

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: LPENS

CNRS identification code: UMR8023

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Internship location: 24 rue Lhomond, 75005 Paris

Thesis possibility after internship: YES

Funding: YES

If YES, which type of funding: ERC

Self-assembly and phase separation of proteins on membranes: interactions, dynamics and structure

The goal of the internship is to study the self-assembly and phase separation of long rod-like proteins on membranes. In the past 10 years, condensation of proteins in cells has been identified in a key mechanism to locally concentrate matter and improve reaction efficiency. These condensates are primarily formed in 3D and require the presence of other molecules, such as protein chaperones, RNA or polymers.

We identified a set of proteins, the golgins. That self-assemble in 2D on membranes without any chaperone, RNA or polymer. We want to study the physics of this intriguing behavior: what interactions are needed for such condensation? What is the phase diagram of these proteins (concentration, temperature)? Can different golgins co-condensate? Answering these questions may have a strong impact on the understanding of an organelle in the cell, the Golgi apparatus, that is made of stacked deflated compartments that need to be precisely ordered for a correct maturation of the proteins. The compartments are coated with golgins. During mitosis this structure is completely dissolved as tiny particles in the cell. These particles spontaneously reassemble to reform a functional Golgi apparatus in each daughter cell. Our recent results on 2D condensates suggest that the disassembly/reassembly cycle is driven by golgins.

The selected intern will form these condensates on giant unilamellar vesicles and characterize their size, shape, fluidity and interactions. The internship will be performed in collaboration with the laboratories of Nobel Prize laureate Professor James Rothman at Yale University, Professor Vivek Malhotra at the Center for Genomic Regulation in Barcelona, Spain and Professor Ivan Lopez-Montero at Complutense University in Madrid.

The internship can be followed by a PhD. Funds for the PhD are already secured.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: YES

Quantum Physics: NO

Theoretical Physics: NO