



Grenoble Alliance for Integrated  
Structural & Cell Biology

## GRAL MSc RESEARCH SCHOLARSHIP 2020-2021 RESEARCH INTERNSHIP PROPOSAL

### Institute / Group

IRIG / IBS - MICA

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### Research Project Title

Moving Structural Biology into the Cell

### Description of the project

Structural biology is the study of the 3D structure of proteins, typically performed on purified proteins and in vitro reconstituted protein complexes. Electron microscopy has recently enjoyed significant technological developments in both hardware (particularly the advent of direct electron detectors) and imageprocessing techniques allowing resolution of atomic structures.

For more details: <https://www.nobelprize.org/prizes/chemistry/2017/summary/>

These proteins have been removed from their biological context, the cell. We use cryoelectron tomography to study protein structure directly in E. coli minicells, genetically modified small E. coli cells which allow us to obtain high-resolution 3D images of their internal structure. This project will focus on (i) the development of this method, helping to implement effective data-processing pipelines for solving high resolution protein structures in situ by cryo-electron tomography and subtomogram averaging, (ii) application of the developed pipelines and the existing state-of-the-art software to solve specific in cellulose structures. If you are interested in structural biology, 3D imaging and computation, you are welcome to apply.

### Keywords

cryo-electron tomography, 3D imaging, image analysis, E. coli minicells, in situ structure of macromolecular complexes

### Relevant publications of the team

Burt A, Cassidy CK, Ames P, Bacía-Verloop M, Baulard M, Huard K, Luthey-Schulten Z, Desfosses A, Stansfeld PJ, Margolin W, Parkinson JS, Gutsche\* I. Complete structure of the core signalling unit of the E. coli chemosensory array in an optimised minicell strain. *BioRxiv*.

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