LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

ARNOLD SOMMERFELD CENTER FOR THEORETICAL PHYSICS

Sommerfeld Theory Colloquium

Prof. Christoph Weber

University of Augsburg

Chemically Active Wetting

Wetting of liquid phases, such as water drops condensing at the surface of plant leaves, is ubiquitous in our daily life. Interestingly, the physics of wetting also plays a crucial role in our cells. Droplets composed of proteins can wet specific target sites in living cells and locally enrich biomolecules for specific chemical processes. Many droplet-forming proteins can also bind to membrane surfaces. Binding in cells is often chemically active since it is maintained away from equilibrium by supplying energy and matter. This non-equilibrium setting suggests a plethora of physical phenomena of soft condensed phases at biological interfaces.

To investigate such phenomena, we derive the non-equilibrium thermodynamic theory of active wetting. By means of this theory, we show that active binding significantly alters the wetting behavior leading to non-equilibrium steady states with condensate shapes reminiscent of a fried egg or a mushroom. We further show that condensate shapes can switch upon changing the strength of active binding. The origin of such anomalous condensate shapes can be explained by an electrostatic analogy, where binding sinks and sources correspond to electrostatic dipoles along the triple line. This analogy suggests a general analogy between chemically active systems and electrodynamics.

Wednesday, July 6, 2022, 16.15h, Room 348, Theresienstr. 37 / III and via Zoom

Prof. Erwin Frey