Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Anomalous cooling and heating – the Mpemba effect and its inverse[1] ZHIYUE LU, University of Chicago, OREN RAZ, University of Maryland College Park — Under certain conditions, it takes a shorter time to cool a hot object than to cool the same object initiated at a lower temperature. This counter-intuitive phenomenon – the Mpemba Effect, has been observed in a variety of systems. So far, no generic mechanism was suggested to explain this effect. In the theoretical framework of non-equilibrium thermodynamics, we construct a model to describe this effect and illustrates the fundamental principles behind it. In addition, we predict and demonstrate an inverse Mpemba effect: it can take a shorter time to heat a cold object than a warmer one. We derive sufficient conditions for the occurrences of both the forward and the inverse Mpemba effects, and suggest experiments to further study the non-equilibrium nature of these effects.

[1]Z.L. acknowledges financial support from the NSF under grant DMR-1206971. O.R. acknowledges financial support from the James S. McDonnell Foundation.

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Date submitted: 25 Oct 2016 Electronic form version 1.4