Review of: "Thermodynamics, Infodynamics and Emergence"

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Potential competing interests: No potential competing interests to declare.

Professor Jaffe is interested in emergent complexity in this article and, in his book *The Wealth of Nations*, "complexity science for an interdisciplinary approach in economics." His identification of complexity (or organized complexity as Weaver called in his 1948 article "Science and complexity") as the central focus of social studies is noteworthy.

However, commonalities can be found in artificial systems of organized complexities, including economic systems, business forms, artificial intelligence, complex engineering projects, and social plans. These commonalities may suggest that there can be a science not only of natural phenomena, the sciences of the natural, but also of what is artificial, the sciences of the artificial. I understand that Professor Jaffe subscribes to an epistemological presupposition that there is a single Scientific Method for both natural phenomena and social constructs. But such an epistemological presupposition, i.e., scientism, must be defended against the competing claim of independent sciences of the natural and sciences of the artificial. The reviewer is disappointed that the author does not even acknowledge the competing claims, including what is articulated in Herbert Simon's *The Sciences of the Artificial* (the latest version is the 2019 Reissue of the third edition).

As a professed practitioner of the scientific method by the author, the reviewer takes a high-standard judgment of this piece of work by Professor Jaffe: The paper makes numerous claims, including the following:

"Complex multi-component systems increase their free energy by discovering novel ways for their component parts to interact between them and with their environment. Novel ways that unleash synergies that augment the free energy of the system will be selected by evolutionary processes. These novel ways represent new information that must be stored and transmitted for future interaction of the system. However, there is no receipt [sic] to discover useful information..."

In making the claims, all terms used and claims made in the paper are not substantiated by definitions (for terms) and mechanisms (for claims): For instance, no elaboration, unlike Dissipative Structure theory, of "ways for their component parts to interact between them and with their environment" is given. Nor any elaboration of "ways that unleash synergies that augment the free energy of the system will be selected by evolutionary processes." Claim such as the latter is extremely bold that if it could be substantiated it would make Klaus Jaffe a Newton of the blade of grass.

Unfortunately, even the definitions adopted by Professor Jaffe fail to provide the foundation for developing those claims. Two definitions stand out: The definition for entropy, "Entropy is the amount of energy that cannot be used to produce work," is not acceptable since the dimension of entropy is not the same as the dimension of energy. Second case,

biological energy: “Biological organisms use different types of energy in their workings. The synergistic interactions between physiology and anatomy produces behaviors that can harness and/or produce energies of different kinds.” If Professor Jaffe is here talking about a biological energy that is not a part of physical energies, he is committing the error of vitalism (an excellent discussion of Helmholtz’s role in the demise of vitalism can be found in Hoffmann’s *Life’s Ratchet,* pp. 36-41).

Without the foundation of precise definitions and any development of the article’s theses from first principles, Professor Jaffe’s claims are incredible. I do not recommend the publication of the article.