Proposal for an interdisciplinary M2 internship in Engineering and Cell biophysics

Mechanical actuation of epithelial monolayers

The goal of the internship is to investigate the response of epithelial cells to dynamic folding.

Laboratory:
Institute for Advanced Biosciences (IAB)
Site Santé, Allée des Alpes, 38700 La Tronche
Team: Cytoskeleton Dynamics and Nuclear Functions
Dpt: Microenvironment, cell plasticity and signaling
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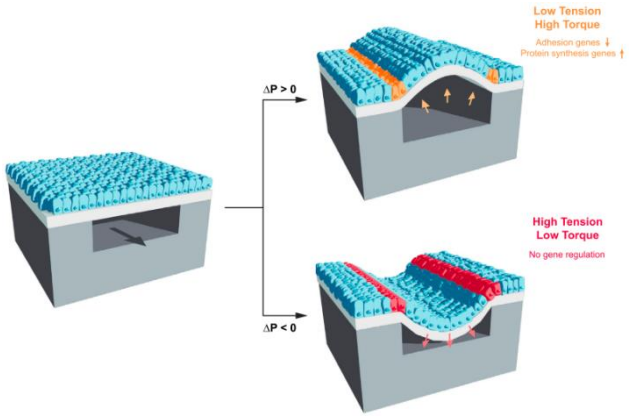
Multiple organs are formed by the deformation of cell layers called epithelia. Many processes at the tissue-scale level, such as tissue folding which induce strong shape changes, are strongly correlated to cell fate and function. Previous works in the team showed the physiological relevance of reproducing epithelial folding with a device based on a microfluidic system[1]. This study demonstrated that epithelial cells, and their nuclei, are sensitive to the orientation of the deformation and consequently that the cell shape changes induce specific cell behaviors. The next step is to expand our understanding of curvature-sensing of epithelia by probing the cellular response to dynamic deformations and to different geometries that will regulate the cell shape and the global deformation architecture.

To achieve this aim, the student will design new geometries of the microfluidic system to expose cells to new folding architecture and will characterize epithelial cell response by videomicroscopy and image analysis.



An elastic layer of PDMS (polydimethylsiloxane, in gray) is used to cover a microfluidic channel casted in resin (dark gray blue). Epithelial cells are grown on top of the PDMS layer. Pressure within the microfluidic channel can induce positive or negative curvature, inducing different cell responses.

The duration of the internship is of **5-6 months**, starting from **January-February 2025**.

Collaborative network - The student will work at the IAB in the team "Cytoskeleton Dynamics and Nuclear Functions", co-supervised by Monika Dolega and Caterina Tomba from the team "Devices for Health & Environment" at the Institute of Nanotechnologies of Lyon (INL - Lyon).
Local environment - The student will benefit from the technological infrastructures of the IAB, including a cell culture and the microscopy facility.
Candidate background - We are looking for a student with a strong motivation for microfabrication tools, bio-imaging and image analysis. A good background in cell biology would be appreciated. The student needs to have good communication skills required for a team and interdisciplinary project.
Keywords – deformable substrates, image analysis, epithelial cells.

To apply, please **send a CV with cover letter, possibly with the names of referees familiar with your work to** dolegam@univ-grenoble-alpes.fr **and** caterina.tomba@univ-lyon1.fr.

1. Blonski, Slawomir, et al. "Direction of epithelial folding defines impact of mechanical forces on epithelial state." *Developmental cell* 56.23 (2021): 3222-3234.