Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Experimental study of memory erasure in a double-well potential
YONGGUN JUN, JOHN BECHHOEFER, Dept. of Physics, Simon Fraser University — We have experimentally demonstrated memory erasure in a time-dependent, double-well potential using a protocol suggested by Dillenschneider and Lutz [PRL 102, 210601 (2009)]. The protocol implements the erasure of information by removing the potential barrier, skewing the potential to one side, and then raising the barrier back. In this context, erasure means that no matter which well the particle started the cycle in, it ends up in a designated well. We implement the potential by placing an overdamped, charged Brownian particle in a feedback trap that uses electrophoresis to generate an arbitrary virtual two-dimensional potential. In a large system, Landauer's principle gives a lower bound for the heat dissipated in the erasure of a single bit (kT ln2). In a small system such as ours, thermal fluctuations allow for occasional violations. We quantify such violations as a function of barrier size and show that while averages are consistent with Landauer's principle, the tail of the distribution of dissipation per cycle—a fraction of trajectories—violates it.

Yonggun Jun
Dept. of Physics, Simon Fraser University

Date submitted: 14 Dec 2010 Electronic form version 1.4