

FREYA R. GEORGE

She/her/hers

freya.george@bristol.ac.uk

+44-7407-182105

 @freyageorge

 freyageorge-geology.com

School of Earth Sciences
The University of Bristol
Wills Memorial Building, Queens Road
Bristol, BS8 1RJ, United Kingdom

PRIMARY RESEARCH INTERESTS

I am a petrologist–geochemist with particular interest in the pressure–temperature conditions of lithospheric metamorphism linked to the kinetics and mechanisms of mineral crystallization and element mobilization, the formation and evolution of metamorphic microstructures, fluid–rock interaction during reaction, and the interplay of these processes with crustal deformation. My approach interrogates the spatiotemporally resolved chemical, microstructural, and geochronological records in metamorphic rocks and minerals by applying a multi-disciplinary toolkit of micro-analytical, petrographic, and modelling approaches.

PRIMARY TEACHING GOALS

My principal aim as an educator is to assist my students in their transition from passively receiving content to actively and critically engaging, such that they obtain both advanced geological acumen and transferrable skills that are valuable in whatever path they follow. From the classroom to the field, I will foster a safe and collegial environment of geological discovery and innovative thinking, in which mistake making (and subsequent evaluation of that mistake!) is encouraged as a part of the learning process.

EDUCATION

- 2014–2019 **Ph.D. Earth Sciences** (University Senate Medal Recipient), Carleton University, Canada
“Rates and mechanisms of metamorphic processes associated with the India–Asia collision in the Sikkim Himalaya.” Supervisor: Fred Gaidies
- 2010–2014 **M. Earth Sci.** (1st Class Honours), University of Oxford, UK
“Petrology and petrogenesis of garnet-bearing rocks from the Jijal Complex, Pakistan Himalaya.” Supervisor: Dave Waters.

PROFESSIONAL EXPERIENCE

- Aug. 2022– **Lecturer** (Two year fixed-term), University of Bristol, Bristol, United Kingdom
- Sept. 2022– **Visiting Scientist**, The Johns Hopkins University, Baltimore, MD, USA
- 2020–2022 **Blaustein Fellow**, The Johns Hopkins University, Baltimore, MD, USA
- 2019–2020 **UK–US Fulbright Postdoctoral Scholar**, The Johns Hopkins University, Baltimore, MD, USA
- 2018–2022 **Freelance Scientific Editor**, Stallard Scientific Editing
- 2014–2019 **Research & Teaching Assistant**, Carleton University, Ottawa, Canada
- 2013 **Geoscience Intern**, BP, Aberdeen, Scotland

PROFESSIONAL RECOGNITION

Awards, Honors, Fellowships

- 2021 Journal of Metamorphic Geology’s Mike Brown Early Career Scientist Best 2020 Publication to George *et al.*, 2020
- 2021 Geological Society of America Doris M. Curtis Outstanding Woman in Science Award; nomination
- 2019 Carleton University Senate Medal for Outstanding Academic Achievement

- 2018 Best Student Presentation, UK Metamorphic Studies Group Annual Research-in-Progress Meeting
- 2016 Outstanding Student Poster Award; Mineralogy, Petrology, Geochemistry, Volcanology Division, EGU General Assembly
- 2014 Achievement Award, St Anne's College, University of Oxford
- 2013 University of Oxford Student Award from Mineralogical Society of Great Britain and Ireland

Bursaries and Funding

- 2020–2022 Johns Hopkins University 2020–2022 Blaustein Postdoctoral Fellowship
- 2019 US–UK Fulbright Commission–Lloyd's of London Scholar Award
- 2018–2019 Ontario Graduate Scholarship
- 2017 Walker Mineralogical Society Peacock Prize
- 2017 AGU Postgraduate Travel Grant
- 2016 David and Rachel Epstein Foundation Grant
- 2016 Carleton University Academic Staff Association Grant
- 2015 Mineralogical Association of Canada Student Research Grant
- 2014–2018 Ontario Trillium Scholarship

