

Morphological Transitions of Interfaces and Membranes

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Abstract

This course will address the morphologies and morphological transitions of fluid interfaces and membranes. It will start with the classical problem of the shape of liquid droplets which represent surfaces of constant mean curvature as described by the shape equation of Laplace. When these droplets are located on a chemically patterned or topographically structured substrate surface, one obtains a variety of distinct morphologies as well as morphological transitions.

The shape of membranes and vesicles is governed by additional curvature terms that describe the membranes' bending energy. The corresponding variational problem has been systematically studied for axially symmetric shapes. The curvature terms lead to new morphological transitions such as conformal diffusion, budding, and the formation of thin tube-like tethers. Additional transitions occur for multicomponent membranes that form several intramembrane domains. As time permits, this course will also address the adhesion and fusion of membranes.

Background material to this course can be found in two reviews by R. Lipowsky et al, *J. Phys.: Condens. Matter* Vol. 17 (2005) S537-S558 and S2885-S2902.