

MATTHEW J. ROCHE

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Research interests | The formation, evolution, and habitability of terrestrial planets.
Planetary impacts and numerical simulations.

EDUCATION

2022–present	PhD – School of Earth Sciences, University of Bristol, U.K. Thesis: <i>Atmosphere–ocean loss during giant impacts and the volatile evolution of terrestrial planets</i> Supervisors: Dr. Simon J. Lock & Prof. Zoë M. Leinhardt
2018–2022	Geology (MSci) integrated masters, 1 st Class (Hons.) – University of Bristol, U.K. Thesis: <i>Iron redox cycling as viable metabolic pathways in Enceladus’ ocean</i> Supervisor: Dr. James Byrne

RESEARCH FUNDING

2022–2026	Science & Technology Facilities Council (STFC) PhD Studentship Role: Graduate student Amount: £81,631
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AWARDS AND HONOURS

2022	Hancock Memorial Prize (£100) – University of Bristol <i>Awarded for the highest performing MSci student in Earth Sciences.</i>
2022	Top Final Year MSci Student in Geology – University of Bristol
2022	Robert Andrew Scott Memorial Prize (£50) – University of Bristol <i>Awarded for overall excellence in Geology fieldwork.</i>
2021	Faculty of Science Undergraduate Award (£100) – University of Bristol <i>Awarded to the highest performing 3rd year students in the Faculty of Science.</i>

PUBLICATIONS

Lead author	3. Roche, M.J., Lock, S.J., Carter, P.J., Dou, J., and Leinhardt, Z.M. (submitted). Pre-lunar oceans shaped Earth’s volatile budget. 2. Roche, M.J., Lock, S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. (2025). Atmospheric loss during giant impacts: mechanisms and scaling of near- and far-field loss. <i>Planetary Science Journal</i>, 6(6):149. doi: 10.3847/PSJ/add929 ↗ 1. Roche, M.J., Fox-Powell, M.G., Hamp, R.E., and Byrne, J.M. (2023). Iron reduction as a viable metabolic pathway in Enceladus’ ocean. <i>International Journal of Astrobiology</i>, 1–20. doi: 10.1017/S1473550423000125 ↗
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Co-author	1. Buckland, H.M., Saxby, J., Roche, M. , Meredith, P., Rust, A.C., Cashman, K.V. and Engwell, S.L. (2021). Measuring the size of non-spherical particles and the implications for grain size analysis in volcanology. <i>Journal of Volcanology & Geothermal Research</i> , 415, 107257. doi: 10.1016/j.jvolgeores.2021.107257 ↗
In prep.	Roche, M.J. , Lock, S.J., and Leinhardt, Z.M. The effect of atmospheric mass on atmospheric loss during giant impacts. Witkowski, C.R., Roche, M.J. , Naafs, B.D., and Pancost, R.D. Isotope discrimination during photosynthesis remained constant across the Phanerozoic.

SERVICE

University of Bristol:

2025–present	Organiser and founder of the non-academic careers network.
2024	Co-organiser of 2 nd year PhD seminar series.
2023–present	Co-organiser and founder of BESERC (Bristol Earth Sciences Enhancing Research Culture) – a 1-day catered conference that brings together all research groups for a series of talks, posters, and celebration of our department’s research. Now a highly-anticipated annual event.
2023–present	Co-organiser of the Geophysics Coffee Break seminar series.
2022–present	Co-organiser of the School of Earth Sciences department band.
2021–2024	Departmental & faculty-level Student-Staff Liaison Committee representative (undergraduate & postgraduate).

PUBLIC ENGAGEMENT & OUTREACH

2025	Assisted in running ‘ <i>Feel the Impact</i> ’ at Bristol Museum, an event designed to make planet formation and impacts more accessible to the visually impaired.
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TEACHING EXPERIENCE

University of Bristol (Demonstrator):

2022–present	A range of theory-, computational-, and field-based undergraduate courses including: • <i>EASC30053: Global Tectonics & Geodynamics</i> • <i>EASC30051: Geomicrobiology</i> • <i>EASC20053: Geospatial Data Analysis</i> (Python, & QGIS) • <i>EASC20045: Mapping, Tectonics, & Remote Sensing</i> • <i>EASC20043: Geochemistry 1</i> • <i>EASC20035: Mineralogy & Petrology</i> • <i>EASC10008: Introduction to Field Skills in Earth Sciences</i> (local day-long excursions and week-long trips to the Isle of Arran, Scotland) • <i>EASC10007: Computing for Earth Scientists</i> (MATLAB) • <i>EASC10006: Physics for Earth Scientists</i> • <i>EASC10002: Environmental Geoscience (Mineral Resources)</i> • <i>EASC10001: Dynamic Interior I</i>
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RESEARCH INTERNSHIPS

University of Bristol:

2020–2023	Organic Geochemistry – development of algal-derived biomarkers for palaeo- $p\text{CO}_2$ reconstruction with Dr. Caitlyn R. Witkowski. Involved data compilation and calculations, and paper reading/writing.
2021	Radiation detection – simulation of high energy particle interactions with CsI detectors with Dr. Dean T. Connor. Involved writing and running code in C++.
2020	Nuclear Threat Reduction (NTR) – study into the scope and scale of the U.K.’s NTR research capabilities with Dr. Peter G. Martin. Involved carrying out wide-reaching surveys to nuclear-adjacent academics, and data analysis in R.
2019	Volcanology – characterisation of ash samples following explosive volcanic eruptions with Dr. Hannah M. Buckland. Involved running particle sorting experiments which resulted in a peer-reviewed publication (Buckland et al., 2021, JVGR).

