Abstract Submitted
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Experimental confirmation of Landauer's principle[1] JOHN BECHHOEFER, YONGGUN JUN[2], Simon Fraser University — Landauer's principle, formulated in 1961, postulates that irreversible logical or computational operation such as memory erasure must dissipate heat, no matter how slowly they are performed. For example, to "reset to one" a memory that can be in state 0 or 1 requires at least kT ln2 of work, which is dissipated as heat. In 1982, Bennett pointed out a link to Maxwell's Demon: Were Landauer's principle to fail, it would be possible to repeatedly extract work from a heat bath. We report the first confirmation of Landauer's principle in an experimental system, where a virtual double-well potential is created via a feedback loop. We observe the position of a charged, fluorescent, colloidal particle in water and calculate and then apply a force = -grad U(x,t) via an electric field. In a first experiment, the probability of "erasure" (resetting to one) is unity, and at long cycle times, we observe that the work is compatible with kT ln2. In a second, the probability of erasure is zero; the system may end up in two states; and, at long cycle times, the measured work tends to zero.

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