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# Maxwell's demon in the real world: Experiments on control, information, and thermodynamics.

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Just over one hundred and fifty years ago, Maxwell posed a thought experiment now known as "Maxwell's demon."Designed to understand more deeply the nature of the newly formulated second law of thermodynamics, the demon was to play a long, controversial role in the development of statistical physics. Just two months later, Maxwell's paper "On governors"gave the first analysis of a feedback system. These two foundational works reflect the fundamental and practical aspects of control. I will present an experiment that unites the two: using feedback to create "impossible"dynamics, we make a Maxwell demon that can reach the fundamental limits to control set by thermodynamics. We test—and then extend—Rolf Landauer's 1961 prediction that information erasure requires at least as much work as can be extracted from a system by virtue of information. Using these ideas, we report the first experimental measurement of the functional form for the Gibbs-Shannon entropy function for a system out of thermal equilibrium.

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