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Bioinspired quantum heat engines DMITRI VORONINE, Texas A&M University, KONSTANTIN DORFMAN, SHAUL MUKAMEL, University of California, Irvine, MARLAN SCULLY, Texas A&M University — Quantum mechanics and thermodynamics have deep connections which govern the behavior of laser and photocell quantum heat engines (QHEs). We describe QHEs inspired by photosynthesis that operate under the natural conditions of incoherent excitation by sunlight. We investigate parameter regimes where large electric current yield enhancement and/or population oscillations are observed and identify noise-induced quantum coherence as the common origin of these effects. Quantum coherence plays a role in enhancing energy and charge transfer efficiencies and holds promise for improving the design and boosting the efficiencies of light-harvesting devices. A broad range of parameter regimes provides flexibility in designs and materials.

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