

**James Hazzard**  
**Postgraduate Researcher – Imperial College London**

Department of Earth Science and Engineering, Prince Consort Road, London, SW7 2BP, UK

Phone: +44 (0)79 3198 5673

Email: j.hazzard20@imperial.ac.uk

Date of Birth: 22/02/1998

## Education

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**Department of Earth Science and Engineering, Imperial College London**  
**PhD Earth Sciences (Geophysics)**

**Sep 2020 – present**

Thesis: *Ice and Fire: Investigating Links between Mantle Structure and Ice Sheet Stability*

Supervisors: Dr. Fred D. Richards and Dr. Gareth G. Roberts

Funding: Natural Environment Research Council (NERC) Science and Solutions for a Changing Planet DTP

Research areas: Mantle structure, transient rheology, glacial isostatic adjustment and ice sheet dynamics.

A key threat associated with climate change is accelerating global mean sea level rise due to ice sheet decay. To predict the future evolution of Earth's cryosphere, a precise understanding of upper mantle thermomechanical structure is required. I have developed state-of-the-art inverse methods, grounded in geophysical observations, that reveal Earth's interior in detail.

- Received an Outstanding Student Presentation Award (OSPA) at AGU in 2021 for my talk outlining a new method to significantly reduce uncertainty in predictions of mantle viscosity from seismological data.
- Generated the first thermomechanically self-consistent inference of Antarctic mantle structure, details of which can be found in my first publication (*JGR: Solid Earth*, doi: 10.1029/2023JB026653).
- Utilised cutting-edge experimental parameterisations of viscoelasticity to reconcile inferences of Antarctic mantle viscosity from GPS and seismological data, highlighting the significance of transient rheology.
- Developed the first technique for inferring Antarctic geothermal heat flow (a crucial constraint for dynamical ice sheet models) directly from seismological data while accounting for lateral variations in crustal composition.
- Acted as co-investigator on an international collaboration with Geoscience Australia, delivering valuable, data-driven insights pertaining to likely locations of large base metal deposits, which are actively used in industry to reduce the search space when exploring for minerals needed for the Net Zero transition.
- Initiated and sustained research collaborations with colleagues across global institutions in the USA, Australia, and Japan (e.g., Prof. Yasuko Takei, University of Tokyo; Dr. John Naliboff, New Mexico Tech).
- Secured in excess of £180,000 in funding.
- Helped to develop the next generation of scientists at Imperial by teaching a range of undergraduate courses, and organising weekly departmental research seminars showcasing early-career research.

**Robinson College, University of Cambridge**  
**MSci and BA Hons Physics (Natural Sciences)**

**Oct 2016 – Jun 2020**  
**Graduated with 1<sup>st</sup> Class Honours**

MSci Thesis: *Investigating Spectral Line Profile Variations for the Sun* (Dr. Annelies Mortier) – **1<sup>st</sup> Class (75%)**

3<sup>rd</sup>-year Dissertation: *Matter-antimatter Asymmetry and Charge-Parity Violation* (Prof. Tina Potter) – **1<sup>st</sup> Class (82%)**

Received College Scholarship (2018, 2019, 2020) and Senior Scholarship (2020) awards for academic excellence.

## Publications

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<b>Accepted, submitted or in prep.</b>	<b>Hazzard, J.A.N.</b> and Richards, F.D., Antarctic Geothermal Heat Flow, Crustal Conductivity and Heat Production Inferred from Seismological Data, <i>in review at Geophysical Research Letters</i> .
	Hoggard, M.J., <b>Hazzard, J.A.N.</b> , Sudholz, Z.J., Richards, F.D., Austermann, J., Jaques, A.L., Yaxley, G.M. and Czarnota, K., The Thermal Structure of Australian Lithosphere and its Influence on Geological Processes, <i>in prep. for submission to Geochemistry, Geophysics, Geosystems</i> .
<b>2023</b>	<b>Hazzard, J.A.N.</b> , Richards, F.D., Goes, S.D. and Roberts, G.G., Probabilistic Assessment of Antarctic Thermomechanical Structure: Impacts on Ice Sheet Stability, <i>Journal of Geophysical Research: Solid Earth</i> , 128, e2023JB026653, doi: 10.1029/2023JB026653.
<b>Company reports</b>	<b>Hazzard, J.A.N.</b> , Richards, F.D., BANCAL22: A Probabilistic Algorithm for Bayesian Anelasticity Model Calibration, <i>Report for Geoscience Australia (Jun 2023)</i> .

