

## Master thesis opportunity

### Harnessing bacterial-fungal interactions for the biorecovery of valuable compounds in anthropogenic waste

**Context:** Industrial and urban wastes represent a growing fraction of the waste produced worldwide. These wastes can be either organic (such as wastewater sludge or compost) or inorganic (such as electronic waste). Both types represent a non-negligible source of valuable, yet non-renewable resources, such as phosphorous or precious metals. At present-day, the recycling of this type of waste is still in its infancy. Current methods in metal recycling consist in relatively polluting approaches (pyro- and hydrometallurgy). Regarding phosphorous, enormous amounts are lost via the incineration of wastewater sludge. As a result, the field of urban waste recycling (urban-mining) is a timely issue that requires the development of innovative and sustainable approaches. Many industrial and urban wastes typically consist of a heterogeneous matrix of materials and thus a parallel can be drawn to other complex systems such as soils. In soils, microbial interactions are essential to maintain biogeochemical cycles. This master project is part of a research area developed in the laboratory where we aim at exploring the possibility of using edible mushrooms fruiting bodies to develop an innovative process for the biorecovery of selected valuable compounds from urban and industrial waste using digested sewage sludge and electronic waste as model urban waste.

**Goals:** **1)** Isolation and/or selection of metal-resistant mushrooms from the lab's collection, the environment and/or industrial samples ; **2)** Assessment of their capabilities towards the formation of fruiting bodies in laboratory conditions ; **3)** Set-up of fruiting trials with actual waste (e.g. e-waste, WWTP sludge), with the possibility of including bacterial isolates known to help in the mobilization and immobilization of valuable compound in previous work performed in our laboratory.

**Knowledge and skill required:** High motivation for experimental work, interest for fungal biology, and imagination. Good knowledge of both French and English.

**Keywords:** urban-mining, mushrooms, fruiting body formation, bacterial-fungal interactions, geomycology/geomicrobiology.

**Working place:** Laboratory of Microbiology, University of Neuchâtel.

**References:** **1)** Baldé CP, Wang F, Kuehr R & Huisman J. 2015. The global e-waste monitor 2014: Quantities, flows and resources. United Nations University, IAS - SCYCLE. **2)** Nancharaiyah Y, Mohan SV & Lens P. 2016. Biological and bioelectrochemical recovery of critical and scarce metals. Trends in biotechnology 34, 137-155. **3)** Canthino P, Matos M, Transcoso MA, Correia dos Santos. 2016. Behaviour and fate of metals in urban wastewater treatment plants: a review. Int J Environ Sci Technol 13, 359-386. **4)** Losa G, Bindschedler S. 2018. Enhanced Tolerance to Cadmium in Bacterial-Fungal Co-Cultures as a Strategy for Metal Biorecovery from e-Waste. Minerals 8, 121, doi:10.3390/min8040121.

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