SKILLS

Programming	Advanced knowledge of Python, Linux, bash, git, L ^A T _E X, and high-performance computing systems. Basic knowledge of MATLAB, R, and C/C++.
Software	Proficient in graphic design using Adobe Illustrator. Working knowledge of Arc/QGIS.
Fieldwork	More than 8 weeks of geological field experience in South West England, South Wales, Snowdonia, the Isle of Arran and Scottish highlands, and Santorini.
Laboratory	8+ months experience in experimental geomicrobiology/geochemistry. Proficient in optical/petrographical microscopy. Experience in Raman spectroscopy, SEM, EPMA, and particle analysis with the CAMSIZER X2.
Communication	Presented posters/talks at a number of international conferences (e.g., ESPC–DPS).
Languages	English (fluent), Welsh (intermediate), Spanish/French/Swedish (basic).

CONFERENCE PROCEEDINGS

Oral Presentations:

2025	Roche, M.J. , Lock., S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. Atmospheric loss during giant impacts: mechanisms and scaling of near- and far-field loss. <i>EPSC–DPS</i> , Helsinki. Roche, M.J. , Lock., S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. Atmospheric loss during giant impacts and the volatile evolution of terrestrial planets. <i>Gordon Research Seminar: Origins of Solar Systems</i> , South Hadley. Roche, M.J. , Lock., S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. Atmospheric loss during giant impacts: mechanisms and scaling of near- and far-field loss. <i>Smashing It Workshop</i> , Leeds.
2024	Roche, M.J. , Lock., S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. Atmospheric loss during giant impacts. <i>Earth & Planets Origin & Evolution Workshop</i> , Paris.

2023	Lock, S.J., Stewart, S.T., and Roche, M.J. Atmospheric loss in giant impacts depends on pre-impact surface conditions. <i>Goldschmidt Conference</i>, Lyon. Lock, S.J., Stewart, S.T., and Roche, M.J. Origin of volatiles on terrestrial planets: Will they stay or will they go? <i>Gordon Research Conference: Origins of Solar Systems</i>, South Hadley.
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Poster Presentations:

2025	Roche, M.J. , Lock., S.J., Dou, J., Carter, P.J., Kegerreis, J.A., and Leinhardt, Z.M. Atmosphere–ocean loss during giant impacts and the volatile evolution of terrestrial planets. <i>Gordon Research Conference/Seminar: Origins of Solar Systems</i> , South Hadley.
2024	Roche, M.J. , Lock., S.J., Dou, J., and Leinhardt, Z.M. Quantifying the effect of atmospheric properties on atmospheric loss during planetary collisions using 3D impact simulations. <i>Rocky Worlds III</i> , Zürich.
2023	Lock, S.J., Roche, M.J., Dou, J., Stewart, S.T., and Leinhardt, Z.M. The effect of pre-impact surface conditions on the efficiency of atmospheric loss in giant impacts. <i>American Geophysical Union (AGU) Fall Meeting</i>, San Francisco. Roche, M.J., Lock., S.J., Dou, J., and Leinhardt, Z.M. The effect of atmospheric properties on atmospheric loss during giant impacts. <i>Gordon Research Conference/Seminar: Origins of Solar Systems</i>, South Hadley.

PERSONAL INTERESTS

Music	Pianist (Grade 8+) and guitarist. Percussionist with the world’s number one ranked brass band (The Cory Band 🔗). University of Bristol brass band conductor (2019–2020) and music society secretary (2020–21).
Other	Hiking, cooking/baking, and travel. Working towards achieving my Private Pilot’s License.

REFERENCES

Dr. Simon Lock – Primary PhD supervisor (s.lock@bristol.ac.uk)
School of Earth Sciences, University of Bristol, Bristol, U.K., BS8 1RJ

Prof. Zoë Leinhardt – Secondary PhD supervisor (zoe.leinhardt@bristol.ac.uk)
School of Physics, University of Bristol, Bristol, U.K., BS8 1TL

Prof. Alison Rust – Head of School and undergraduate tutor (alison.rust@bristol.ac.uk)
School of Earth Sciences, University of Bristol, Bristol, U.K., BS8 1RJ

Prof. Nick Teanby – Director of Postgraduate Studies in Earth Sciences (n.teanby@bristol.ac.uk)
School of Earth Sciences, University of Bristol, Bristol, U.K., BS8 1RJ

Prof. Tim Elliott – Fellow of the Royal Society (tim.elliott@bristol.ac.uk) School of Earth Sciences,
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