PHYSICAL MATHEMATICS SEMINAR

The Non-equilibrium Dynamics of Active Droplets and their Collectives

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ABSTRACT:

Active droplets i.e. emulsion droplets which exhibit self-propelled motion are of tremendous interest in understanding collective dynamics of systems far from thermal equilibrium. A particularly appealing feature of these active droplet systems is that the coupling between the individuals are mediated by physical effects such as steric interactions and hydrodynamics, leading to a range of collective behavior. We create such active droplet systems using emulsions (water-in-oil or oil-in-water, respectively) stabilized by surfactants. A common theme in the propulsion of these individual droplets is a spontaneously broken symmetry (unlike colloidal swimmers which are often asymmetric by design) which is sustained via dissipation of chemical energy. I will talk about the molecular mechanisms involved in the self-propulsion, the resultant hydrodynamic flow fields of individual swimmers and the emergent collective dynamics of populations of many swimmers. In particular, we show that hydrodynamics and geometry play a crucial role in the emergent self-organization of the active droplets, which might be exploited for computation mediated by activity, physical coupling and confinement.

TUESDAY, MAY 13, 2014
2:30 PM
Building E17, Room 136

Reception following in Building E17, Room 401A
(Math Dept. Common Room)

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