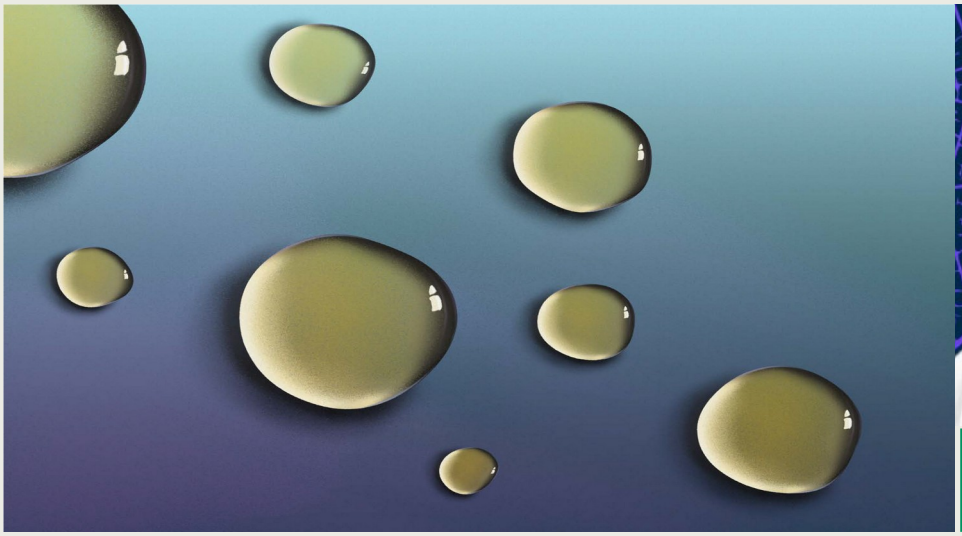
# Physikalisches Kolloquium

UNIVERSITÄT BAYREUTH
Physikalisches Institut

## Brownian motion near complex interfaces

Colloidal motions near complex boundaries are ubiquitous in fundamental physics and biology, as well as in industrial applications. This class of problems invariably involves the intricate coupling between confined fluid flows, soft boundaries, charges, external forces and fluctuations. Using a combination of interferometric microscopy and advanced statistical inference, we address such a coupling in two main situations. First, we consider the Brownian motion of a rigid particle near a rigid wall. All the key statistical-physics observables are reconstructed with high precision, allowing for nanoscale resolution of local mobilities and femtonewton inference of conservative and nonconservative forces. Furthermore, we characterize the displacement non-Gaussianities induced by the flow boundary condition at the wall, and their drastic consequences on target-finding dynamics. Then, we investigate the Brownian motion of soft micrometric oil droplets near rigid walls. The analysis reveals the existence of a novel, transient but large, soft-Brownian force. The latter might be of importance for microbiological and nanophysical transport, as well as for chemical reactions in crowded environments — and hence the whole life machinery.

**Dienstag, 23. Juni 2026 | 17 Uhr s.t. | Hörsaal H15 (NW I)**



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