

Article

Not peer-reviewed version

Existence, Complexity and Truth in a Finite Universe

[Yosef Akhtman](#)*

Posted Date: 14 April 2026

doi: 10.20944/preprints202505.1779.v3

Keywords: finite universe; existence; symmetry; coherence; projection; complexity; randomness; quantum uncertainty; truth; infinity



Preprints.org is a free multidisciplinary platform providing preprint service that is dedicated to making early versions of research outputs permanently available and citable. Preprints posted at Preprints.org appear in Web of Science, Crossref, Google Scholar, Scilit, Europe PMC.

Copyright: This open access article is published under a [Creative Commons CC BY 4.0 license](#), which permit the free download, distribution, and reuse, provided that the author and preprint are cited in any reuse.

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

Article

Existence, Complexity and Truth in a Finite Universe

Yosef Akhtman ^{1,2} 

¹ AGH University of Science and Technology, Krakow, Poland; ya@gamma.earth

² Gamma Earth Sàrl, Morges, Switzerland

Abstract

The article explores an epistemological framework for understanding existence, symmetry, complexity, and randomness as emergent phenomena arising when a large-but-finite complex totality is represented through lower-complexity observational subsystems. We propose that existence is not a binary property, but an epistemological category determined by the measure of a system's structural symmetry over time. Chaos, randomness, and infinity are reinterpreted as epistemic markers — thresholds of comprehension rather than fundamental properties of reality. Through this lens, we examine fractals, cellular automata, and quantum uncertainty, arguing that apparent uncertainty emerges from the compression of finite universal structure into observable forms. The article argues that all localized systems, from particles to cognitive processes, are projections of the universe's total informational structure. This paradigm reframes emergence, not as the accumulation of local interactions, but as the revelation of global coherence through representational compression. By situating existence and complexity within this framework, the manifesto outlines a programme-level foundation for understanding the interconnectedness of phenomena and the unity of the universe as a singular, self-reflective process.

Keywords: finite universe; existence; symmetry; coherence; projection; complexity; randomness; quantum uncertainty; truth; infinity

1. Introduction

One of the most fundamental and profound questions in human intellectual pursuit since its inception has been whether the universe we inhabit may be infinite. Modern theoretical physics remains agnostic on the subject of the Universe finitude for the most part, but the state-of-the-art mathematical apparatus it relies on, makes numerous implicit and explicit assumptions that require the universe to be infinite. Let us denote this *de facto* assumption as the *infinitude conjecture*.

Indeed, our common mathematical apparatus is based on an infinite number system, infinitesimal calculus, as well as trigonometry and complex number theory that include fundamental constants, such as the enigmatic π and the natural base e - transcendental numbers that can never be fully derived in a system with finite complexity. Advanced fields of mathematics such as abstract algebras and formal logic assume the existence of infinite number of distinct categories, objects and statements with infinitely complex interplay. A sharp modern counterpoint to this habit of thought is Zeilberger's argument that real analysis can itself be understood as a degenerate case of discrete analysis [1].

There are, of course, a variety of finite mathematical constructs routinely used in physics as well as numerous other scientific and technological fields. But these advanced mathematical concepts are often perceived as utilitarian, auxiliary and abstract rather than the fundamental mathematical foundations our reality is based on.

The *infinitude conjecture* presents a slew of paradoxes, singularities, and inconsistencies across both mathematics and theoretical physics, notably the Russell Paradox in set theory [2], the Turing halting problem in computer science [3], Gödel's Incompleteness Theorems in formal logic [4], as well as the Cosmological Constant problem, *a.k.a.* the *Vacuum Catastrophe*, in physics [5]. But disposing of the *infinitude conjecture* altogether appears to be nothing but inconceivable.

Nevertheless, some of the most profound breakthroughs in both physics and mathematics have been accomplished by overcoming the infinitude conjecture in the context of at least some physical processes or mathematical constructs, and providing an elegant and useful explanation based on the conclusion that these processes are fundamentally finite, quantized, or/and periodic. Some notable examples range from the important discovery that the Earth is round (very large, but finite, circular surface) [6], the discovery of the Earth and other planets' orbit around the sun (finite, periodic) [7], and all the way to Einstein's quantization of light (very small, but finite quanta) [8], relativity (very large, but finite speed) [9], and ultimately quantum physics — quantization of essentially everything else with the notable exception of gravity [10].

It is interesting to note that despite the "common sense" assumption that our every-day number system is somehow infinite, every time we try building effective computational mechanisms, we immediately default to number systems that are finite and periodic. For example, we count using a decimal system which relies on a finite and periodic system of 10 characters, where $9+1=0 \pmod{10}$. Of course, we take care of the extra digit in a smart way, but let us just make this little cognitive note for further reference. We measure time using a somewhat complex and arbitrary mix of modulo 12, 24 and 60 computations that are of course informed by some of the natural cycles of our planet, but take quite some time for our children to figure out and get used to.

But perhaps the most striking example of this dichotomy is the way computations are carried out by modern computers. The entirety of the output of the multitude of digital computing systems, large and small, that permeate our modern existence is based on finite and periodic modulo-2 computations. All the music we listen to, all the movies we watch, all the video games we play, all the complex and oftentimes extraordinarily accurate simulations of the physical world we use for our scientific and technological endeavours, and all the wisdom we partake from our new and shiny Large Language Models is based on a fundamentally finite system of numbers and calculations.

It is therefore appropriate to contemplate the possibility that the universe is fundamentally finite. In this work, we postulate the feasibility of constructing a mathematical and physical framework grounded not in the abstraction of infinite axiomatic systems, but in the singular acknowledgment of a finite, coherent, information-complete reality — **The Fundamental Axiom of Existence**. We aim to lay the ontological foundation for a model in which all observable phenomena emerge when a globally coherent, large-but-finite complex totality is represented through lower-complexity observational subsystems. Here complexity means the finite structural richness of a system: the number and organization of distinctions, relations, and possible states available within it. Within this paradigm, complexity, unpredictability, and apparent randomness are not intrinsic features of reality, but artifacts of the symbolic and informational compression inherent to finite representations. We propose that such a model holds the potential to reframe and unify our understanding of emergence, structure, and knowledge itself, offering a coherent account of the interconnectedness and stability of the universe without recourse to the concept of actual infinity.

The present study is intended as a conceptual and philosophical manifesto in support of the mathematical and physical framework that we refer to as the Finite Ring Cosmology. As such, we will not be providing any formal definitions, theorems, or proofs in this article. The corresponding technical formalism is presented throughout a series of subsequent technical papers, including the following publications:

In that sense, the present article should be read as a programme-level declaration of direction rather than as a standalone technical checkpoint. References [11–15] provide the current coherence base of the broader programme, while some of the implications discussed later in this manuscript remain aspirational research directions whose full formalization is still in progress.

[11] A formal reconstruction of the conventional number systems, including integers, rationals, reals, and complex numbers, based on the principle of relational finitude over a single finite field. Arithmetic and algebra are defined as observer-dependent constructs grounded in finite field symmetries.

- [12] The emergence of geometry, Euclidean datum, and harmonic structures from the global shell FRC layer, with a detailed account of the structural roles of e , π , and i as finite field constructs.
- [13] Euclidean-Lorentzian split, spacetime-like geometry, and causal separation within finite-field arithmetic of a FRC framework.
- [14] Representational universality of modern AI foundational models arising from a shared finite latent domain.
- [15] Reductio ad Absurdum reading of classical paradoxes of infinity, including Cantor's diagonal argument, Russell's antinomy, Gödel's incompleteness, and Turing's undecidability, as well as a subsequent finite/periodic resolution.

