

### Master 2 internship project Year 2024-2025

Laboratory/Institute: Institut de Biologie Structurale Team: Biomolecular NMR **Director:** W. Weissenhorn **Head of the team:** B. Brutscher

HDR: yes x no □

Name and status of the scientist in charge of the project: B. Brutscher (E6, CEA, HDR), B. Bersch (CRHC, CNRS, HDR)

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### Program of the Master's degree in Biology:

□ Microbiology, Infectious Diseases and Immunology x Structural Biology of Pathogens
□ Physiology, Epigenetics, Differentiation, Cancer □ Neurosciences and Neurobiology

# Title of the project: Functional characterization of proteins using NMR spectroscopy

# Objectives (up to 3 lines):

NMR is the method of choice for the detailed analysis of some functional aspects of biomolecules such as protein-protein interactions, protein dynamics, and even catalysis directly in the living cell. In this internship the student will be trained in NMR spectroscopy and its application on the functional characterization of isotopically labelled proteins.

#### Abstract (up to 10 lines):

Research activity within the Biomolecular NMR spectroscopy group actually addresses two main subjects: (1) photo-switching in light-sensitive proteins and (II) interactions at the bacterial cell wall. In both cases, up-to-date NMR spectroscopy is the privileged method used in our group for the characterization of the underlying molecular mechanisms. The M2 student will participate in an ongoing project and will mainly be trained in practical aspects of NMR spectroscopy, as a complement to the theoretical part taught in the first semester. This includes hands-on experience on the spectrometer (data acquisition and treatment) and interpretation of the acquired NMR data in the context of the biological question addressed. The student will also be able to do the preparation of isotopically labelled proteins and acquire the necessary skills for the preparation of NMR samples.

Methods (up to 3 lines):

NMR spectroscopy and data interpretation; Protein expression and labelling; NMR sample preparation

Up to 3 relevant publications of the team:

<u>Disentangling Chromophore States in a Reversibly Switchable Green Fluorescent Protein: Mechanistic</u> <u>Insights from NMR Spectroscopy.</u> Christou NE, Giandoreggio-Barranco K, Ayala I, Glushonkov O, Adam V, Bourgeois D, **Brutscher B.** J Am Chem Soc. 2021 May 19;143(19):7521-7530. doi: 10.1021/jacs.1c02442.

Monitoring Drug-Protein Interactions in the Bacterial Periplasm by Solution Nuclear Magnetic Resonance Spectroscopy. Razew A, Herail Q, Miyachiro M, Anoyatis-Pelé C, Bougault C, Dessen A, Arthur M, **Simorre JP.** J Am Chem Soc. 2024 Apr 3;146(13):9252-9260. doi: 10.1021/jacs.4c00604.

Solution Structure of the C-terminal Domain of A20, the Missing Brick for the Characterization of the Interface between Vaccinia Virus DNA Polymerase and its Processivity Factor. Bersch B, Tarbouriech N, Burmeister WP, Iseni F. J Mol Biol. 2021 Jun 25;433(13):167009. doi: 10.1016/j.jmb.2021.167009.

Requested domains of expertise (up to 5 keywords):

Basic knowledge in structural biology, in NMR spectroscopy, and in scripting (python) would be appreciated