PHYSIK

PHYSIKALISCHES KOLLOQUIUM

UNIVERSITÄT DES SAARLANDES

Donnerstag
28.11. um 16 Uhr
Studentinnen/Studenten sind herzlich willkommen

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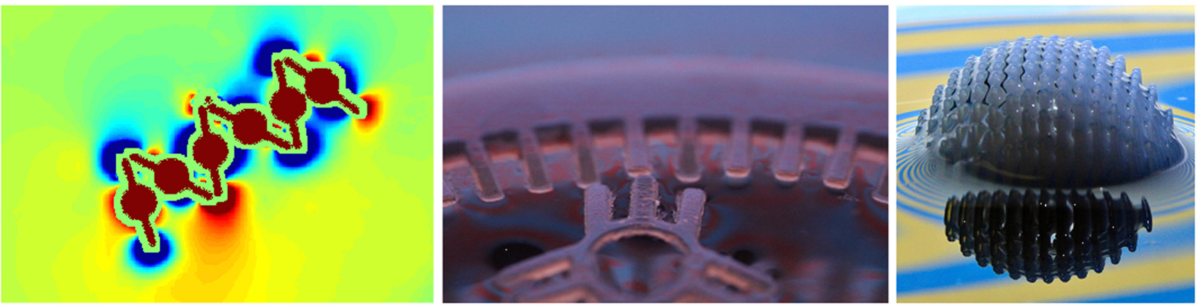
Exploiting capillary interactions for assembling meso-structures

Thursday, November 28rd, 2024, at 4.00 p.m. c.t.
Building C6.4, Lecture Hall II

Self-assembly, an inherently spontaneous process marked by the emergent ordering of systems through thermal agitation and intermolecular interactions, holds a pivotal role in the formation and the self-folding of intricate macromolecules, being highly relevant for chemistry and biology. While ubiquitously observed at the molecular level, its application extends to the mesoscopic scale, wherein capillary-driven self-assembly has been proposed for building structures in the gap between classical bottom-up and top-down fabrication methods, specifically, at spatial scales ranging from 10 micrometers to 10 millimeters. Although this fabrication approach was introduced two decades ago, accomplishments have largely been confined to the realization of regular or simplistic structures. This study leverages principles derived from both experimental and statistical physics to elucidate methodologies for manipulating subtle capillary interactions, thereby facilitating the construction of intricately complex structures [1]. Furthermore, we illustrate how such mesoscopic systems can serve as analogous models for various physical systems, encompassing folding molecules [2,3], molecular lock-key mechanisms, and crystallization processes. By harnessing magnetic fields, we introduce the potential to actuate particles towards the self-assembly of micromachines [4], presenting applications including interface cleaning, particle sorting, and transport functionalities.



Left to right, illustrations of the self-assembly of floating components. (left) A chain of 6 components possessing positive and negative menisci is self-folding into an undulated floating structure. (center) Positive and negative menisci controlled by the curvature of floating objects allow for complex interactions close to molecular recognition. (right) An array of spines is piercing the liquid interface creating a giant meniscus. If the shape of each spine is judiciously chosen, the shape of the meniscus can be controlled like here in a hemispherical shape.

1. M.Delens, A. Franckart, N.Vandewalle, *submitted* (2024) - https://doi.org/10.21203/rs.3.rs-3467162/v1
2. M.Delens, Y.Collard, and N.Vandewalle. *Phys. Rev. Fluids* **8**, 074001 (2023)
3. N.Vandewalle, M.Poty, N.Vanesse, J.Caprasse, T.Defize, C.Jérôme, *Soft Matter* **16**, 10320-10325 (2020)
4. Y.Collard, G.Grosjean, N.Vandewalle, *Comm. Phys.* **3**, 112 (2020)

Prof. Christian Wagner takes care of the speaker.
You can participate online via TEAMS: https://tinyurl.com/vandewalle2811

Interested people are cordially invited.

Coffee and cookies are served at 4.00 p.m. in front of the Lecture Hall

Naturwissenschaftlich – Technische Fakultät

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