1.1. Relation to Existing Literature

The present programme stands alongside a broader contemporary effort to treat finitude, discreteness, and relational structure as foundational rather than auxiliary. In one direction, 't Hooft's cellular automaton interpretation explores the possibility that quantum theory is an effective formal language for an underlying deterministic substrate [16]. In another, Wolfram's hypergraph models seek to derive spacetime and physical law from discrete rule-based relational evolution [17]. Related programmes in causal set theory and causal dynamical triangulations likewise treat spacetime as emergent from locally finite or discretized structures rather than as a primitive continuum [18,19]. Finite-field and Galois-field approaches to quantum theory further show that core quantum formalisms can be reformulated over finite algebraic domains [20,21].

Against this background, the Finite Ring Cosmology explores the idea that the physical universe we experience can be best understood as the symmetry space of algebraic possibilities [22]. What appears as physical structure is the local and global resolution of those possibilities as experienced by a local observer inside a finite relational whole. The programme therefore treats number, geometry, causality, dynamics, representation, and observerhood as connected expressions of one finite architecture, structured by admissible operations and the invariants they preserve. The present article serves as an introduction to this programme, outlining the core conceptual motivation and its implications for our understanding of existence, complexity, and knowledge in a finite universe.

In what follows, existence, complexity, randomness, falsehood, and infinity are treated as categories whose meaning depends on how a finite totality is represented through partial observational frames.

2. Existence

The concept of existence has long been a central question in ontology. Traditional perspectives often treat existence as a binary condition: something either is or is not. For example, a rock exists, a thought exists, but a unicorn does not. While this binary framework is linguistically convenient, it fails to capture the nuanced reality of existence. This section proposes an alternative scalar model, wherein existence is proportional to the degree to which a system preserves coherent relations under the transformations available to its frame. In the present manifesto, this proportionality is introduced as a programme-level conceptual criterion, with fuller formal elaboration deferred to the technical development of the framework.

In the usage adopted here, symmetry names the preservation of relations under transformation; coherence names the persistence of such preserved relations across time, interaction, or frame; existence denotes the degree to which such coherence is retained; stability is passive coherence under limited disturbance; and survival is the active preservation of coherence under changing conditions.

2.1. The Fundamental Axiom of Existence

Our subjective experience provides the most immediate and undeniable evidence that something indeed does exist. The very act of experiencing — of perceiving, thinking, and being aware — confirms the presence of existence in some form. This foundational insight, rooted in the subjective, is the starting point for any exploration of ontology. As Descartes famously concluded, **"I think, therefore I**

am". However, this statement, while profound, is inherently limited to the individual perspective. It asserts the existence of the self but does not address the broader context within which the self exists.

This insight aligns with the wisdom of the Talmud, which states, "**We don't see things as they are, we see them as we are**". Our perception of existence is inherently shaped by our subjective frameworks — our cognitive limitations, cultural contexts, and prior experiences. This means that what we perceive as reality is not an objective reflection of the Universe but a relational construct filtered through the lens of our own being. The act of perceiving is not passive; it is an active process of interpretation, shaped by the observer's position within the broader system.

When we examine the nature of existence more deeply, it becomes evident that all separate objects and constructs — whether material or conceptual — are inherently composite and partial. A chair, for instance, is not an independent entity but a composite of wood, screws, and design, each of which is itself a composite of molecules, atoms, and subatomic particles. Even the so-called elementary particles of physics are not fundamental in an absolute sense but are emergent features of a deeper, interconnected system of physical laws and cognitive interpretations. These particles are not isolated, self-sufficient entities. Their existence is defined relationally — by their interactions with other particles, by the fields they inhabit, and by the frameworks through which we observe and describe them. Without the intricate web of physical laws that govern their behavior, and without the cognitive tools we use to interpret those laws, these particles would have no coherent meaning. They are not "fundamental" in an absolute sense but are emergent features of a deeper, interconnected system.

Similarly, cognitive constructs — ideas, theories, and abstractions — are not fundamental. They are composites of prior knowledge, linguistic structures, and shared cultural frameworks. Their existence is defined not by their objective reality but by their coherence and utility within the cognitive systems that generate and sustain them. This leads us to the conclusion that the existence of any particular object, whether material or conceptual, is relative and subjective. It is not defined by some intrinsic, independent essence but by its function within a broader system of relationships. An object "exists" to the extent that it preserves coherent relations and interacts meaningfully within a given context — whether that context is physical, informational, or cognitive.

This leads to a profound conclusion: within the ontological stance advanced by this programme, objective existence is attributed in the strongest sense to the Universe as totality, while localized objects are treated as partial and observer-relative expressions of that whole. Such subsystems derive their existence not from any intrinsic, independent essence but from their role and function within the broader context of the Universe.

From this perspective, we can reformulate the famous Cartesian axiom as "**I think, therefore the Universe is**". This shifts the focus from the individual to the totality: thought is itself a subsystem of the Universe, and its existence implies the larger reality within which it occurs. This axiom is sufficient to ground the further argument of the paper, namely that all other phenomena are relational expressions within the totality of the universe.

2.2. Existence as Symmetry

The root criterion for existence is symmetry: the preservation of coherent relations under transformation. A system exists because some structure remains sufficiently invariant to be recognized, acted upon, and carried forward. Along the temporal axis, this coherence can be denoted as persistence. A central formal precedent is Noether's theorem, which links symmetries in the laws of physics to conserved quantities and shows that invariance has direct structural force [23]. In the present manifesto, that formal precedent is extended more broadly to preserved relational form across representational frames.

This holds true for both the Universe itself, as much as all the constituent objects within it. The Universe is a vast, complex system whose coherence is carried by the interplay of physical laws and cosmic structures. This foundational coherence enables the emergence of the intricate systems necessary for observation, thought, and cognition.

More precisely, existence is proportional to the depth and reach of preserved coherence. A system exists to the extent that its internal relations remain intelligible across frame, scale, orientation, representation, interaction, or temporal update. When a system collapses into entropy and loses its identifiable structure, it ceases to exist ontologically.

An unstable elementary particle may only materially exist for a fleeting moment, decaying almost as soon as it emerges. Yet, the particle's emergence follows a predictable and repeatable pattern, governed by the fundamental laws of physics. The particle's decay products, its interactions with other particles, and the probabilistic structures that predict its behavior all contribute to a broader, enduring system of coherence. It is this system — the preserved symmetry of the patterns and laws that govern the particle's emergence and dissolution — that grants the particle its ontological significance.

The study of coherent structure across change has deep roots in philosophical and scientific thought. Aristotle, in his *Metaphysics*, introduced the notion of substance and the distinction between potentiality and actuality — emphasizing the continuity of essential form across change as a condition of coherent being [24]. Immanuel Kant, in the *Critique of Pure Reason*, articulated the relational nature of objects within human cognition, suggesting that objecthood depends on the structure of temporal intuition [25].

In the 20th century, Alfred North Whitehead's *Process and Reality* advanced the view that reality consists of processes rather than static entities, framing existence through interrelated events [26]. Henri Bergson, in *Creative Evolution*, emphasized the dynamic flow of time and life, tying coherent becoming to the creative unfolding of duration [27]. Ilya Prigogine's *Order Out of Chaos* explored how dissipative structures maintain local coherence by generating order from entropy in far-from-equilibrium systems [28]. Stuart Kauffman, in *At Home in the Universe*, extended this perspective by highlighting how self-organizing systems sustain coherence through the interplay of order and complexity [29].

