

**M2 Matière Quantique, Matière Complexe Matière du Vivant,
Nanochimie, Nanobiologie et Nanophysique**

Laboratory Address and Affiliation:

Institut de Biologie Structurale, 71 Avenue des Martyrs, 38000 Grenoble
UGA/CNRS/CEA

Laboratory/Team Research area (Keyword)

Stress response in bacteria / Electron microscopy

Summary of the Proposed Internship Project (10 lines)

Title: Visual Proteomics : High-throughput cryo-EM atlas of the cell

DESCRIPTION: Cryo-electron microscopy (cryo-EM) is undergoing a rapid revolution, enabling atomic resolution structural insights into samples of ever greater complexity. One of the current bottlenecks of cryo-EM and other *in vitro* structural techniques is undoubtedly the sample preparation. In most cases it consists in isolating one protein complex of interest in a particular state before elucidating its structure. Here, we propose to partially skip the purification process and to work on semi-heterogeneous samples as close as possible to their native cellular state. Besides avoiding costly and lengthy purification, the advantages of working with non-purified samples are multiple: one can observe novel proteins which would not have been identified in a target-oriented approach, analyze complexes that are not amenable to over-expression, capture transient assemblies involving different interaction partners or different functional states, etc.

In the proposed internship project, the student will participate in fractionation of crude cell lysates, initiate analysis of fractions' contents by mass-spectrometry to identify most interesting targets, and image the obtained fractions by negative stain and cryo-EM. As soon as the first usable images are obtained, this mainly computational project will focus on development and implementation of an effective data-processing pipeline for analysis of the acquired cryo-EM data with the aim to solve the 3D structure of as many components as possible from each fraction.

Methodologies and/or Techniques to be used

Main methods: negative stain and cryo-electron microscopy, image analysis

Additional methods: cell culture, size exclusion chromatography, mass-spectrometry data analysis

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Additional information

Interested students are invited to contact us with any specific questions about the project or the research, informal inquiries are welcomed.