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Collective behaviour of synthetic cilia arrays

Initiative: "Experiment!" (beendet)

Ausschreibung: Explorative Phase

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Fluid transport is a key function in biology and is often accomplished by motile cilia and flagella, thin elongated organelles that protrude into the extracellular environment from the surface of many eukaryotic cells. They perform beat cycles, which drive the surrounding fluid and generate vital flows for physiological functions such as establishment of the left-right asymmetry in embryos, transport of ova in fallopian tubes, transport and expulsion of mucus from the airways for removing foreign particles and fending off infections. In most cases cilia grow in high density arrays and their synchronization leads to emergent collective beat patterns in the form of travelling waves. The source of synchronization observed in cilia is not well understood yet. In this project bio-inspired beating microstructures are created consisting of a few biological building blocks and capable of mimicking natural beating cilia. This will provide us a completely new model system for studying how coupling between many beating structures can induce cilia synchronization. The results can encourage the development of new technologies for synthetic transport systems at the micro- and nanoscale.

Projektbeteiligte

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Active beating modes of two clamped filaments driven by molecular motors
A Synthetic Minimal Beating Axoneme
Active bending of disordered microtubule bundles by kinesin motors
Pattern formation under mechanical stress in active biological networks confined inside evaporating droplets
Spontaneously Beating Biomimetic Structures