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Mimicking Nonequilibrium Steady States with Time-Periodic Driving OREN RAZ, YIGIT SUBASI, CHRISTOPHER JARZYNSKI, Univ of Maryland-College Park — Under static conditions, a system satisfying detailed balance generically relaxes to an equilibrium state in which there are no currents: to generate persistent currents, either detailed balance must be broken or the system must be driven in a time-dependent manner. A stationary system that violates detailed balance evolves to a nonequilibrium steady state (NESS) characterized by fixed currents. Conversely, a system that satisfies instantaneous detailed balance but is driven by the time-periodic variation of external parameters - also known as a stochastic pump (SP) - reaches a periodic state with non-vanishing currents. In both cases, these currents are maintained at the cost of entropy production. Are these two paradigmatic scenarios effectively equivalent? For discrete-state systems we establish a mapping between NESS and SP. Given a NESS characterized by a particular set of stationary probabilities, currents and entropy production rates, we show how to construct a SP with exactly the same (time-averaged) values. The mapping works in the opposite direction as well. These results establish a proof of principle: they show that SP are able to mimic the behavior of NESS, and vice-versa, within the theoretical framework of discrete-state stochastic thermodynamics.

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