Seminar of SFB 910

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"Active colloidal fluids"

Flocks of birds and schools of fish are familiar examples of emergent collective behavior, where interactions between self-propelled (active) individuals lead to coherent motion on a scale much larger than the isolated unit. Similar phenomena have been observed with active micro-particles such as bacteria and motile colloids. Recently, the Quincke instability (spontaneous spinning of a dielectric particle in an applied uniform DC field) has attracted great interest as a means of propelling colloids, by simply letting the particles roll on a surface. In this talk, I will present our experiments showing how Quincke rollers, previously studied mainly as active Brownian particles, can be designed to perform Run-and-Tumble-like locomotion mimicking bacteria such as E. coli. Populations of the Quincke random walkers self-organize and exhibit behaviors reminiscent of bacterial suspensions such as dynamic clusters and mesoscale turbulent-like flows. I will also discuss some novel collective dynamics of Quincke rotors levitating in a bulk fluid: unlike the rollers, the hovers form crystals, chains and other dynamical assemblies.

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