



"Soft-Matter Seminar"

Self-assembled microscopic swimmers and walkers

Prof. Alfredo Alexander-Katz
Department of Materials Science and Engineering, MIT

Abstract

Nature has evolved a variety of locomotion schemes at the microscopic scale that are useful to search for nutrients, escape a threat, or fight foreign pathogens. These mechanisms are also used to transport viscous fluids, or direct the motion of cells in the human body. Among the most common motifs employed to propel organisms at the microscopic scale one finds cilia and flagella, both of which are long semi-flexible filaments. In this talk I will present our work on designing and characterizing theoretically and experimentally self-assembled microscopic swimmers and walkers. Our design in the former category is a sperm-like swimmer that is driven by a rotary magnetic field. This swimmer exhibits a nontrivial motion reversal transition above a critical frequency due to a drag-induced instability. In terms of ciliated surfaces, we have created carpets of chain-like rotors that self-assemble under the influence of a rotating magnetic field. Due to the coupling of rotation and translation near the surface, these systems behave as microscopic conveyor belts useful for transporting larger objects in a controlled fashion. I will finalize by presenting a perspective on future work in this area and discuss its potential for creating novel microfluidic systems.

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Prof. Dr. Roland Netz
Physik-Department T 37, Technische Universität München, Theoretische Physik
85747 Garching