Simple thermodynamics: The resource theory of infomational nonequilibrium

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Small thermodynamic systems have been modeled by a resource theory like that of pure bipartite entanglement. When all Hamiltonians are totally degenerate, this thermodynamic resource theory becomes a resource theory of information, or nonuniformity. I will detail the nonuniformity theory, insights it offers into thermodynamics, its relevance to Oxford research, and its intrinsic interest (arXiv:1309.6586). Two mathematical tools elucidate the nonuniformity theory: Lorenz curves and smooth single-shot entropies. After introducing these tools, I will illustrate their simplification of proofs and their geometric insights. In a small way, this research program will hopefully help clarify small-scale thermodynamics and inform future applications such as nanoscale engines.