RESEARCH OUTPUT AND DISSEMINATION

Invited lectures and seminars

- Feb. 2023 University of Cambridge, Sedgwick Club Seminar (Cambridge, UK)
- Dec. 2022 University of Lausanne, Department Seminar (Lausanne, Switzerland)
- Oct. 2022 University of Southern California, Department Seminar Series (California, USA)
- Mar. 2022 Princeton University Department of Geosciences Seminar Series (New Jersey, USA)
- Feb. 2022 Williams College Geosciences Department Virtual Seminar (Massachusetts, USA)
- Dec. 2021 Queen's University Geological Sciences and Geological Engineering Distinguished Speaker Program (Kingston, Canada)
- Sept. 2021 University of Maryland Department of Geology Colloquium (Maryland, USA)
- June 2021 Bristol University virtual seminar (Bristol, UK)
- April 2021 Humboldt State University Department of Geology Virtual Seminar (California, USA)
- May 2020 Canada–UK Metamorphic Virtual Seminar Series
- July 2019 Jackson School of Geosciences DeBuhr Lecture Series (Texas, USA)

Published or submitted peer-reviewed publications

8. Becker, N., **George, F.R.**, Guice, G.L., Crowley, J., Nelson, W.R., Browning-Hanson, J., Roy, S., Viete, D.R. (accepted, *Geosphere*). Subduction initiation recorded in the Dadeville Complex of Alabama and Georgia.
6. **George, F.R.**, Viete, D.R., Ávila, J., Seward, G.G.E., Guice G. L., Allen M. B., Harrower M. J. (submitted to *Earth and Planetary Science Letters*). Garnet zoning patterns record multiple processes of chemical transfer during subduction.
7. **George, F.R.**, Waters, D.J., Gough, S., Searle, M.J., Forshaw, J. (2021). Metamorphic constraints on the high temperature building of an arc: the Jijal garnet granulites, northern Pakistan. *Journal of Metamorphic Geology*, [doi:10.1111/jmg.12622](https://doi.org/10.1111/jmg.12622)
5. Gaidies, F., **George, F.R.**, (2021). The interfacial energy penalty to the growth of porphyroblasts. *Geology*, [doi:10.1130/G48715.1](https://doi.org/10.1130/G48715.1).
4. Guice, G. L., Ackerson, M. R., Holder, R. M., **George, F. R.**, Browning-Hanson, J., Burgess, J. L., Foustoukos, D. I., Becker, N. A., Nelson, W., Viete, D. R. (2021) Suprasubduction (SSZ) ophiolite fragments in the central

Appalachian Orogen, USA: evidence for the mantle and Moho in the Baltimore Mafic Complex (Maryland). *Geosphere*, doi: [10.1130/GES02289/1](https://doi.org/10.1130/GES02289/1).

3. **George, F.R.**, Gaidies, F. (2020). Simultaneous operation of opposing reaction mechanisms: the influence of matrix heterogeneity on post-kinematic garnet crystallisation in an inverted metamorphic sequence. *Journal of Metamorphic Geology*, 38, 743–769, doi: [10.1111/jmg.12539](https://doi.org/10.1111/jmg.12539).
2. **George, F.R.**, Gaidies, F., Boucher, B. (2018). Population-wide garnet growth zoning revealed by LA-ICP-MS mapping: implications for trace element equilibration and syn-kinematic deformation during crystallisation. *Contributions to Mineralogy and Petrology*, 173(9), p.74, doi: [10.1007/s00410-018-1503-0](https://doi.org/10.1007/s00410-018-1503-0).
1. **George, F.R.**, Gaidies, F. (2017). Characterisation of a garnet population from the Sikkim Himalaya: insights into the rates and mechanisms of porphyroblast crystallisation. *Contributions to Mineralogy and Petrology*, 172(7), p.57, doi: [10.1007/s00410-017-1372-y](https://doi.org/10.1007/s00410-017-1372-y).

