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**Title: Demons and Angels in Quantum Thermodynamics**

**Abstract:**

The Second Law of Thermodynamics states that the entropy cannot decrease in an isolated system with fixed values of energy, volume, and particle number. The extension of this law to the quantum world generates new questions and opportunities. E.g., it turns out that a system--environment setup can be found with an autonomous unitary evolution that reduces the system entropy via the transfer of purity from the environment to the system---the functionality of this setup is naturally described by the action of a quantum Maxwell demon that exerts a (partial) SWAP operation between the system- and demon-states. We discuss a specific mesoscopic setup involving the scattering of an electron (the system) in the presence of a spin (the demon) that illustrates the relevant steps in such an entropy decreasing evolution and make use of the gained insights in the design of a quantum thermodynamic engine that operates free of local waste heat; such positive action is rather attributed to an `angel' than a `demon'. We discuss the spatial extent over which such a demon or angel can perform its action and find that macroscopic distances can be reached.

Work in collaboration with David Oehri, Andrey Lebedev, Gordey Lesovik, and Valerii Vinokur.