Collective migration of epithelial cells

We experimentally study the collective motility of epithelial cells that maintain strong adhesions between them during their migration. To that end, we culture epithelial (MDCK) cells within the apertures of a micro-stencil previously put on the substrate. The removal of this stencil triggers the migration of the monolayer without damaging the border cells.

This collective motility can be characterized by using Particle Image Velocimetry. It involves long-range coordinated displacements of large groups of cells well within the monolayer that are well described by a simple model of self-propelled interacting particles. In a second stage, the edges of these epithelia roughen drastically and exhibit a strong directional fingering led by a cell of different phenotype (a “leader cell”) initially not discernible from the others. Interestingly, similarly looking leader cells are found in a large number of different situations such as morphogenesis or local invasion from tumors. In this talk I’ll question the nature of these cells and the properties of the migration fingers by using a variety of physical techniques (image analysis, force measurements, laser photoablation), together with the mapping of the biochemical activity of migration-involved small GTPases.