

## Controlling the interactions in fluctuating supported bilayers

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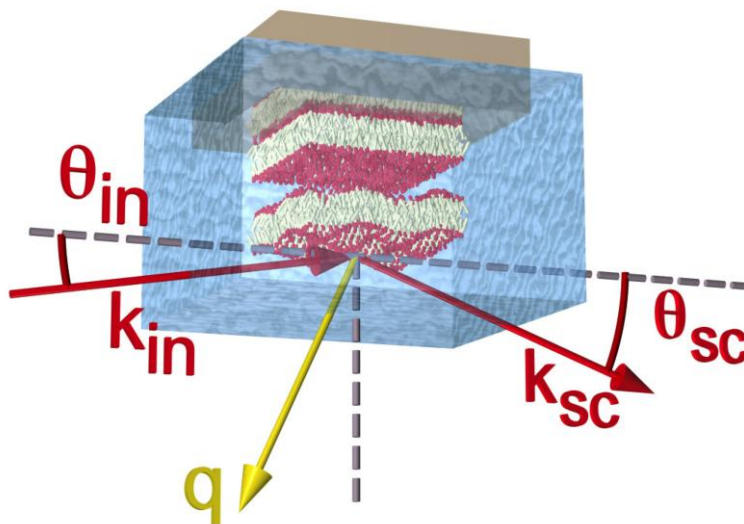
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### Abstract

Understanding interactions between membranes requires measurements on well-controlled systems close to natural conditions, in which fluctuations play an important role.

We have determined, by grazing incidence x-ray scattering, the interaction potential between two lipid bilayers, one adsorbed on a solid surface and the other floating close by<sup>1,2</sup>. We find that interactions in this highly hydrated model system are two orders of magnitude softer than in previously reported work from multilayer stacks<sup>3</sup>. This is attributed to the weak electrostatic repulsion due to the small fraction of ionized lipids in supported bilayers with a lower number of defects. We also have a unique access to very weak entropic repulsion potentials, which allowed us to discriminate between the various models proposed in the literature.

The effects of an electric field on the properties of membranes have also been measured. We show for the first time that the field induces a negative electrostatic tension and a significant increase of the rigidity, as predicted by recent theories<sup>4</sup>, opening new perspectives into the understanding of membrane interactions and stability.



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<sup>2</sup> Malaquin, L.; Charitat, T. & Daillant, J., *Supported bilayers: combined specular and diffuse x-ray scattering*, EPJE, **2010**, 31, 285-301

<sup>3</sup> Petrache, H. I.; Gouliaev, N.; Tristram-Nagle, S.; Zhang, S.; Suter, R. M. & Nagle, J. F., *Interbilayer interactions from high-resolution x-ray scattering*, Physical Review E, **1998**, 57, 7014-7024

<sup>4</sup> Ziebert, F. & Lacoste, D., *A Poisson-Boltzmann approach for a lipid membrane in an electric fields*, New Journal of Physics, **2010**, 12, 095002