LABORATOIRE D'ELECTROCHIMIE MOLECULAIRE
Université Paris Cité
Unité Mixte de Recherche CNRS 7591

Funded Ph'D proposal

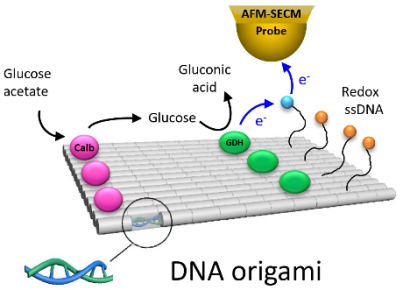
Fall 2022

Ph'D proposal

Electroenzymatic cascades organized on DNA nanostructures: assembly and nanoscale interrogation

Keywords: Biomolecular electrochemistry, DNA nanotechnology, enzyme catalysis, AFM-SECM microscopy

Summary



This project aims at using DNA nanostructures as scaffolds for the assembly of electro-enzymatic cascades. DNA origami, formed by the programmed folding of long DNA strands, will be used as scaffolds to organize, with nanometric precision, enzymes and redox mediators into an integrated system. The catalytic functioning of these bioelectroenzymatic "nanoreactors" will be studied at the scale of individual origami by mediator-tethered atomic force electrochemical microscopy (Mt/AFM-SECM). This novel approach will contribute to a better understanding of the unparalleled performance of biochemical pathways of living, which are naturally organized at the nanoscale. It will also allow to define the rules for the design of artificial organized multienzyme systems with optimal catalytic activity.

The project will be carried out in collaboration with two specialists in DNA nanotechnology:

- Dr. Nesrine Aissaoui, Faculty of Pharmacy, Université Paris Cité, co-supervisor of the thesis.

- Dr. Gaëtan Bellot, Centre de Biologie Structurale de Montpellier (CNRS/INSERM).

Funding

Beginning: October 2022. ***Duration:*** 3 years.
Gross income: 1860 € per month - 2050 € with teaching (64 h per year).

Host laboratory

Laboratoire d'Electrochimie Moléculaire (LEM) UMR CNRS 7591 / Université de Paris Cité (https://lem-uparis.cnrs.fr/recherche/bionano/)
***Group BIONANO* « Biomolecular systems. Electron transport at the nanoscale»**
***Head* :** Christophe Demaille

Candidate Profile

We are looking for a candidate with a master's degree in physics, chemistry, biology, nanoscience or process engineering.
The candidate will have a taste for experimental work and qualities of rigor, care and organization.
Experience in nano(bio)electrochemistry, local probe microscopies (AFM,...) would be a plus.

To apply

Candidates should send a CV and a letter of motivation by e-mail to Christophe Demaille,

demaille@u-paris.fr - Tel : 0157278797