Membrane-mediated interactions between colloid induced deformations

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Many membrane-associated proteins locally deform lipid membranes [1]. Simulations and theoretical models [2, 3] predict that these membrane deformations induce interactions between the proteins, but a quantitative measurement has remained elusive. In order to separate the membrane-mediated interaction from other protein-specific interactions, we here employ a model system consisting of membrane-adhesive colloidal particles and giant unilamellar vesicles. Using confocal microscopy, we are able to establish that the adhered colloidal particles are either completely wrapped by the membrane or not wrapped at all. Depending on the state of wrapping, we find that the particles assemble into a rich variety of structures. We experimentally observe and quantify for the first time a reversible attraction between particles that is purely originating from the membrane deformation they induce. The observed interaction potential has a strength of -3 k_BT and extends over several micrometers. Our new model system provides detailed insights into the long-ranged interaction induced by local membrane deformations and thus enables us to test existing theoretical frameworks. [4]

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[2] Reynwar B.J. et al., Nature 447, 461 (2007).

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