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Energy-harvesting at the Nanoscale[1] ANDREW JORDAN, University of Rochester, BJÖRN SOTHMANN, University of Geneva, RAFAEL SÁNCHEZ, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC), MARKUS BÜTTIKER, University of Geneva — Energy harvesting is the process by which energy is taken from the environment and transformed to provide power for electronics. Specifically, the conversion of thermal energy into electrical power, or thermoelectrics, can play a crucial role in future developments of alternative sources of energy. Unfortunately, present thermoelectrics have low efficiency. Therefore, an important task in condensed matter physics is to find new ways to harvest ambient thermal energy, particularly at the smallest length scales where electronics operate. To achieve this goal, there is on one hand the miniaturizing of electrical devices, and on the other, the maximization of either efficiency or power the devices produce. We will present the theory of nano heat engines able to efficiently convert heat into electrical power. We propose a resonant tunneling quantum dot engine that can be operated either in the Carnot efficient mode, or maximal power mode. The ability to scale the power by putting many such engines in a "Swiss cheese sandwich" geometry gives a paradigmatic system for harvesting thermal energy at the nanoscale.

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