Robert Myhill

Postdoctoral Research Fellow

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Personal Information

Full Name	Robert Christopher Myhill
Date of birth	16 March 1986
Place of Birth	Gorleston, Norfolk, UK
Nationality	British

Employment

2017-2020 **UK Space Agency Postdoctoral Research Fellow**, University of Bristol.
The thermochemical state and evolution of Mars' deep interior

2016-2017 **Postdoctoral Research Associate**, *School of Earth Sciences*, University of Bristol.
Preparation for the InSight Mission to Mars

2015 **Postdoctoral Researcher**, *Bayerisches Geoinstitut*, University of Bayreuth.
Thermodynamics of light element incorporation into metallic melts and differentiation of the terrestrial planets

2013-2014 **Humboldt Postdoctoral Fellow**, *Bayerisches Geoinstitut*, University of Bayreuth.
Phase compositions and melting relations of hydrous and ferric-rich phases

2012 **Visiting Scientist**, *Bayerisches Geoinstitut*, University of Bayreuth.
High pressure volatile-rich melting

Education

2008–2012 **PhD in Earth Sciences**, *Magdalene College*, University of Cambridge.
The Mechanisms of Deep Earthquakes *Advisors: Professors Dan McKenzie and Keith Priestley.*

2004–2008 **MSci + BA**, *Peterhouse*, University of Cambridge, *First Class.*
Natural Sciences (Physical; 4 years)

- Part III: First Class. 1/36 in Class (Geological Sciences).
- Part II: First Class. 1/39 in Class (Geological Sciences).
- Part IB: First Class (Maths, Stratigraphic Geology, Mineralogy, Petrology).
- Part IA: First Class (Geology, Maths, Physics, Chemistry).

Selected Grants and Awards

2017 UK Space Agency Aurora Postdoctoral Fellowship (2017-2020; 302k GBP over three years).

2012 Alexander von Humboldt Research Fellowship for Postdoctoral Researchers (2013-2014).

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. Peterhouse, Cambridge.

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, University of Cambridge.

The John Reekie Memorial Prize for the best geological fieldwork-based thesis submitted for the first degree at the Department of Earth Sciences, University of Cambridge.

2004 The George Watson Prize for Outstanding Scholarship (Best results, Class of 2004, Sir John Leman High School).

Peer-reviewed publications

In preparation

2018 Myhill, R. et al., BurnMan 1.0: A Planetary Geophysics Toolkit, in prep.

2018 Myhill, R. and Beyer, C., A thermodynamic model for the incorporation of ferric iron in high pressure garnets, in prep.

2018 Myhill, R. et al., Redox reactions in Mars' deep mantle and the extent of core-mantle equilibration, in prep.

2018 Gassmöller et al., On Formulations of Compressible Mantle Convection, in prep. for Geophysical Journal International

2018 Myhill, R., Linear algebra in metamorphic petrology: Phase compositions, solutions and thermodynamic equilibria, in prep. for Geochimica et Cosmochimica Acta

Submitted and accepted

2018 Ishii, T. et al., An extremely narrow binary post-spinel transition explains the sharp 660-km discontinuity, submitted to Nature.

2018 Zhang, H., Wang, F. and Myhill, R., High-resolution seismic imaging of slab morphology and deformation beneath Izu-Bonin, Nature Communications, in revision.

2018 Smrekar, S. et al., Pre-Mission InSights on the Interior of Mars, Space Science Reviews, accepted.

Published

2018 Murdoch, N. et al., Flexible mode modelling of the InSight lander and consequences for the SEIS instrument, Space Science Reviews (in press)

2018 Myhill, R. et al., 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.

2018 Myhill, R., 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.

2018 Beyer, C. et al., 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.

2017 Teanby, N. et al., 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.

2017 Dannberg, J. et al., The importance of grain size to mantle dynamics and seismological observations, G-cubed, 18.8:3034–3061, doi:10.1002/2017GC006944.

