Review of: "A Law for Irreversible Thermodynamics? Synergy Increases Free Energy by Decreasing Entropy"

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Potential competing interests: No potential competing interests to declare.

The paper deals with the application of thermodynamic concepts to complex systems which are normally outside the set of systems studied by physics. These are systems derived from the social, economic or biological sciences in the broadest possible sense. The use of exact sciences to characterize these systems is extremely important and goes through the paradigm of statistical mechanics, where the behavior of a large system is sought from the functioning of its elements. This article represents an interesting effort in this direction. However, there are points that should be clarified and deepened. For example, at the beginning of the abstract the author states that classical thermodynamics applies only for reversible processes. It should be pointed out in this regard that non-equilibrium thermodynamics has already been developed and, although with some limitations, has also been extensively verified by a series of experiments. Just think of the work of L. Onsager on kinetic coefficients, and of I. Prigogine and G. Nicolis on irreversible processes in complex systems (and many others not mentioned here for brevity). Another point that should be better discussed is where the author says that irreversible thermodynamics applies to open systems while reversible thermodynamics applies to closed systems. In general, reversibility or irreversibility is not directly related to whether the system is open or closed. Perhaps the misunderstanding arises from the use of terms that are not explicitly defined in the article. For this reason, the author is also advised to give precise quantitative definitions of the quantities introduced and discussed. This, if done starting from the concept of synergy to the others used, would give greater scientific value to the entire paper. In other words, it would be interesting to see the same concepts expressed in more rigorous terms from a quantitative scientific point of view. This does not detract from the fact that the work can provide a positive stimulus to the use of thermodynamic concepts for the interpretation of complex systems in the sense said above.