

PHYSICAL MATHEMATICS SEMINAR

Inconsistent thermostatistics and negative absolute temperatures

JÖRN DUNKEL

Massachusetts Institute of Technology

ABSTRACT:

Over the past 60 years, a considerable number of theories and experiments have claimed the existence of negative absolute temperature in spin systems and ultra-cold quantum gases. This has led to speculation that ultra-cold gases may be Dark Energy analogs whilst also suggesting the feasibility of heat engines with efficiencies larger than one. Here, we prove that all previous negative temperature claims and their implications are invalid as they arise from the use of an entropy definition that is inconsistent both mathematically and thermodynamically. We show how the underlying conceptual deficiencies can be overcome, if one adopts a microcanonical entropy functional originally derived by Gibbs. The resulting thermodynamic framework is self-consistent and implies that absolute temperature remains positive even for systems with bounded spectrum.

TUESDAY, SEPTEMBER 10, 2013

2:30 PM

Building E51, Room 149

*Reception following in Building E17, Room 401A
(Math Dept. Common Room)*

<http://math.mit.edu/pms>



Massachusetts Institute of Technology