Dr. Chetan Nathwani

Postdoctoral Researcher and Lecturer, ETH Zürich
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Google Scholar ◇ Github ◇ LinkedIn

EDUCATION

PhD in Geochemistry *October 2018 – June 2022*
Imperial College London
Thesis: Magmatic controls on porphyry copper deposit formation and machine learning approaches for mineral exploration
Supervisors: Prof. Jamie Wilkinson (NHM) and Dr. Christian Ihlenfeld (Anglo American)
Examiners: Prof. Jon Blundy (Oxford) and Dr. Cedric John (internal)

MSci in Geology (1st class) *October 2014 – June 2018*
Imperial College London
Thesis: Apatite as metallogenic fertility indicator in arc magmas

RESEARCH APPOINTMENTS

Assistant Professor of Mineral Resources *January 2026 –*
Imperial College London

Postdoctoral Research Fellow *January 2023 – present*
ETH Zürich (Swiss Federal Institute of Technology)
Awarded prestigious two year ETH Zürich research fellowship for independent research in Mineral Resource Systems group

Postdoctoral Research Associate *June 2022 – December 2022*
Natural History Museum, London
Project: From arc magma to ores – developing new exploration tools for mineral resources

International Research Placement *July 2019 – August 2019*
University of British Columbia
Awarded funding for placement in diamond exploration and kimberlite petrology research group

FUNDING ACQUISITION

• ETH Zürich Seed Grant (PI): Reading the crystal record of volcanic eruptions using machine learning (30,000 CHF; £27,000)
• ETH Zürich Postdoctoral Research Fellowship (PI) – two years research salary and research budget (**233,990 CHF; ∼£210,000; 2022-4**)
• Lindemann Trust Fellowship 2 year fellowship (PI) awarded by English Speaking Union (declined – **100,000 USD; £80,000; 2022)**
• European Synchrotron and Radiation Facility (PI): Beamtime for XANES analysis of sulfur speciation in apatite **(72 hours beamtime, travel and overnight costs; 2023)**
• NERC Ion Microprobe Grant (Co-I): Beamtime for analysis of volatiles in apatite inclusions in zircon **(£12,000; 2021)**
• Natural Environmental Research Council Science and Solutions for a Changing Planet Doctoral Training Partnership Studentship (PI): Awarded 3.5 year PhD funding (£65,000) and fieldwork budget **(£7000; 2018-2022)**
• Anglo American PhD CASE Partnership (Co-I): Co-secured funding, lab and field support for PhD project **(£35,000; 2018-2022)**
• Imperial College IROP Fund (PI): Funding for internship at the University of British Columbia **(3000 CAD; £1700; 2017)**

• Imperial College UROP Fund (PI): Funding for internship at the Natural History Museum **(£1200; 2016)**

PUBLICATIONS

2025:

[22] **C. Nathwani**, D. Szymanowski, L. Tavazzani, S. Markovic, A. L. Virmond, and C. Chelle-Michou, "Controls on zircon age distributions in volcanic, porphyry and plutonic rocks," *Geochronology*, 2025.

2024:

[21] **C. Nathwani**, J. Blundy, S. J. Large, *et al.*, "A zircon case for super-wet arc magmas," *Nature Communications*, pp. 1–24, 2024. DOI: 10.1038/s41467-024-52786-5.

[20] S. J. Large, **C. L. Nathwani**, J. J. Wilkinson, T. R. Knott, S. R. Tapster, and Y. Buret, "Tectonic and crustal processes drive multi-million year arc magma evolution leading up to porphyry copper deposit formation in central Chile," *Journal of Petrology*, vol. 65, no. 4, egae023, 2024. DOI: 10.1093/petrology/egae023.

2023:

[19] T. Buckle, M. Williams, **C. L. Nathwani**, and H. S. Hughes, "WebNORM: A web application for calculating normative mineralogy," *Frontiers in Earth Science*, vol. 11, p. 1 232 256, 2023. DOI: 10.3389/feart.2023.1232256.

[18] **C. L. Nathwani**, S. J. Large, E. R. Brugge, J. J. Wilkinson, Y. Buret, and EIMF, "Apatite evidence for a fluid-saturated, crystal-rich magma reservoir forming the Quellaveco porphyry copper deposit (Southern Peru)," *Contributions to Mineralogy and Petrology*, vol. 178, no. 8, p. 49, 2023. DOI: 10.1007/s00410-023-02034-8.

[17] **C. L. Nathwani**, J. J. Wilkinson, W. Brownscombe, and C. M. John, "Mineral texture classification using deep convolutional neural networks: An application to zircons from porphyry copper deposits," *Journal of Geophysical Research: Solid Earth*, vol. 128, no. 2, e2022JB025933, 2023. DOI: 10.1029/2022JB025933.

2022:

[16] M. A. Loader, **C. L. Nathwani**, J. J. Wilkinson, and R. N. Armstrong, "Controls on the magnitude of Ce anomalies in zircon," *Geochimica et Cosmochimica Acta*, vol. 328, pp. 242–257, 2022. DOI: 10.1016/j.gca.2022.03.024.

