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**Achieving swift equilibration of a Brownian particle using flow-fields** AYOTI PATRA, CHRISTOPHER JARZYNSKI, Univ of Maryland-College Park — Can a system be driven to a targeted equilibrium state on a timescale that is much shorter than its natural equilibration time? In a recent experiment, the swift equilibration of an overdamped Brownian particle was achieved by use of an appropriately designed, time-dependent optical trap potential (Nat. Phys. 12, 843-846, 2016). Motivated by these results, we develop a general theoretical approach for guiding an ensemble of Brownian particles to track the instantaneous equilibrium distribution of a desired potential $U(q,t)$. In our approach, we use flow-fields associated with the parametric evolution of the targeted equilibrium state to construct an auxiliary potential $\bar{U}(q,t)$, such that dynamics under the composite potential $U(t) + \bar{U}(t)$ achieves the desired evolution. Our results establish a close connection between the swift equilibration of Brownian particles, quantum shortcuts to adiabaticity, and the dissipationless driving of a classical, Hamiltonian system.

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