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I. Surface Tension and Biocapillarity.

Abstract:

We consider physical systems dominated by the influence of surface tension. A number of canonical systems are considered with a view of developing physical intuition for interfacial flows. Examples from biology are considered, with particular attention given to elucidating natural strategies for water-repellency, underwater breathing, fluid transport and propulsion.

II. Quantum Capillarity.

abstract:

Yves Couder and coworkers have recently reported the results of a startling series of experiments in which droplets bouncing on a fluid surface exhibit wave-particle duality and, as a consequence, several dynamical features previously thought to be peculiar to the microscopic realm. We explore this fluid system in light of the Madelung transformation, whereby Schrodinger's equation is recast in a hydrodynamic form. Doing so yields insight into the correspondence between bouncing droplets and subatomic particles, and provides rationale for the observed macroscopic quantum behaviour. New experiments are presented, and indicate the potential value of this hydrodynamic approach to both visualizing and understanding quantum mechanics.