Because of recently developed techniques of producing nanometer-scaled systems, questions have arisen about the limits of applicability of thermodynamics to small systems. Small systems are generally defined as systems in which the range of the interactions is of the order of the size of the system itself.\(^1\)

This seminar will cover two approaches to thermodynamics of small systems or “nanothermodynamics”. The first was developed in the early 1960’s and extended recently.\(^2,3\) This approach is based on a generalization of Gibbs’ differential relations to include a subdivision potential. The second is based on generalized Boltzmann-Gibbs statistical mechanics, which was developed in 2004.\(^4\) The nonextensive Tsallis entropy arises naturally from this theory.\(^5\)

An experimental version of Maxwell’s demon on the nanoscale has been suggested,\(^6\) but it does not actually violate the Second Law of Thermodynamics.

References