

Mechanics and dynamics of cytoskeletal components and phase separated droplets studied with optical tweezers correlated to fluorescence microscopy

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Mechanical properties of cellular substructures and compartments are tightly regulated by the cell and allow for fast adaptation to environmental requirements. The cytoskeleton with its filamentous components (actin, intermediate filaments, microtubules) is crucial for maintaining morphology and structural integrity as well as intracellular transport and (mechanical) signaling. More recently, the role of membraneless organelles in intracellular organization has moved into focus. Also here, mechanical and dynamic properties of these biomolecular condensates play a key role in their physiological functions. Aberrant behavior can lead to loss of function and pathological conditions.

In this talk, we introduce the C-Trap microscopy platform that correlates optical trapping for highly precise force measurements with fluorescence imaging capabilities from the single-molecule to the filament and organelle level. We outline selected experiments and assays that enable the quantification of mechanical properties and the dynamic behavior of the aforementioned intracellular structures.