David Bohm's *Wholeness and the Implicate Order* proposed that explicate phenomena unfold from a deeper implicate coherence within the enfolded relational structure of reality [30]. In informational and computational domains, John von Neumann's *Theory of Self-Reproducing Automata* and Claude Shannon's *A Mathematical Theory of Communication* provided key insights into how systems preserve structure over time through redundancy, feedback, and error correction [31,32].

Finally, Lee Smolin's *The Life of the Cosmos* [33] and Karen Barad's *Meeting the Universe Halfway* [34] extend this concern with coherent structure to cosmological and quantum scales. Smolin's cosmological model suggests that physical laws themselves evolve to favor stable universes, while Barad's agential realism emphasizes the relational emergence of existence through interactions. These contributions collectively enrich our understanding of coherence as the defining characteristic of existence, providing a robust foundation for the scalar ontology proposed in this framework.

This scalar model of Existence has far-reaching implications. It suggests that what we call "objects" are systems that achieve a sufficient threshold of stability to interact with other systems. Systems that flicker too briefly or change too erratically fall below the threshold of meaningful ontology. They lack actionable presence and are functionally irrelevant.

Furthermore, this model dissolves the sharp boundary between existence and non-existence. A thought that lasts a second exists less than a mathematical proof that endures for millennia. Similarly, a momentary glitch in a system may "exist" for a nanosecond, but without sufficient coherence, it has no impact—no relational presence in the broader system of the world.

3. From Stability to Survival

The transition from stability to survival marks a critical juncture in the ontology of symmetry. Stability, as a property of systems, refers to the capacity to maintain coherence and structure over time. However, in a dynamic universe characterized by entropy, disruption, and change, stability alone is insufficient for long-term coherence. Survival, therefore, emerges as an active process, requiring systems to adapt, respond, and evolve in order to endure.

This section explores the principles underlying the shift from stability to survival, drawing on insights from evolutionary biology, systems theory, and thermodynamics. It argues that survival is not merely a biological phenomenon but a universal principle applicable to all coherent systems, from physical structures to informational constructs. Having defined existence in terms of preserved coherence, we now consider the conditions under which such coherence endures under perturbation.

3.1. Stability as Preserved Coherence

Stability is the baseline condition for preserved coherence. A stable system is one that resists external perturbations and maintains its internal structure over time. Examples of stable systems include planetary orbits, crystalline structures, and thermodynamic equilibria. As Ludwig Boltzmann's work in statistical mechanics demonstrates, stability often arises from probabilistic structures that favor equilibrium states [35].

However, stability is inherently passive. It relies on favorable initial conditions and external environments that do not impose excessive stress. In a universe governed by the second law of thermodynamics, where entropy tends to increase, stability is fragile. Systems that rely solely on passive stability are vulnerable to collapse when faced with significant disruptions. Survival represents an active extension of stability. It involves the capacity of a system to detect changes in its environment, adapt to those changes, and preserve its coherence in the face of entropy. This principle is evident in the evolution of biological systems, as described by Charles Darwin in **On the Origin of Species** [36]. Organisms that could sense and respond to environmental changes were more likely to survive and reproduce, leading to the development of increasingly sophisticated survival mechanisms.

Ilya Prigogine's concept of dissipative structures further illustrates this principle [28]. Dissipative structures are systems that maintain their stability by exchanging energy and matter with their surroundings. Examples include hurricanes, chemical reactions, and living organisms. These systems do not merely resist entropy; they actively harness it to sustain their structure. The transition from stability to survival can be understood as a shift from passive to adaptive systems. Passive systems, such as rocks or crystals, endure because they are inherently stable. Adaptive systems, by contrast, endure because they can modify themselves in response to changing conditions. This distinction aligns with Stuart Kauffman's exploration of self-organization and the emergence of order in complex systems [29].

Adaptive systems exhibit several key characteristics:

- **Sensing:** The ability to detect changes in the environment.
- **Processing:** The capacity to interpret and respond to environmental signals.
- **Feedback:** Mechanisms for self-regulation and adjustment.
- **Replication:** The ability to reproduce and propagate successful adaptations.

These characteristics are not limited to biological organisms. Informational systems, such as blockchain networks, also exhibit adaptive behaviors. Blockchain protocols, for example, adjust their difficulty levels to maintain stability in the face of fluctuating computational power [37]. The principle of survival extends beyond biology to encompass all systems that preserve coherence over time. Whether a system is physical, biological, or informational, its ability to endure depends on its capacity to adapt and respond to its environment. This universal applicability underscores the importance of survival as a foundational concept in the ontology of symmetry.

Lee Smolin's work on cosmological natural selection provides a compelling example of this principle at the largest scales [33]. Smolin suggests that universes themselves may be subject to a form of selection, with those capable of producing stable structures and black holes enduring while others fade into entropy. The transition from stability to survival represents a critical evolution in the ontology of symmetry. Stability provides the foundation, while survival ensures continuity in a dynamic and entropic universe. By adapting to change and harnessing entropy, systems can achieve a higher degree of coherence, extending the limits of passive stability. This principle, rooted in both biological and physical systems, offers a unifying framework for understanding the dynamics of existence across

scales and domains. Stability and survival are therefore not parallel themes, but dynamic extensions of the coherence criterion introduced in Section 2.

3.2. *The Survival of Fundamental Laws*

The apparent fine-tuning of the universe — its precise physical constants, elegant equations, and mysterious symmetries — has long been a subject of philosophical and scientific inquiry. Why is the speed of light what it is? Why do the fundamental forces have the strengths they do? Why is there just enough entropy to allow for change, and just enough order to allow for structure? Within the present framework, these questions point to the survival of fundamental laws as a key interpretive principle in the ontology of symmetry.

From the ontological perspective advanced here, the laws of physics that we observe are not arbitrary but are interpreted as the result of a selection process. In a chaotic multiverse of possibilities, the vast majority of hypothetical “laws” would lead only to disorder, collapse, or immediate entropy. They would produce no atoms, no time, no stars, no coherent continuity — and crucially, no quasi-stable systems. As Lee Smolin suggests in his theory of cosmological natural selection, universes capable of producing stable structures, such as black holes, are more likely to endure and propagate [33].

This principle aligns with the broader framework of symmetry: only those patterns — including physical laws — that give rise to stable, coherent systems can be said to “exist” in any meaningful or observable way. The laws of physics, therefore, may be interpreted through a process of ontological Darwinism, where the survivable set of laws remains [28]. The fine-tuning of the universe can be understood as a natural outcome of this selection process. For example, the cosmological constant, which governs the rate of expansion of the universe, is finely balanced to allow for the formation of galaxies and stars [5]. Similarly, the strengths of the fundamental forces — gravity, electromagnetism, and the strong and weak nuclear forces — are precisely calibrated to permit the existence of complex matter [38].

These constants and laws are the result of a filtering process: only those laws that support coherence and complexity are capable of giving rise to observers who can question their existence. This anthropic principle, as articulated by Brandon Carter, provides a framework for understanding why the universe appears so uniquely suited to life [39]. Symmetry and invariance play a crucial role in the survival of fundamental laws. As Noether’s theorem demonstrates, every symmetry in the laws of physics corresponds to a conserved quantity, such as energy, momentum, or charge [23]. These conserved quantities provide stability and coherence, enabling physical systems to retain structure over time.

For example, the rotational symmetry of space ensures the conservation of angular momentum, while the translational symmetry of time guarantees the conservation of energy. These symmetries are not merely aesthetic features but are essential for the stability and predictability of the universe [40]. The survival of fundamental laws has profound implications for our understanding of reality. It suggests that the universe is not a static entity but a dynamic system subject to principles of selection and symmetry. This perspective bridges the gap between physics and metaphysics, providing a unified framework for understanding the emergence and stability of the cosmos.

