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AT THE EDGE OF CHAOS IN PHYSICS AND ELSEWHERE

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ABSTRACT

Classical dynamical systems, either conservative or dissipative, exhibit typically three different types of behavior: stable orbits, with either zero or negative maximal Lyapunov exponent, strongly chaotic, with positive maximal Lyapunov exponent, and weakly chaotic (or at the edge of chaos), with vanishing maximal Lyapunov exponent. Within the strongly chaotic class, reigns the celebrated Boltzmann-Gibbs statistical mechanics, based on the additive Boltzmann-Gibbs-von Neumann-Shannon (BG) entropy. At the edge of chaos, reign instead theories such as nonextensive statistical mechanics, based on nonadditive entropies. Finally, for the stable orbit class, there is no fundamental reason for using statistical methods based on entropic functionals. In the present lecture we focus on the complex world described by nonadditive entropies, which currently recover the BG one as a particular instance. A brief introduction will be followed by illustrative applications in physics and elsewhere. Bibliography in C. Tsallis, *Entropy,* Encyclopedia **2**, 264-300 (2022), and at http://tsallis.cat.cbpf.br/biblio.htm

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