Active motion: Understanding single microswimmers and their emergent collective behavior

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Active motion of artificial and biological microswimmers is relevant in microfluidics and biological applications but also poses fundamental questions in nonequilibrium statistical physics. Mechanisms of single microswimmers need to be understood and a detailed modeling of microorganisms helps to explore their complex cell design and their behavior. The collective motion of microswimmers generates appealing dynamic patterns.

In this talk I review some of our work modeling biological microswimmers such as *E. coli* [1] and the African trypanosome [2], the causative agent of the sleeping sickness, in order to contribute to their better understanding. Using simpler model microswimmers such as active Brownian particles, I will also demonstrate their emerging collective behavior. Hydrodynamic interactions lead to a clustering transition dependent on swimmer type [3] or to the formation of fluid pumps in 3D harmonic traps [4], while self-phoretic active colloids show biomimetic auto-chemotactic behavior, which can induce dynamic clustering or a chemotactic collapse [5].

**References**


(Host: A. Rohrbach)