Moreover, this framework challenges the notion of a “designed” universe. Instead, it posits that the universe’s structure is the result of a natural process of selection, where configurations capable of sustaining coherence and complexity endure. This view aligns with the broader principle that existence itself is a function of preserved coherence. The fine-tuning of the universe and the survival of its fundamental laws are principles to be understood within the ontology of symmetry. The laws of physics that we observe are the survivors of a vast landscape of possibilities, selected by their capacity to sustain structure, coherence, and complexity. In this light, the universe is not merely a collection of arbitrary constants and equations but a testament to the enduring principles of stability and symmetry that underlie all existence. In that sense, even the apparent fine-tuning of laws is read here through the same grammar of preserved coherence that later reappears in the discussion of complexity, truth, and infinity.

4. Chaos and Randomness

The concepts of chaos and randomness have long been subjects of philosophical and scientific inquiry. Within the framework of symmetry and projection, these phenomena are not ontological categories but epistemic phenomena — reflections of the limitations of our capacity to model and understand complex systems. This section explores the nature of chaos and randomness, arguing that they are not fundamental properties of reality but emergent features of incomplete perspectives.

Chaos is often described as the absence of order, a state of unpredictability and apparent randomness. However, as David Bohm argues in **Wholeness and the Implicate Order**, chaos is better understood as a shadow cast by complexity onto a limited perspective [30]. From this view, chaotic systems are not devoid of structure; rather, their structure exceeds the scope of the observer's tools and models.

For example, the behavior of turbulent fluids or weather systems appears chaotic when analyzed through classical models. Yet, advances in nonlinear dynamics and chaos theory, as pioneered by Edward Lorenz, reveal underlying patterns and attractors that govern these systems [41]. These insights suggest that chaos is not a lack of order but an order that is too intricate to be resolved by current methodologies.

4.1. Randomness as Unresolved Complexity

Randomness, like chaos, is often treated as a fundamental property of certain systems, particularly in quantum mechanics. However, as Claude Shannon's work on information theory demonstrates, randomness can also be understood as a measure of unpredictability or entropy within a given informational framework [32]. In this sense, randomness is not an intrinsic feature of reality but a reflection of the observer's inability to predict outcomes due to incomplete information.

Quantum mechanics provides a compelling case study. While the behavior of particles at the quantum level appears probabilistic, the underlying wave functions described by Schrödinger's equation are deterministic [42]. This duality suggests that what we perceive as randomness is, in fact, a manifestation of unresolved complexity within a probabilistic framework.

The reinterpretation of chaos and randomness as epistemic phenomena has significant implications for the ontology of symmetry. Coherent systems, whether physical, biological, or informational, operate within environments that appear chaotic or random only from the perspective of limited observers. As Ilya Prigogine's work on dissipative structures illustrates, systems can harness apparent chaos to maintain stability and adapt to changing conditions [28]. This perspective also aligns with Henri Bergson's concept of duration, which emphasizes the continuous flow of time and the dynamic interplay of order and disorder [27]. Such systems integrate apparent chaos, using feedback mechanisms to transform unpredictability into adaptive strategies.

In the examples that follow, dimensional language is used in its standard mathematical sense for local dynamical models. The broader claim of this manuscript concerns how richer finite structure is represented through simpler observational frames.

Chaos, in many classical systems, appears in relatively low-dimensional phase spaces — for instance, a 3D system like the Lorenz attractor. Yet, the underlying processes that give rise to chaotic dynamics can often involve many more degrees of freedom — in some cases, they are effectively higher-dimensional (like in fluid turbulence or climate models).

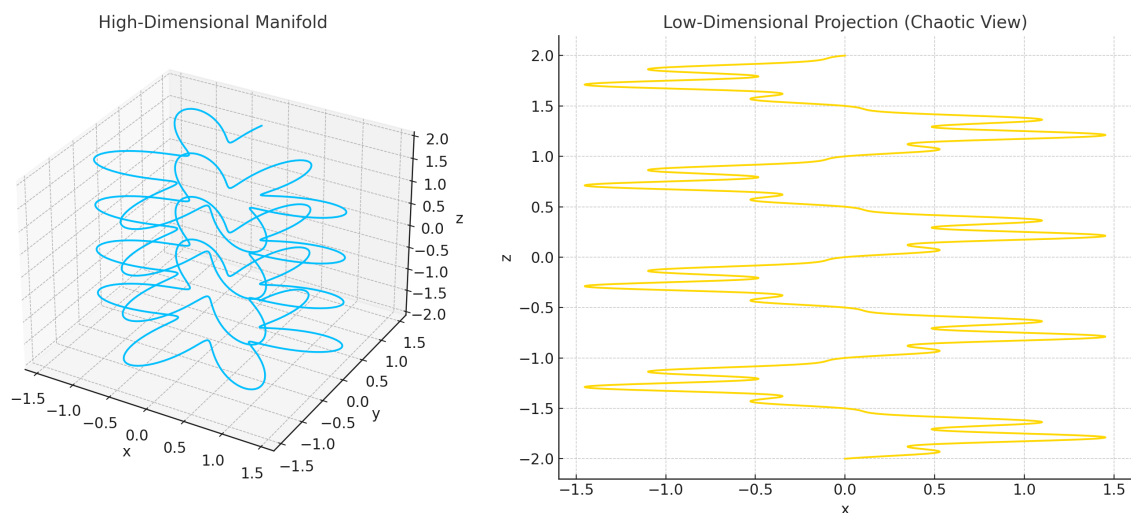


Figure 1. A seemingly complex dynamics in a low-dimensional projection (right) of a very simple periodic motion in a higher-dimensional space (left).

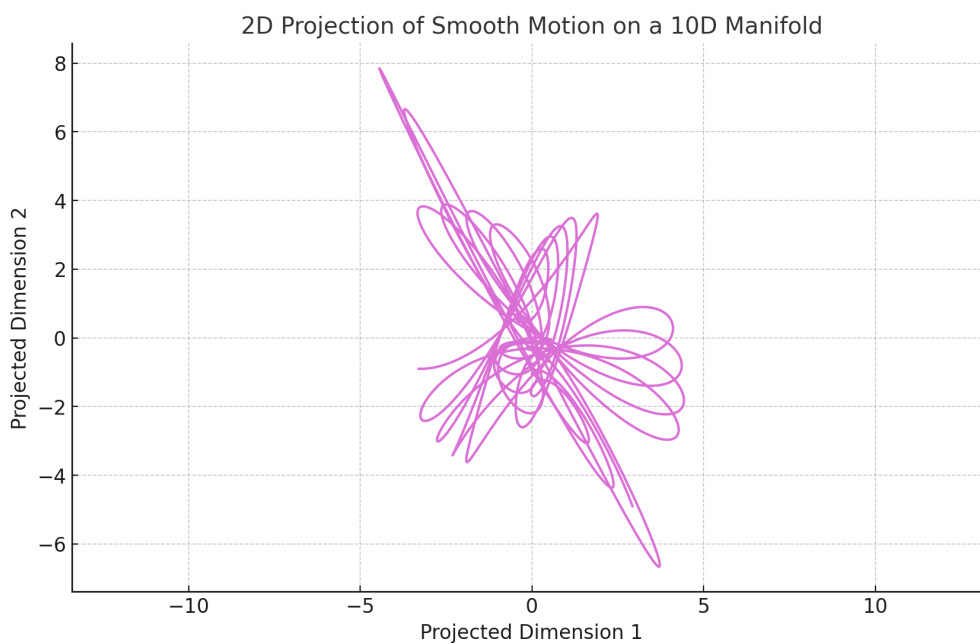


Figure 2. A seemingly chaotic system in a low-dimensional projection of a smooth motion on a high-dimensional manifold.

