

# Positions "PhD students" (F/H) in the field of microbial-mineral interactions, electron microscopy- and/or synchrotron-assisted investigations.

## Description of Research Project

The ERC-funded project BIOMAMA (Biogenicity of Martian Materials) aims to investigate interactions of various Earth's chemolithoautotrophic microorganisms with Martian mineral materials (genuine Martian meteorites, Mars regolith simulants, etc.) and examine microbial-meteorite interfaces at the micrometer and nanometer scale. We perform the targeted biotransformation of Martian mineral materials to comprehensively explore the chemolithoautotrophic microbial fingerprints left on Martian materials, focusing on mineral biosignatures (e.g., microbial nano-lithologies, metalloorganic signatures) that are critical for life search (Milojevic et al., 2021 <https://www.nature.com/articles/s43247-021-00105-x>). Towards biotransformed Martian mineral materials we will apply techniques based on transmission electron microscopy (TEM) and synchrotron light that are promising tools for non-destructive investigation of the biogenicity of geobiological structures. TEM technique coupled to the analytical spectroscopy is a powerful tool in the analysis of metal-microbial interactions. Likewise, exploring the microbial-Martian material interfaces under the X-ray will provide insights on morphology, elemental composition, crystalline structure, oxidation states, magnetic properties, and others, significantly adding to the investigation of the biogenicity of microbial nano-lithologies and the search of putative biosignatures in samples returned from Mars in the near future.

## Description of CBM

The Center for Molecular Biophysics (CBM, <http://cbm.cnrs-orleans.fr>) is a research unit of the French National Center for Scientific Research (CNRS), affiliated with the University of Orléans. At the Exobiology Group of the CBM in Orléans, PhD positions are available in the field of astrobiology, biogeochemistry and the study of microbial interactions with meteorites within the framework of a project funded by the ERC. The Exobiology Group at the CBM provides extensive supervision and expertise for cultivation and physiological characterisation of metallophilic microorganisms, biochemistry of extremophiles, molecular techniques, electron microscopy and analytical spectroscopy techniques, as well as participation in a continuously evolving astrobiological projects. The candidate will be integrated into an interactive and international lab environment with a broad scientific experience in astrobiology, biochemistry, microbiology, biophysics, as well as microbial physiology.

## Activities

**Domains of the research:** astrobiology, geomicrobiology, biogeochemistry, analytical chemistry, synchrotron-assisted spectroscopy and crystallography, transmission electron microscopy coupled to analytical spectroscopy.

## The activities of the recruited person:

- Participation and implementation of research projects in the field of astrobiology with a focus on microbial interactions with meteorites from Mars, including field campaigns, analysis of environmental

samples from extreme environments or microbial samples after exposure outside the International Space Station (ISS);

- Supervision of master students and participation in the administration of the laboratory, teaching and research;
- Process and interpret experimental data;
- Present and promote the obtained results (reports, publications, conferences);
- Collaborate with team and consortium members, exchange and share knowledge;
- Ensure compliance with milestones and deliverables.

## Specificities

### Service / Laboratory

Centre de biophysique moléculaire (CBM) d'Orléans, France.

### Starting date of the employment

As soon as possible

## Required research profile

### Expected skills:

- Master degree in geomicrobiology, biogeochemistry, analytical chemistry, materials science, biophysics or similar for a PostDoc position.
- Fundamental techniques of synchrotron-assisted spectroscopy, crystallography and/or Transmission Electron Microscopy and associated sample preparation techniques.
- Previous work experience with synchrotron-based tools (spectroscopy and crystallography) and/or Transmission Electron Microscopy and associated sample preparation techniques.
- A strong interest in Astrobiology/Geomicrobiology and a passion for science and research.
- Excellent command of written and spoken English.

### Tools:

- conventional laboratory techniques, such as Raman/IR spectroscopy, Scanning and Transmission Electron Microscopy,
- synchrotron X-ray absorption spectroscopy (XAS),
- synchrotron X-ray emission spectroscopy (XES),
- synchrotron X-ray diffraction (XRD).

### Qualities :

- Strong interest in experimental work;
- Autonomy and a taste for teamwork (5 other persons from the CBM are involved in this ERC project);
- English: excellent read, written and spoken;
- Know how to communicate and promote research;
- Spirit of initiative, analysis and synthesis;
- Organised, rigorous, respectful of safety instructions.

## Applications

If you are interested, please send your application including CV, list of publications, and 3 references to Prof. Tetyana Milojevic: [tetyana.milojevic@cnrs-orleans.fr](mailto:tetyana.milojevic@cnrs-orleans.fr) (Chair of Exobiology at the University of Orléans, Head of Exobiology Group, CNRS-Centre de Biophysique Moléculaire, Rue Charles Sadron, 45071 Orléans cedex 2, France).