Manuscripts in preparation

Please get in touch if you are interested in learning about my in prep manuscripts!

Conference proceedings and invited talks

- **George, F.R.**, title and author list to be decided, Goldschmidt 2023, Lyon, France (**Invited talk**)
- **George, F.R.**, Viète, D.R., Nelson, L.L., Burgess, J.L. Conditions, rates, and timing of metamorphism in Baltimore City: a correlative record of Acadian orogenesis between central and northern Appalachia? *2022 Northeast Geological Society of America*, Lancaster, PA. (**Invited talk**)
- Viète, D.R., Becker, N.A., Junkin W.D., Burgess, J.L., **George, F.R.**, Holder, R.M. The Baltimore Mafic Complex: key record of earliest convergence in the central Appalachians. *2022 Northeast Geological Society of America*, Lancaster, PA.
- Becker, N., **George, F.R.**, Guice, G.L., Viète, D.R. Evidence of subduction initiation recorded in the Dadeville Complex of Alabama. *2022 Southeast Geological Society of America*, Cincinnati, OH.
- Burgess, J.L., **George, F.R.**, Piccoli, P., Viète, D.R. New approaches to discern the potentially polymetamorphic history of the Gassetts Schist, Vermont. *2022 Geological Association of Canada–Mineralogical Association of Canada Joint Annual Meeting*.
- **George, F.R.**, Viète, D.R., 2021. Systematic geochemical zoning in minerals from high pressure low temperature metamorphic rocks: do ubiquitous patterns reflect a ubiquitous process? Geological Society of America Annual Meeting, Portland, Oregon (Poster)
- Viète, D.R., Holder, R.M., **George, F.R.**, Guice, G.L., 2021. Metamorphic scales illuminate past tectonic processes. Geological Society of America Annual Meeting, Portland, Oregon.
- **George, F.R.**, 2021. Decoupled oscillatory and O-isotope zonation: records of heterogeneous fluid transfer processes. EGU General Assembly Conference Abstracts. (**Invited talk**)
- **George, F.R.**, 2021. There's no accounting for oscillations: rhythmic garnet zoning unrelated to heterogeneous high pressure low temperature fluid transfer? Metamorphic Studies Group Research in Progress Annual Meeting, UK. (**Keynote speaker**)
- Burgess, J.L., **George, F.R.**, Piccoli, P., Viète, D.R., 2021. New approaches to discern the potentially polymetamorphic history of the Gassetts Schist, Vermont. Geological Association of Canada–Mineralogical Association of Canada Joint Annual Meeting.
- **George, F.R.**, Viète, D.R., Ávila, J., Seward, G.E., Poirer, G., Dierkrup, D., 2020. Oscillatory major element and isotopic zoning in high-pressure low-temperature garnets: records of non-uniform fluid transfer processes? Geological Society of America Connects Online. (**Invited virtual talk**)
- Guice, G. L., Ackerson, M. R., Holder, R. M., **George, F. R.**, Browning-Hanson, J., Burgess, J. L., Foustoukos,

D. I., Becker, N. A., Nelson, W., Viete, D. R., October 2020. The Baltimore Mafic Complex, Maryland: ophiolite fragments in the southern Appalachian Orogen, *GSA Connects Online*.

