stability of dense oceanic crust near the core-mantle boundary, submitted to JGR Solid Earth.
2. Huang, Q. et al., Seismic detection of the martian mantle transition zone by InSight, submitted to Science.

Published peer-reviewed articles

1. Myhill, R., 2022, An anisotropic equation of state for high-pressure, high-temperature applications, Contributions to Mineralogy and Petrology, Geophysical Journal International 231 (1), 230-242, doi:10.1093/gji/ggac180.
2. Perrin, C. et al., 2022, Geometry and segmentation of Cerberus Fossae, Mars: Implications for marsquake properties. Journal of Geophysical Research: Planets 127 (1), e2021JE007118 doi:10.1029/2021JE007118.
3. Myhill, R. and Connolly, J., 2021, Notes on the creation and manipulation of solid solution models, accepted, Contributions to Mineralogy and Petrology, Contributions to Mineralogy and Petrology 176 (10), 1-19. doi:10.1007/s00410-021-01825-1.
4. Beyer, C., Myhill, R. et al., A reversed redox gradient in Earth's mantle transition zone. Earth and Planetary Science Letters 575, 117181. doi:10.1016/j.epsl.2021.117181.
5. Dahmen, N. et al., 2021, Resonances and lander modes observed by InSight on Mars (1-9 Hz), BSSA 111 (6), 2924-2950. doi:10.1785/0120210056.
6. Stott, A.E. et al., 2021, The Site Tilt and Lander Transfer Function from the Short-Period Seismometer of InSight on Mars, BSSA, 111 (6), 2889-2908. doi:10.1785/0120210058.
7. Dannberg, J., Myhill, R. et al., The morphology, evolution and seismic visibility of partial melt at the core-mantle boundary: Implications for ULVZs, Geophysical Journal International, ggab242, doi:10.1093/gji/ggab242.
8. Lognonné et al., 2020, Constraints on the shallow elastic and anelastic structure of Mars from InSight seismic data, Nat. Geosci. 13, 213–220 doi:10.1038/s41561-020-0536-y.
9. Gassmüller et al., 2020, On Formulations of Compressible Mantle Convection, Geophysical Journal International 221 (2), 1264-1280, doi:10.1093/gji/ggaa078.
10. Panero et al., 2020, Dehydration Melting Below the Undersaturated Transition Zone, G-cubed. doi:10.1029/2019GC008712
11. Sinmyo, R. et al., 2019, Effect of Fe^{3+} on Phase Relations in the Lower Mantle: Implications for Redox Melting in Stagnant Slabs, JGR (Solid Earth), doi:10.1029/2019JB017704.
12. Ishii, T. et al., 2019, Sharp 660-km discontinuity controlled by extremely narrow binary post-spinel transition, Nature Geoscience, 12:10, doi:10.1038/s41561-019-0452-1.
13. Zhang, H. et al., 2019, Slab morphology and deformation beneath Izu-Bonin, Nature Communications, 10:1310, doi:10.1038/s41467-019-09279-7.
14. Smrekar, S. et al., 2019, Pre-Mission InSights on the Interior of Mars, Space Science Reviews, 215:3, doi:10.1007/s11214-018-0563-9.
15. Murdoch, N. et al., 2018, Flexible mode modelling of the InSight lander and consequences for the SEIS instrument, Space Science Reviews, 214:117, doi:10.1007/s11214-018-0553-y.

