Coarse Grained Entropy is Nonlocal

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Abstract

In the greatest scientific innovation since the works of Newton, Faraday, in 1830, introduced the notion of locality, which states that causation is a local property. Locality inspired both Maxwell and Einstein in their formulations of electromagnetism and relativity. In this paper, we review our recent discovery that classical physics itself is nonlocal, in particular the field of thermodynamics. The coarse grained entropy of a macrostate is equal to its Boltzmann entropy plus its Kolmogorov complexity. If coarse grained entropy were computable, then faster than light communication of its properties is computationally possible.