Review of: "Thermodynamics, Infodynamics and Emergence"

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Potential competing interests: No potential competing interests to declare.

I appreciate the clarity with which these authors present the problem of thermodynamic control and the role of information dynamics in living systems. If the reality of physical phenomena is dependent upon the act of observation, as suggested by modern quantum theory, then the stability and survival of these observing living systems that actualize that reality could have broad implications for all of Science. Additionally, a grounding of a quantitative metric for meaning in the context of the continued existence of the living systems provides another dimension to the analysis that has not previously been available in scientific investigations.

The authors are completely correct in their assessment that $\Delta F \sim \Delta \Phi$. This notion has also been the foundation of the important work of Karl Friston in his Free Energy Principle. The great work of Giulio Tononi describing an Integrated Information Theory of Consciousness (also designated as Φ) has similar ideas. The key to thinking about this relationship between $\Delta F \sim \Delta \Phi$ is finding a methodology for the determination of information usefulness and the process of energy qualification in general. Such a methodology is critical for the future development of a framework for a theoretical biology.

Living systems utilize their unique experiential process to deconstruct information concerning the state of matter and energy within their biocontinuum (external and internal to the organism). The perceived information that constitutes a surprisal then triggers the adaptive mechanisms of the organism driven by the energy tensions of the natural nonequilibirum conditions of the living system. Therefore, this surprisal information is considered useful and is translated into actionable meaning for the objective of stabilizing and sustaining the living system. The coherency of the total system created by the integrated cohesion of system processes reduces the degrees of freedom of the system as a whole and limits entropy excursions. The details and proposed mathematical framework for this experiential process and translation to useful, meaningful information are presented in the following publications.

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