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Large deviations and condensation

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Condensation is the phenomenon whereby a finite fraction of some quantity, e.g. a particle density, concentrates into a small region of phase-space, as in the paradigmatic example of a vapor transforming into a liquid when crossing a phase-transition. It is observed in a number of different models, related to magnetic properties, gravity, mass transport and other issues. A different manifestation of condensation is observed when probability distributions of a fluctuating collective variable, such as the number of particles in a thermodynamic system, are considered. In this case, a fluctuation well above the typical value can be associated to a condensed configuration of the system. This effect, referred to as condensation of fluctuations, is not restricted to the particle number but is observed for quantities as diverse as energy, exchanged heats, particles currents etc... In this talk I will review some examples of this phenomenon and elucidate its origin.

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