The Edwards Centre for Soft Matter Mini-Conference

Friday **4 December** 2020

Zoom meeting ID: 962 7794 5792

12:45 - 13:00 Welcome

13:00 - 14:00 **Keynote Lecture: Prof. Howard A. Stone (Princeton)**

Two short stories in soft matter: (1) thin films and a novel similarity solution and (2) nanoscale capillary instabilities and molecular biology

14:00 - 14:20 Dr Jerelle Joseph (Chemistry)

Salt-mediated re-entrant liquid condensate phase of proteins

14:20 - 14:35 Break

14:35 - 14:55 Philipp Kloza (Materials Science)

Untangling Carbon Nanotube Network Formation

14:55 - 15:15 Dr Rosalba Garcia-Millan (DAMTP)

Field theory of a run-and-tumble particle in a harmonic potential and its entropy production

15:15 - 15:40 Flash presentations

Dr Julian Kappler (DAMTP) - Experimental measurement of relative path probabilities and stochastic actions
Dr Rajesh Singh (DAMTP) - Self-propulsion of active droplets
Ben Young (DAMTP) - RIMS: how to peek inside an avalanche
Clare Rees-Zimmerman (Chem. Eng.) - Stratification in drying films: diffusion and diffusiophoresis
Stuart Knowles (Cav.) - The Colour of Current - Investigating Polymer Adsorption using Spectral Analysis

15:40 - 16:00 Gea T. van de Kerkhof (Chemistry)

Bacteria colonies as photonic crystals: the inflence of nutrients

16:00 - 16:20 Karol Bacik (DAMTP)

Concerto for two sand dunes in quasi-2D

16:20 - 16:35 Break

16:35 - 17:00 Flash presentations

Dr Tirthankar Banerjee (DAMTP) - Active, interacting lattice gases
Ren Liu (Cav.) - DLS based microrheology of DNA-functionalised triblock copolymer solutions
Xiaoying (Grace) Tang (Cav.) - Colloid-manipulation using optical tweezers at interfaces
Jiaming Yu (Cav.) - TBA
Dr Weichao Zheng (Oxford) - On the origin of permeative flows in cholesteric liquid crystals

17:00 - 18:00 **Keynote Lecture: Prof. Andrea J. Liu (UPenn)**

Exploiting the Malleability of Disorder to Design Biologically-Inspired Function

18:00 Flash presentation prize - End of the meeting

The Edwards Centre for Soft Matter Mini-Conference - Keynote Lectures

Prof. Howard A. Stone (Princeton)

Two short stories in soft matter: (1) thin films and a novel similarity solution and (2) nanoscale capillary instabilities and molecular biology

Abstract: I discuss two recent projects combining experiments and theory in different areas of soft matter and fluid dynamics. In the first example, we document experimentally the time and (three-dimensional) space variations of the shape of a falling film near the edge of a vertical plate and rationalize the quantitative features using a similarity solution. This example seems unusual since we are able to theoretically show that the shape is described by a nonlinear partial differential equation, involving three independent variables, yet the equation can be reduced by a similarity transformation to a nonlinear ordinary differential equation. As a second example, we discuss the formation of the spindle in a dividing cell, and report experiments documenting a condensed protein phase on growing microtubules, followed by the Rayleigh-Plateau instability, which produces discrete droplets along a microtubule, that then drives branching nucleation.

Prof. Andrea J. Liu (UPenn)

Exploiting the Malleability of Disorder to Design Biologically-Inspired Function

Abstract: The complexity of living systems poses a formidable challenge to physical scientists interested in biology. I will discuss one theoretical approach towards gaining possible insight into biological phenomena: to design systems to exhibit similar phenomena. To do so, we start with systems with complex energy/cost landscapes, which have far more variation in their properties than those with simple ones. This natural variation can be pushed even further by design, allowing us to tune in properties inspired by those common in living matter, such as the ability of proteins (e.g. hemoglobin) to change their conformations upon binding of an atom (oxygen) or molecule, or the ability of the brain's vascular network to send enhanced blood flow and oxygen to specific areas of the brain associated with a given task. We create ensembles of systems designed for a given task to gain new insight into the relation between microscopic structure and function that may help us to understand living systems.