Thesis Project Offer

Joint Research and Education Programme "Palestinian-German Science Bridge PGSB"
Forschungszentrum Jülich GmbH & Palestine Academy for Science and Technology

Thesis type*

☒ BSc	☒ MSc	☐ PhD	Intended starting date (approx.): 2023

Contact details of supervisor/responsible host at Forschungszentrum Jülich

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Project description*

Collective motion is observed for bird flocks, fish schools, and cooperative motion of bacteria. It can lead to complex behaviour, sometimes referred to as "swarm intelligence". We aim to understand emerging collective behaviour from a physics point of view. As a generic model system, we study self-propelled particles that are also subject to thermal noise, so called active Brownian particles (ABPs). In bulk, ABPs have been shown to phase-separate into a dense liquid and a dilute gas phase. If ABPs are confined in channels and channel networks with complex geometries, we hypothesize that the particle flux is optimal in the gas phase.

In this project, you will characterize structure, dynamics, and flux of self-propelled particles in channels. To direct the particle motion, the particles have a dipole moment and are subject to a field that aligns their propulsion forces. Examples are magnetic particles and magnetotactic bacteria in an external magnetic field, but self-propelled agents that show Vicsek-like behaviour. In the latter case, the direction of the propulsion force of a particle is aligned with its neighbours' velocities. You will perform computer simulations with the help of a program written in C++ to simulate particle motion, and use Python scripts to evaluate simulation data.

Date*	Signature*
31.01.2023	

* required field

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