

Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Plenary Invited

Invited Talk

News on Statistical Mechanics for Complex Systems

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Strong thermodynamical arguments exist in the literature which show that the entropy S of say a many-body Hamiltonian system should be extensive (i.e., $S(N) \propto N$) independently from the range of the interactions between its elements. If the system has short-range interactions, an additive entropy, namely the Boltzmann-Gibbs one, makes the job. For long-range interactions, nonergodicity and strong correlations are generically present at virtually all thermodynamical conditions (not only at possible critical points), and nonadditive entropies becomes necessary to preserve the desired entropic extensivity. Such is the case of the entropy S_q introduced in 1988 in order to generalize Boltzmann-Gibbs statistical mechanics. Such is also the case of the entropy S_δ introduced in 2009 and recently advanced for reconciling black holes with thermodynamics. These points, as well as recently related ones (concerning the q -Fourier transform, large-deviation theory, connections to nonlinear quantum mechanics, and others) will be briefly presented.

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