16. Myhill, R. et al., 2018, Frequency dependence of seismic attenuation and coupling through Mars' regolith: implications for the InSight Mission, *Space Science Reviews*, 214:85, doi:10.1007/s11214-018-0514-5.
17. Myhill, R., 2018, The elastic solid solution model for minerals at high pressures and temperatures, *Contributions to Mineralogy and Petrology*, 173:12, doi:10.1007/s00410-017-1436-z.
18. Beyer, C. et al., 2018, An internally consistent pressure calibration of geobarometers applicable to the Earth's upper mantle using in situ XRD, *Geochimica et Cosmochimica Acta*, 222:421–435, doi:10.1016/j.gca.2017.10.031.
19. Teanby, N. et al., 2017, Seismic Coupling of Short-Period Wind Noise Through Mars' Regolith for NASA's InSight Lander, *Space Science Reviews*, 211:485–500, doi:10.1007/s11214-016-0310-z.
20. Dannberg, J. et al., 2017, The importance of grain size to mantle dynamics and seismological observations, *G-cubed*, 18.8:3034–3061, doi:10.1002/2017GC006944.
21. Baron, M.A. et al., 2017, Experimental constraints on melting temperatures in the MgO-SiO₂ system at lower mantle pressures, *Earth and Planetary Science Letters*, 472:186–196, doi:10.1016/j.epsl.2017.05.020.
22. Novella, D. et al., 2017, Melting phase relations in the systems Mg₂SiO₄-H₂O and MgSiO₃-H₂O at upper mantle conditions, *Geochimica et Cosmochimica Acta*, 204:68–82, doi:10.1016/j.gca.2016.12.042.
23. Myhill, R. et al. 2017, Hydrous melting and partitioning in and above the mantle transition zone: insights from water-rich MgO-SiO₂-H₂O experiments, *Geochimica et Cosmochimica Acta*, 200:408–421, doi:10.1016/j.gca.2016.05.027.
24. Myhill, R. et al., 2016, On the P-T-fO₂ stability of Fe₄O₅ and Fe₅O₆-rich phases: a thermodynamic and experimental study, *Contributions to Mineralogy and Petrology*, 171.5:1–11, doi:10.1007/s00410-016-1258-4.
25. Ishii, T. et al., 2016, Generation of pressures over 40 GPa using Kawai-type multi-anvil apparatus with tungsten carbide anvils, *Review of Scientific Instruments*, 87:024501, doi:10.1063/1.4941716.
26. Rassios, A. et al., 2016, Preserving the non-preservable geoheritage of the Aliakmon River: A case study in geo-education leading to cutting-edge science, *Bulletin of the Geological Society of Greece*.
27. Wessel, P. et al., 2015, Semiautomatic fracture zone tracking, *Geochemistry, Geophysics, Geosystems*, doi:10.1002/2015GC005853.
28. Pamato, M. G., Myhill, R. et al., 2015, Lower mantle water reservoir implied by the extreme stability of a hydrous aluminosilicate, *Nature Geoscience*, 8:75–79, doi:10.1038/ngeo2306.
29. Myhill, R., 2013, Slab buckling and its effect on the distributions and focal mechanisms of deep-focus earthquakes, *Geophysical Journal International*, 192.2:837–853, doi:10.1093/gji/ggs054.
30. Myhill, R. and Warren, L. M., 2012, Fault plane orientations of deep earthquakes in the Izu-Bonin-Marianas subduction zone, *Journal of Geophysical Research*, 117:B06307, doi:10.1029/2011JB009047.
31. Myhill, R., McKenzie, D. and Priestley, K., 2011, The distribution of earthquake multiplets beneath the southwest Pacific, *Earth and Planetary Science Letters*, 301:87–97, doi:10.1016/j.epsl.2010.10.023.
32. Myhill, R., 2011, Constraints on evolution of the Mesohellenic Ophiolite from sub-ophiolitic metamorphic rocks, in Wakabayashi, J., and Dilek, Y., eds., *Mélanges: Processes of Formation and Societal Significance: Geological Society of America Special Paper 480*:1–20, doi:10.1130/2011.2480(03).

Published book chapters

1. Anglada-Escudé, G. et al., 2021, The Nüwa Concept. A development model for a self-sustainable city on Mars doi:10.13140/RG.2.2.29517.56803.
2. Frost, D. J. and Myhill, R., 2016, Chemistry of the Lower Mantle, in “Deep Earth” (AGU Geophysical Monograph), 225–240, doi:10.1002/9781118992487.ch18.

Book reviews

1. Myhill, R. 2020, Thermodynamics in Earth and Planetary Sciences (Ganguly, J.). *Elements* 16 (3), 215–215

INVITED ORAL PRESENTATIONS

2019	Iron disproportionation in the Earth's mantle transition zone	AGU Fall Meeting
2019	Thermodynamic model creation: Prospects and challenges for performing MCMC inversions on multicomponent data	ENKI Workshop, Boulder, CO
2019	Mars InSight: Geophysical investigations on another planet	University of Cambridge
2018	Probing the structure and chemistry of Mars' deep interior: Prospects for NASA's InSight Mission.	Utrecht
2018	Probing the structure and chemistry of Mars' deep interior: Prospects for NASA's InSight Mission.	Imperial College London
2018	A brief guide to living on Mars (talk and panel discussion).	We the Curious, Bristol
2018	Oxygen and sulphur in Mars' deep interior.	DCO meeting, Edinburgh
2017	Deep seismicity and the strength of subducting slabs: Rheological insights from geophysics.	Hefei, China
2016	Quenchable water-rich, aluminous post-stishovite: implications for seismic anomalies in the mid-mantle.	AGU Fall Meeting
2016	Determining the thermochemical structure of Mars from limited seismic data: potential insights for InSight.	InSight Team Meeting, Toulouse
2015	Water, water everywhere: H ₂ O in the deep mantle.	University of Bristol
2015	Getting into deep water: H ₂ O in the Earth's mantle.	CEED, Oslo
2014	Volatile-driven melting in the deep mantle.	St Louis University
2011	Insights into deep earthquake mechanics.	Bayerisches Geoinstitut
2010	The search for structure: deep-focus earthquakes.	University of Cambridge

SELECTED OUTREACH ACTIVITIES

2018– present	Scientific advisor to the collaborative art/engineering/science project <i>Building a Martian House</i> .
2019	Invited Speaker, Stargazing Evening at Reepham, Norfolk Invited Speaker, West of England Geological Association Provided voice-over for an arts-science project on the past and future of space exploration based at Blickling Hall, Norfolk.
2016	Scientific outreach in geophysics and seismic hazard awareness with @Bristol (Bristol's science museum).
2015–2016	Planetary Geology outreach for the Global Summer School, Imperial College London.

OTHER INTERESTS

- Photography: I am a keen macro and landscape photographer.
- Climbing and caving: I enjoy rock climbing (bouldering and lead-climbing) and caving (the Mendips are very close to Bristol).
- First Aid: I have been an active member of St John Ambulance for much of my life.
- Greek culture: I have enjoyed many happy months hiking and conducting fieldwork in Greece, and spent my final year at undergraduate level studying Modern Greek.