Master 2 + PhD Project:

Tissue mechanics on 3D curved surfaces

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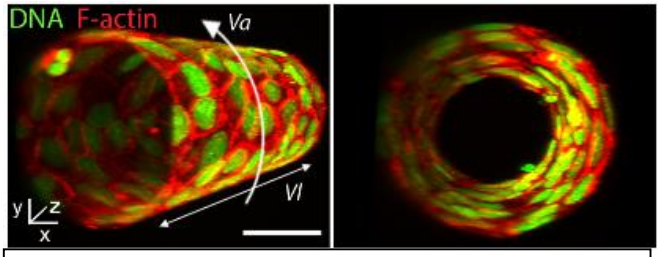
Other collaborations: Rene-Marc Mege and Delphine Delacour (cell biologists, same team)

Project description :

Whole-tissue collective epithelial rotation (CeR) features a cohort of cells lining a quadric surface, such as ellipsoid and sphere, persistently and synchronously rotating three-dimensionally (3D) around a given axis with no free edge. This unexpected behavior has been observed *in vivo* as well as *in vitro*. As a particular type of collective epithelial movement, CeR plays a critical role in embryonic development and glandular tissue transformation, accompanies with tissue morphogenesis and may be involved in cancerous invasion. However, how epithelial organization, polarity and tissue geometry may influence CeR remains elusive until now. In this project, we propose to grow epithelial tissues on microfabricated 3D scaffolds to form various cylindrical epithelia (see figure). We then will observe the emergence of CeR in response to different tissue curvatures. We expect large-scale, persistent and circumferential rotation in both concavely and convexly curved cylindrical tissues. We also expect actin cytoskeleton network in these tissues will re-organize in response to different curvatures. Using *in vitro* biophysical experimental approaches, we will reveal the hiding principles that underpin this interesting biological phenomenon. We look for a self-motivated master-2 student to join us for this exciting project.



Cylindrical epithelial tissue formed on 3D scaffolds