The Concept: You can imagine that what we perceive as a “chaotic system” is actually a projection of some much richer, high-dimensional dynamical process that unfolds on a complex manifold — a geometric space that locally resembles Euclidean space but can have intricate global structure [30,41].

When you observe or model a system in reduced dimensions (e.g., measuring only temperature and pressure in a weather system), you’re effectively compressing or projecting the full state space into something simpler. This projection loses information — particularly the interactions among unobserved degrees of freedom — and this can make the observed behavior seem unpredictable, sensitive to initial conditions, and chaotic [43,44].

Analogy: Imagine watching the shadow of a dancer on a wall. The shadow might move in erratic, seemingly inexplicable ways — limbs appearing and disappearing, strange contortions — yet this is just a 2D projection of a graceful, continuous motion in 3D space. Chaos, similarly, might be a distorted shadow of a smooth flow on a high-dimensional manifold [45].

In Mathematical Terms: Let the full system evolve on a manifold M of high dimension N . Observations are limited to a low-dimensional subspace or projection $P(M)$ where $\dim(P(M)) \ll N$. The dynamics in $P(M)$ can appear chaotic, even if the flow on M is smooth or structured (though often still nonlinear) [43,44]. This perspective aligns with ideas in:

- Manifold learning and dimensionality reduction (e.g., t-SNE, UMAP) [46,47]
- Dynamical systems theory (e.g., embedding theorems like Takens' theorem) [43]
- Physics (e.g., holography, statistical mechanics, or emergent phenomena) [28,48]

Chaos and randomness emerge from the interplay of complexity and perspective. They arise at the observational edge of symmetry: the point where a projected observer loses access to the invariants organizing the system. As our tools and frameworks evolve, what once appeared chaotic or random may reveal deeper layers of structure and coherence. This interpretation enriches the ontology of symmetry and offers a coherent way of navigating the complexities of an ever-changing universe [27,32].

4.2. Fractals as Compressed Dynamical Structure

Fractal structures in low-dimensional observations can be understood as one visible consequence of projecting richer dynamics into simpler frames. Once a high-dimensional evolution is compressed, *stretching* and *folding* in the observable space can generate self-similar structure rather than smooth curves.

Formally, if a deterministic system evolves on a smooth manifold \mathcal{M}^N and is observed through a projection $\mathcal{P} : \mathcal{M}^N \rightarrow \mathbb{R}^d$ with $d \ll N$, the effective dynamics on the observed space need not remain smooth or one-to-one. The resulting attractor $\mathcal{A} \subset \mathbb{R}^d$ may therefore acquire fractal geometry, including non-integer Hausdorff dimension, as in strange attractors.

Like the shadow of a folded sheet, such geometry can arise from structured compression rather than from fundamental randomness. Fractal behavior in observed systems is thus not inherently disordered, but a legible trace of deterministic dynamics whose full state structure exceeds observational capacity.

4.3. The Mandelbrot Set

The Mandelbrot set is a canonical example of a fractal structure arising from iterative nonlinear dynamics. Traditionally viewed as a set of complex numbers with bounded iterates under a quadratic map, it can be reinterpreted as a two-dimensional parameter view of an unbounded iterative process. In the finite-complexity reading, the important contrast is the compression of a full orbit description into an observable parameter plane.

The Mandelbrot set \mathcal{M} is defined by the iteration:

$$z_{n+1} = z_n^2 + c, \quad z_0 = 0, \quad c \in \mathbb{C},$$

where c is a complex parameter. The set \mathcal{M} contains all values of c for which the sequence $\{z_n\}$ remains bounded. The boundary of \mathcal{M} forms a highly intricate and self-similar fractal, which has been widely studied as a prototype of complex dynamical behavior. Each parameter c can be understood as defining a unique dynamical system. For any finite observational depth K , the orbit of $z_0 = 0$ under this system defines a finite trajectory segment:

$$\Phi_K : \mathbb{C} \rightarrow \mathbb{C}^K, \quad \Phi_K(c) = (z_1(c), z_2(c), \dots, z_K(c)).$$

The evolution of z under iteration can thus be studied through finite trajectory data of increasing depth. The exact mathematical condition for inclusion in \mathcal{M} is the idealized boundedness condition on the full orbit. The standard visual representation of the Mandelbrot set is effectively a projection:

$$\mathcal{M} = \{c \in \mathbb{C} \mid \sup_n |z_n(c)| < \infty\},$$

which identifies parameters for which the full trajectory remains bounded. In computation and observation, this condition is approached through finite truncations Φ_K . The complexity and fractality of the boundary arise due to the nonlinear structure of the iteration, which involves repeated squaring and translation, causing strong folding and stretching effects in the trajectory space. Such repeated compression of finite orbit data into a 2D parameter space induces self-similarity and scale invariance. Small changes in c can result in drastically different long-term behaviors, a hallmark of chaotic sensitivity, even though the generating rule is entirely deterministic. Within the finite-complexity projection paradigm, the Mandelbrot set becomes a 2D visualization of a parameter space in which each point carries finite orbit data, compressed through nonlinear projection.

The apparent complexity in the Mandelbrot set's boundary reflects the intricate structure of trajectory divergence and bifurcation in the full state space. Just as strange attractors emerge from folding dynamics in phase space, the Mandelbrot set's geometry results from folding dynamics in *parameter space*. This interpretation situates the Mandelbrot set within the same geometric framework used to understand chaotic attractors and fractals in dynamical systems. It emphasizes the unity of these phenomena as visible artifacts of structured deterministic processes compressed into lower-complexity views.

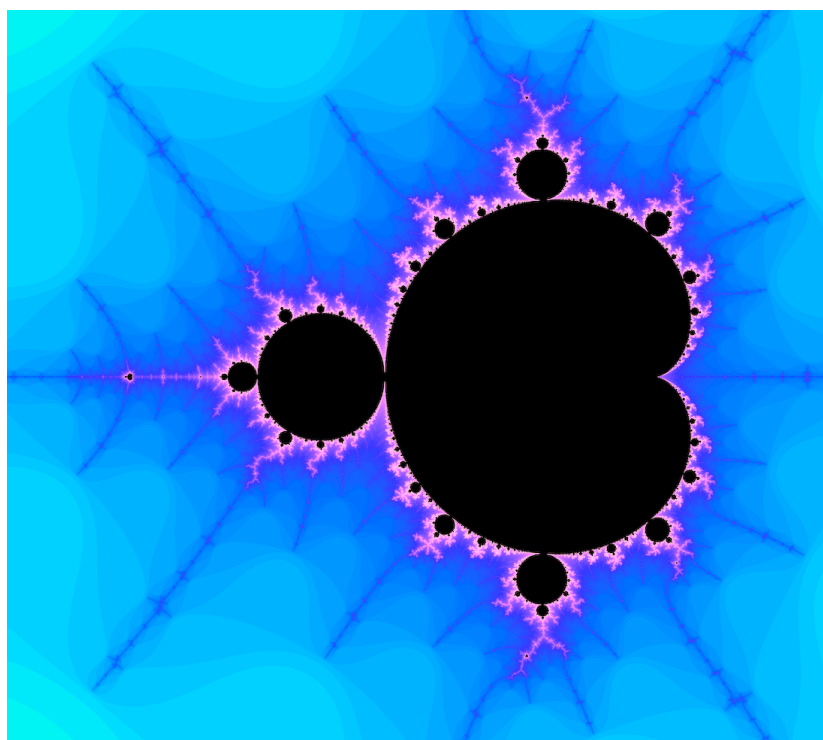


Figure 3. The Mandelbrot set, a fractal generated by iterating a simple complex function, displaying intricate structure through a finite visual representation.

