THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Mathematics Colloquium

Thursday, Aug 29
3:30–4:30 p.m.
Phillips Hall 332

Title Energy landscapes, metastability, and transition paths

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Abstract.

The concept of an energy landscape emerged in the 1930's as a way to calculate chemical reaction rate constants via Henry Eyring's transition state theory. Its use has expanded since then, remaining central to quantifying metastability (infrequent jumps between deterministically-stable, energy minimizing, states) that arises in noisy systems when the thermal energy is small relative to the energy barrier separating two states. In this talk, I will present extensions of this theory that I have developed and applied to physical and biological systems. The first is an infinite dimensional system for which I prove metastability is present in the absence of an energy barrier; I extend transition state theory to compute mean transition times. In the second, I derive a model for a spatially-extended magnetic system with spatially-correlated noise designed to sample the Gibbs distribution relative to a defined energy functional. In the third, I show a quasi-potential can be found and used to describe metastable transitions between stable clusters in a bead-spring polymer model of chromosome dynamics with additional stochastic binding pushing the system out of equilibrium.