

The Non-Turing Universe: Entropy as the Ontological Source of Information and Law

Aslan Alwi, Munirah

Independent Researcher at Almudaya Research Institute

Lecturer at Department of Informatics Engineering, Faculty of Engineering, Universitas Muhammadiyah Ponorogo, Indonesia

Abstract

This paper proposes a metaphysical and informational framework in which *Entropy* is not merely the statistical counterpart of Information but its *ontological antecedent* — a supra-computational substrate from which both information and physical law emerge. Challenging the view of the universe as a Turing-computable simulation, this work argues that the totality of physical reality cannot be reduced to algorithmic causality. Instead, the universe manifests as a self-generating entropic process that continuously redefines the informational phase space in which computation itself becomes possible. By introducing the concept of *Entropic Supra-Informationalism*, we explore how entropy functions not as a measure of disorder but as a *creative medium of becoming* that transcends any fixed algorithmic description. We discuss implications for cosmology, epistemology, and consciousness: if reality is non-Turing, then both physical law and cognition are emergent equilibria of a deeper entropic continuum that exceeds computation.

1. Introduction

Since the rise of computational paradigms in physics and cognitive science, the universe has often been conceived as a digital simulation — a vast computation reducible to algorithmic causality. However, recent advances in quantum mechanics, complexity theory,

and information philosophy suggest that reality exhibits features *beyond Turing computability*: non-determinism, emergent law, and the continuous creation of novel informational structures. This paper argues that these features indicate a deeper ontological substrate — *Entropy*, not as the thermodynamic residue of order, but as the *generative field* from which both information and law arise. The central claim is that Entropy is not informationally symmetric with Information; rather, it is *supra-informational*—an ontic potential that generates informational differentiation and algorithmic order as secondary phenomena.

2. Information, Entropy, and the Limits of Computation

In Shannon’s theory, information and entropy are dual measures of uncertainty and message content. This equivalence assumes that all states are enumerable and therefore *computable*. A Turing machine, by definition, can only operate within a pre-defined symbol space and cannot invent new symbols, alter its own alphabet, or redefine its space of possibilities. Physical reality, however, constantly expands its phase space. Quantum fluctuations, biological emergence, and cognitive novelty all demonstrate *ontological creativity*—the capacity of reality to produce new configurations not derivable from prior states. Hence, entropy must be re-interpreted not as a measure *within* computation, but as a process that *creates the very space of computability*. It is the “meta-rule” by which rules themselves emerge.

3. The Non-Turing Universe Hypothesis

We propose the *Non-Turing Universe Hypothesis (NTUH)*:

The universe is not an algorithmic process but a self-modifying entropic continuum that generates information and law as temporary, locally computable equilibria.

In this view:

- **Information** corresponds to localized reductions of entropy—transient configurations of order.

- **Laws of nature** are stable attractors within the entropic continuum, not eternal axioms.
- **Computation** is a by-product of entropic self-organization, not its foundation.

This aligns with the observation that quantum mechanics, chaos theory, and even neural processes exhibit behaviours that resist deterministic computation. Reality thus functions more like an *entropic autopoesis*—a self-evolving fabric whose “rules” are emergent expressions of its own dynamics.

4. Entropic Supra-Informationalism

To formalize this conceptual shift, we introduce the principle of *Entropic Supra-Informationalism (ESI)*:

Entropy is not the absence of information but its transcendental field — a supra-computational process that continuously produces, sustains, and dissolves informational form.

Under ESI:

- Information is *derivative*, not fundamental.
- Computation is *local*, not universal.
- Entropy is *creative*, not destructive.

Entropy thus serves as the *non-computable generator* of informational order. Whereas computation processes data, entropy *produces the very conditions under which data can exist*.

5. Implications

5.1. Cosmology

The Big Bang can be reframed not as an explosion of energy, but as the first differentiation of the entropic field — the *inception of informational space*. Cosmic evolution then becomes

a process of entropic self-articulation: law, matter, and consciousness co-emerge as the field explores new configurations.

5.2. Epistemology

If knowledge arises from reducing uncertainty, then epistemology itself is a *local manifestation of the universal entropic process*. Cognition mirrors the cosmos: it is entropy folding into awareness, compressing potential into meaning.

5.3. Consciousness

Consciousness represents a meta-entropic equilibrium — the ability of the system (the brain, or perhaps the universe itself) to reflect upon its own informational state. Thus, self-awareness is the moment when *entropy becomes self-observing*.

6. Conclusion

If the universe is not a simulation, then it cannot be merely computational. Its essence lies not in the discrete manipulation of symbols but in the *continuous emergence of possibility*. Entropy, therefore, stands not as the negation of information, but as its *ontological source*—a process that eternally generates, maintains, and transcends informational reality. In this light, every law of nature is a crystallized wave on the surface of a vast entropic ocean—momentarily stable, yet fundamentally fluid. And perhaps, to understand the universe, we must cease trying to compute it—and instead, learn to *listen* to the entropic field that breathes meaning into being.

References

References

- [1] M. Faizal, L. M. Krauss, A. Shabir, F. Marino, “Consequences of Undecidability in Physics on the Theory of Everything,” *Journal of Holography Applications in*

Physics, Vol. 5, No. 2, pp. 10–21, 2025. DOI: 10.22128/jhap.2025.1024.1118. Also arXiv: 2507.22950. :contentReference[oaicite:1]index=1

- [2] M. Starr, “Physicists Just Ruled Out The Universe Being A Simulation,” *ScienceAlert*, 1 November 2025. Available: <https://www.sciencealert.com/physicists-just-ruled-out-the-universe-being-a-simulation> :contentReference[oaicite:2]index=2
- [3] K. Zuse, *Calculating Space* (translated and reprinted), MIT Press, 1969.
- [4] J. A. Wheeler, “Information, Physics, Quantum: The Search for Links,” in *Complexity, Entropy and the Physics of Information*, W. H. Zurek (ed.), Addison-Wesley, 1989, pp. 3-28.
- [5] C. E. Shannon, “A Mathematical Theory of Communication,” *Bell System Technical Journal*, Vol. 27, pp. 379-423 623-656, 1948.
- [6] L. Boltzmann, *Lectures on Gas Theory*, translated by S. G. Brush, University of California Press, 1964 (original 1877).