4.4. Cellular Automata: Randomness and Complexity

Cellular Automata are discrete, rule-based systems capable of generating complex patterns from simple initial conditions [49–51]. Despite the deterministic nature of their update rules, certain cellular automata exhibit behavior that appears stochastic or chaotic. Within the finite-complexity projection paradigm, this complexity can be reinterpreted as the consequence of representing a large finite configuration space through a lower-complexity observable substrate.

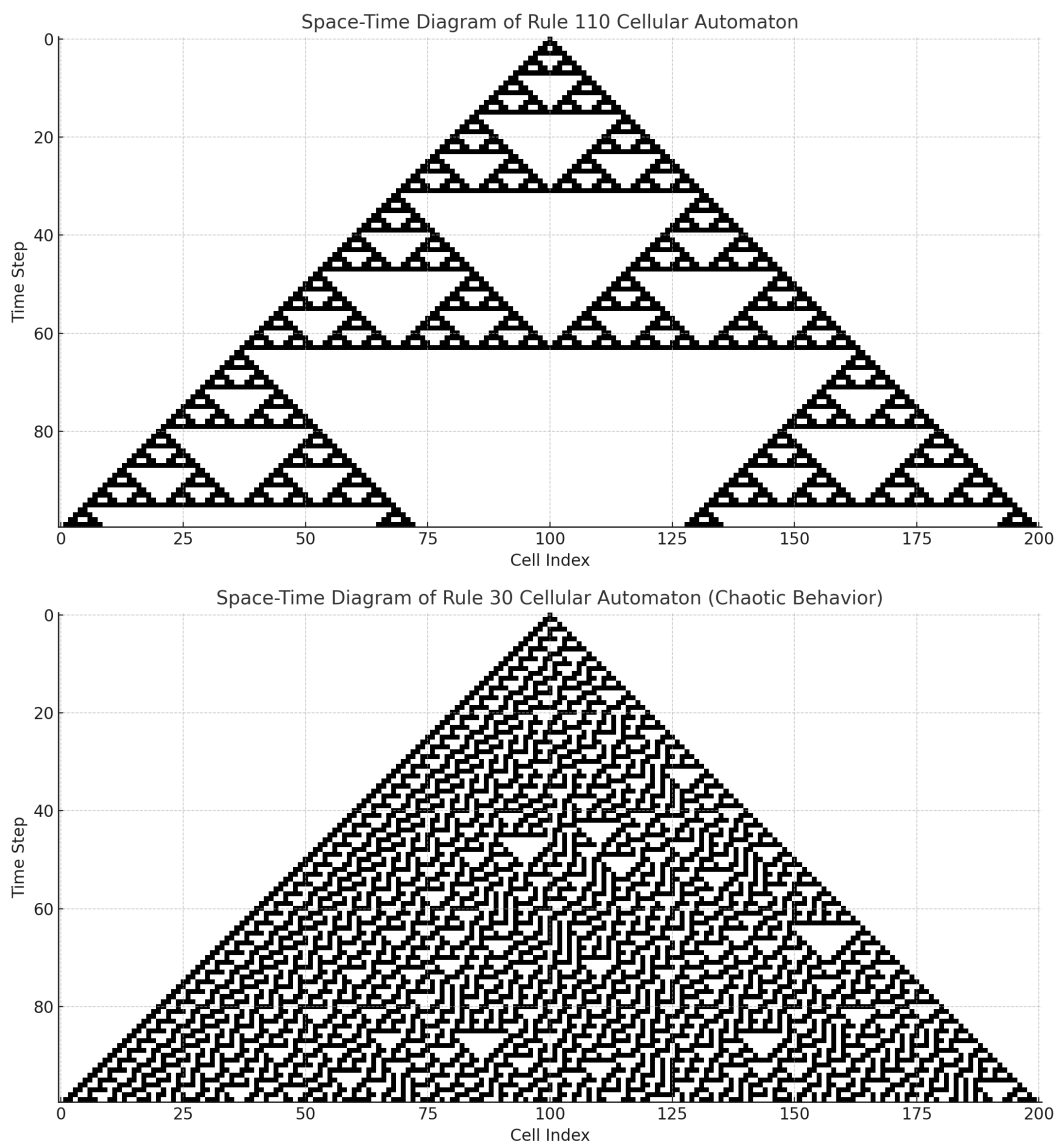


Figure 4. Cellular automata exhibiting complex behavior.

Formally, a one-dimensional cellular automaton consists of a finite array of discrete cells, often idealized as infinite, each of which can adopt a finite number of states. The system evolves in discrete time steps according to a fixed local rule that updates each cell's state based on the states of its neighbors. Let $s_i(t) \in \Sigma$ denote the state of cell i at time t , where Σ is a finite state set. The global state of the system at time t can be represented as a vector $\mathbf{s}(t) = (s_1(t), s_2(t), \dots, s_n(t)) \in \Sigma^n$, where n is the number of cells. The evolution rule defines a global update function:

$$\mathbf{s}(t+1) = F(\mathbf{s}(t)), \quad F: \Sigma^n \rightarrow \Sigma^n,$$

which is deterministic, but may generate highly intricate patterns over time. This representation places the cellular automaton in a large finite discrete configuration space, specifically the finite set Σ^n . The more precise measure here is cardinality: Σ^n contains $|\Sigma|^n$ possible states. For large n , this space becomes combinatorially vast and structurally rich.

In most practical or theoretical analyses, we observe a CA by tracking individual cell states or plotting spacetime diagrams — effectively projecting the global evolution $\mathbf{s}(t)$ into a lower-complexity visual or statistical representation. This projection significantly compresses the full dynamics and obscures interdependencies in the global state.

Let $\mathcal{P} : \Sigma^n \rightarrow \mathbb{R}^d$ represent such a projection, e.g., extracting summary statistics, visual rows, or entropy measures. The observable behavior of the system becomes:

$$\mathbf{y}(t) = \mathcal{P}(\mathbf{s}(t)),$$

where $\mathbf{y}(t)$ can appear complex or random due to the loss of global configuration information. When the cellular automaton exhibits class IV behavior (in the Wolfram classification), it generates localized structures, long-range correlations, and apparent unpredictability. However, the underlying process is fully deterministic and governed by a fixed update rule F . The apparent randomness observed in $\mathbf{y}(t)$ can thus be interpreted as a manifestation of:

- *Folding of trajectories*: Similar global states may evolve into divergent local behaviors when projected.
- *Compression of causality*: Global correlations are masked in the projection, producing outputs that appear locally unpredictable.
- *Emergent scales*: Patterns observed in spacetime diagrams emerge from nonlinear composition of simple local rules operating in a vast configuration space.

From this viewpoint, complex behavior in cellular automata is analogous to the fractal boundary of the Mandelbrot set or strange attractors in chaotic flows: a visible shadow of compressed deterministic dynamics in a large finite configuration space. This interpretation connects cellular automata with broader classes of complex systems. Just as chaos in simplified maps can be understood as a compressed view of richer flows, the emergence of complexity in CAs arises from observing structured evolution through a narrow observational lens. Within this interpretive frame, apparent randomness in cellular automata need not be taken as evidence of intrinsic disorder, but rather as the projection of combinatorially structured logic unfolding in a large finite discrete space.

