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Maximum Entropy Principle for the Microcanonical Ensemble
DONALD KOBE, MICHELE CAMPISI, University of North Texas — We use the Maximum Entropy Principle with a Rényi entropy for a system in contact with a finite heat bath. The generalized distribution function we obtain is one previously proposed in a different context by C. Tsallis called the escort distribution with a parameter q. We show that this generalized distribution function describes a heat bath whose heat capacity can vary from zero to infinity depending on q. When $q \to 1$ from below, the heat capacity of the bath becomes infinite and we obtain the canonical distribution. When $q \to -\infty$ the heat capacity of the bath reduces to zero and we obtain the microcanonical ensemble. When thermodynamic variables, like internal energy and pressure, are defined as statistical averages of mechanical quantities over the generalized distribution, they satisfy the combined first and second laws of thermodynamics, which Boltzmann called the "heat theorem."

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