

Review of: "Systematically Challenging Three Prevailing Notions About Entropy and Life"

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This article challenges three prevailing misconceptions across various disciplines. These misconceptions all stemmed from the fundamental misconception that entropy equates to disorder. These misconceptions have faced criticism for decades, yet these voices of challenge have remained relatively faint. As a result, the misconceptions have been widely embraced and frequently invoked in the life sciences and other fields. They have misled many laypeople and researchers alike through numerous channels, including encyclopedias, textbooks, research articles, and online social interactions. These misconceptions have become a significant obstacle and have led to considerable scientific confusion in recent decades.

The article systematically debunks the three notions, with the potential to eliminate their long-standing misleading influence in the life sciences and beyond. It could redefine the understanding of entropy, energy, disorder, order, life, thermodynamics, and rigorous reasoning for both the research community and the general public. It promises to correct and advance scientific research and education related to complexity, order, and evolution. For example, the systematic challenge posits that the second law of thermodynamics is neither associated with changes in disorder nor in conflict with evolution, a natural process marked by an increase in order.

The conclusions of this article are accurate, though they lack originality. The article is engaging, meaningful, and innovative in its reasoning. For example, it sheds light on the basic scientific principle: any concepts derived from a valid idea should not conflict with the original, fundamental, and uncontroversial (OFU) essence of the idea. The article employs this scientific principle to establish criteria for assessing the validity of entropy-related concepts. It elucidates the OFU nature of entropy and lists several examples demonstrating that an increase in entropy can result in a less uniform distribution of energy within a system. The article draws attention to the opposing views of Boltzmann and Schrödinger regarding the connection between animal life and entropy. It categorizes order and disorder into three separate types and clarifies that none of these types reliably corresponds to entropy. The article provides an in-depth analysis of the historical and logical fallacies underlying these notions. It challenges the concept that entropy quantifies disorder, even within the framework of ideal gases, and presents a fresh perspective on the second law from modern physics.

The authors have delineated at least three types of order and disorder. In reality, whether a system appears ordered or disordered can vary depending on the observer. This implies that entropy is an objective concept, while order and disorder are subjective perceptions, thereby suggesting that entropy is not a proxy for disorder. This can be added to this article.

The article is well written, but certain sentences, particularly those concerning free energy, could be improved with some polishing.

The article posits that order does not necessarily arise from a decrease in entropy; can the authors explain the origins of the order found in life and other systems?