Quantum nonlinear thermodynamics from polaritons and spins to black holes

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We introduce a paradigm change in quantum thermodynamics: Instead of the usual *open systems* coupled to thermal baths, with possible modifications due to coherence effects, we resort to *closed systems* with *nonlinear interactions* between thermal noise channels as work and information resources. Nonlinear interferometers fed by thermal noise and filtered by giant polariton-polariton interactions or light-matter interactions in cavities are shown to act as unique heat engines [1], quantum sensors [2] or quantum microscopes [3]. Black holes are shown to be resources for nonlinear heat engines usable for spaceship propulsion [4]. We further show that quantum measurements can be a "poor man's substitute" for nonlinear work and information resources [5-8].

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