LadHyX Seminar – March 13th, 10:45

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Cell growth under mechanical pressure

Cells act against steric constraints when growing in a spatially-limited environment. At the multicellular level, confined cell proliferation results in the emergence of a growth-induced mechanical pressure. Compressive stresses are ubiquitous to any cell population developing in confinement, such as most solid tumors or microbes, and can deeply impact cell physiology.

We observed that the growth of S. cerevisiae decreased under mechanical pressure. Using novel genetically-encoded nanoparticles (GEMs) to assess the rheological properties of a cell, we show that compressive stress alters the motion of macromolecules inside the cell. Under compression, reactions such as protein synthesis can become diffusion-limited, globally decreasing the dynamics of biomass production, and elucidating a mechanism in which growth limitation can be attributed to modifications in the rheological properties of cells.

At the end of the talk, we will explore the possibility that the cytosolic rheological properties can control mechanical competition for space, and that they are partly conserved across organisms. This result can expand the observations made on S. cerevisiae to other organisms such as bacteria and mammalian cells, and point towards a universally-conserved biophysical mechanism regulating growth under pressure.