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GHI Floor Seminars

Special seminar by invited speaker

Aurélien Roux

Biochemistry Department, UNIGE

Buckling of epithelium growing under spherical confinement

Many organs, such as the gut or the spine are formed through folding of an epithelium. While genetic regulations of cell fates leading to epithelium folding have been investigated, mechanisms by which forces sufficient to deform the epithelium are generated are less studied. Here we show that cells forming an epithelium onto the inner surface of spherical elastic shells protrude inward while growing. By measuring the pressure and local forces applied onto the elastic shell, we show that this folding is induced by compressive stresses arising within the epithelial layer: while growing under spherical confinement, epithelial cells are subjected to lateral compression, which induces epithelium buckling. While several fold initiations can be observed within one capsule, final shapes often show one or two folds. While analytical theory of epithelium buckling predicted a single fold at equilibrium, multicellular simulations showed several folds occurred from a competition between epithelium bending, growth and adhesion to the shell. By quantitatively comparing the shapes of buckled epithelium predicted by theory and simulations, with experimental shapes, we determined how epithelium bending rigidity, adhesion and proliferation control buckling, and extracted their values in our experimental conditions. As proposed for gastrulation or neurulation, our study shows that forces arising from epithelium proliferation are sufficient to drive epithelium folding.

Host: Gisou van der Goot

Tuesday, April 9, 2019

12:15, SV 1717