

# Conservative and dissipative nonlinear dynamical systems living in the world beyond Boltzmann-Gibbs: Consequences of nonadditive entropies

**Constantino Tsallis**<sup>1</sup>

<sup>1</sup>Centro Brasileiro de Pesquisas Físicas, Rio De Janeiro, Brazil, <sup>2</sup>Santa Fe Institute, Santa Fe, USA, <sup>3</sup>Complexity Science Hub, Vienna, Austria

Conservative and dissipative nonlinear dynamical systems exhibiting exponential sensitivity to the initial conditions (i.e., positive maximal Lyapunov exponents for classical systems) belong to the domain of validity of the Boltzmann–Gibbs (BG) entropy and its associated statistical mechanics. Those, however, exhibiting power-law sensitivity to the initial conditions (i.e., vanishing maximal Lyapunov exponents) violate the BG usual concepts and require the use of nonadditive entropies such as  $S_q$  and its associated nonextensive statistical mechanics. We illustrate the consequences of this scenario going beyond the BG theory with low-dimensional dissipative systems, Hamiltonian long-range interacting ones [which exhibit crossovers grounded on nonuniform convergences in the  $(1/N, 1/t) = (0, 0)$  limit], as well as with the “stubborn” and ubiquitous phenomenon of turbulence.

Bibliography at <https://tsallis.cbpf.br/biblio.htm>