- **George, F.R.**, Gaidies, F., 2020, Post-kinematic and matrix-dependent garnet nucleation and growth in the inverted Barrovian metamorphic sequence of the Sikkim Himalaya. Metamorphic Studies Group Research in Progress Annual Meeting, UK. (Virtual poster)
- **George, F.R.**, Viete, D.R., Ávila, J., Seward, G.E., 2020. Oscillatory and stepwise compositional zoning in high pressure–low temperature garnets: records of transient and spatially-variable fluid-fluxing during subduction? EGU General Assembly Conference Abstracts, p. 9077. (Virtual talk)
- **George, F.R.**, Gaidies, F., 2019. Porphyroblastic microstructures and metamorphic grade: controls on systematic trends from a Himalayan inverted Barrovian sequence, Geological Society of America Annual Meeting, Phoenix, Arizona. **(Invited talk)**
- **George, F.R.**, Gaidies, F., 2018. 3D textural and geochemical porphyroblast analysis: unraveling the integrated history of nucleation, growth, and deformation. European Geosciences Union General Assembly Abstracts, Vol. 20, p. 10102. **(Invited talk)**
- **George, F.R.**, Gaidies, F., 2018. Chromium spirals in garnet: a record of deformation during crystallisation? Metamorphic and Tectonic Studies Group Research in Progress Annual Meeting, UK. (Talk)
- **George, F.R.**, Gaidies, F., 2017. Differential equilibration and intergranular diffusion of trace elements during rapid regional metamorphism: constraints from LA-ICP-MS mapping of a garnet population. AGU Fall Meeting Abstracts, p. V31D-06. (Talk)
- **George, F.R.**, Gaidies, F., 2017. LA-ICP-MS trace element maps of a garnet population: insights into the crystallisation of a metamorphic garnet population. EGU General Assembly Abstracts, Vol. 19, p. 9661. (Talk)
- **George, F.R.**, Gaidies, F., 2016. Rates and mechanisms of porphyroblast crystallisation: Insights from a garnet-grade schist of the Lesser Himalaya. European Mineralogical Conference Abstracts. (Talk)
- **George, F.R.**, Gaidies, F., 2016. Characterisation of a garnet population from the Sikkim Himalaya: implications for the state of equilibrium during prograde metamorphic crystallisation. Advances in Earth Sciences Research Conference annual meeting, Ottawa, Canada. (Talk)
- **George, F.R.**, Gaidies, F., 2016. Characterisation of a garnet population from the Sikkim Himalaya: implications for the rates and mechanisms of porphyroblast crystallisation. EGU General Assembly Conference Abstracts. Vol. 18, pp. 5040. (Poster)
- Waters, D.J., **George, F.**, Searle, M., Gough, S., 2015. Metamorphic constraints on the building of an arc: the Jijal garnet granulites, Northern Pakistan. Geological Society of Great Britain and Ireland's Metamorphic Studies Group annual meeting, Keyworth Nottingham, UK. (Poster)
- **George, F.**, Waters, D.J., Searle, M., 2014. Petrology and petrogenesis of garnet-bearing rocks of the Jijal Complex, Pakistan Himalaya. Geological Society of Great Britain and Ireland's Metamorphic Studies Group annual meeting, Milton Keynes, UK. (Poster)

TEACHING AND ADVISING

Teaching roles:

Lecture and Laboratory courses (as a teaching assistant/demonstrator at Carleton University, 2014–2019):

- Metamorphic Petrology (Y3 UG, 4 times)
- Thermodynamics, Kinetics and Advanced Metamorphic Petrology (G, 2 times)
- Structural Geology (Y2 UG, 1 time)

- Geological Map Interpretation (Y2 UG, 3 times)
- Earth Systems Through Time (Y1 UG, 1 time)
- Natural Disasters (Y2 UG, 1 time, online virtual learning course)

Guest Lectures:

- Stable isotopes in high-temperature igneous and metamorphic systems (Feb. 2021, Johns Hopkins)
- Ophiolites as a lithospheric framework, using examples from the Baltimore Mafic Complex (April 2021, Humboldt State University)

Field courses:

- Geology Field Skills (EASC20017); Cornwall (May 2023 with Tim Elliott, Bristol)
- Geology Fieldwork (EASC30006); Naxos (April 2023 with Ian Parkinson, Bristol)
- Geology 1 (EASC10001); Ogmores-by-Sea to Dunraven, UK (Nov. 2022, Bristol)
- Introduction to Field Mapping (EASC20029); Mendips, UK (Sept. 2022, Bristol)
- Death Valley, California: An Immersive Field Experience Exploring Earth Evolution (Y1 UG to G, co-lead and developed, Jan. 2022, Johns Hopkins)
- Field Geology and Mapping in the Grenville Province (Y2 UG, demonstrator then co-lead, 2015–2019, Carleton)
- Advanced Field Geology in the Swiss–Italian Alps (Y4 UG and G, co-lead, 2018, Carleton)

