

Thomas Weikl (Max Planck Institute of Colloids and Interfaces):

Membrane-mediated cooperativity of proteins and particles

Abstract:

Indirect interactions mediated by membranes play an important role for the assembly and cooperative function of proteins in membrane shaping and adhesion and for the wrapping of nanoparticles by membranes. The intricate shapes of biological membranes are generated by proteins that locally induce membrane curvature. Indirect curvature-mediated interactions between these proteins arise because the proteins jointly affect the bending energy of the membranes. These curvature-mediated interactions are attractive for arcshaped proteins and a driving force in the assembly of the proteins during membrane tubulation. Membrane adhesion results from the binding of receptor and ligand proteins that are anchored in the apposing membranes. The binding of these proteins strongly depends on thermal shape fluctuations of the membranes on nanoscales, which leads to a fluctuation-mediated binding cooperativity. Nanoparticles are wrapped spontaneously by membranes if the adhesive interactions between the particles and membranes compensate for the cost of membrane bending. The interplay of adhesion and bending energies during wrapping can lead to attractive curvature-mediated interactions and to the cooperative wrapping of spherical or elongated nanoparticles in membrane tubules.