



# Marie Curie Postdoc Fellowship

## 2026



### 1. Supervisor

**Supervisor:** Fabio Arzilli – School of Science and Technology – Geology Division

#### Curriculum Vitae

Current academic position: Associate Professor at the University of Camerino, School of Science and Technology, Geology Division, Camerino (Italy).

Professional and academic competencies: Petrology, Experimental petrology, Volcanology, Geochemistry, Mineralogy, Synchrotron X-ray tomography, In situ experiments using synchrotron techniques.

Peer-reviewed articles: 54

h index: 28 (Google Scholar)

#### SELECTED SCIENTIFIC ARTICLES:

- **Arzilli, F.**, La Spina, G., Bamber, E.C., Morgavi, D., Fedele, L., Mancini, L., Prašek, M., Santangelo, I., Chiominto, G., Perrotta, A. and Lemaire, T., Balcone-Boissard, H., Giordano, D., Scarpato, C., 2026. The role of crystal-bubble interactions, outgassing and magma composition in the ascent dynamics of alkaline magmas: Implications for eruptions at Vesuvius. *Earth and Planetary Science Letters*, 675, 119771.
- Bamber, E.C., **Arzilli, F.**, Cipiccia, S., Batey, D.J., La Spina, G., Polacci, M., Gholinia, A., Bagshaw, H., Di Genova, D., Brooker, R., Giordano, D., Valdivia, P., Burton M.R. (2025). 3D quantification of nanolites using X-ray ptychography reveals syn-eruptive nanocrystallisation impacts magma rheology. *Nature Communications*, 16, 7083.
- Bonechi B., Polacci M., **Arzilli F.**, La Spina G., Hazemann J.L., Brooker R.A., Atwood R., Marussi S., Lee P.D., Wogelius R.A., Fellowes J., Burton M.R. (2024). Direct observation of degassing during decompression of basaltic magma. *Science Advances*, 10, 2585.
- Bamber, E.C., La Spina, G., **Arzilli, F.**, Polacci, M., Mancini, L., de' Michieli Vitturi, M., Andronico, D., Corsaro, R.A. and Burton, M.R. (2024). Outgassing behaviour during highly explosive basaltic eruptions. *Communications Earth & Environment*, 5, 3.
- Bamber, E.C., La Spina, G., **Arzilli, F.**, de' Michieli Vitturi, M., Polacci, M., Hartley, M.E., Petrelli, M., Fellowes, J. and Burton, M. (2022). Basaltic Plinian eruptions at Las Sierras-Masaya volcano driven by cool storage of crystal-rich magmas. *Communications Earth & Environment*, 3, 53.
- La Spina G., **Arzilli F.**, Burton M.R., Polacci M. and Clarke A.B. (2022). Role of volatiles in highly explosive basaltic eruptions. *Communications Earth & Environment*, 3, 1-13.
- **Arzilli, F.**, Polacci, M., La Spina, G., Le Gall, N., Llewellyn, E.W., Brooker, R.A., Torres-Orozco, R., Di Genova, D., Neave, D.A., Hartley, M.E. and Mader, H.M., Giordano D., Atwood R., Lee P.D., Heidelbach F. and Burton M.R. (2022). Dendritic crystallization in hydrous basaltic magmas controls magma mobility within the Earth's crust. *Nature Communications*, 13, 1-14.



