

Allgemeines Physikalisches Kolloquium

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Prof. Stefan Karpitschka

Universität Konstanz

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Viscoelastic Contact Dynamics in Soft and Living Matter

The contact dynamics of soft and living materials ubiquitously determine their mechanical interactions experienced in everyday life or technological applications. In this talk, I will present our recent progress on two types of dynamical contact mechanics problems: (i) Dynamical wetting of soft materials, which has recently gained significant interest in the soft matter community, allows to probe the response of soft solids to virtually infinitely sharp line tractions. It turns out that, on such small scales, solid surface tension and poroelastic phenomena cannot be ignored, leading to an intricate coupling of elastic, osmotic, and capillary forces. (ii) Gliding motility of filamentous cyanobacteria, for which no comprehensive explanation exists to date, relies on direct contact of the bacteria with solid surfaces. Harnessing mechanical instabilities, we could measure the forces involved in gliding motility on the scale of individual filaments and show that this type of motility requires adhesion. We expect these findings to be relevant far beyond cell motility research as these organisms belong to the oldest known forms of life on earth and played a key role in the oxygenation of our atmosphere, and today their giant blooms pose major ecological and economical challenges.