

## PhD position in applied geomicrobiology

**Project title:** Microbial biomining of critical raw materials from geothermal brines

**Background:** Metals, such as copper, gold, silver, lithium and rare earths (to name a few) are essential for the functioning of our modern societies. Indeed, information and communication tools as well as low-carbon renewable energies require various metals for their effective functioning. For instance, a smartphone may contain up to 70 different metals! Yet metals are non-renewable natural resources and their mining in the environment is generally considered un-ecological and often non-ethical. In addition to this, there is a strong geopolitical dependency for most metal resources, in particular for Europe. However, the overall need in metal resources is not expected to decrease due to a constant technological innovation along with the traditional pattern of a consumer's society. For this reason, alternative sources for critical raw materials (CRM) are currently actively researched. In this project funded by the State Secretariat for Education, Research and Innovation, as part of an international collaboration sponsored by a Europe Horizon grant, we are focusing on the possibility of bio-recovering CRM from deep geothermal environments exploited for the generation of electricity and heat.

Microorganisms constantly interact with mineral materials in the environment, either actively by altering their solubility and/or redox state or passively by sorbing them onto cellular surfaces. In addition to this, interactions between bacteria and fungi are essential for the functioning of biogeochemical cycles, as in soils for example where their interactions make nutrients available to plants or reduce the toxicity of heavy metals. These same abilities can be harnessed for bio-inspired metal recovery processes. To do so, the idea is to select microbial properties and/or metabolisms that are known to be involved in biogeochemical processes where metal solubility is at the core. Then, the aim is to understand the abiotic and trophic factors that are necessary to trigger either metal-mobilization or -immobilization, in order to achieve selective metal recovery depending on the brine's composition.

**PhD work description:** The laboratory of microbiology of the University of Neuchâtel has a large collection of bacterial and fungal strains with known biogeochemical abilities. The aim of this PhD thesis is to investigate the feasibility of using these strains, under different conformations, in an urban-mining context in order to biorecover CRM (e.g. lithium, strontium) from geothermal environments (brine and scales).

**Requirements:** We are seeking a PhD student with skills in both microbial ecology and mineralogy. Applicants are expected to have knowledge in both fungal and prokaryotic biology. Additionally, experience in methods such as electron microscopy and associated micro-analytical tools, X-ray diffraction and other approaches at the micro-scale are a plus. Applicants should be interested in interdisciplinary research at the microbe-mineral interface. Besides research activities, the hired PhD student will participate to the teaching activities of the laboratory and should be interested in communication, as well as to be able to communicate in French (both written and spoken, with the possibility to learn during the PhD). An excellent level of English (spoken and written) is required.

**Supervision:** Dr Saskia Bindschedler and Prof. Pilar Junier.

**How to apply:** Send a single pdf file including a motivation letter, a full CV, and the names and contact information of two reference persons to [saskia.bindschedler@unine.ch](mailto:saskia.bindschedler@unine.ch). **The deadline to apply is 01.07.23 and the planned starting date is 01.09.23.**

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