**Master 2 internship project**

**Year 2025-2026**

**Laboratory/Institute:** LPCV/ CEA **Director:** Eric Maréchal

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

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

**HDR: yes ☐ no ☐**

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

**☐** Microbiology, Infectious Diseases and Immunology **☐** Biochemistry & Structure

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

**Title of the project: Sharing limited resources between competitive actin architectures**

Objectives (up to 3 lines):

In this internship, we propose to use a biomimetic system in order to study the effects of local component depletion and heterogeneity on the **coexistence of competitive actin architectures**. These experiments will enable us to demonstrate the basic mechanisms of actin architecture coexistence in cells.

Abstract (up to 10 lines):

Actin is a constitutive protein of the cytoskeleton, regulating cell shape, movement and division. It polymerizes into filaments that form dynamic networks in the presence of specific proteins. Within the cell, as access to resources is limited, there is **competition** for their use: networks have to share the same resources in order to coexist and perform their respective functions.

We recently demonstrated that **protein turnover** is a key element for the coexistence of various structures. We propose to use a biomimetic system in order to study the effects of local component depletion and heterogeneity on the coexistence of competitive architectures. To that aim, the student will manufacture cell-sized microwells to impose 3D boundaries to his/her experimental system and control precisely the finite biochemical composition of the system. In this defined and controlled environment, the minimal elements for the coexistence of different architectures will be evaluated.

Methods (up to 3 lines):

We will use a biomimetic system made from purified proteins. The student will manufacture cell-sized microwells to impose 3D boundaries and control precisely the finite biochemical composition of the system. Then, different architectures will be generated from polystyrene beads or lipid-coated micropatterns.

Up to 3 relevant publications of the team:

- Vianay et al., Fabrication of microcompartments with controlled size and shape for encapsulating active matter. Frontiers in Cell and Developmental Biology 2025.

- Guérin et al., Balancing limited resources in competitive actin networks. Current Biology 2025

- Colin et al., Recycling of the Actin Monomer Pool Limits the Lifetime of Network Turnover. The EMBO Journal 2023

Requested domains of expertise (up to 5 keywords):

biochemistry, microfabrication, fluorescence microscopy, image analysis