Title:	Attaining Carnot efficiency with quantum and nanoscale heat engines
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Abstract:	A heat engine operating in the one-shot finite-size regime, where systems composed of a small number of quantum particles interact with hot and cold baths and are restricted to one-shot measurements, delivers fluctuating work. Further, engines with lesser fluctuation produce a lesser amount of deterministic work. Hence, the heat-to-work conversion efficiency stays well below the Carnot efficiency. Here we overcome this limitation and attain Carnot efficiency in the one-shot finite-size regime, where the engines allow the working systems to simultaneously interact with two baths via the semi-local thermal operations and reversibly operate in a one-step cycle. These engines are superior to the ones considered earlier in work extraction efficiency, and, even, are capable of converting heat into work by exclusively utilizing inter-system correlations. We formulate a resource theory for quantum heat engines to prove the results.
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