Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Influence of non-conservative optical forces on the dynamics of optically trapped colloidal spheres: The fountain of probability BO SUN, YOHAI ROICHMAN, ALLAN STOLARSKI, DAVID G. GRIER, Center for Soft Matter Research, New York University — We demonstrate both experimentally and theoretically that a colloidal sphere trapped in an optical tweezer does not come to equilibrium, but rather reaches a steady state in which its probability flux traces out a toroidal vortex. This non-equilibrium behavior can be ascribed to non-conservative optical forces and constitutes a particularly simple thermal ratchet. We briefly discuss ramifications of this effect for previous experiments in which optical tweezers have been treated as conservative potential energy wells.

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Date submitted: 16 Dec 2007 Electronic form version 1.4