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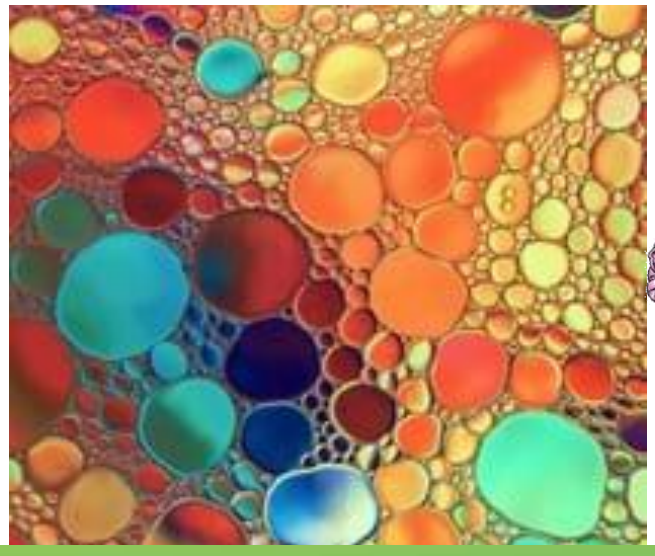
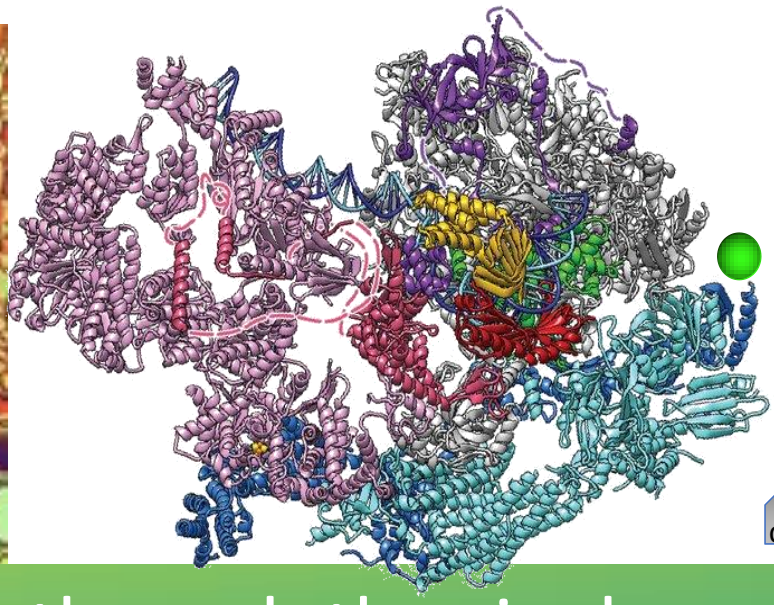
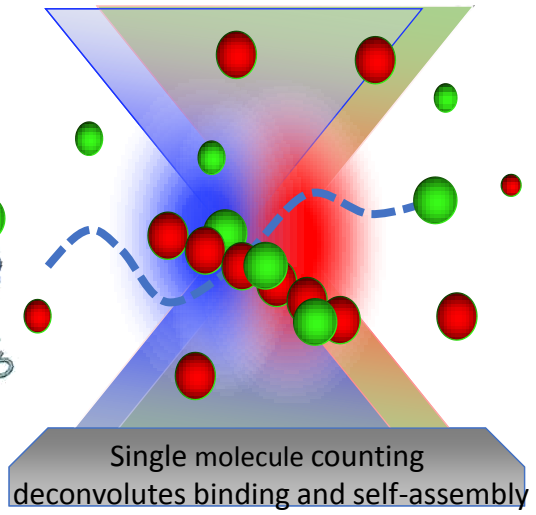


