Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

The thermodynamic geometry of the Ising model GRANT ROTSKOFF, University of California, Berkeley, GAVIN CROOKS, Lawrence Berkeley National Laboratory — Biological machines have evolved to produce useful work in a finite time by operating out-of-equilibrium, but we do not know how evolution has guided the design of these machines: Are there generic design principles that direct motors towards higher efficiency? To answer this question, one must first calculate a finite-time efficiency, which poses a significant challenge—tools of equilibrium statistical mechanics fail to describe the relationship between a protocol and the efficiency of a machine subject to that protocol. Using a geometric framework, I will describe a procedure for predicting the protocol that minimizes the dissipated work during an irreversible process. My talk will focus on optimal control of the 2D Ising model; this example will provide strategies for employing geometric thermodynamics to models that cannot be solved analytically.

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Date submitted: 05 Nov 2014 Electronic form version 1.4