
Fluctuations theorems: where do we go from here ?

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Abstract

It is a general rule that as a system gets smaller its fluctuations increase. As a consequence, in small classical systems, like an enzyme or a colloid particle, thermodynamic quantities like work or heat are only defined in a statistical sense. Exact relations between the statistical distributions of thermodynamic quantities, known as fluctuations relations, have been first obtained about two decades ago. Within the linear regime, these fluctuations relations lead to modified fluctuation-dissipation theorems and to inequalities which can be viewed as extensions of the second law of thermodynamics at the trajectory level. We will present an illustration of these ideas on a selection of examples, and we will discuss possible applications mainly in the context of biological or soft matter systems.

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