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On the Limiting Cases of Nonextensive Thermostatistics
MICHELE CAMPISI, University of North Texas — We investigate the limiting cases of Tsallis statistics. The viewpoint adopted is not the standard information-theoretic one, where one derives the distribution from a given measure of information. Instead the mechanical approach recently proposed in [M. Campisi, G.B. Bagci, Phys. Lett. A, 362(1):11-15 (2007)], is adopted, where the distribution is given and one looks for the associated physical entropy. We show that, not only the canonical ensemble is recovered in the limit of q tending to one, as one expects, but also the microcanonical ensemble is recovered in the limit of q tending to minus infinity. The physical entropy associated with Tsallis ensemble recovers the microcanonical entropy as well and we note that the microcanonical equipartition theorem is recovered too. We are so led to interpret the extensivity parameter q as a measure of the thermal bath heat capacity: $q = 1$ (i.e. canonical) corresponds to an infinite bath (thermalised case, temperature is fixed), $q = -\infty$ (microcanonical) corresponds to a bath with null heat capacity (isolated case, energy is fixed), intermediate $q's$ (i.e. Tsallis) correspond to the realistic cases of finite heat capacity (both temperature and energy fluctuate).

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