

GRAL MSc RESEARCH SCHOLARSHIP 2020-2021

RESEARCH INTERNSHIP PROPOSAL

Institute / Group

IRIG / IBS – METALLO

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Research Project Title

Structural study of the Nitrogenase active site maturation using CryoElectron Microscopy in anaerobic conditions

Description of the project

Nitrogen is one of the main components of proteins and nucleic acids, but the majority of living organisms are unable to directly assimilate atmospheric dinitrogen. Only few microorganisms, named diazotrophs, are able to catalyze the difficult reaction of dinitrogen reduction into ammonia under ambient conditions. An enzymatic complex called nitrogenase, which contains one of the most complex metal clusters, is responsible for this conversion. In addition to its fundamental interest, the study of nitrogenase also aims at bioengineering plants to make them capable of using atmospheric nitrogen instead of supplying nitrates, which are responsible for water and soil contamination. Because these proteins are sensitive to oxygen degradation, these systems must be studied under a strict anaerobic environment inside the different glove boxes of the laboratory.

The M2 student will use perform a structural study the multiprotein complex ensemble responsible for the maturation of the nitrogenase active site. He or She will use the unique ability to freeze cryo electron microscopy grids under anaerobic conditions we are currently developing in the laboratory

Keywords

Nitrogenase, Structural Biology, CryoElectron Microscopy, Anaerobic conditions, Proteins complexes

Relevant publications of the team

Cherrier, M.V., Amara, P., Talbi, B., Salmain, M., and Fontecilla-Camps, J.C. (2018). "Crystallographic evidence for unexpected selective tyrosine hydroxylations in an aerated achiral Ru-papain conjugate." *Met. Integr. Biometal Sci.* 10, 1452–1459.

Rohac, R., Amara, P., Benjdia, A., Martin, L., Ruffié, P., Favier, A., Berteau, O., Mouesca, J.-M., Fontecilla-Camps, J.C., and Nicolet, Y. (2016). "Carbon-sulfur bond-forming reaction catalysed by the radical SAM enzyme HydE." *Nat. Chem.* 8, 491–500.

Sicoli, G., Mouesca, J.-M., Zepieri, L., Amara, P., Martin, L., Barra, A.-L., Fontecilla-Camps, J.C., Gambarelli, S., and Nicolet, Y. (2016). "Fine-tuning of a radical-based reaction by radical S-adenosyl-L-methionine tryptophan lyase." *Science* 351, 1320–1323.
