Physical Mathematics Seminar

Experiments on swimming and collective behavior in self-propelled particles

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ABSTRACT:

We discuss a series of experiments with mechanical systems to develop the physics of active soft matter. We first discuss experiments with polar granular particles which undergo directed random walks on a vibrated surface. We discuss the collective behavior which arises simply due to steric interactions between particles as well as the boundary. In particular, we demonstrate formation of vortices involving most of the particles in the system, and the swarming at the boundaries of the system. We demonstrate formation of clusters because of temporary jamming of directed random walkers. Then we will examine the diffusion of self-propelled rods as a function of their number density and describe the dynamics in terms of tube like dynamics. We will compare and contrast the observations with apolar systems composed of beaded chains. Finally, we will examine the effect of the medium on the dynamics of an active micro-particle using a flexible sheet swimming with a prescribed wave pattern - a Taylor swimmer - through a fluid. This simplified system allows us to calculate the observed swimming speed in a Newtonian fluid in the low Reynolds regime. We find that the swimming speed depends on the visco-elastic nature of the fluid and further discuss the impact of the amplitude of the swimming stroke on the swimming speed.

TUESDAY, APRIL 8, 2014
2:30 PM
Building E17, Room 136

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

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