2017 Baron, M.A. et al., Experimental constraints on melting temperatures in the MgO-SiO_2 system at lower mantle pressures, Earth and Planetary Science Letters, 472:186–196, doi:10.1016/j.epsl.2017.05.020.

2017 Novella, D. et al., Melting phase relations in the systems Mg_2SiO_4-H_2O and $MgSiO_3$-H_2O at upper mantle conditions, Geochimica et Cosmochimica Acta, 204:68–82, doi:10.1016/j.gca.2016.12.042.

2017 Myhill, R. et al. Hydrous melting and partitioning in and above the mantle transition zone: insights from water-rich MgO-SiO_2-H_2O experiments, Geochimica et Cosmochimica Acta, 200:408–421, doi:10.1016/j.gca.2016.05.027.

2016 Myhill, R. et al., On the P-T-fO_2 stability of Fe_4O_5 and Fe_5O_6-rich phases: a thermodynamic and experimental study, Contributions to Mineralogy and Petrology, 171.5:1–11, doi:10.1007/s00410-016-1258-4.

2016 Frost, D. J. and Myhill, R. Chemistry of the Lower Mantle, in "Deep Earth" (AGU Geophysical Monograph), 225–240, doi:10.1002/9781118992487.ch18.

2016 Rassios, A. et al., 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, 50.

2016 Ishii, T. et al., 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.

2015 Wessel, P. et al. Semiautomatic fracture zone tracking, Geochemistry, Geophysics, Geosystems, doi:10.1002/2015GC005853.

2015 Pamato, M. G., Myhill, R. et al. Lower mantle water reservoir implied by the extreme stability of a hydrous aluminosilicate, Nature Geoscience, 8:75–79, doi:10.1038/ngeo2306.

2013 Myhill, R. 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.

2012 Myhill, R. and Warren, L. M. Fault plane orientations of deep earthquakes in the Izu-Bonin-Marianas subduction zone, Journal of Geophysical Research, 117:B06307, doi:10.1029/2011JB009047.

2011 Myhill, R., McKenzie, D. and Priestley, K. 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.

2011 Myhill, R. 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).

Selected Presentations

2018 Probing the structure and chemistry of Mars' deep interior: Prospects for NASA's InSight Mission. Invited seminar, Utrecht (November 2018)

2018 Probing the structure and chemistry of Mars' deep interior: Prospects for NASA's InSight Mission. Invited seminar, Imperial College London (October 2018)

2018 A brief guide to living on Mars. Invited talk and panel discussion, We the Curious, Bristol (October 2018)

2018 Oxygen and sulphur in Mars' deep interior. Invited talk, Edinburgh, UK (September 2018)

2017 Deep seismicity and the strength of subducting slabs: Rheological insights from geophysics. Invited seminar, Hefei, China.

2017 High-pressure melting in the deep Earth. Guest lecture, Hefei, China.

2017 Seismology on Mars: An Introduction to the InSight Mission. Guest lecture, Hefei, China.

2016 Quenchable water-rich, aluminous post-stishovite: implications for seismic anomalies in the mid-mantle. Invited talk, American Geophysical Union Fall Meeting.

2016 Determining the thermochemical structure of Mars from limited seismic data: potential insights for InSight. InSight Team Meeting, Toulouse, 2016

2015 Water, water everywhere: H_2O in the deep mantle. Invited seminar, University of Bristol

2015 Getting into deep water: H_2O in the Earth's mantle. Invited seminar, The Centre for Earth Evolution and Dynamics, Oslo.

2014 Volatile-driven melting in the deep mantle. Invited seminar, St Louis University.

2014 Ferric iron and its influence on Earth's deep structure. Oral presentation, Geological Society of London.

2011 Fault plane orientations of deep earthquakes in the Izu-Bonin-Marianas subduction zone. Oral presentation, American Geophysical Union Fall Meeting.

2011 Insights into deep earthquake mechanics. Invited seminar, Bayerisches Geoinstitut.

2010 The search for structure: deep-focus earthquakes. Cambridge Earth Sciences Graduate Seminar.

2009 Clustering of deep-focus earthquakes in the southwest Pacific. Poster presentation, American Geophysical Union Fall Meeting.

