Grenoble Alliance for Integrated Structural & Cell Biology

**INTERNSHIP PROPOSAL**

**Institute and Group:** CytoMorphoLab, Cell & Plant Physiology Laboratory, Biosciences and Biotechnology Institute (BIG), GRENOBLE, France

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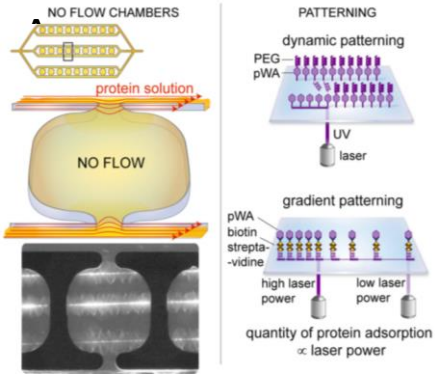
**Research project title:** *Using microfluidics to control the biochemical environment during actin assembly*

**5 Keywords to describe the project:** Actin dynamics, actin associated proteins, microfluidics, micropatterning.

**Description of the project:** Despite their fundamental importance in the regulation of cell physiology, the basic mechanisms that control the coordinated dynamics of co-existing actin networks are not understood. Therefore, the aim of the project is to find the physical, structural and biochemical conditions needed to reconstitute the cellular actin dynamics in vitro in a minimum system mimicking the intracellular environment. In order to achieve this goal, a microfluidic device with arrays of non-flow chambers (Figure 1A) will be used to mimic an actionable cell-sized environment where actin networks will be grown. Furthermore, surface protein micropatterning technique (Figure 1B) will be used to control the geometry of actin assembly sites inside the chambers. An interdisciplinary set of skills is involved in the project, since it requires knowledge in cell biology, biophysics and biochemistry, as well as in microfluidics and microfabrication techniques. Thus, a background in nanobiosciences is highly recommended.

**Figure 1: A)** No flow microfluidic chambers (Top) with actin assembly (bottom). **B)** Surface protein patterning technique.




**Justification that the internship's subject fits with the general theme of GRAL:**

Developing new modalities to explore cell biophysics is at the core of the GRAL project. This project will provide a unique opportunity to understand how the adaptive response of the cell cytoskeleton derives from the complex interplay between its biochemical, structural and mechanical properties.

**Relevant publications of the team:**

Boujemaa-Paterski R, Suarez C, Klar T, Zhu J, Guérin C, Mogilner A, Théry M, Blanchoin L. (2017). Network heterogeneity regulates steering in actin-based motility. Nat Commun. 21;8(1):655.

Cambier T., Honegger T., Vanneaux V., Berthier J., Peyrade D., Blanchoin L., Laghero J., Théry M. (2015) Design of no-flow chamber to monitor hematopoietic stem cells. *Lab Chip* 15: 77-85.

Blanchoin L., Boujemaa-Paterski R., Sykes C., Plastino J. (2014). Actin dynamics, architecture and mechanics in cell motility. *Physiol Rev,* 94: 235-283.