UNIVERSITÄT DUISBURG ESSEN

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# Physikalisches Kolloquium

**Mittwoch, 29.04.2026**
**13:00 Uhr**
**MC 122 und Zoom**

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

## Physics of active matter

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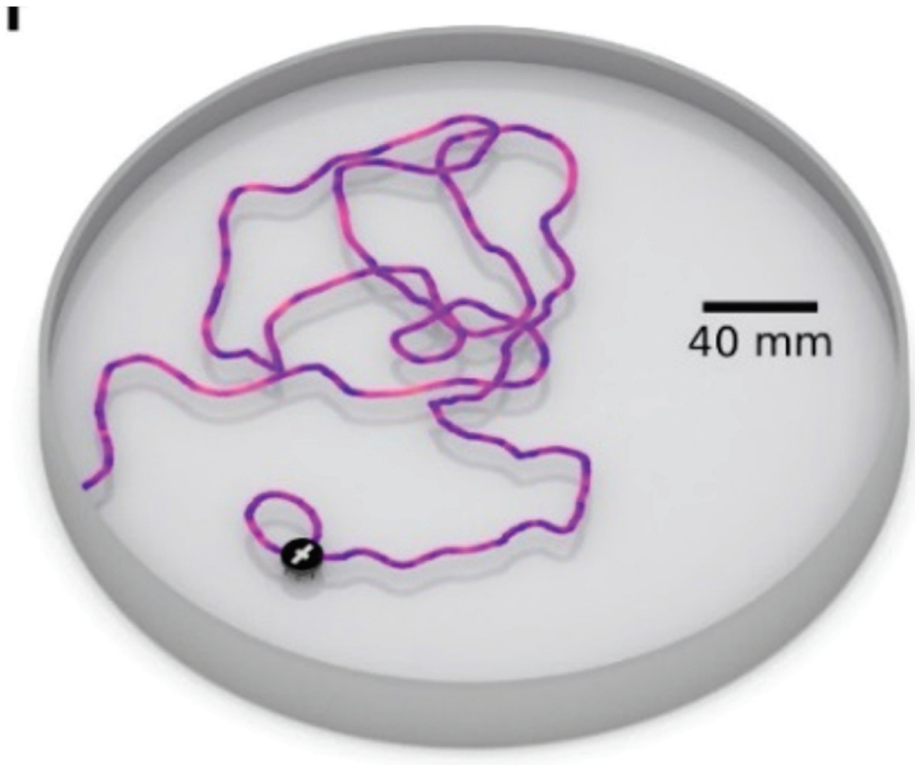


While ordinary materials are typically composed of inert „passive“ particles, active matter comprises objects or agents which possess an intrinsic propulsion. Examples are living systems like schools of fish, swarms of birds, pedestrians and swimming microbes but also artificial particles equipped with an internal motor such as robots and colloidal Janus particles. Active matter is praised for possible technological applications ranging from micro-surgery to environmental cleaning. This talk provides an introduction to the basic physics of active matter with an emphasis on the statistical mechanics of synthetic artificial self-propelled particles. After an introduction of basic concepts to describe self-propelled colloids in the mesoscopic soft matter regime, such as active Brownian motion, novel collective phase transitions are described including motility-induced phase separation of repulsive self-propelled particles. Then the importance of inertia relevant for particles of larger size is discussed. Finally two possible paths to next generation‘s active materials are pointed out: either functionalized microswimmers equipped with artificial intelligence or ultracold atoms in optical fields opening the door to the new field of quantum active matter.