

# Dr. Chetan Nathwani

Assistant Professor of Mineral Resources, Imperial College London

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Google Scholar ◊ Github ◊ LinkedIn

## EDUCATION

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### PhD in Geochemistry

*Imperial College London*

*October 2018 – June 2022*

**Thesis:** Magmatic controls on porphyry copper deposit formation and machine learning approaches for mineral exploration

### MSci in Geology (1st class)

*Imperial College London*

*October 2014 – June 2018*

## RESEARCH APPOINTMENTS

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### Assistant Professor of Mineral Resources

*Imperial College London*

*January 2026 –*

### Postdoctoral Research Fellow

*ETH Zürich (Swiss Federal Institute of Technology)*

*January 2023 – December 2025*

- Awarded prestigious two year ETH fellowship to develop independent research programme
- Project: Tracing the cycling of volatiles in the deep crust of arcs
- Primarily focused on sulfur (and chalcophile cycling) at the base of the Famatinian arc, Argentina

### Postdoctoral Research Associate

*Natural History Museum, London*

*June 2022 – December 2022*

- Developed machine learning and geochemistry based models to discriminate porphyry-ore forming intrusions

### International Research Placement

*University of British Columbia*

*July 2019 – August 2019*

## FUNDING ACQUISITION

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- 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**)

**2026:**

- [27] Z. Moser, M. Guillong, **C. Nathwani**, K. Iwahashi, R.-G. Popa, and O. Bachmann, “Improving crystallization and eruption age estimation using u-th disequilibrium dating of young volcanic zircon,” *Geochronology*, vol. 8, no. 1, pp. 63–84, 2026. DOI: 10.5194/gchron-8-63-2026.
- [26] **C. Nathwani**, E. Giovanini, O. Bachmann, *et al.*, “Sulfate-dominant apatite in the deep arc crust indicates that high oxidation state promotes copper fluxing in arcs,” *Geology*, vol. 54, no. 1, pp. 87–91, 2026. DOI: 10.1130/G53549.1.

**2025:**

- [25] L. G. Candiotti, **C. Nathwani**, and C. Chelle-Michou, “Validating thermodynamic models of arc-magma differentiation and training neural networks for rapid thermodynamic property inference,” *Authorea Preprints*, 2025.
- [24] Z. El Ouad, M. A. Belfoul, M. Souhassou, *et al.*, “Lithostructural controls of Pb-Cu-Ag mineralized veins of Jbel Addana district (Western Anti-Atlas, Morocco): Implications for mineral exploration,” *Journal of African Earth Sciences*, p. 105 801, 2025. DOI: 10.1016/j.jafrearsci.2025.105801.
- [23] F. Askkour, M. Ikenne, B. L. Cousens, *et al.*, “Anatectic origin of the pegmatite-aplite dykes from the Paleoproterozoic basement of the Bas Draa inlier (Anti-Atlas-Morocco): Insights from whole rock geochemistry, Sm-Nd isotopes and tourmaline chemistry,” *Journal of African Earth Sciences*, p. 105 703, 2025. DOI: 10.1016/j.jafrearsci.2025.105703.
- [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*, pp. 15–33, 2025. DOI: 10.5194/gchron-7-15-2025.

**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**

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- [11] **C. Nathwani**, E. Giovanini, C. Chelle-Michou, *et al.*, “Late sulfide saturation in the Valle Fertil deep crustal section, argentina: Implications 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: Implications 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**

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• Invited talk, China University of Geoscience (Beijing)	November 2025
• Invited talk, China University of Geoscience (Wuhan)	November 2025
• Invited talk, Goldschmidt 2025: Calc-alkaline magmatic systems, Prague	July 2025
• 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

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• 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

## TEACHING EXPERIENCE

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**Lecturer** *September 2024 – present*

*Department of Earth and Planetary Sciences, ETH Zürich*

- Designed and taught four lectures/practical class of the MSc course ‘Quantitative and conceptual methods in geochemistry’ (~10 students) including petrogenetic modelling, compositional data analysis, multivariate statistical techniques and thermodynamic modelling of magmatic systems
- Lectured two classes of the MSc course Mineral Resources II in 2025

**Student supervision, ETH Zurich**

- Niklas Lötscher (MSc): Constraining crustal controls on trace element compositions of arc magmas using computational modelling
- 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
- Yaying Peng + Angela Rigaux (RA): clustering of plagioclase textures using machine learning
- 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

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**Associated Editor**

*January 2026 – present*

*Journal of Geophysical Research: Machine Learning and Computation*

**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: Nature Geoscience, Geology, 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**

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**• 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