Cost of Non-instantaneous Stochastic Resetting

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The physics of stochastic resetting has gained particular attention in recent years [1]. In general, stochastic resetting involves resetting a dynamical system to a prescribed state at random times, thereby interrupting its natural evolution. This mechanism is observed in various scientific disciplines, ranging from animal foraging strategies and computer algorithms to extreme events and target search processes in chemical and biological systems.
Recent experiments [2] have implemented resetting employing an external trap, whereby a system relaxes to the minimum of the trap and is reset in a finite time (in contrast to instantaneous resetting reported originally in Ref. [1]). In this talk, I will discuss the thermodynamic cost associated with such a stochastic resetting protocol. I will present a general framework, valid even for non-Poissonian resetting, that captures the thermodynamic work required to maintain a resetting process up to a given observation time. This framework enables us to calculate the moment-generating function of this work exactly. Moreover, I will discuss the regimes of optimization of the thermodynamic cost [3,4].

References:

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