EQUILIBRIUM THERMODYNAMICS AND BIOLOGICAL CHEMISTRY

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Since science progresses by building block upon block, it is important to examine the structure from time to time to make sure that there are no badly fitted blocks, none which are being made to carry more than their proper capacity and none which might be made more useful. This is particularly true when thermodynamics, which is a vast and variegated structure erected upon the simple bases of the two laws of thermodynamics, is applied in biology and biological chemistry to systems so much more complicated than those in which its results have been tested by physical chemists. Yet such an examination is discouraged because we are so certain of the foundation on the two laws of thermodynamics as laid out by J. Willard Gibbs. 

I see no reason to question the validity of the two laws of thermodynamics, even for vital processes, and the only mistake I know in Gibbs's great paper is a trivial typographical error. However, a close examination shows that the foundation we are using is not exactly the one laid out by Gibbs. A discussion