Call for PhD and Postdoc. Positions

Coupling of cell polarization and differentiation in organoids

Understanding how out of single cells functional tissues and organs develop is a major challenge of biology. Recent progress allows us to grow organ-like cell assemblies (organoids) from stem cells *in vitro*. Organoids offer great potential for studying diseases and development. However, in many cases we do not yet understand how these complex tissues emerge out of progenitor stem cells. A common feature in the initial growth phase of many organoid systems is the formation of a polarized epithelial cyst with a single or multiple internal apical lumen. This initial transition into an epithelial cyst establishes a tissue template that on the one hand enables maintenance of progenitor/stem cells (niche) and on the other hand guides the patterning of differentiated cells into a functional tissue. Our aim is to understand how the interplay between proliferation (cell divisions), polarization (epithelial transition) and differentiation (patterning) leads to self-organization of this epithelial progenitor template and how this structure facilitates correct patterning into functional organoids. To this end, we will systematically control and characterize the early growth phase of two organoid systems (pancreatic and neural tube) using microfabrication and micro-patterning approaches. We will quantify evolution of cell shapes, adhesion and cortical forces, apical-basal polarization and differentiation as a function of initial cell contact patterns. This approach will provide the means to find rules how local cell interactions (cell-cell, cell-matrix, cell-lumen) are connected to tissue growth and differentiation. We will then test sufficiency of the hypothetical rules to generate the observed organoid structures using an *in silico* mechano-chemical model. Taken together, by dissecting the early growth phase of two organoid systems, we aim to uncover the common rules on how progenitors establish a polarized epithelial template, and how this template is then differentially used to generate organ specific differentiation patterns.

Candidates will join a team at the Interfaces between Physics and Biology. Applicants with backgrounds in cell and developmental biology, theoretical physics, microfabrication/microfluidics will be considered for interviews.

For more details, candidates should contact the following PIs with CV and motivation letter before June 15th 2018 :

Anne Grapin-Botton : anne.grapin-botton@sund.ku.dk (Copenhagen, Pancreatic organoids)
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