Mentorship and advisory roles:

2020–22	Training graduates and undergraduates in LA-QQQ-ICP-MS approaches
2019–22	Naomi Becker, Ph.D. Candidate, Johns Hopkins University
2018–2019	Olivier Heldwein, M.Sci. Candidate, Carleton University
2018	Himani Despande, Dean’s List Summer Undergraduate, Carleton University

Educational training:

Present	Postgraduate Certificate in Academic Practice for HEA Associate Fellowship (“CREATE”), Bristol
2022	Introduction to Higher Education Teaching at Bristol

PROFESSIONAL SERVICE, EDI, AND COMMUNITY ENGAGEMENT

Institutional responsibilities and memberships

2023–	Fieldwork representative, School of Earth Sciences EDI Committee, Bristol University
2022–	Committee member, Metamorphic Studies Group, Mineralogical Society of Great Britain & Ireland
2021–2022	Postdoctoral representative, Krieger School of Arts and Sciences, Johns Hopkins University
2020–2021	Interim manager, Johns Hopkins Earth and Planetary Sciences LA-ICP-MS lab
2016–	Member, European Geosciences Union
2015–2018	President, Graduate Students in Earth Sciences Society, Carleton University
2015–	Member, Mineralogical Society of Great Britain and Ireland
2014–	Member, Geological Society of America
2011–2012	President, Oxford University Geological Society, University of Oxford

Community EDI development and service

2023/24	Lead organizer of Mineralogical Society of Great Britain & Ireland’s 2024 Metamorphic Studies Group Research in Progress Meeting, to be held at the University of Bristol
2023	Co-chair, European Geosciences Union 2023, “Computational petrology and geochemistry”
2022	Co-organizer of JHU Earth and Planetary Sciences 2022 Colloquium
2021–2022	Unlearning Racism in Geoscience (URGE) pod member. (https://urgeoscience.org/)
2020	Co-chair, EDI discussion in Canada–UK Metamorphic Virtual Seminar Series
Reviewer	NSF Petrology & Geochemistry, Geology, Contributions to Mineralogy & Petrology, Journal of Metamorphic Geology, Geoscience Frontiers, EGU Solid Earth, Journal of Petrology

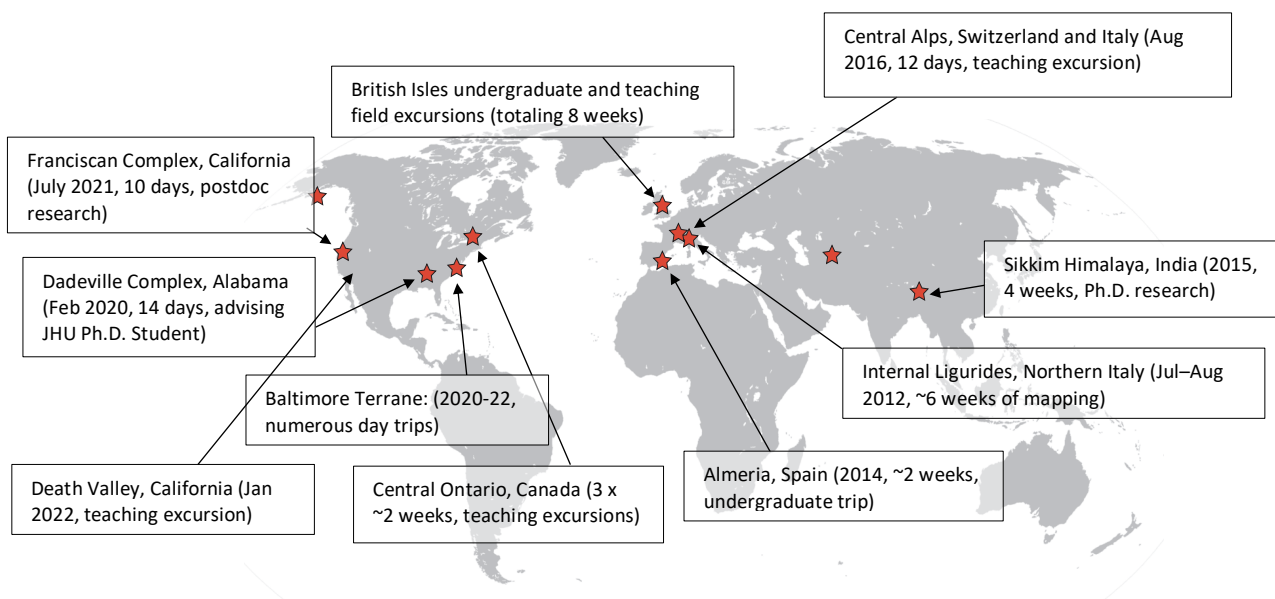
2020 Chair, GSA Connects Online 2020 Session T38
2020 Co-chair, Goldschmidt 2020 Session 04h