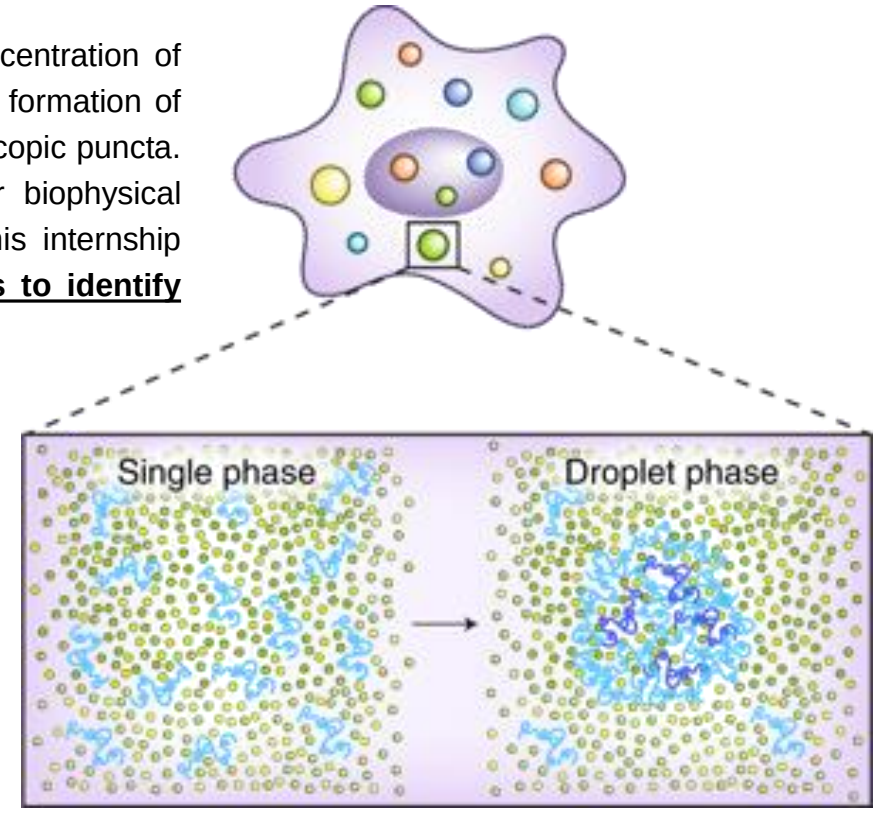




molecular biology through the single molecule lens

Separation or segregation of cellular components into membraneless compartments with liquid-like properties allows for the dynamic exchange of components between the organelles and their environment. Liquid-liquid phase separation (LLPS), a process akin to the demixing of oil and water provides a mechanism for such segregation. In the last 5 years, the concept that LLPS played a role in biological processes has gained more and more ground, extending from a mechanical description (e.g. the gel-like properties of the nuclear pore complex) to a functional one. The recent years have seen considerable advances in the comprehension of LLPS of biological components yet multiple aspects of the phenomenon, starting with how specificity is achieved, remain to be explored.

LLPS of biomolecules is so far, mainly characterized at higher concentration of proteins by following the macroscopic formation of liquid droplets or formation of hydrogels, in vitro. In cells, LLPS signature is the presence of microscopic puncta. However, the initial steps of LLPS are still ill-defined and proper biophysical characterization of the early events is still missing. The goal of this internship project is to **establish a combination of single molecule assays to identify and characterize LLPS assembly** at the early stages.



By varying different parameters and developing new analysis methods, we expect to **define the phase diagram that underlies the behaviour of any protein**. This will allow us to test the contribution of different intrinsic parameters (charge, intrinsic disorder content, multivalency, importance of linker domains) on the LLPS properties of a protein, focusing in particular on the early events that drive phase separation. These new single molecule methods have the potential to be extended to cellular imaging

References: Boeynaems S et al. Protein Phase Separation: A New Phase in Cell Biology. TiCB. 2018, Gambin Y et al. Confocal Spectroscopy to Study Dimerization, Oligomerization and Aggregation of Proteins: A Practical Guide. IJMS 2016

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