Dr. Marco A. Acevedo Zamora

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Travel document: Australian Temporary Graduate visa (485) until November 2027.

EDUCATION

2020-2024   **PhD in Geology** (focus on geoscientific correlative microscopy)
Queensland University of Technology, Brisbane, Australia
Thesis title: "Petrographic microscopy of geologic textural patterns and element-mineral associations with novel image analysis methods" – Nominated for the Outstanding Doctoral Thesis Awards 2024.
Supervisors: Prof. Balz Kamber and Associate Prof. Christoph Schrank.
The thesis included three publications.

2017   **Eng in Geology** (professional certification)
National University of Engineering, Lima, Peru
Thesis: "Modelamiento geoquímico de la cristalización del magma con simulación de Monte Carlo: Complejo Val Fredda, Batolito del Adamello, Norte de Italia"
Supervisor: Atilio Mendoza Apolaya

2014-2016   **MSc in Geology** (focus on geochemistry and ore deposits)
University of Geneva, Geneva, Switzerland
Thesis: "Emplacement and Magmatic Evolution of the Val Fredda Complex intrusions (southern Adamello Batholith, N. Italy)"
Supervisors: Dr. Luca Caricchi and Prof. Urs Schaltegger.
Included coursework (60 ECTS; ~5/6) and thesis (60 ECTS; 4.25/6 points) components. The classes and exams were taken in English and French in collaboration with the University of Lausanne.

2007-2012   **BSc in Geology** (focus on mining geology)
National University of Engineering, Lima, Peru
The degree included 2 years of fundamental sciences and 3 years of the discipline.
The last semesters 6 months of internships in mining sites (MARSA San Andres and MILPO Cerro Lindo sites)
Top one-fifth of the graduating class (grade 12.5/20). This is the most scientific and competitive university in Peru.

RESEARCH EXPERIENCE

2023-Present   **Research Associate** (School of Earth and Atmospheric Sciences)
Queensland University of Technology, Brisbane, Australia.

I work designing and developing image analysis workflows that use microscopy and mass spectrometry data to study rock thin section and mineral mounts using several laboratory instruments. My approaches

are multi-disciplinary and aid team experts to unveil mysteries about the history of the Earth with increased efficiency and productivity (automation).

- Main workflow and software developer for:
  - Load 60%: the BHP-QUT project studying detrital zircons (geochemistry, age, cathodoluminescence texture). Lead: Prof. Allen.
  - Load 40%: the AuScope project developing a virtual microscope for correlative microscopy. Supervisor: Prof. Kamber.
- Writing papers and presenting in national and international seminars and conferences to expose new technologies to the broader geoscientific community.
- Currently collaborating with QUT, UQ, and ANU researchers (see co-authored papers).

2018-2020 **Research Assistant** (Department of Geology)
Trinity College Dublin, Dublin, Ireland.

Member of the Metal Intelligence project (European Union 2020 funds) granted to Prof. Balz Kamber. The local supervisor was Assistant Professor Sean H. McClenaghan.

- Developing software that covered data-analysis gaps using a variety of acquisition techniques such as optical, electron microscopy, and micro-analysis (e.g., LA-ICP-MS mapping) to demonstrate new applications and reutilize legacy datasets.
- Trialling whole-slide imaging using electron and optical microscopy techniques with several acquisition settings.
- Learning about state-of-the-art geometallurgy techniques applied in mining by Finland (Outotec) and Sweden (Luleå University of Technology) researchers.

MINING INDUSTRY EXPERIENCE

2017-Apr 2018 **Intermediate Geologist**
Geoandina Exploraciones S.A.C., Peru.

Third-party core re-logging programme in Tantahuatay mining project requested by Coimolache Mining Company (owned by Buenaventura).

- Daily diamond drill hole (DDH) core logging and database digitalization (GVMapper software). I totalled 2.5 km out of 10 km (total teamwork) of logged core in mainly volcanic rocks and argillic alteration.
- Elaborating periodic progress reports for Buenaventura and following the feedback of the prospect 2D geological sections done by an external consultant (Eng. Angel Paredes).
- Leading the small team as the substitute of Senior geologist (Eng. Nestor Landeo).

2017 **Visiting Engineer**
Consultancy jobs in the Peruvian Andes, including:

- Geomecanica Latina S.A. (Sep-Nov 17): Geomechanics study onsite at the Casapalca project in collaboration with the Mine Planning Department. It included structural geology of the mine deepening levels (Lvl. 15 to 18) looking forward to study tectonic paleo-stresses and fault kinematics.
- RAM Peru S.A.C. (Oct 16-Mar 17): Visiting DDH platforms in Sierra Antapite project (Aug 17) and Concesion Minera Virrila and Tajo Norte projects to understand CAPEX and core logging work.

Sep 12-Apr 14 **Mine Geologist** (graduate programme)
Antapaccay Mining Company, Peru.
Trainee in rotation throughout several areas of the Mine Engineering Management at the Tintaya-Antapaccay mine (owned by Glencore-Xstrata).

- Exploration Geology group (6 months) and Ore Control Department
  - Perform core logging and sampling of the drilling (DDH and RC).