## Conference Proceedings

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- 2023** **Hazzard, J.A.N. (talk)**, Richards, F.D., Roberts, G.G., Antarctic Upper Mantle Viscosity: Reconciling Inferences From Above and Below Ground, 25<sup>th</sup> EGU General Assembly, Vienna, EGU-3400.
- 2022** **Hazzard, J.A.N. (talk)**, Richards, F.D., Goes, S.D., Roberts, G.G., Reducing Uncertainty in Upper Mantle Rheology, Lithospheric Thickness and Geothermal Heat Flow Using a Bayesian Inverse Framework to Calibrate Experimental Parameterisations of Anelasticity, 24<sup>th</sup> EGU General Assembly, Vienna, EGU22-12967.
- 2021** **Hazzard, J.A.N. (talk)**, Richards, F.D., Goes, S.D., Roberts, G.G., Reducing Uncertainty in Upper Mantle Rheology and Rates of Glacial Isostatic Adjustment Using a Bayesian Inverse Framework to Calibrate Experimental Parameterisations of Anelasticity, AGU Fall Meeting, New Orleans, D141A-02.

## Funding and Awards Obtained (£180,000+)

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2023	<b>Geoscience Australia, Co-investigator as part of Consultancy Agreement (£95,000)</b> – Developing and applying a Bayesian modelling framework using xenolith-derived geothermal profiles to map Australian lithospheric architecture.
2023	<b>International Union of Geodesy and Geophysics, Travel Grant (\$1,100)</b> – Used to attend POLENET GIA Training School at Lantmäteriet, 2023.
2022	<b>Imperial College London, Travel Grant (£650)</b> – Used to attend TU Delft Sea-Level Summer School, 2022.
2021	<b>AGU, Outstanding Student Presentation Award (\$250)</b> – Received for talk entitled <i>Reducing Uncertainty in Upper Mantle Rheology, Lithospheric Thickness and Geothermal Heat Flow using a Bayesian Inverse Framework to Calibrate Experimental Parameterisations of Anelasticity</i> . Award recognises top 2-5% of presenters.
2020–2024	<b>Natural Environment Research Council, PhD Studentship (£20,622 p/a + £15,000)</b> – Investigating links between mantle structure and ice sheet stability.
2020	<b>Robinson College (University of Cambridge), Senior Scholarship (£225)</b> – Academic achievement.
2018–2020	<b>Robinson College (University of Cambridge), Scholarship (£125 p/a + £75)</b> – Academic achievement.

## Selected Courses Attended

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2023	<b>POLENET GIA Training School</b> – one-week course on interactions between solid Earth deformation, ice mass change, and sea-level variations.
2022	<b>TU Delft Sea-Level Summer School</b> – one-week course on advanced techniques in measuring and predicting sea-level change, and sea-level related policy issues.
2020–2023	<b>Graduate School (Imperial College London)</b> – one-day classes on a range of topics including: using Git to code, collaborate and share, C++/Fortran for research computing and data science, data science: exploration and visualisation

## Teaching and Supervision

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2023	Undergraduate research project mentor of Earth Sciences undergraduate student, Jay Haley.
2020–2023	<b>Department of Earth Science and Engineering (Imperial College London), Graduate Teaching Assistant</b> – Demonstrated courses within the Earth Sciences curriculum (selected list below). <ul style="list-style-type: none"><li>- Physical and Surface Processes (95 students, 24 hours)</li><li>- Mathematical Methods II (55 students, 18 hours)</li><li>- Inversion and Optimisation (158 students, 15 hours)</li><li>- Mechanics and Waves (55 students, 12 hours)</li><li>- Advanced Applied Geophysics (22 students, 8 hours)</li><li>- Apennines Undergraduate Field Trip (31 students, 9 days)</li></ul>
2020–2023	<b>Department of Physics (Imperial College London), Graduate Teaching Assistant</b> – Demonstrated courses within the Physics curriculum (selected list below). <ul style="list-style-type: none"><li>- Optical Physics and Electronics Laboratory demonstration (10 students, 106 hours)</li><li>- Laboratory notebook and report assessment (28 hours)</li><li>- Group research project supervisor (5 students, 2 hours)</li></ul>

## Outreach, Engagement and Industrial Experience

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2023	Committee member for organisation of BGA's 2024 Postgraduate Research in Progress conference.
2022	Data Science and Research Intern for Modo Energy, a start-up in the renewable energy sector providing data-driven insights to enable GB's transition to a sustainable electricity system. I transformed data into market-based analysis, and assisted in platform back-end development by automating data processing procedures. Further activities involved attending conferences and client-visits, as well as delivering reports and presentations to high-value clients.
2022–2023	Co-organiser of Earth Science and Engineering Research Seminars.
2021	Speaker for Grantham Institute "Meet the Researcher" school outreach event.

## Skills and Interests

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Experienced practitioner in mathematics and computing. I regularly use programming languages to implement scientific numerical models (Python, MATLAB, Fortran, C++, bash script), and geoscientific packages to process and visualise data (Paraview, QGIS, GMT).

**Languages:** English – native, German and Japanese – basic.

**Sport:** Cycling and bikepacking (cycling with camping equipment), Football (player for Robinson Is, IIs and IIIs 2016–2020, Westminster Wanderers 2020–2022, organiser of Department of Earth Science and Engineering five-a-side football 2022–2023).