This paradigm offers a coherent interpretive framework for viewing CAs not merely as simple rule-based systems, but as models of information compression and projection in computational and natural systems. Notably, several cellular automata, such as Rule 110 and Conway's Game of Life, are known to be Turing complete. This suggests that their configuration spaces can encode arbitrary computational processes. From the projection perspective, this means that any computable evolution over a sufficiently large finite state space — including those representing physical or biological systems — may yield structured, fractal-like, or chaotic patterns when projected into simpler observable forms. Such cellular automata thus serve as fertile models for studying the limits of observability, the emergence of patterns, and the interpretability of complex systems under representational compression.

4.5. Quantum Uncertainty as a Consequence of Incomplete System Isolation

Quantum mechanics introduces fundamental uncertainty through the indeterminacy of measurement outcomes. The Heisenberg uncertainty principle, the probabilistic collapse of the wavefunction, and the impossibility of simultaneously knowing conjugate variables are often interpreted as intrinsic to the quantum world. However, within the paradigm that views complexity and apparent randomness as projections of larger finite-complexity structure, quantum uncertainty may be reinterpreted as a consequence of treating a fundamentally open system as closed. What follows is proposed as an interpretive reading of quantum formalism within the broader finite-complexity paradigm, not as a replacement derivation of that formalism.

Canonical quantum mechanics models systems using wavefunctions ψ evolving unitarily under the Schrödinger equation:

$$i\hbar \frac{d\psi}{dt} = \hat{H}\psi,$$

where \hat{H} is the system's Hamiltonian operator. Crucially, this formalism assumes that the system under consideration is *closed*—isolated from the rest of the universe. Measurements, environmental influences, and unknown degrees of freedom are typically modeled as external perturbations or abstract operators. This closed-system assumption is a mathematical idealization. In practice, no

quantum system exists in perfect isolation: all systems are *embedded* in the full universe, which itself possesses vast finite complexity.

Let the total universe be represented, within the conventional quantum formalism, as a complex state in a Hilbert space \mathcal{H}_U , while the quantum system of interest resides in a much smaller subspace $\mathcal{H}_S \subset \mathcal{H}_U$. The state of the universe evolves unitarily according to some unknown universal Hamiltonian \hat{H}_U :

$$|\Psi(t)\rangle \in \mathcal{H}_U, \quad \text{with} \quad i\hbar \frac{d|\Psi\rangle}{dt} = \hat{H}_U |\Psi\rangle.$$

Our observations are restricted to a projection:

$$\rho_S(t) = \text{Tr}_E(|\Psi(t)\rangle\langle\Psi(t)|),$$

where the partial trace over the environment E reflects the information loss due to our limited observational reach. This projection compresses a richer universal evolution into a lower-complexity probabilistic description. The indeterminacy captured by quantum uncertainty can thus be interpreted as the result of projecting the state of the total universe onto a subsystem, filtering out interactions and entanglements with inaccessible degrees of freedom. In this interpretation:

- **Wavefunction collapse** reflects a structural transformation when a weakly coupled quantum system interacts with a complex, non-quantum measurement apparatus, and the balance between accessible and inaccessible degrees of freedom shifts. The system thus transitions from a low-complexity, probabilistic mode to a higher-complexity, effectively deterministic one.
- **Probabilistic outcomes** arise not from inherent randomness but from marginalizing over unknown global correlations.
- **Entanglement** is a visible sign of global structure, where separable projection is no longer valid.

Within this interpretive frame, quantum behavior need not be taken as evidence of fundamental indeterminism, but can instead be read as a signal of *representational compression*—our description of a large-but-finite, causally coherent universe reduced to a manageable but incomplete subsystem. This reinterpretation parallels earlier analyses of chaos, fractals, and cellular automata: in each case, apparent complexity, unpredictability, or randomness arises when richly structured dynamics are observed through a narrow, lower-complexity lens. Quantum uncertainty is not necessarily a window into fundamental randomness, but rather a shadow cast by the full complexity of the universe onto the subspace we are able to observe.

Thus, the peculiar features of quantum theory—superposition, measurement collapse, and entanglement—can be read as artifacts of attempting to isolate and describe a non-isolatable fragment of a universal process whose full complexity exceeds the subsystem description. This perspective resonates with quantum decoherence theory, relational interpretations, and quantum information approaches. It suggests that the route to a deeper understanding of quantum phenomena lies not in seeking hidden variables per se, but in developing mathematical and conceptual tools that account for the unavoidable *entanglement with the rest of reality*, and the projection thereof. By extending the finite-complexity projection paradigm to quantum mechanics, the present manifesto proposes a unified explanatory framework across classical chaos, complex systems, and quantum phenomena—each revealing only a partial cross-section of a more complete dynamical whole.

4.6. Information Coherence and Non-Locality of Subsystems

To illustrate the inherent non-locality of subsystems in the universe, we consider the following thought experiment rooted in relativistic spacetime geometry and quantum causality. Imagine a distant galaxy located some three billion light-years from Earth. On the surface of a star within that galaxy, an electron undergoes a transition and emits a photon. This photon traverses intergalactic space, unaffected by intervening matter, and ultimately reaches Earth, where it is absorbed by an electron in the retina of a human observer. This absorption event initiates a cascade of neural activity, culminating in a conscious perceptual experience.

Despite the immense spatial distance between the site of emission and the site of absorption, the spacetime interval Δs^2 between these two events is precisely zero:

$$\Delta s^2 = c^2 \Delta t^2 - \Delta x^2 = 0,$$

indicating that they are connected by a null (lightlike) trajectory. According to the geometry of Minkowski spacetime, such events are not separated by any “real” spacetime interval, but rather exist in direct causal contact along the light cone.

From the conventional perspective, these events are separated by a spatial distance of three billion light-years and by a temporal delay of three billion years. However, along a null trajectory there is no proper-time separation between emission and absorption. In that precise relativistic sense, there is no internal interval, no delay, and no intermediate state: the process is indivisible and coherent. The two events of emission and absorption constitute two expressions of a single, unified process the same way that the two shadows in Figure 5 are not independent but are two 2D projections of the same 3D object observed from two distinctive frames of reference. The point of the example is not to equate relativistic null connection with quantum entanglement, but to illustrate how subsystem separability may depend on the descriptive frame employed.

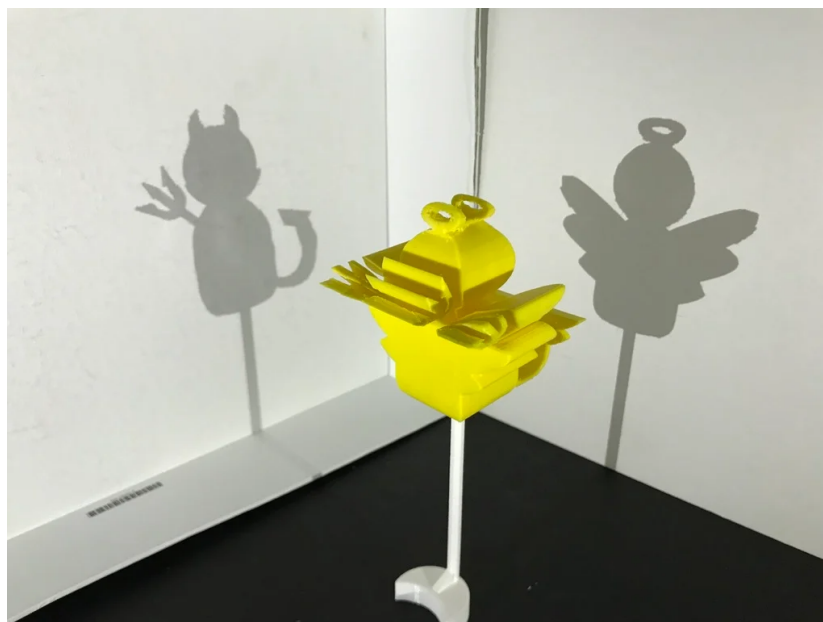


Figure 5. Multiple perspectives on the same object. Image by Magic Angle Sculpture.

