

CV, TOM BURNS

Undergraduate Geologist/Geophysicist

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EDUCATION

Imperial College London

Department of Earth Science and Engineering

PhD Researcher

Oct 2023 – present

Thesis: *'Integrating Geochemistry and Geophysics to Make Critical Metal Treasure Maps'*

Supervisors: Dr Fred Richards (Imperial), Prof Saskia Goes (Imperial), Dr Mark Hoggard (Australian National University)

Funding: Janet Watson Full Academic Scholarship

Researcher in the Solid-Earth Fluid-Earth Interaction Group (SoEFEI) investigating the links between deep seated mantle geodynamics and shallow metal mineralization. Our work aims to accelerate progress towards the United Nation's Sustainable Development Goals and access towards sustainable and affordable energy through the creation of probabilistic maps of important critical metals. Currently, I am working on inverting seismic wave speeds for the thermo-chemical structure of cratonic lithosphere using a Bayesian approach.

Imperial College London

Department of Earth Science and Engineering

MSci Geology (1st Class Honours)

Oct 2019 – Jun 2023

Assessed modules include Maths Methods I/II, Programming for Geoscientists, Data Science & Machine Learning, Advanced Programming, Continental Tectonics, Tectonics of the Ocean, Advanced Remote Sensing and Advanced Applied Geophysics. Graduated with a Head of Department Prize.

RESEARCH PROJECTS

Oct 2022 – MSci Thesis: 'Mantle Convective Simulations Parameterised Using Observed Uplift Histories'

Jan 2023 Researcher in Geodynamics in the PMaC (Plates, Mantle and Core) group with supervisors Dr Fred Richards and Dr Gareth Roberts. Thesis involved finite element modelling of the convecting upper mantle beneath Western North America, with models parameterised by recent constraints on the Cenozoic-recent uplift of the Colorado Plateau (CP) and synchronous basaltic volcanism in the CP/adjacent Basin and Range Provinces (Grade: 77%).

Jul–Aug 2022 Undergraduate Research Opportunities Program (UROP) Summer Research Assistant

UROP Student with full funding from the National Environmental Research Council (NERC). Work involved the generation of a global waterfall inventory, and subsequent statistical analysis to demonstrate consistent drop height scaling laws across different geological substrata. This work has important implications for ongoing studies on the power-spectral characteristics of longitudinal river profiles.

Oct–Dec 2021 BSc Thesis: 'Tectono-stratigraphic Analysis and 1:10,000 Mapping of the Western Aspromonte Massif, Southern Calabria'

5-week independent mapping project associated report, involving production of fair copy maps, cross-sections & sequence tectono-stratigraphy showing relationships between Plio-Pleistocene sediments, active faulting and Variscan basement deformation. The study reconstructed 10 distinct brittle, ductile and mylonitic deformation phases relating to the geodynamic evolution of the Europe-Adria-Africa plate subduction system.

ENTREPRENEURIAL HACKATHONS/PROJECTS

Feb 2023 Winner of the 'London Energy Ideas Challenge 2023', with the Oxford, Cambridge, ICL, LSE and UCL Energy Societies

Idea involved the design of an optimised Wastewater Heat Pump for thermal energy recovery in sewage plants, with an integrated machine learning pipeline for predicting equipment repair and optimising performance. Our team included 4 undergraduates from Imperial College London and University College London including a chemist, a geologist and an economist. In 48 hours we developed the idea, a financial model for implementation and pitched to representatives from Octopus, KPMG and Guidehouse and were awarded £5000 of prize money.

Mar 2020 Winner of the 'Code4Green European Environmental Data Hackathon', with the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

Idea involved prototyping an app with SMART meter sync to automatically start domestic tasks based on real time solar and wind flux peaks. Project involved online collaboration between 2 other Imperial undergraduates and 1 PhD student in Tübingen, Germany, and an online pitch to representatives from SpaceTech, the BMU and the European Environment Agency. Following this, we were invited to Berlin to pitch at the informal meeting of eu2020 to 27 EU Environmental Ministers attracting interest from 3 government environmental agencies.

TEACHING AND ACADEMIC RESPONSIBILITIES

June 2023 Mentor for Undergraduate Research Opportunities Program (UROP) student Jay Haley. Project supported by Geoscience Australia.