[15] **C. L. Nathwani**, J. J. Wilkinson, G. Fry, R. N. Armstrong, D. J. Smith, and C. Ihlenfeld, "Machine learning for geochemical exploration: Classifying metallogenic fertility in arc magmas and insights into porphyry copper deposit formation," *Mineralium Deposita*, vol. 57, no. 7, pp. 1143–1166, 2022. DOI: 10.1007/s00126-021-01086-9.

2021:

[14] **C. L. Nathwani**, A. T. Simmons, S. J. Large, J. J. Wilkinson, Y. Buret, and C. Ihlenfeld, "From long-lived batholith construction to giant porphyry copper deposit formation: Petrological and zircon chemical evolution of the Quellaveco District, Southern Peru," *Contributions to Mineralogy and Petrology*, vol. 176, pp. 1–21, 2021. DOI: 10.1007/s00410-020-01766-1.

2020:

[13] **C. L. Nathwani**, M. A. Loader, J. J. Wilkinson, Y. Buret, R. H. Sievwright, and P. Hollings, "Multi-stage arc magma evolution recorded by apatite in volcanic rocks," *Geology*, vol. 48, no. 4, pp. 323–327, 2020. DOI: 10.1130/G46998.1.

2018:

[12] M. Gaudet, M. Kopylova, C. Muntener, V. Zhuk, and **C. Nathwani**, "Geology of the Renard 65 kimberlite pipe, Québec, Canada," *Mineralogy and Petrology*, vol. 112, pp. 433–445, 2018. DOI: 10.1007/s00710-018-0633-4.

SELECTED CONFERENCE PRESENTATIONS

[11] **C. Nathwani**, E. Giovanini, C. Chelle-Michou, *et al.*, "Late sulfide saturation in the Valle Fertil deep crustal section, argentina: Implcations for chalcophile cycling in arcs," in *Swiss Geoscience Meeting*, 2024.

[10] L. G. Candioti, **C. L. Nathwani**, and C. Chelle-Michou, "Towards fully-coupled thermodynamic-thermomechanical two-phase flow models of transcrustal magmatic systems," in *EGU General Assembly*, 2024.

[9] Z. Moser, R. Popa, S. A. Halldórsson, K. Jónasson, **C. Nathwani**, and O. Bachmann, "Crystallization and eruption age estimations using the U-Th disequilibrium: Torfajökull volcano, South Iceland," in *6a Conferenza Alfred Rittmann*, 2024.

[8] **C. Nathwani**, D. Szymanowski, L. Tavazzani, S. Markovic, A. L. Virmond, and C. Chelle-Michou, "Controls on high precision zircon U-Pb age spectra in magmatic systems," in *EGU General Assembly*, 2024.

[7] **C. Nathwani**, S. Large, J. Blundy, *et al.*, "Cold arc magma differentiation linked to porphyry copper deposit formation? (keynote talk)," in *Proceedings of the 17th SGA Biennial Meeting*, 2024.

[6] **C. Nathwani**, S. Large, J. Blundy, *et al.*, "Zircon evidence for super-wet arc magmas," in *Proceedings of the 10th Hutton Symposium on Granites*, 2023.

[5] **C. Nathwani**, E. Giovanini, C. Chelle-Michou, *et al.*, "Late sulfide saturation in the Valle Fertil deep crustal section, argentina: Implcations for chalcophile cycling in arcs," in *Gordon Research Conference: Geochemistry of Mineral Deposits*, 2024.

[4] M. Williams, T. Buckle, and **C. Nathwani**, "Developing reusable tools for geochemical data in Python: The pyrolite roadmap," in *Goldschmidt Conference*, 2023.

[3] J. J. Wilkinson, **C. Nathwani**, E. Brugge, *et al.*, "FAMOS insights into the magmatic plumbing systems that control the genesis of porphyry copper deposits," in *SEG 2022: Minerals For Our Future*, 2022.

[2] **C. L. Nathwani**, J. J. Wilkinson, G. Fry, R. N. Armstrong, D. J. Smith, and C. Ihlenfeld, "Machine learning for geochemical exploration: Classifying metallogenic fertility in arc magmas and insights into porphyry copper deposit formation (invited talk)," in *SEG 2021: Celebrating 100 Years of Discovery*, 2021.

[1] S. Large, **C. Nathwani**, Y. Buret, T. Knott, and J. Wilkinson, "Resolving changes in arc magma volatile budgets over myr timescales leading up to porphyry Cu formation," in *EGU General Assembly*, 2021.

