

PHYSICAL MATHEMATICS SEMINAR

Pulling on RNA and Getting Equilibrium Properties

EDWARD FENG

University of California, Berkeley

Single molecule experiments use optical methods to apply forces on biological molecules such as RNA. The data from these experiments have been analyzed with the work fluctuation relations, a set of novel results in statistical physics that relate far from equilibrium work measurements to equilibrium free energy differences. Hence, one can yank on RNA but ultimately get thermodynamic properties. Another important concept in the study matter out of equilibrium is thermodynamic length, a thermodynamic function of path that nevertheless bounds the dissipation of finite time process along the path. Here, we link the thermodynamic length to the work fluctuation relations in the context of single molecule experiments. For a stochastic model of the experiments, we derive a reweighting theorem that connects the far from equilibrium experiments to equilibrium quantities such as the thermodynamic length. These results provide a means to extract the thermodynamic length from experimental single molecule data. Moreover, the thermodynamic length has a simple physical interpretation in terms of the equilibrium fluctuations in the force exerted on the molecule.

THURSDAY, APRIL 24, 2008

2:30 PM

Building 2, Room 190

*Refreshments at 3:30 PM in Building 2, Room 349
(Applied Math Common Room)*



Massachusetts Institute of Technology
Department of Mathematics
Cambridge, MA 02139