Emerging modes of collective cell behaviors under physical contraints

Abstract:  
Fundamental biological processes such as morphogenesis and wound healing involve the dynamics of epithelial cells. In collective cell migration, many features of single cell migration apply, but a level of complexity is added by the fact that groups of cells move coordinately and coherently as a collective. Such modes of migration are relevant for understanding most of the first stages of development,  as well as tumor progression and wound healing. I will present our recent studies on the collective behaviors of cells in response to the presence of physical constraints. We show that the geometrical properties of the environment regulate the dynamics of collective cell migration patterns through cell-cell interactions. Using microfabrication techniques to allow epithelial cell sheets to migrate into strips whose width can be varied from one up to several cell diameters, we have identified various modes of collective migration in response to these geometrical constraints. Furthermore, we have recently observed that such collective responses strongly depend on the cell type and consequently, our approach can be used to probe the mechanics of epithelial cell sheets. I will thus present and compare our results obtained with various epithelial cell lines such as MDCK cells and human keratinocyte epithelial cells.