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- La Spina G., **Arzilli F.**, Llewellyn E.W., Burton M.R., Clarke A.B., de' Michieli Vitturi M., Polacci M., Hartley M.E., Di Genova D. and Mader H.M. (2021). Explosivity of basaltic lava fountains is controlled by magma rheology, ascent rate and outgassing. *Earth and Planetary Science Letters*, 116658.
- Di Genova D., Brooker R.A., Mader H.M., Drewitt J.W., Longo A., Deubener J., Neuville D.R., Fanara S., Shebanova O., Anzellini S., **Arzilli F.**, Bamber E.C., Hennet L., La Spina G. and Miyajima N. (2020). In situ observation of nanolite growth in volcanic melt: A driving force for explosive eruptions. *Science Advances*, 6, 413.
- **Arzilli F.**, La Spina G., Burton M.R., Polacci M., Le Gall N., Hartley M.E., Di Genova D., Cai B., Vo N.T., Bamber E.C., Nonni S., Atwood R., Llewellyn E.W., Brooker R.A., Mader H.M. and Lee P.D. (2019). Magma fragmentation in highly explosive basaltic eruptions induced by rapid crystallization. *Nature Geoscience*, 12, 1023-1028.
- Polacci M., **Arzilli F.**, La Spina G., Le Gall N., Cai B., Hartley M.E., Di Genova D., Vo N.T., Nonni S., Atwood R.C., Llewellyn E.W., Lee P.D. and Burton M.R. (2018). Crystallisation in basaltic magmas revealed via in situ 4D synchrotron X-ray microtomography. *Scientific Reports*, 8, 1-13.
- La Spina G., Burton M., de' Michieli Vitturi M. and **Arzilli F.** (2016). Role of syn-eruptive plagioclase disequilibrium crystallization in basaltic magma ascent dynamics. *Nature Communications*, 7, 1-10.
- Pistone M., **Arzilli F.**, Dobson K.J., Cordonnier B., Reusser E., Ulmer P., Marone F., Whittington A. G., Mancini L., Fife J. L. and Blundy J. D. (2015). Gas-driven filter pressing in magmas: Insights into in-situ melt segregation from crystal mushes. *Geology*, 43, 699-702.
- **Arzilli F.** and Carroll M.R. (2013). Crystallization kinetics of alkali feldspars in cooling and decompression-induced crystallization experiments in trachytic melt. *Contribution to Mineralogy and Petrology*, 166, 1011-1027.

### RESEARCH GRANTS

- 2023-2025: **Project funded by the MIUR-PRIN (PRIN2022)**. Principal Investigator. Project title: *Quantifying micro- and nano-crystallization kinetics of magmas: from laboratory and real-time in situ observations to implications for magma fragmentation*. Acronym: CRYSTALKIN. The amount of the grant: 189.933 €

- 2022-2024: **Project funded by the European Union - NextGenerationEU - Ministry of University and Research - Promotion and Development Fund - Ministerial Decree No. 737/2021 - KINETICVOLC project**. Principal Investigator. Project title: *Quantifying KINETICS of magmatic processes via time resolved in situ experiments at high pressure high temperature conditions: implications for conduit dynamics and style of VOLcanic eruptions*. The amount of the grant: 64.000 €

- 2023-2025: **Project funded by Istituto Nazionale di Geofisica e Vulcanologia (INGV)**. Collaborator. Project title: *Historical Sources, Mineral microanalysis, Experimental pETrology and numerical modeling to unravel the precursor phenomena Of volcanic eruptions: the case of the neapolitan volcanoes*. Acronym: SMEEGOL. The total amount of the grant: 299,000 €.

- 2019-2020: **EUROVOLC grant** (Principal Investigator - project title: *Understanding large volume effusive silicic eruption at Mt. Amiata (Tuscany, Italy): an experimental volcanology and petrology study*).

- Oct-Dec 2010: **Grant for a research period in a non-European country** at the Institute of Geochemistry and Petrology (ETH), Zurich (Switzerland). The amount of the grant: 1800 €



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### Ph.D. FUNDS

- 2023: **1 PhD grant funded by Istituto Nazionale di Geofisica e Vulcanologia (INGV)**. Principal Investigator - project title: *Multidisciplinary approach to investigate the eruptions of Schiappone (40ka) and Zaro (6.1-3.74 ka), (island of Ischia): implications for volcanic risk in the Neapolitan area*. The amount of the grant: 76.000 €
- 2025: **1 PhD grant funded by Natural Hazards and Disaster Risks Reduction (NHDRR)**. Doctoral program associated form with: REDI Research Consortium, Istituto Nazionale di Fisica Nucleare, Istituto Nazionale Geofisica e Vulcanologia, Gran Sasso Science Institute. Principal Investigator - project title: *The role of magma mixing in controlling eruptive style at Los Humeros caldera (Mexico)*. The amount of the grant: 76.000 €

