

INTERFEROMETRIC TRACKING OF PARTICLE FLUCTUATIONS AND SINGLE RECEPTOR BINDINGS

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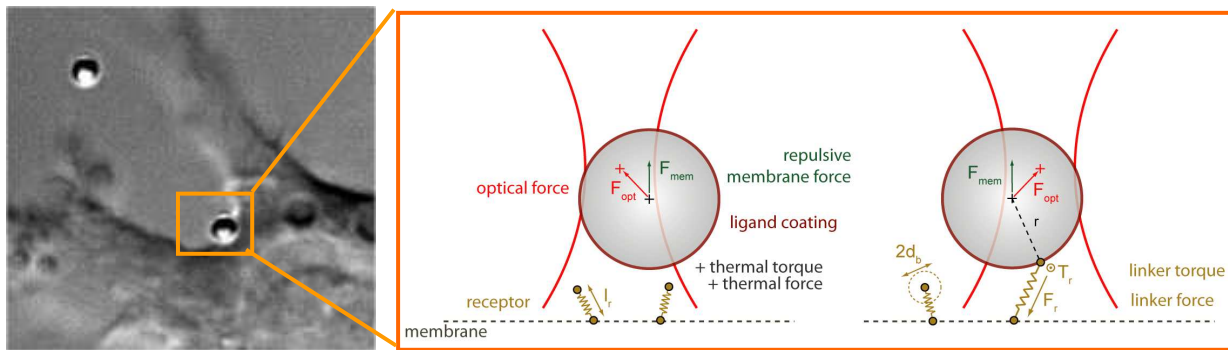
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The usage of optical traps combined with arbitrary microscopy methods has a decisive advantage especially in biology: rare events can be turned into frequent events by bringing e.g. interaction partners into close proximity to each other. New insights especially in cell biology are enabled by recording the relevant processes in a small volume at ultra-high speed and with nanometer precision.



Here we investigate phagocytosis, which is the process by which bacteria are internalized into macrophages. This process, which is a central mechanism in the immune system, was so far mainly investigated by conventional light and electron microscopies. However, its mechanical properties were barely known up to now. The motion of an optically trapped bead was tracked interferometrically in 3D with nanometer precision at a microsecond timescale. The measurement of the thermal bead fluctuations during the binding to the cell membrane enabled the observation of individual receptor-ligand bond formation. Comparison with Brownian Dynamic Simulations confirm the feasibility of several new types of experiments, which enable fast and precise images of local interactions – information which is not accessible with current light microscopy techniques !