Part I
Parameter Estimation

The point of view developed in this part of the book is that statistical mechanics is statistics applied to classical mechanics or quantum mechanics. The essential concept is that of the exponential family. It gives a mathematically concise formulation of the Boltzmann-Gibbs distribution.

One of the goals of statistical physics is to give a microscopic basis to thermodynamics. Some notions of thermodynamics are introduced in the Section 3. Because of the essential role of the micro-canonical ensemble within statistical mechanics the emphasis lies on the entropy $S(U)$ as a function of the energy U, and its Legendre transform, which is Massieu's function. This function replaces the free energy $F(T)$ which is a function of the temperature T and which is the Legendre transform of the energy $U(S)$ as a function of the entropy S.