

2022-23 M2 Internship proposal at LMGP

Purification and characterization of a biomimetic glue protein

Abstract: In our daily lives, all conventional man-made adhesives are petrochemical products, which are toxic for the body and show limited efficiency in wet conditions, major drawbacks for biomaterials. In this project, we aim at producing adhesives effective in air and/or in wet conditions inspired by natural glues. Hence some proteins produced by animals, like spider silks or barnacle cements, have adhesive properties for material surfaces. Protein sequences of several of these proteins are available, which allows studying their structure-function relationships in order to understand the molecular basis of their remarkable properties. These proteins are indeed able to rapidly self-assemble into fibers when released by the animal, either in air (spider) or in a liquid environment (barnacle). Since silks or cements consist of several proteins, combination between these molecules is therefore likely to be important to adhere on a variety of solid supports.

Project description: Knowing the sequences of some natural glue proteins, several recombinant ones have already been produced and purified. These engineered proteins self-assemble and form amyloid fibers in contact with well-defined material surfaces. As natural glues are made of a mixture, we aim at producing other recombinant proteins.

Methodology: The goal of the internship is to establish a strategy for the production and the purification of a new recombinant protein. Its gene will be cloned into a plasmid and overexpressed into bacteria (*Escherichia coli*). The conditions of production (induction, temperature...) should be tested. Then a purification protocol using affinity chromatography will be designed. At the end, the self-assembly of the purified protein will be characterised using fluorescence spectroscopy and potentially atomic force microscopy.

Objectives: The outcome will be to shed light on the mechanisms involved in the formation of a layer of adhesive protein on model surfaces. These mechanisms could be exploited for the development of new biomimetic adhesives that are sticky in dry or wet conditions.

Scientific environment: The candidate will work within the LMGP, Materials and Physical Engineering Laboratory in the IMBM team. She/he will access the automated purification system and a large variety of characterization techniques. Located in the heart of an exceptional scientific environment, the LMGP offers the applicant a rewarding place to work.

LMGP Web Site: <https://lmgp.grenoble-inp.fr/>

Profile & requested skills:

We look for a student with a strong knowledge in biochemistry, biophysics and/or in material science. The student should be able to work in a team, have good writing skills (report, presentation...) and a good knowledge of spoken and written English.

The internship will be from February 2023 for a duration of 6 months.

Subject could be continued with a PhD thesis: no

Allowance: Internship allowance will be provided

CONTACT: Send a C.V. and a motivation letter to Charlotte Vendrely:
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