Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Statistical interpretation of heat and work and the adiabatic theorem in irreversible processes PURU GUJRATI, University of Akron — By generalizing the traditional concept [1] of heat and work to include their irreversible components allows us to express them in statistical terms so that dW is the *isentropic* energy change; this generalizes the equilibrium adiabatic theorem. Then dQ is then nothing but the energy change solely due to the change in the microstate probability. Accordingly dQ=TdS [2] so that *all powerful aspects of the equilibrium formulation are preserved*, a quite remarkable but unexpected result. The traditional formulation of the first law of thermodynamics, which uses the fields (temperature, pressure, etc.) of the medium can be *equivalently* written as dE=dQ-dW using the fields of the system. This makes the two descriptions using the fields of the medium or the system equivalent and settles the long existing dispute in the literature regarding the proper choice of the fields. Moreover, the use of system fields (including affinities) allows us to analyze non-equilibrium processes such as free expansion between non-equilibrium states, which cannot be analyzed in the traditional approach.

[1] P.D. Gujrati, arXiv:1105.5549.
[2] P.D. Gujrati, Phys. Rev. E **81**, 051130 (2010).

Puru Gujrati
University of Akron

Date submitted: 20 Nov 2011 Electronic form version 1.4