Master Biologie Moléculaire et Cellulaire 'BMC',
Université de Paris - *UFR Sciences du Vivant*

Parcours : **Biologie et Développement Cellulaires 'BDC'**
http://www.master2bdc.fr/
Fiche de Projet de Stage M2, Année 2026-2027

Unité INSERM, CNRS ou Université : Institut Curie, Inserm U934, CNRS UMR3215, Génétique et biologie du développement **Intitulé Equipe : Polarity, Division, Morphogenesis** **ED d'appartenance : Complexité du Vivant** **Responsable de l'Equipe : Yohanns Bellaïche**	**Responsable du Stage :** **Florencia di Pietro** **Contacts** **florencia.di-pietro@curie.fr**

Titre du projet : MECHANISMS OF MITOTIC CELL RESHAPING IN EPITHELIA

Résumé du Projet de Stage (en 300 mots maximum, mots clés en gras)

Cell division is key to organism development, and its deregulation can lead to tumorigenesis. Cell division entails drastic cell shape changes which are necessary for faithful genome segregation (Rankumar, Baum 2016). Mitotic cell reshaping has been extensively explored in single cells; **in contrast, how cell reshaping occurs in multicellular contexts remains far less understood. The general aim of this project is to dissect the mechanisms of mitotic rounding in epithelia.**

With this aim, we will combine **time-lapse fluorescent microscopy, genetics, optogenetics and quantitative biology** in **Drosophila**. In particular, we will use the pupal dorsal epithelium, a key model in epithelial biology (Bosveld et al. 2012). This tissue offers excellent conditions for time-lapse microscopy, and we have recently implemented optogenetics to modulate protein function with high spatiotemporal resolution (di Pietro et al. 2021). Complementarily, we have recently started to use **mouse intestinal organoids** to investigate mitotic rounding in a vertebrate epithelium.

A key feature of epithelial division is that the mitotic cell maintains close contact with the neighbouring cells, and thereby, mitotic rounding leads to the deformation of the neighbours. Interestingly, we have recently uncovered that during epithelial mitosis, **neighbouring cells reorganize their actomyosin cytoskeleton, supporting the existence of a crosstalk between the mitotic cell and its neighbours**. Moreover, a specific set of actomyosin and mechanosensitive regulators redistribute around the mitotic cell. Together, these results pave the way to investigate the mechanisms and functions of the crosstalk between the mitotic cell and its neighbours. In this internship, the student will characterize **the neighbour response to mitotic rounding, and explore its modulation by actomyosin regulators, polarity proteins, and oncogenes**.

Our research will shed light on mitotic rounding from a **multicellular perspective**, to uncover new fundamental principles in the biology of **proliferative epithelia**, expected to be relevant in safeguarding epithelial and genome integrity.

Publications de l'équipe, relatives au stage proposé (max 5)

-di Pietro F, Osswald M, …, Morais-De-Sá E, Bellaïche Y. Systematic characterization of Drosophila RhoGEF/GAP localizations uncovers regulators of mechanosensing and junction formation during epithelial cell division. Curr Biol. 2023 Mar 13;33(5):858-874. PMID: 36917931.

- di Pietro F, …, Vincent JP, Bellaïche Y. Rapid and robust optogenetic control of gene expression in Drosophila. Dev Cell. 2021. PMID: 34879263

- López-Gay JM, Nunley H, Spencer M, di Pietro F, …,Lubensky DK, Bellaïche Y. Apical stress fibers enable a scaling between cell mechanical response and area in epithelial tissue. Science. 2020 Oct 16;370(6514). PMID: 3306032.

- Pinheiro D , Hannezo E , Herszterg S , … , Bellaïche Y . Transmission of cytokinesis forces via E-cadherin dilution and actomyosin flows. Nature. 2017 May 4;545(7652):103-107. PMID: 28296858

Please note that this internship is not associated to a PhD in the lab