Interactions from lipid membrane deformations

Azadbakht, A.

Propositions

accompanying the thesis

Interactions from Lipid Membrane Deformations

I

The use of simple anisotropic colloids, such as dumbbells, provides valuable insight into understanding the role of particle shape in endocytosis.
Chapter 2 of this thesis

II

The deformation-mediated interaction in lipid membranes is non-additive, which means that the presence of an additional particle weakens the interaction between the other two particles.
Chapter 3 and 5 of this thesis

III

Holographic optical tweezers are a precise tool for manipulating and quantifying indirect forces between colloids.
Chapter 4 and 5 of this thesis

IV

By using the attachment-free method, the experimental system for measuring the deformation-mediated interaction on lipid membranes was greatly simplified which allowed studying the interaction between more than three spheres and anisotropic objects.
Chapter 5 and 6 of this thesis

V

The presence of different polymers outside and inside a membrane induces a spontaneous curvature of the membrane, which should be taken into account when wrapping a particle by a membrane.
Spanke HT, et al. "Wrapping of Microparticles by Floppy Lipid Vesicles". Phys Rev Lett. 2020;125(19):1-9.

VI

The aggregation of colloidal particles on a vesicle observed by Ramos et al. was driven exclusively by charged surfactants and colloidal particles, and deformation-mediated interactions were hardly involved in the aggregation.
Ramos L, et al. Surfactant-mediated two-dimensional crystallization of colloidal crystals. Science. 1999;286(5448):2325-2328.

VII

The difference in interaction energy between two membrane-deforming particles measured by van der Wel et al. and Sarfati et al. was due to the wrapping fraction of the particles.
Sarfati R, et al. Long-range attraction of particles adhered to lipid vesicles. Phys Rev E. 2016;94(1):2-7. and *van der Wel C, et al. Lipid membrane-mediated attraction between curvature inducing objects. Sci Rep. 2016;6 :1-10.*

VIII

In contrast to the findings reported by Ewins et al., we could not reproduce 50% penetration depth of negatively charged colloids into the lipid membrane with 5% positively charged lipid. This significant penetration depth was achieved only when the lipid membrane was doped with 40% positively charged lipids alongside similar lipids and colloids.
Ewins EJ, et al. "Controlled adhesion, membrane pinning and vesicle transport by Janus particles". Chem. Commun. 2022;58(18):3055-3058.

IX

To better understand the effect of artificial activity on membrane fluctuation, Vutukuri et al. should have measure membrane tension directly and without significant disturbance by pulling on a membrane tube from their vesicles.
Vutukuri HR, et al. Active particles induce large shape deformations in giant lipid vesicles. Nature. 2020;586(7827):52-56.

X

Artificial intelligence (AI) is becoming more and more helpful in academic projects, but scientists should find a way to put an end to p-hacking by AI.

XI

Scientists should communicate to the public that scientific findings are not always absolute truths and emphasize the importance of considering the context and dynamic nature of scientific findings.

Ali Azadbakht
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