### SYNCHROTRON PROPOSALS GRANTED

Elettra-Sincrotrone Trieste S.C.p.A, SYRMEP beamline (Basovizza Italy): 12 proposals granted

Diamond Light Source, I12 beamline, (Harwell, UK): 10 proposals granted

Diamond Light Source, I13-1 beamline, (Harwell, UK): 2 proposals granted

Swiss Light Source, TOMCAT beamline, (Villigen, Switzerland): 3 proposals granted

ESRF, BM05 beamline: 2 proposals granted

ESRF, BM18 beamline: 1 proposal granted

ESRF, ID19 beamline: 1 proposal granted

ESRF, ID16 beamline: 1 proposal granted

ESRF, ID27 beamline: 1 proposal granted

ESRF, ID02 beamline: 1 proposal granted

### AWARDS

- 2021 EES Postdoctoral Researcher of the Year in the research category at the Department of Earth and Environmental Sciences of the University of Manchester.
- 2011 Award of the School Advanced Studies for outstanding research performance during the Ph.D. period at University of Camerino.

**Contacts:** [fabio.arzilli@unicam.it](mailto:fabio.arzilli@unicam.it)

## 2. Research Group and Facilities

**Laboratory & Facilities:** Includes HP/HT experimental labs (up to 2 GPa/1800°C), X-ray diffraction, digital imaging, spectroscopy (FTIR, Raman), electron microscopy (SEM/TEM/EMPA), and access to international synchrotron facilities.

**Research Network:** Dr. Fabio Arzilli is a member of the EGU, IAVCEI and AIV. Collaborates with top European universities (e.g., University of Manchester, University of Bristol, University of Durham, University of



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Bayreuth, University of Orleans, University of Hannover, University College of London) and several European synchrotrons (Diamond Light Source, ESRF, Swiss Light Source, Elettra).

### 3. Research Thematic Area/Project Idea

**Title of the project:** Role of Volatile Elements and Crystallisation Processes in the Petrogenesis and Volcanism of Terrestrial and Planetary Magmas: An Interdisciplinary Experimental Approach

**Macroarea:** Petrology-Volcanology-Geochemistry

**Project Overview:** This project investigates syn-eruptive magma conditions and their role in controlling nanolite and microlite crystallisation, with particular emphasis on their influence on magma rheology and eruptive style. The research will explore how volatile elements and rapid disequilibrium processes during magma ascent affect crystallisation kinetics and magma dynamics in volcanic conduits.

High-pressure and high-temperature experimental petrology will be used to simulate natural magmatic conditions during ascent and eruption. Experiments will reproduce conduit dynamics and rapid changes in pressure, temperature, and volatile content that promote nano- and micro-scale crystallisation.

Advanced real-time 4D imaging (3D + time) using X-ray microtomography will allow direct observation of crystallisation processes and phase evolution during experiments. These observations will be integrated with quantitative image analysis and modelling to better understand the relationships between crystallisation, magma rheology, and eruptive behaviour.

The project will provide new insights into the petrogenesis and eruptive dynamics of both terrestrial and planetary magmas, while also offering potential applications for glass-ceramic material development, where controlled crystallisation processes are of technological interest.

### 4. Candidate and Career Plan

**Expected background of the candidate:** The candidate should have a background in volcanology, petrology, and geochemistry, with a strong interest in experimental petrology under high-pressure and high-temperature conditions and in understanding magmatic and volcanic processes.

**Competences and knowledge to be developed by the candidate:** During the project, the candidate will develop expertise in:

- Real-time 4D (3D + time) experiments using X-ray microtomography
- Advanced image analysis and quantitative microstructural characterization
- Disequilibrium magmatic processes
- Nano- and micro-crystallisation kinetics
- Magma reservoir and conduit dynamics
- Experimental and numerical modelling of volcanic processes

These skills will provide interdisciplinary training at the interface between petrology, volcanology, materials science, and imaging techniques.