

**THERMODYNAMICS, ECONOMIC EVOLUTION AND GROWTH OF INFORMATION:
THE PERSPECTIVE OF PEIRCIAN SEMIOTICS**

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ABSTRACT

Relating thermodynamics and human economy has been mainly achieved in the context of explaining economic growth, in two senses: analysing thermodynamic constraints on growth and investigating the role of energy in driving growth. This approach ignores the core feature of growth, which is the generation and accumulation of information (aka knowledge). The possible role of thermodynamics in linking the concepts of energy and information in economics remains neglected. One reason is that the existing physical concepts of information are mostly informed by the Shannon view, which leaves aside the semantic and pragmatic dimensions of information. I argue that a synthesis of thermodynamics and economics must build on a new approach to the physics of information, and I suggest that this can be achieved by semiotics as framed in the philosophy of Charles S. Peirce.

One field that has already contributed substantially to this project is modern biosemiotics, such as in Stanley Salthe's numerous contributions. I elaborated these contributions in my 2013 book *'Foundations of Economic Evolution: A Treatise on the Natural Philosophy of Economics'*. Rethinking causality is pivotal in this endeavour, especially with reference to final causality in evolutionary processes, as Terence Deacon has also argued forcefully. Integrating physics and economics via thermodynamics is impossible without eschewing common exclusive notions of efficient causality. If final causality is recognized as a physical concept, it is straightforward to approach the growth of information as an embodied form of inference mediated by semiosis, along Peircian lines. The modern correspondence in thermodynamics is the Maximum Entropy hypothesis which is employed both as a formalism of inference and as a physical mechanism of energy dissipation. I present a conceptual frame and apply this on a central concept that bridges engineering and economics in technological evolution, 'design'.

Keywords: semiotics, information, knowledge, design, economic evolution