Position: PhD fellowship in High Resolution Mass Spectrometry applied to Cultural Heritage (M/F)

PhD Title: Deciphering macromolecular networks in ancient materials: interactions and assemblies

Name of supervisor: Prof Caroline TOKARSKI
CNRS Laboratory: CBMN UMR 5248 and Proteome Platform, Bordeaux, France https://proteome.u-bordeaux.fr/
Environment: IRP ARCHE with the Metropolitan Museum of Art, New York, U.S.A. https://arche.cnrs.fr/
Tenure: 3-year full time position starting on the 1st September 2024 (or at latest the 1st October 2024)

Context. Deciphering the molecular complexity of cultural heritage objects is central to understand an artwork or a museum object, how it was created or how it has changed over time. Molecular information can place objects in time, in space and in context. It informs us on societal, cultural and economic aspects of the past communities. It plays also a central role in conservation and preservation strategies as well as authentication.

PhD Objectives. This PhD work will use unexplored and multifaceted developments in analytical chemistry to decipher *in situ* chemistries of ancient proteins (i.e. networks, molecular assemblies and interactions). To achieve these aims, the PhD fellow will design, assess, and deploy the most advanced and next generation workflows based on high-resolution mass spectrometry, employing the latest technical developments, several which have never been applied to Cultural Heritage, involving omics methods (top down, bottom up), structural mass spectrometry (XLMS and HDXMS) and MS imaging (MALDI IMS). The developed workflows will be miniaturized; tailored to the study of very small sample amounts (trace analysis). A fundamental challenge is to bridge the gap between the information currently available, which is mainly based on individual classes of molecule independent of their matrices, with understanding "multi-component materials" that inherently have highly complex interactions. This PhD project will address specific questions about:

(i) Material manufacture and origin – The constituent or impregnated biomolecules identified in art objects can lead to more confident placement of artworks to geographic locations, cultures, or individuals

(ii) Attribution - a better knowledge of protein/lipid in situ chemistries and their networks / assemblies can make a significant contribution to understanding the materials that artists select and how they use them.

(iii) Preservation- the evolving chemical knowledge of paint alteration over time will shed new light on the consequences of cleaning and other conservation treatments. Both chemical characterization and imaging approaches will be used to determine the (in)organic paint and degradation components spatially resolved in microscopic paint cross sections.

The PhD project will benefit from the exceptional environment of The Metropolitan Museum of Art, New York, through its collections, the direct link with experts of other disciplines (conservators, art historians, archaeologists) as well as the scientists at the MET.

Essential and Preferred Experience and Skills

- Chemistry or biochemistry background
- Demonstrated knowledge of analytical chemistry, in particular, mass spectrometry (theoretical and experimental).
- Demonstrated experience in tandem MS-based proteomics data acquisition and analysis is a valued plus.
- Demonstrated experience in bioinformatics analysis and statistical validation of the results is a valued plus.

Other Skills

- Good communication skills in written and oral English is required.
- Integrity, motivation, organization, and good collaboration skills.
- Ability to comfortably work in a highly interdisciplinary environment with colleagues with different scientific backgrounds.

Eligibility: Selection process steps: 1-Pre-selection based on the applicant's CV and cover letter, 2- Interview

Deadline for application: July 10th 2024 23:59:00 Paris time

Submit application: https://emploi.cnrs.fr/Offres/Doctorant/UMR5248-CELGAU-030/Default.aspx?lang=EN