Title: **3D micropattern platform for biomechanical and molecular analysis in intestinal cancer**

Cells interact with their environment through chemical and mechanical signals that are key to embryonic development, homeostasis, and disease. Indeed, the mechanical interactions of the cells with the surrounding environment are gaining great relevance in cancer biomedical research. One of the most importat factors that control cell behaviour is the dimensionality of the microenvironment, and 2D cultures behave very different from their tissues of origin, thus limiting their potential in biomedical research. Organoids exhibit 3D spatial organization and cellular interactions that resemble those of the organ from which they derive, and thus have been used to address these important limitations. However, very few studies have addressed the mechanics of organoids in a quantitative and systematic way.
In this project we will *develop of a new 3D platform for the growth of intestinal organoids derived from healthy and tumorigenic human samples.* We will use this new device for *the analysis of biochemical and biomechanical properties of epithelial cells and address their impact on cancer*. In particular, we will be able to characterize the 3D forces exerted by organoids during their formation under normal and pathological conditions, and to calculate its intraluminal pressure and cellular contractility. We will characterize the interaction and relationship of these mechanical forces with the organoid geometry and other biological characteristics, such as adhesion to ECM. Then, we will study the response these organoids to different biomechanical stimuli through local variation of their geometry and mechanical state, induced by differential hydrostatic pressure, ECM composition and by optogenetic techniques. In the final part of this project, we will study the biomechanical response of organoids to different modifications of gene expression associated with cancer.
In summary, deciphering the interplay between the cellular biology and mechanics of organoids will help into the development of new therapeutic targets to treat human cancers.

We are looking for a *motivated master student with a background in biophysics*. We offer the possibility of a **financed PhD position** at the end of the master period through a FPI grant.

Concept Scheme