

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

The thermodynamic meaning of negative entropy LIDIA DEL RIO, RENATO RENNER, JOHAN AABERG, ETH Zurich, OSCAR DAHLSTEN, VLATKO VEDRAL, Centre for Quantum Technologies, National University of Singapore — Landauer’s erasure principle states that all irreversible operations, like the erasure of data stored in a system, have an inherent work cost. This work cost depends on our knowledge of the system: the less we know about its state, the more it costs to erase it. Here, we analyse erasure in a general setting, where our information about a system can be quantum mechanical. We show that the work cost of erasure is bounded by the entropy of the system conditioned on that quantum information. Our result implies that conditional entropies, originally introduced in the context of information theory, have a direct thermodynamic significance. Since these entropies can become negative, a particular consequence is that an observer who is strongly correlated to a system may gain work while erasing it.

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Date submitted: 14 Nov 2010

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