

Membrane-mediated mechanical stresses and attractive forces on membrane proteins

Patricia Bassereau

Institut Curie, PSL Research University, CNRS UMR168, 75005 Paris, France

Email: patricia.bassereau@curie.fr

Cell membranes are highly deformable fluid surfaces that can bend on length scales of a few tens of nanometers and stretch in response to external constraints. Membrane-shaping processes involve interactions with proteins possessing intrinsically curved structures, as well as membrane deformations induced by proteins with conical shapes embedded in the bilayer. Mechanical stresses can alter the lateral distribution and conformational states of membrane proteins and, consequently, modulate their biological functions, such as transmembrane transport. In addition, short-scale membrane fluctuations can mediate interactions between proteins bound to or inserted into lipid membranes.

Here, I will present our recent results obtained using reconstituted membrane systems to investigate how membrane mechanics (stretching and curvature) influences active protein diffusion, clustering, and their activity. I will also present the first direct measurement of an effective membrane-fluctuation-induced attraction (Casimir-like interaction) between two membrane-bound proteins, using a DNA-based force nanosensor.