- o Perform mapping of areas nearby to the open pit (brownfield), benches (delimitation) and geological interpretation. Supervision of two drilling platforms (DDH).
  - o Quality control of chemical analysis by Atomic absorption, Fire Assays and ICP.
- Ore Control group (10 months)
  - o Report job updates in meetings about production (work shifts) and occupational security (HIRA). This includes activities such as preparing maps of RC drilling, marking mineral polygons in the field (benches) and control ore/waster quality and shippinh (front and stockpiles).
  - o Update the short-term model in MineSight with new RC drilling analyses.
  - o I led a campaign to improve sampling of RC mounts (blast hole) in the open pit using "auger" drilling increments. We reduced to <5% the sampling error generating a positive impact on productivity.
- Short- and Long-term Planning group (3 months): (1) Assistance in topography (Trimble instrument) at stopes, dumps, concentrate stock, etc. (2) Update the mining phase solids in MineSight.

AWARDS

- Queensland University of Technology Faculty of the Science Executive Dean's Commendation for Outstanding Doctoral Thesis for 2024. **250 AUD.**
- First place on the 'Light Microscopy Australia & Volume Imaging Australia 2023 Image Competition' in the Material Science Category (https://microscopy.org.au/3357-2/). **400 AUD gift card.**
- Queensland University of Technology South American Scholarship 2019 for the tuition fee of the PhD in Geology (Sep 2020 - Jan 2023). **153,600 AUD.**
- Southern-ProUNI 2014 scholarship for the living cost of the MSc in Geology. Granted by the "Patronato" of the National University of Engineering (April, 2014). **20,000 USD.**

PUBLICATIONS

Manuscripts (in progress and submitted)

Elise B. Laupland, Balz S. Kamber, Marco A. Acevedo Zamora, John T. Caulfield, Charlotte M. Allen. Evaluation of Uniform Manifold Approximation and Projection for dimensionality reduction of large geochemical datasets relevant to magmatic ore-fertility, petrologic classification, and provenance. In revision in *Chemical Geology*.

Acevedo Zamora, M. A., Kamber, B. S., Caulfield, J., Allen, C. Forward image registration for higher level interpretation of zircon provenance based on combined CL, U/Pb age and geochemical data. In revision in *AGU Geochemistry, Geophysics, Geosystems*.

Scientific journal articles

Ubide, T., Murphy, D. T., Emo, R. B., Jones, M. W. M., Acevedo Zamora, M. A., & Kamber, B. S. (2025). Early pyroxene crystallisation deep below mid-ocean ridges. *Earth and Planetary Science Letters*, *663*, 119423. https://doi.org/https://doi.org/10.1016/j.epsl.2025.119423

Kamber, B. S., Acevedo Zamora, M. A., Rodrigues, R. F., Li, M., Yaxley, G. M., & Ng, M. (2025). Exploring High PT Experimental Charges Through the Lens of Phase Maps. *Minerals*, *15*(4), 355. https://www.mdpi.com/2075-163X/15/4/355

Acevedo Zamora, M. A., Schrank, C. E., & Kamber, B. S. (2024). Using the traditional microscope for mineral grain orientation determination: a prototype image analysis pipeline for optic axis mapping (POAM). *Journal of Microscopy*. https://doi.org/10.1111/jmi.13284

Acevedo Zamora, M. A., Kamber, B. S., Jones, M. W. M., Schrank, C. E., Ryan, C. G., Howard, D. L., Paterson, D. J., Ubide, T., & Murphy, D. T. (2024). Tracking element-mineral associations with unsupervised learning and dimensionality reduction in chemical and optical image stacks of thin sections. *Chemical Geology*, 121997. https://doi.org/10.1016/j.chemgeo.2024.121997

Acevedo Zamora, M. A., & Kamber, B. S. (2023). Petrographic Microscopy with Ray Tracing and Segmentation from Multi-Angle Polarisation Whole-Slide Images. *Minerals*, *13*(2). https://doi.org/10.3390/min13020156

Thesis

Acevedo Zamora, M. (2024). *Petrographic microscopy of geologic textural patterns and element-mineral associations with novel image analysis methods* [Thesis by publication, Queensland University of Technology]. Brisbane. https://eprints.qut.edu.au/248815/

Acevedo Zamora, M. A. (2016). *Emplacement and Magmatic Evolution of the Val Fredda Complex intrusions (southern Adamello Batholith, N. Italy)* [Monograph, University of Geneva]. Geneva, Switzerland.

Conference Communications (as speaker)

Acevedo Zamora, M. A., Caulfield, J. T., Laupland, E., Kamber, B. S., & Allen, C. M. (2025). Mineral Separate Microanalysis with Intelligent Spot Placement, Manual Edition, and Simulation: Two Correlative Microscopy Prototypes for Relating Zircon Texture, Age, and Geochemistry. https://doi.org/10.14293/apmc13-2025-0280

Acevedo Zamora, M. A. Integrating petrographic optical microscopy and image analysis. In the Automated Mineralogy User's Group (AMUG). Event at Curtin University, Perth, Australia. 1st November 2024.

