Sakuntala Chatterjee

Assistant Professor
Theoretical Sciences
sakuntala.chatterjee@bose.res.in

Dr. Sakuntala Chatterjee finished her PhD from Tata Institute of Fundamental Research, Mumbai in 2007. She spent 2007-09 in Research Centre Juelich, Germany and 2009-11 in Technion, Israel, as postdoctoral fellow. Since 2011 she is at S.N. Bose Centre. She is interested in the field of Nonequilibrium Statistical Physics and Biological Physics.

Supervision of Research / Students

Ph.D. Students

1. Subrata Dev; Effect of extra-cellular nutrient environment and intra-cellular biochemical conditions on the chemotactic performance of E.coli; Ongoing.
2. Shauri Chakraborty; Dynamics of propagating modes and characterization of ordering in coupled non equilibrium systems; Ongoing.
3. Rajkumar Sadhu; Force generation by actin filaments growing against a barrier; Ongoing.

Teaching activities at the Centre

1. Fall semester, 2016, Quantum Mechanics 1, IPhD level, 9 students

Publications in Journals

1. Raj Kumar Sadhu and **Sakuntala Chatterjee;** *Actin filaments growing against a barrier with fluctuating shape*; Physical Review E; 2016; **93**; 062414.
2. Rakesh Chatterjee, **Sakuntala Chatterjee,** and Punyabrata Pradhan; *Symmetric exclusion processes on a ring with moving defects*; Phys. Rev. E; 2016; **93**; 062124.
3. Shauri Chakraborty, Sukla Pal, **Sakuntala Chatterjee**, and Mustansir Barma; *Large compact clusters and fast dynamics in coupled nonequilibrium systems*; Phys. Rev. E; 2016; **93**, 050102(R).

Lectures Delivered

1. Ordering and dynamics in coupled driven systems; S.N. Bose Centre; Kolkata; January; 2017; 1.
2. Equilibrium Statistical Mechanics; S. N. Bose Centre (C.K. Majumder Memorial Summer Workshop); Kolkata; May; 2016; 2.
3. Coupled non-equilibrium systems: ordering and dynamics; Presidency University; Kolkata; March; 2017; 1.
4. Actin filaments growing against a barrier with fluctuating shape; Calcutta University; Kolkata March; 2017; 1.

Membership of Committees

External Committee

Acted as reviewer for Phys Rev E, Phys Rev Lett, Physica A; Served in KVPY interview board.

Sponsored Projects

1. Study of *E.coli* chemotaxis at the single cell level: a statistical physics approach; SERB, DST; 27th Feb 2017 -26th Feb 2020.

Collaborations including publications (Sl. No. of paper/s listed in 'Publications in Journals' jointly published with collaborators)

National

1. Sl. No. 3

Significant research output / development during last one year

General research areas and problems worked on

Phase-ordering in coupled systems; Actin filaments; Bacterial chemotaxis; Periodically driven systems.

Interesting results obtained

We show the importance of considering the shape fluctuations of a barrier against which actin filaments exert force while polymerizing. The shape of the force velocity curve has been measured as convex or concave, depending on the experimental set-up or modeling details. We show that the relative time-scale between the shape fluctuations of the barrier and polymerization of the filaments decide the shape of the force-velocity characteristic and by tuning this time-scale, it is possible to go over from a convex to a concave characteristic.

We obtain interesting phase diagram showing novel ordered phases on varying the coupling parameters between two coupled driven systems. These novel phases are characterized by presence of pure domains, along with fast dynamics of the domain boundaries over algebraic time-scale. The existence of fast dynamics also gives rise to an algebraic relaxation during the coarsening phase, which was not seen earlier in systems with pure domains.

Proposed research activities for the coming year

1. Characterization of propagating dynamical modes in coupled driven systems.
2. Bacterial chemotaxis with signaling noise.