Westfälische
Wilhelms-Universität
Münster

Fachbereich
Physik

› Allgemeines Physikalisches Kolloquium

› Donnerstag, 12.07.2018 um 16 Uhr c.t.

Prof. Dr. Gerhard Gompper

Forschungszentrum Jülich

"Toward Swimming Nanorobots"

Both in soft matter and in biology, there are numerous examples of microswimmers and self-propelled particles. With a typical size in the range of tens of nanometers to several micrometers, both low-Reynolds-number hydrodynamics and thermal fluctuations are es-sential to determine their dynamics and their collective behavior. Prominent examples are sperm cells which are propelled by a snake-like motion of their tail, bacteria like E. coli which move forward by a rotational motion of their spiral-shaped flagella, and synthetic Janus colloids which catalyze a chemical reaction on their surface.

The talk will focus on swimming mechanisms, the cooperative behavior of many self-propelled particles, and on the interaction of microswimmers with walls. The helical flagella of peritrichous bacteria synchronize and form bundles for propulsion, but also unbundle to induce tumbling. Sperm uses its flagellum not only for propulsion, but also for steering. Cilia beating in large two-dimensional arrays form metachronal waves, which strongly improve the fluid transport efficiency.

Active particles show a strong tendency for aggregation and clustering in the bulk, and display a strong surface excess in confined geometries. The effects of self-propulsion, hydrodynamic interactions, microswimmer shape, and noise on these phenomena will be discussed. Insight into the behavior of biological systems can help in the design of artificial micro-transport systems and nanorobots.

Kolloquiums-Kaffee
ab 16 Uhr vor dem Hörsaal

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