INVITED TALKS

- Invited talk, University of Lausanne, Switzerland — April 2025
- Invited talk, University of British Columbia, Canada — January 2025
- Invited talk, Chengdu University of Technology, China — November 2024
- Keynote talk, "Porphyry-type and skarn deposits" session at SGA 2023, Zürich — August 2023
- Invited talk, Chinese Academy of Geological Sciences, Beijing — March 2023
- Invited talk, Data-driven discovery session, SEG 2022, Vancouver — September 2022
- Invited talk, Ore Deposits Hub, 'Machine learning in mineral exploration' — September 2022
- Invited talk, Memorial University SEG Chapter, Canada — March 2022
- Departmental seminar, University of Manchester — April 2021

AWARDS AND HONOURS

- Rio Tinto Best Student Talk Prize, MDSG Conference 2020, London — January 2020
- Rio Tinto Best Student Talk Prize, MDSG Conference 2019, University of Exeter — January 2019
- Imperial College Earth Science and Engineering Centenary Prize, Best Masters project — June 2018
- Bennet H. Brough Medal, excellence in mining-related subjects — June 2017
- MinSouth Young Person's Lecture Competition Winner — March 2017

• Engineering Dean's List, top 10% performing students in faculty — June 2015, 2016, 2017 and 2018

TEACHING EXPERIENCE

Lecturer — *September 2024 – present*

Department of Earth and Planetary Sciences, ETH Zürich

• Teaching four lectures of the postgraduate course 'Quantitative and conceptual methods in geochemistry" (∼10 students) including petrogenetic modelling, compositional data analysis, multivariate statistical techniques and thermodynamic modelling of magmatic systems
• Designed new lecture material and assessed coding exercises in Python
• Teaching assistant in Mineral Resources MSc course

Student supervision, ETH Zurich

• Federica Müller (MSc): Controls on mineralisation at the Tizert sediment-hosted Cu deposit in Morocco
• Ugo Pillaut (MSc): High-precision zircon-apatite dating as a predictor of porphyry Cu deposit size
• Angela Rigaux (RA): clustering of plagioclase textures using machine learning and computer vision
• Laurin Haller (BSc): Investigating magmatic processes using cold-cathodoluminescence imaging of plagioclase

Graduate teaching assistant — *October 2017 – April 2022*

Department of Earth Science and Engineering, Imperial College London

• Courses: Arc Magma Processes and Products, Igneous Petrology, Optical Mineralogy and Petrology, Igneous and Metamorphic Petrology, Ore Deposits, Hydrothermal Ore-Forming Processes

Tuition

• Volunteer tutor at *The Access Project* charity which aims to assist under-resourced students to achieve places at top UK universities (2021-2022)
• Over 200 hours of private tuition experience in science subjects (2017-2022)

PROFESSIONAL SERVICE

Departmental Seminar Co-organiser — *September 2024 – December 2024*

Department of Earth and Planetary Sciences, ETH Zürich

• Co-organised weekly seminar series in autumn semester on topic of "geo-mitigation of greenhouse gases and critical resources for the green transition" including budget management, inviting and hosting speakers

ETH Zürich Seed Proposal Panelist — *April 2023 and October 2023*

ETH Zürich Research Commission

• Reviewed over 10 funding proposals for the university from internal staff

Peer review

• Reviewed manuscripts for journals including: Earth and Planetary Science Letters, Economic Geology, Mineralium Deposita, Journal of Petrology, American Mineralogist, Lithos, Chemical Geology, Journal of Geochemical Exploration, Mathematical Geosciences, Natural Resources Research

Conference sessions convened

• 'Machine learning, data mining and new target generation in mineral exploration', SGA 2023
• 'Recent advances in computational petrology and geochemical data analysis', EGU 2023

Diversity, Equality and Inclusivity Committee — *October 2020 – September 2022*

Department of Earth Science and Engineering, Imperial College London

President — *October 2017 – September 2018*

Imperial College Society of Economic Geologists Student Chapter

• Organised industry-related seminars and "Students into mining" symposium
• Organised student field trip to Namibia raising over 10,000 GBP to subsidise student attendance

OUTREACH AND SCIENCE COMMUNICATION

- **Online coverage of research**:
  - Prospecting for Copper with Machine Learning and Zircons: Eos Science News Magazine from AGU
  - Water-rich magmas are crucial for forming copper deposits: ETH Zürich EAPS departmental website
- **Natural History Museum Explorers Programme volunteer**:
  Initiative to promote natural sciences for school children from marginalized groups — May 2022
- **COP26 Green Zone Invited Panelist**: Two 15 minute Q&A sessions
  streamed live at COP26 in Glasgow — November 2021
- **Royal Society Summer Science: Mining for a sustainable future**:
  Invited lecture and Q&A session on the role of copper in a low-carbon future — July 2021
- **Nature Live: Down the Mines**: "Ask the Scientist" session for the public,
  streamed live on the Natural History Museum's social media platforms: — September 2020
- **WWF Global Changemakers: Ask the Experts**:
  Invited panelist on the role of copper in a low-carbon future — May 2020
- **Pint of Science**: Co-organised '2019: A Space Odyssey' planetary science
  outreach event — May 2019

SKILLS

Programming Languages	Python, MATLAB, Julia
Machine Learning Tools	Pytorch, Tensorflow, Sklearn, Pandas, Numpy
Field	Mapping, drillcore sampling and logging
Lab (analytical)	EPMA, LA-ICP-MS, SIMS, XANES, SEM, cold-CL
Lab (prep)	crushing, mineral separation, mounting, polishing