Statistical forces induced by out-of-equilibrium media

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Abstract

We study the statistical force of a nonequilibrium environment on a quasi-static probe. In the linear regime the isothermal work on the probe equals the excess work for the medium to relax to its new steady condition with displaced probe. Also the relative importance of reaction paths can be measured via statistical forces, and from second order onwards the force on the probe reveals information about nonequilibrium changes in the reactivity of the medium. We also show that statistical forces for nonequilibrium media are generally nonadditive, in contrast with the equilibrium situation. Both the presence of non-thermodynamic corrections to the forces and their nonadditivity put serious constraints on any formulation of nonequilibrium steady state thermodynamics.

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