Public outreach

Feb. 2023 Soapbox Science (application submitted Feb. 2023)
Oct. 2022 Community talk, Natural History Society of Maryland, Must Learn Lecture Series
2019–2022 Skype a Scientist (total of seven classroom virtual-visits across USA)
2019–2022 Request a Woman in STEM, Member
2017/18 Ottawa Geoheritage Days
Oct. 2017 Invited Talk, Walker Mineralogical Society of Toronto
2012–2014 Stargazing Live volunteer, University of Oxford Physics Department
2011–2014 Department of Earth Sciences Open Days, University of Oxford

RESEARCH EXPERIENCE

Extended fieldwork



Principal active projects and collaborations

Please get in touch if you are interested in learning about my current projects and collaborations!

Analytical and laboratory experience

High-resolution X-ray μ -computed tomography (XR-CT): Scanning and imaging of geological and non-geological materials, paleontological scans; data processing.

Electron probe microanalysis (EPMA): major- and trace-element WDS spot analyses and mapping.

Scanning electron microscopy (SEM): BSE, SE, and cathodoluminescence imaging; energy-dispersive spectrometry mineral chemistry and standardization; electron backscatter diffraction (EBSD); focused-ion-beam milling for transmission electron microscopy foil preparation.

Laser ablation–inductively coupled plasma–mass spectrometry (LA-ICP-MS): U–Pb dating of zircon, calcite and monazite, and multi-material trace element analyses via mapping and spot analyses on a triple-quadrupole single-collector; instrument maintenance and servicing; training new users and students, developing collaborations for material sciences and engineering applications.

Transmission electron microscopy (TEM): Crystallographic and chemical characterization of grain boundaries

Secondary ionized mass spectrometry (SIMS): Sample preparation and standardization; oxygen-isotopes in

garnet analyses and data reduction.

Clean and ultra-clean lab isotope geochemistry: Mineral preparation and micromilling; dissolution and column chromatography for thermal ionization mass spectrometry.

Rock preparation, mineral separation, polishing, optical microscopy

Specialist training and other qualifications

2022	Bystander intervention workshop
2021	Wilderness First Aid and CPR/AED 2-year Emergency Care and Safety Institute (ECSI) certificate
2021	Phase equilibrium modelling E-workshop
2018	RiMG European Geosciences Union Petrochronology Short Course
2017	European Mineralogical Union School on Mineral Reaction Kinetics
2014	Geological Society of America Geochronology short course
Skilled	Illustrator, Matlab, AvisoFire, ProbeSoftware
Valid	Full British (including D1 minibus) and US driving licenses