

Supervisor:

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Host laboratory:

Lab : LPCV

Host group/team:

Cytomorpholab (<http://cytomorpholab.com/>)

Title of the M2 research internship:

Cellular actin structural adaptability with size

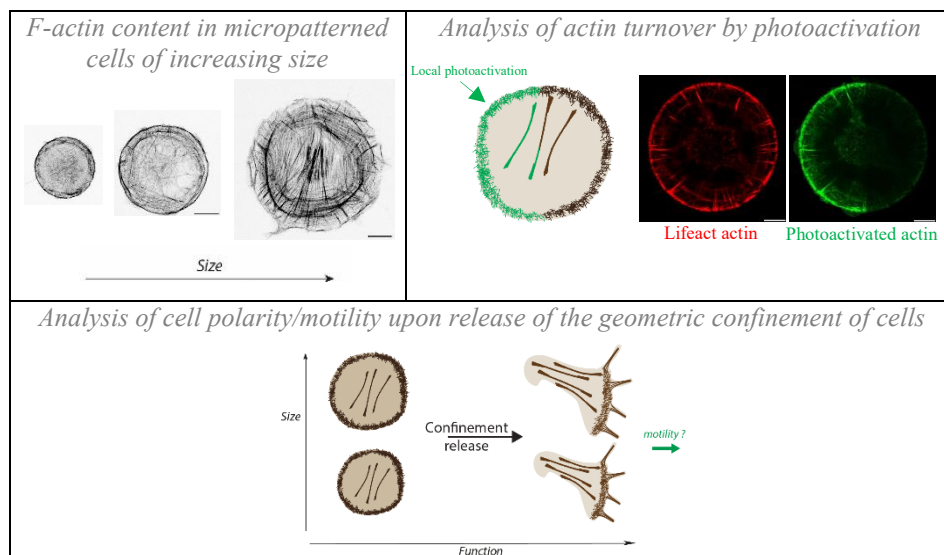
Project summary:

Understanding what regulates cell size is a fundamental question in biology. Indeed many organelles and subcellular structures established during development can maintain their size when cells grow or change their shape. Among those, the actin cytoskeleton can form different stable while dynamic intracellular architectures that play a major role in the structural plasticity of cells in response to such changes. However, the mechanisms of **scaling of the actin networks with cell size** are still poorly understood. In particular, how cells adapt the turnover and organization of their numerous structures assembled from a limiting pool of actin monomers remains unknown. In addition, how these adaptations endow cells with specific **capabilities to respond environmental cues** and **how they affect their respective function** also represents open fundamental questions.

In this project, the selected candidate will thus **develop an original assay to study the relationship between actin dynamics, cell size and function**. For that, we propose to combine cutting-edge techniques available in the lab including:

- live cell micropatterning to control the size and architecture of the actin networks formed by the cells and release on demand their geometric confinement (link between cell size, actin architecture and function).
- photoactivation and live-imaging to record the structures dynamics and their turnover (link between cell size and actin turnover).
- perturbations experiments using drugs targeting the actin dynamics (link between actin turnover and function).

The selected candidate is expected to have a background in cell biology and live cell-imaging. A knowledge of the cytoskeleton would constitute an advantage. He/she will also be expected to demonstrate a high motivation and a kin interest in learning challenging techniques and performing the associated analyses.



The selected researcher will have a unique opportunity to be part of an internationally renowned team, working in a creative and lively environment, providing access to state of the art techniques (microfabrication techniques, advanced microscopy, biophysics).

Keywords:

Cytoskeleton, Turnover, Cell size, Cell polarization

Relevant publications of the team:

- [Balancing limited resources in actin networks competition](#). Guérin C. *et al.*, **Current Biology**, 2024.
- [Recycling of the actin monomer pool limits the lifetime of network turnover](#). Colin A *et al.*, **EMBO J.**, 2023.
- [Contractile forces direct the chiral swirling of minimal cell collectives](#). Badih G. *et al.*, **In revision at PNAS**
- [The biochemical composition of the actomyosin network sets the magnitude of cellular traction forces](#). Kollimada S. *et al.*, **Molecular Biology of the Cell**, 2021.
- [Stress fibres are embedded in a contractile cortical network](#). Vignaud T. *et al.*, **Nat. Materials**, 2021