

THE ORIGIN OF UBIQUITOUS PATTERNS

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ABSTRACT

The most comprehensive result of scientific inquiry across disciplines is that data, irrespective of origin, display skewed distributions, sigmoid curves, and power laws as well as oscillations and, at times, chaos. While mathematical models and computer simulations can be made to reproduce these universal patterns of nature, science is not only about modeling and mimicking the data but making sense of it. I argue that these patterns, regardless of scale and scope, follow from the least-time consumption of free energy. These natural processes can be understood by the many-body theory of open systems, i.e., non-equilibrium statistical physics of quantized systems. This theory, also known as the principle of least action in its original form and 2nd law of thermodynamics, explains the arrow of time in terms of flows of quanta that yield non-determinate, multiplicative, and path-dependent evolution, which are characterized the ubiquitous scale-free patterns.

Keywords: atomism, complexity, free energy, the principle of least action, scale-free patterns, the second law of thermodynamics