



THEORETICAL PHYSICS SEMINAR CIRCUIT

S N BOSE NATIONAL CENTRE FOR BASIC SCIENCES

SALT LAKE, KOLKATA 700 106

NOTICE FOR SEMINAR

Title

Theoretical studies of the non-equilibrium statistical mechanics of colloidal and polymeric systems at the single molecule level

Speaker

Aishani Ghosal

Inorganic and Physical Chemistry Department, IISc, Bangalore

Date: 1st November 2019

Time: 3:00 pm

Venue: Fermion Hall

Abstract

In this talk, I review theoretical work I have carried out over the last several years to understand various aspects of the thermodynamics of small systems driven out of equilibrium by the action of external forces. The small systems I consider in this work are (i) a single colloid in a fluid heat bath (which I model as a point particle executing Brownian motion), and (ii) a single long polymer in a theta solvent (which I model as a non-interacting continuous curve of finite extensibility subject to thermal fluctuations.) I have investigated the response of these systems to the effects of external forces by calculating a number of different thermodynamic and kinetic quantities, including: (i) the distribution of heat fluctuations of two coupled Brownian oscillators in a dual temperature reservoir [1], (ii) the degree of stretching of a chain in the presence of pure elongational flow [2], (iii) the rate of entropy production in a flow-driven colloid and polymer, and (iv) the distribution of binding times during the reaction of a polymer and a receptor [3]. I find generally good agreement between my theoretical results and available data from experiments or simulations. I also show that several of the calculated thermodynamic quantities satisfy one or more of the mathematical relations known as fluctuation theorems, which are statements about the distributions of fluctuating thermodynamic variables away from equilibrium.

References

- [1] A. Ghosal and B. J. Cherayil, *J. Stat. Mech.* 043201 (2016).
- [2] A. Ghosal and B. J. Cherayil, accepted in *Eur. Phys. J. B*; A. Ghosal and B. J. Cherayil, *J. Chem. Phys.* 141, 214902 (2016); *J. Chem. Phys.* 147, 064905 (2017); *J. Chem. Phys.* 148, 094903 (2018).
- [3] A. Ghosal and B. J. Cherayil, *J. Stat. Mech.* P10012 (2015).