



Title: Cell Wall Mechanosensing

Summary: The cell wall, is a thin elastic layer encasing cells ranging from bacteria to fungi and plants. It protects the cell by opposing large mechanical stresses derived from high internal turgor pressure typical of walled cell. Our team has a long standing interest on the contribution of the mechanics of the cell wall to essential processes such as cell growth and morphogenesis, using the rod-shaped model system fission yeast (Minc et al. *Curr Biol* 2009; Bonazzi et al. *Dev Cell* 2014; Davi and Minc *Curr Op Microb*, 2015). In particular, by developing the first method to image the dynamics of cell wall in live growing and dividing cells, we have recently evidenced important mechanisms of mechanosensation, central to cell survival and morphogenesis (Davi et al. *Dev Cell* 2018; Davi et al. *PNAS* 2019; Haupt et al. *Curr Biol* 2018). These mechanisms are regulated by transmembrane mechanosensors, Wsc1 and Mtl2, which feature long extracellular domains directly embedded into the cell wall, akin to animal cell's integrins which probe the mechanics of the extracellular matrix. The overarching goal of this Master/PhD project, is to understand how those nanometric sensors may probe the mechanical properties of the Cell Wall at the cellular-scale level. For this, we will build on our initial observation of a massive clustering of the sensors in response to local cell wall mechanical compression. We notably aim to develop adapted large force-exertion systems (derived for AFM or Magnetic tweezers), to apply calibrated stresses and monitor sensor clustering and pathway activation in live cells. This interdisciplinary project will integrate quantitative live imaging, super-resolution, physical manipulations and measurements of the cell wall, genetics and modelling. Those data shall bring core understanding on the generic principles of the mechanobiology of walled cells and beyond.

Details: The candidate should be interested in working at the interface between physics and biology. This internship could be pursued by a PhD thesis, and funding will be secured in case the candidate does not obtain a fellowship.

Lab info: “Cellular spatial organization”, Institut Jacques Monod; 15 rue H el ene Brion, 75013, Paris

Lab Website: www.minclab.fr

Contact: Nicolas Minc ; email: nicolas.minc@ijm.fr