A highlight of my PhD project:

Eukaryotic cells adapt their metabolism according to acute changes in their surrounding environment and macromolecular crowding is reported as a key cellular parameter related to cellular homeostasis and stress regulation. In the budding yeast *Saccharomyces cerevisiae*, I investigate the role of macromolecular crowding in various stress conditions such as osmotic stress and nutrient starvation. To characterize crowding dynamics in the cell I used a combination of molecular biosensors and Slimfield super-resolution light microscopy technique allowing high-speed (millisecond) single fluorescent molecules detection and confocal microscopy as physical tools.

I pushed further my research toward understanding the spatial reorganisation of cellular components during cell division and stress episodes. I focus on protein aggregate reported to ageing and cellular stress by product reported to be asymmetrically distributed inside the cell and optimised a cellular model in yeast with strains engineered to allow the controlled expression of trackable (down to single molecule level) fluorescently tagged cytoplasmic aggregates.

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MsC project

Using α-Synuclein (α-Syn) as a model protein I investigated the role of hydrophilic/hydrophobic interfaces on the formation of amyloid fibres. The cells are an enclosed system with a delimiting membrane composed of lipids (hydrophobic species), while the interface is aqueous (hydrophilic) therefore forming a hydrophilic/hydrophobic interface in vivo. I used custom wells, built to create conditions with or without an air/water interface mimicking in vitro hydrophilic/hydrophobic formed in vitro to test its influence on amyloid aggregation. I performed kinetics measurements and used super-resolution microscopy (DSTROM and AFM) to access the dynamics of aggregation and the morphology of fibres produced according to condition tested. α-Syn protein are responsible for Parkinson's disease where it is found to form amyloid fibres in the brain of ageing patients, a type of protein aggregate. These fibres accumulating in neurones are toxic and alternate cell functions. Insight on physical parameter influencing their formation have the potential to help health challenges currently facing to understand the mechanism causing the disease.