Tata Institute of Fundamental Research
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Internal Seminar

Early time dynamics in the Light-Heavy Model

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We study the early time dynamics and onset of instabilities in a non-equilibrium lattice model known as the Light-Heavy (LH) model. This system consists of two species of particles (light and heavy) advecting on a fluctuating surface (described by tilt fields). The dynamics of particles and tilts are coupled through update rules, and lead to different phases depending on their microscopic rates. We propose a local correlation function (S) that is able to distinguish between several phases of this system through its coarsening properties. Starting from a random initial configuration, S displays an initial linear rise, a broad maximum, followed by a gradual decay which could include a power-law regime. Focusing on the early time dynamics, we posit coupled evolution equations governing the densities and tilts, which at short times are well approximated by a linear set of equations. We analytically solve these equations in continuum as well as on a lattice. The predicted early time evolution of S corresponds well with direct simulations of the LH model at early times. Beyond a timescale set by an ultraviolet (lattice) cut off and preceding the onset of coarsening, our linearised theory predicts the existence of an intermediate diffusive (power-law) regime, which we also find in simulations of the unstable regime in the LH system.

Wednesday, Oct 23rd 2019

11:30 AM (Tea/Coffee at 11:00 AM)

Seminar Hall, TIFR-H