2008 The significance of high temperature low pressure rocks beneath the Mesohellenic Ophiolite. Poster presentation, Greek Institute of Geology and Mineral Exploration (IGME) Field Symposium.

Skills

- Competent user of LaTeX, Microsoft and Serif Office programs.
- Competent in the C, C++ and Python programming languages, BASH and HTML scripting, and basic knowledge of FORTRAN and the OpenGL API.
- Experience in waveform modelling, including receiver function construction, directivity and focal mechanism analysis and relocation routines.
- Over 400 hours experience with THERMOCALC, and a competent user of Perple_X thermodynamic software. Developer of the burnman thermoelastic and thermodynamic toolkit.
- User of the FEniCS finite element modelling software and the ASPECT open-source geodynamics software.

Outreach and service to the profession

2018 Scientific advisor to the collaborative art project *Building a Martian House* (Panel discussion event: `https://www.wethecurious.org/event/building-a-martian-house`)

2017 User and code contributor to the open-source thermodynamics portal ENKI (`http://enki-portal.org/`)

2015-2016 Planetary Geology outreach for high school students, Imperial College London

2015 Scientific outreach in geophysics and seismic hazard awareness with @Bristol science museum

2014- Software developer for *burnman*, an open-source mineral physics toolkit written in python (`http://geodynamics.org/cig/software/burnman/`).

2015- Code contributor for *ASPECT*, open-source software for mantle convection written in C++ (`http://geodynamics.org/cig/software/aspect/`).

2014- Reviewer for *Contributions to Mineralogy and Petrology*, *Earth and Planetary Science Letters*, *Geochemical Perspectives*, *Minerals*, and *The Journal of Mineralogical and Petrological Sciences*.

2012/15/16 Session Convener, AGU Fall Meeting.

Relevant Experience

06/07-01/08 Master's Thesis, University of Cambridge. Metamorphic Development beneath the Mesohellenic Ophiolite. In this self-designed project, I used THERMOCALC to interpret the mineral assemblages in samples collected from the amphibolite-granulite facies metamorphic soles of the Mesohellenic Ophiolite in Northern Greece. I obtained a high First (80%) for this project. *Advisor: Dr Timothy Holland, University of Cambridge.*

06/06-01/07 Bachelor's Thesis, University of Cambridge. Independent mapping project and industrial work experience: Vourinos, Northern Greece. I obtained the top First in the year for this project (80%). *Advisors: Dr Alan Smith, University of Cambridge and Dr Anne Rassios, IGME.*

07/05-08/05 Field geologist, British Geological Survey. Paid appointment for the Tellus Project, part of a national environmental survey completed in 2006. *Advisors: Louise Ander, Sean Quigley, Sophia Passmore (British Geological Survey).*

09/08 Field demonstrator and member of the organising team, IGME Field Symposium: Ophiolites 2008.

2008–2012 Supervisor in Stratigraphy, Structural Geology, Hydrosphere and Tectonics, and Demonstrator in Structural Geology, Tectonics and Seismology, University of Cambridge.

Demonstrator on Earth Sciences departmental field trips to Ketton, Arran, and Sedbergh.

2005–2012 Fieldwork experience. 250+ days (as of October 24, 2018) as demonstrator, field guide, employee, researcher and student (Locations around the UK, Iceland and Greece).

Other Interests

- Photography: I am a keen macro and landscape photographer.
- Climbing: I started rock climbing (mostly indoor) in July 2016.
- First Aid: I have been an active member of St John Ambulance for much of my life. I volunteered for about 400 hours per year during my PhD, primarily as first aider and Duties Coordinator of Cambridge LINKS (the student division of SJA) 2010–2012, and also as Stores Manager in 2011–2012.
- Greek culture: I have enjoyed many happy months hiking and conducting fieldwork in Greece, and spent my final undergraduate year at undergraduate level studying Modern Greek.