Acevedo Zamora, M. A. Petrographic Microscopy of Geologic Textural Patterns and Element-Mineral Associations with Novel Image Analysis Methods. In the Australian Microscopy and Microanalysis Society (AMAS) sixteenth biennial symposium, Brisbane, Australia. 8th February 2024. https://members.asnevents.com.au/event/1889/abstract/101975/view

Acevedo Zamora, M. A.; Schrank, C. E.; Kamber, B. S. Image registration, dimensionality reduction and semantic segmentation of combined optical and chemical images: Discoveries in an example of carbon mass-balancing in a pelagic limestone. In Goldschmidt 2023, Lyon, France. 14th July 2023. DOI: https://doi.org/10.7185/gold2023.18820.

Acevedo Zamora, M. A. Automated mineralogy from high-resolution, multi-angle optical microscope scans: evaluating scalable software tools for trainable image segmentation. In the Automated Mineralogy User's Group (AMUG). Event at the University of Adelaide, Adelaide, Australia. 7-8th July 2022.

Acevedo Zamora, M. A. Novel ways of automated trace element-mineral association recognition. In Conference in Minerals Engineering, Lulea, Sweden. February 4-5th, 2020; Rosenkranz, J., Ed.; Luleå University of Technology.

Full list at https://www.researchgate.net/profile/Marco_Acevedo2

COMMUNITY ENGAGEMENT

2021-2023   During PhD candidacy

I collaborated as:

- o Leading microscopist and trainer of new users on the Olympus VS200 slide scanner at the Central Analytical Research Facility (CARF). I trained several users including students and researchers (~40 people).
- o Sessional Academic Appointment (course tutor) demonstrating one time in Earth Materials (ERB-205) and two times in Chemical Earth (ERB-301) (Semester 1). Total time of 75 hr.
- o Trialling my approaches for processing images from the Perseverance 2020 rover mission with JPL (NASA) (in coordination with David Flannery). The PIXL and WATSON images were registered for display in the PIXLISE web-interface (in collaboration with Peter Nemere). Total time of 1 month.

Member of:
- Australian Microscopy & Microanalysis Society (2023 - Present). https://microscopy.org.au/
- European Association of Geochemistry (2025 – 31 Dec 2029). https://www.eag.org/
- Colegio de Ingenieros del Peru (2018 - Present). CIP 215876. http://www.cip.org.pe/
- Society of Economic Geologist (2012 –2022). Student member 901531. https://www.segweb.org/

SKILLS AND COMPETENCES

As a proficient programmer, I can produce my own customised software for sought-after applications using tools and graphical interfaces) like:
- Open-source imaging software: ImageJ-Fiji, QuPath, and SuperSIAT.
- Programming languages: MatLab, Python, PyTorch framwork, R Studio, HTML, CSS
- Proprietary mass spectrometry software: Iolite v4, AZtec v3.2, TESCAN TIMA

I am also familiar with commercial and compiled software: LeapFrog Geo (geological modeling), and IoGAS (bulk-rock geochemistry). In addition, I understand the basics of HSC v.9 Outotec (mineral processing), Autocad 2010, Surfer 9 (anomalies surveying), Illustrator (image edition), GVMapper (core logging), Dips, Stereonet and Faultkin (structural geology).

Recent certifications:

Deep Learning specialization (Coursera)   Aug 20
Introduction to Deep Learning in Python and Tensorflow/Keras with Andrew Ng.
https://www.coursera.org/account/accomplishments/specialization/certificate/R4BPCMUPV25P

Machine Learning (Coursera)   Jan 19
Introduction to Artificial Intelligence in MatLab with Andrew Ng (Stanford University).
https://www.coursera.org/account/accomplishments/certificate/DR449FET8R3J

HSC Chemistry 9.6   Jun 18
Full software introductory course of LCA, Basic, Equilibrium, Pyro, Hydro, Minpro, and Minpro Advanced. 4-15 June 2018 at Outotec Research Center, Pori, Finland.

Geometallurgy workshop   May 18
Course modules II (analytic methods) and III (geometallurgical model) with Samuel Canchaya (Sampling OK). 11th, 12th, 25th and 26th May 2018. Lima, Peru.

Leapfrog Geo 4.0 geological modeling   Jan 18
A review of the software workflow for building geological models (15 hrs) with Eng. Richard Osorio. Lima, Peru.

LANGUAGE SKILLS

SPANISH – Native

ENGLISH – Competent
IELTS (listening 8.5, reading 7.5, writing 6.5, speaking 7.0 = 7.5 /9.0). July 18th, 2024.

FRENCH – Intermediate
DELF (A1), ALLIANCE FRANÇAISE – LIMA, August 2014. I practiced during my Masters in Geneva (Switzerland).

REFEREES

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Prof. Urs Schaltegger
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Mining (Peru)

Eng. Jorge Luis Valverde Vega. Mine manager in various Peruvian mines.
https://www.linkedin.com/in/jorge-luis-valverde-vega-23606210b/

Eng. Jose Fernando Zamora Rodriguez. Superintendent and consultant in gold metallurgy.
https://www.linkedin.com/in/fernando-zamora-81524271/