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Entropic pulling and diffusion diode effects in systems with coordinate-dependent damping

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Biological environments at micrometre scales and below are often crowded and experience incessant stochastic thermal fluctuations. The presence of membranes/pores and multiple biological entities in a constricted space can make the damping/diffusion inhomogeneous. This effect of inhomogeneity is presented by the diffusion becoming coordinate-dependent.

In this talk, we analyse the consequence of inhomogeneity-induced coordinate-dependent diffusion on Brownian systems in local thermal equilibrium under Itô's interpretation. The Itô-distribution comprises the Boltzmann factor (canonical part) and a factor of inverse diffusivity, when diffusion is coordinate-dependent, which is the microcanonical density of states. The presence of microcanonical density of state results in an emergent force of entropic origin, which can have substantial effects on diffusive transport processes.

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