Stochastic modeling of nanoscale friction phenomena

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ABSTRACT: Direct molecular dynamical simulations of a nanoscale object involve numerical integration of the equations of motion for all its atoms. This method is exact, but is characterized by severe time-scale and size limitations. Stochastic modeling is a useful alternative approach, where one focuses on just a few relevant degrees of freedom, whereas the remaining irrelevant ones are incorporated by introduction of dissipation and noise into the Langevin equations of motion for the relevant coordinates.

In this talk, we will discuss the derivation of the Langevin equations for a nanoscale system in contact with a heat bath. In contrast to the majority of the previous derivations assuming the system-bath coupling potential to be linear in bath coordinates, we will consider a general case where the corresponding interaction potential has an arbitrary functional form, but is weak in comparison to the coupling between the bath particles. In the second part of this talk, I will show how the ideas of stochastic modeling can be applied to atomic friction phenomena, namely, the stick-slip motion of an atomic force microscope cantilever and friction aging.

ALL ARE WELCOME!!!