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INTERNSHIP OFFER
Assessment of the effect of soil contamination on the evolution of soil functionality indexes under controlled conditions

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Location: Verneuil-en-Halatte (60) – accessible by public transport, 40 minutes north of Paris
Contract type: Internship
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CONTEXT AND OBJECTIVES OF THE INTERNSHIP

Soil, a non-renewable natural resource, is the foundation of terrestrial ecosystems. The numerous functions performed within the soil matrix support essential ecosystem services, including biomass production, organic matter decomposition, nutrient cycling, and water filtration. However, soil degradation is currently estimated to affect approximately 60–70% of soils at the EU level, with contamination representing one of the major pressures contributing to the loss of soil functionality. In this context, soil preservation has become a major priority, increasing the need for reliable indicators of soil state.

Biological indicators, including soil enzymatic activities, soil respiration and cellulose degradation capacity, are commonly used to assess soil functionality and detect changes resulting from environmental pressures. However, their capacity to specifically reflect the effect of soil contamination remains only partially understood. Previous experimental results have shown that distinguishing contaminant-related effects from those resulting from other environmental drivers, such as pH, organic matter content, soil moisture, vegetation cover, and climatic conditions can be challenging. These observations highlight the need for further research into the effects of soil contamination on biological indicators.

Within that context, a laboratory experiment will be conducted including selected organic and inorganic contaminants commonly found in the environment and selected biological indicators. The contaminants will include: copper (Cu), cadmium (Cd), and aminomethylphosphonic acid (AMPA). The individual effects of AMPA and the combined effects of Cu and Cd, as well as Cu, Cd, and AMPA, will be tested at different concentrations. The biological indicators will include the enzymatic activities of four extracellular hydrolases: arylsulfatase (ARS), β-glucosidase (GLU), alkaline phosphatase (PAK), and urease (URE), as well as cellulose degradation capacity. These enzymatic activities are associated with the cycling of sulfur (S), carbon (C), phosphorus (P), and nitrogen (N), respectively, and are mainly mediated by soil microorganisms. Cellulose degradation capacity provides information on the overall capacity of both soil microorganisms and mesofauna to degrade an introduced carbon source. In addition to the biological measurements, the experiment will include physicochemical measurements, including pH and soil moisture content, while soil sampling for metagenomics analysis will be considered as well. All indicators will be monitored at defined time intervals over a total period of six months.

During this six-month internship, the student will be involved in a laboratory experiment (as presented above), with the main objective to contribute to current knowledge on the potential of soil enzymatic activity (extracellular hydrolases) and cellulose degradation capacity to reflect soil contamination status.

The work will include a literature review on the topic, experimental laboratory work, and data analysis and interpretation.

This internship is part of a thesis work, aiming to characterize biological indicators for their capacity to reflect soil contamination status and support environmental risk assessment.

CANDIDATE PROFIL

This internship is intended for Master's level students (M2) specializing in ecotoxicology, biology, or environmental sciences.

Experience / Skills

- Interest in experimental laboratory work
- Autonomy
- Strong analytical skills
- Good writing skills
- Ability to work effectively in English

PRACTICAL INFORMATION

Duration: 6 months
The intern will be hosted within the ICAT unit at INERIS and will work under the supervision of Christina Chatzimarinaki (PhD student within the ICAT unit) and co-supervised by Nicolas Manier (engineer within the same unit).

This position is open to candidates with disabilities.