**Master 2 internship project**

**Year 2023-2024**

**Laboratory/Institute:** PCV/CEA **Director:** Eric Marechal

**Team:** Cytomorpholab **Head of the team:** Laurent Blanchoin

**Name and status of the scientist in charge of the project:** Alexandra Colin

 **HDR: yes ☐ no ☐**

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**Program of the Master’s degree in Biology:**

**☐** Microbiology, Infectious Diseases and Immunology **☐** Structural Biology of Pathogens

**☐** Physiology, Epigenetics, Differentiation, Cancer **☐** Neurosciences and Neurobiology

**Title of the project: Set-up of a biomimetic system to study cytoskeleton dynamics**

Objectives (up to 3 lines):

The aim of this internship is to use a **biomimetic approach** to study the dynamics of intracellular actin architectures. In particular, the aim is to identify the minimum ingredients required to obtain **dynamic actin architectures** in cells.

Abstract (up to 10 lines):

Understanding what differentiates an inert object from living matter is a fundamental question in biology. Living matter is dynamic and requires a continuous energy consumption; however, the fundamental principles of its dynamics are still largely unknown.

During this internship, we propose to use a biomimetic approach in order to understand how a biological structure can self-organize from individual proteins. We will study the dynamics of actin (principal component of the eukaryote cytoskeleton) and more precisely networks mimicking the cell motility (fundamental process of cell biology).

In the future, we will add more blocks to this biomimetic system in order to go towards the reconstitution of an artificial cell.

Methods (up to 3 lines):

We developed microwells that mimic the cell volume. The proteins are then encapsulated in those microwells and observable with fluorescence microscopy. In this controlled environment, we can follow the dynamics of our actin structures and characterize their behavior in a quantitative manner.

Up to 3 relevant publications of the team:

Colin *et al*. Recycling of the actin monomer pool limits the lifetime of network turnover, *The EMBO Journal 2023*

Yamamoto *et al*. Actin network architecture can ensure robust centering or sensitive decentering of the centrosome, *The EMBO Journal 2022*

Vignaud *et al*. Stress fibres are embedded in a contractile cortical network, *Nature Materials 2021*

Requested domains of expertise (up to 5 keywords):

Biochemistry / Microfabrication / Microscopy / Image Analysis