



## JOB OPENING

### Ph.D. student in Environmental Analytical Chemistry

Exploring the historical contamination of the Rhone River through non-targeted chemical analysis by liquid and gas chromatography coupled to high resolution mass spectrometry

*The French National Research Institute for Agriculture, Food and Environment (INRAE) is a public research institute gathering 12 000 employees within more than 200 research units and 42 experimental units implanted across France. INRAE is among the world leaders in agricultural and food sciences, as well as in plant and animal sciences. INRAE's research activities aims to build solutions for multi-performance agriculture, food quality and sustainable management of resources and ecosystems.*

### YOUR MISSION AND ACTIVITIES

■ You will join the AQUA department, within the RiverLy research unit that combines expertise in hydrology, hydraulics, environmental chemistry, ecology, ecotoxicology and microbiology to develop innovative approaches that allow apprehending the quality, operation and dynamics of hydrosystems. These approaches cover every level of living organisms (from cell to communities of organisms) at different scales structuring hydrosystems (from microsites to large catchment basins). These interdisciplinary research aims to a better consideration of anthropic and natural hazards for an improved river management and restoration.

Within the research unit Riverly, you will join the aquatic chemistry laboratory (LAMA, [www.https://lama.inrae.fr/](https://lama.inrae.fr/)). The LAMA research team assesses the sources, fate and impact of contaminants in hydrosystems in order to lower the input and related hazards. The LAMA research team develops methodologies and approaches to characterize contamination related to input from agricultural and urban areas.

The number of anthropic molecules (pharmaceuticals, plasticizers, pesticides...) available keeps growing. When these molecules reach the aquatic environment, they are considered micropollutants. The concentration of micropollutants in rivers changes through the years as our society evolves for instance phasing out some pesticides or improving wastewater treatment or the implementation of new legislation regarding the discharge of chemicals in the environment. While micropollutants can be transferred to sediments, these represent an archive of environmental contamination. Therefore, the analysis of suspended solids and sediment core allows revealing the contamination history of a river. Several studies already used a targeted approach to establish the profile of a limited number of micropollutants in some sediment core.

Through several completed and on-going research programs, the LAMA research team has access to samples of suspended solids and sediment cores collected upstream and downstream the city of Lyon (France). Suspended solids sampled monthly represent a detailed archive of the contamination in the Rhone River over the last decade while sediment cores represent an archive covering several decades. In order to establish a comprehensive assessment of historical contamination in the Rhone River with such samples, we offer a position for a PhD student in environmental analytical chemistry aiming at developing an analytical strategy for the analysis of sediments by liquid and gas chromatography coupled to high resolution mass spectrometry using a non-targeted approach.

Challenges mostly consist in developing a method allowing extracting as many micropollutants as possible from sediments then developing relevant workflows to process the large amount of data resulting from the analysis by high resolution mass spectrometry. These workflows should include : i) criteria to select relevant signals (significantly higher than the noise, repeatability...); ii) necessary and suitable statistical analysis; iii) a new approach including innovative quality controls to ensure data reliability.

■ You will be in charge of:

- Developing and optimizing an extraction method for the micropollutants contained in sediments and their analysis by liquid and gas chromatography coupled to high resolution mass spectrometry ;
- Developing and optimizing workflows to process data resulting from non-targeted analysis using multiple tools like R, workflow for metabolomic, MZmine, then statistical analysis (PCA, ANOVA, cluster analysis...);
- Match chemical data with historical data (authorization of new molecules, improvement of wastewater treatment...) and hydrological data with the assistance of experts in these research areas ;
- Present results at conferences and publish scientific papers.

The research activities will be co-directed by Sylvain Merel (research scientist) and Cécile Miège (senior research scientist) within the LAMA research team.

## The candidate we are looking for

- Recommended education: Master in environmental analytical chemistry, environmental sciences
- Knowledge expected: sample preparation techniques, chromatographic techniques, mass spectrometry, statistical data treatment, fluent english level (B2).
- Experience with: treatment of high resolution mass spectrometry data (R software, exploratory analysis of large data sets, statistical analysis such as PCA, ANOVA...)
- Skills expected: team work, initiative, good writing capacity

### ↳ Contract details

- Research Unit: RiverLy
- Zip code + city: 69100 Villeurbanne
- Type of contract : fixed term
- Duration of the contract : 3 years
- starting date: November 1st, 2021
- Salary: 1 874,41€ before tax

### ↳ How to apply

Send a cover letter and a resume to :  
Sylvain Merel et Cécile Miège

by e-mail : [sylvain.merel@inrae.fr](mailto:sylvain.merel@inrae.fr)  
[cecile.miege@inrae.fr](mailto:cecile.miege@inrae.fr)

✘ Deadline to apply: **June 15<sup>th</sup>, 2021**