Sep 2023 – present Graduate Teaching Assistant (GTA)

GTA on Dr Fred Richard's 3rd year advanced structural geology module (Continental Tectonics) and Dr Alan Spencer's 1st year structural geology module (Deforming the Earth). Roles involve assistance in 16 practical sessions, for 80 students, 5 hours per week

SKILLS, LANGUAGES, INTERESTS

- Computing/IT**
- Specialist geoscience software for i.e., GMT, ArcGIS, ER Mapper (ERDAS 2013), Stereonet 11
 - Modelling and analysis of geoscientific data using Python & Excel
 - Basic proficiency C/C++ and matlab
 - Machine learning for geoscientific problems using e.g., scikit-learn
 - Finite element modelling for Earth mantle convection simulations using ASPECT
 - Seismic data processing and analysis in Petrel
 - Report writing in LaTeX, Word, and proficiency in Excel, PowerPoint, Access, and Dreamweaver
 - Figure production in INKSCAPE, gnuplot

- Languages**
- English (native), Mandarin Chinese (HSK Level 4)

- Sports**
- Royal School of Mines Mens 1st XI Hockey, and 2x RSM-CSM Varsity Winner
 - Queen Mary's Grammar School 1st XI Hockey full colours

OTHER RESPONSIBILITIES

Sep 2021 – Honorary Secretary, Royal School of Mines Union (RSMU) Imperial College London

Jan 2022 Responsibilities included negotiation for £4,000 of financial grants for the RSM-CSM Varsity and RSMU events, the organisation of RSM Careers Night and frequent meetings with the RSMU Executive Committee about events and student-alumni engagement.

Sep 2020 – Symposium Officer, Imperial College Geology Society Imperial College London

Jun 2021 Worked in a team of 2 to organize a Symposium on Sustainable Geoscience, with panel discussions on "*The Interface Between Research and Industry in Sustainable Geoscience*" and "*The Responsibilities of the Geoscientist in the 21st Century*". We secured 6 geoscience speakers from across research and industry, an audience of over 100 people and £1,500 of corporate sponsorship for the event.

Sep 2018 – Vice-Captain of School Queen Mary's Grammar School

Jun 2019 Member of the Pupil Senior Leadership Team. Role included presenting on the school's involvement with the Confucius Classroom Institute for Mandarin Learning and the Mandarin Excellence Programme to governors, alumni and town locals at Speech Day, and a position on a staff/student panel interviewing external candidates for the position of Assistant Head.

Sep 2018 – Senior Army Cadet, QMGS Combined Cadet Force (CCF) Queen Mary's Grammar School

Jun 2019 Senior Cadet and parade commander of the largest CCF contingent in the UK. Responsibilities related to the management and implementation of weekly training for 200 army cadets, delivered by ~30 NCOs.

FIELDWORK, OUTDOOR INTERESTS AND FIELD QUALIFICATIONS

June 2023 2-week advanced field trip synopsing the geodynamic evolution of the Apennine Orogenic Belt, informed by the geology and geophysics of a transect across Northern Italy.

May 2022 2-week integrated field geology course in Sardinia, Italy and associated report titled '*Hawaiite Melt Ascent Rates in the Montferro Volcanic Complex, Western Central Sardinia*'.

Sep–Oct 2021 3-week integrated geology fieldtrip in South Wales and Kinlochleven, Scotland investigating sediments, structural deformation, and igneous/metamorphic processes. Included a 4-day independent structural mapping exercise.

Jul-Aug 2017 Fully funded 6-week field course at Argonaut Military Base titled '*Expedition Instructor Cadre*' with the Royal Canadian Army Cadets. Involved a 3-week self-supported hiking and canoeing expedition in the Bay of Fundy in a team of 6 cadets. Awarded an Expedition Instructor qualification.

Feb 2017 PADI Open Water Diving Licence. Awarded in Puerto del Carmen, Canary Islands.

ACADEMIC REFEREES

1. **Professor Gary Hampson (Undergraduate Personal Tutor)**, Professor of Sedimentary Geology, Faculty of Engineering, Department of Earth Science and Engineering, Imperial College London, Email: g.j.hampson@imperial.ac.uk, Tel: +44 (0) 20 7594 6475
2. **Doctor Fred Richards (MSci/PhD Supervisor)**, Lecturer, Faculty of Engineering, Department of Earth Science and Engineering, Imperial College London, Email: f.richards19@imperial.ac.uk, Tel: +44 (0) 20 7594 7402