This suggests that, although spatially distant, the emission and absorption events are in a state of *informational coherence*. The emission cannot be fully defined without reference to its eventual absorption, and vice versa. In this sense, these events are not merely causally linked, but are aspects of a single, unified process when viewed from a more complete informational framework. This thought experiment challenges the classical intuition of subsystem separability. The emission event on the star and the perceptual event in the human brain are not strictly independent. They are connected by a fundamental continuity through the fabric of spacetime, a continuity that is invisible when the universe is arbitrarily decomposed into isolated, local systems.

Under the finite-complexity projection paradigm, the universe evolves as a globally entangled system. Local subsystems — such as the electron on the star and the neuron in the retina — are not ontologically independent entities, but are emergent features of a single large-but-finite process. Their apparent separability arises only under projection into a lower-complexity, locally causal model. This view aligns with the non-local character of quantum entanglement, the retrocausal implications of certain quantum interpretations, and recent developments in quantum information theory and holography. It reinforces the idea that what appears to be local, sequential, and disconnected behavior

may in fact be a compressed representation of a fundamentally coherent, non-local evolution. Two events, separated by billions of light-years and years, are in informational contact through a null interval; in relativistic terms, they are null-connected and not separated by proper time along the lightlike trajectory.

This perspective suggests that non-locality is not an exotic feature of quantum entanglement alone, but a general consequence of describing a globally structured universe through the lens of subsystems and projections. Building upon the preceding thought experiment, we now consider the ontological and epistemological consequences of non-local coherence. If every event is embedded in a continuum of causal and informational connections across spacetime, then every *localized subsystem* is not an isolated entity, but a *projection* of the global structure of the universe.

In conventional physical models, systems are often decomposed into smaller, spatially or causally local subsystems. These are then studied in isolation or treated as weakly coupled to an external environment. However, the assumption of subsystem independence is a methodological convenience, not an ontological truth. As illustrated by the photon thought experiment, the interactions that define a subsystem's evolution are informed by, and contingent upon, the full dynamical state of the universe. The apparent separability of a system is only meaningful within a projected or coarse-grained description. In the full state structure of the universe, such separations vanish.

Let \mathcal{U} denote the total informational state of the universe, represented as a large-but-finite state structure. Any subsystem S is not an independent subspace, but a functional projection $\mathcal{P}_S(\mathcal{U})$ of the whole:

$$S = \mathcal{P}_S(\mathcal{U}).$$

Thus, the complexity observed in any system S — be it a particle, a living organism, or a human brain — is inherited from the global complexity of \mathcal{U} . In this sense, the human observer is not a *small piece* of the universe, but a *specific perspective* on its total informational state. Every electron, every thought, every event is a compressed, localized expression of a cosmic-scale computation. This leads to a profound conclusion: Every localized system in the universe is as complex as the universe itself — not because it *contains* all information, but because it is a projection of the full dynamical structure.

The analogy with holography is instructive: in a physical hologram, each part encodes the entire image in compressed form. Similarly, in a non-locally coherent universe, each event encodes — via entanglement, correlation, and causal history — the full tapestry of cosmic evolution. This perspective challenges reductionist methodologies that seek to explain systems solely in terms of proximate components. Instead, it emphasizes that understanding any system — particularly complex or conscious systems — requires situating it within the full informational context of the universe. It also redefines the meaning of emergence: what appears as emergent complexity is in fact the reappearance, under projection, of global structure in localized form. Complexity is not built up from below, but compressed down from above.

The non-local coherence of spacetime, demonstrated even by simple causal chains such as photon emission and absorption, implies that the universe cannot be fundamentally decomposed. Every subsystem is a lens on the whole. The complexity of any one part is a manifestation of the complexity of the totality. The universe is not made of separate things. It is made of different ways the whole looks when viewed from within.

5. The Nature of Truth and the Limits of Information

To deepen our inquiry into the nature of information and its entanglement with truth, we turn to a well-known logical construction:

“This statement is false.”

At first glance, this appears to be a simple declarative sentence. However, its self-referential structure produces a paradox: if the statement is true, then what it asserts must hold — hence, it is

false. But if it is false, then what it asserts does not hold — hence, it is true. The result is a logical contradiction, often classified as the **Liar Paradox** [52].

The paradox arises not from any flaw in syntax or grammar, but from the sentence's attempt to refer to itself *as an object of evaluation*. In doing so, it violates the implicit hierarchy of linguistic levels — what logicians refer to as the *object language* and the *meta-language* [52]. A statement that attempts to encapsulate its own truth value recursively creates a logical loop without fixed resolution. This reveals a deep property of information: Truth is not a static attribute of a sentence, but a relational property between statements and the broader context in which they are interpreted.

To further refine our understanding of truth and information, we must reconsider a foundational ontological assumption: that in the universe we inhabit, there is no such thing as negative existence. Everything that appears — every symbol, every event, every configuration of matter, meaning, or language — *exists* to some extent. There are no “false” entities in the ontological sense; there are only entities whose significance, coherence, or durability may vary.

All that manifests — whether as a transient pattern in a cloud, a random bitstring, or a proposition written in logical form — partakes in the structure of reality. It may endure or vanish. It may be coherent or disordered. But its appearance affirms its existence. Even contradictions, illusions, or lies are *there*. They have form. They take place. They register in the informational fabric of the cosmos. Hence, there is no ontological negative. What is called “false” does not fail to exist — it only fails to cohere within our horizon of meaning.

From this perspective, “falsehood” is not a metaphysical category but an *epistemic placeholder*. It marks the boundary where our knowledge fails to resolve structure. To say that something exists is not yet to say that it is true in a given frame: existence concerns ontological presence, whereas truth concerns adequacy of coherence, correspondence, or fit within an interpretive horizon. A false statement is therefore not an entity that contradicts being; it is a configuration that exceeds — or escapes — our current framework for assigning coherence or correspondence. The label “false” therefore functions like terms such as “noise,” “randomness,” or “chaos”: it designates what is, but what we do not yet understand. These are not categories of non-being, but indicators of our own perceptual and cognitive limits.

What we conventionally refer to as a “lie” is often simply a *cropped frame* — a local slice of a more expansive structure. The cognitive error lies in mistaking the partial utterance for the totality of meaning. In this view, the term “falsehood” operates not as a judgment of existential invalidity, but as a placeholder indicating that the full context is *not yet visible or known*.

This reframes the idea of deception in pragmatic and epistemological terms. A deceptive statement does not fail to exist; it exists fully as an intentional act embedded in a field of motivations, constraints, and symbolic strategies. The “false” quality attributed to it is a result of focusing narrowly on surface syntax without perceiving the structure that gave rise to it. Just as a fractal segment appears irregular only when removed from its recursive whole, or a chaotic sequence seems random only when viewed through a restricted projection, so too does a deceptive utterance seem false only when divorced from its generative logic.

Falsehood, therefore, is not a statement about the inexistence or negation of reality. It is a linguistic and epistemic marker indicating that our interpretive lens is too narrow, that we are perceiving only a sliver of a broader pattern. In this framework, what we call falsehood is often a measure of our own distance from the fuller generative context of an utterance.

Falsehood = Contextual Compression Beyond Interpretive Horizon

5.1. Perspective and Shared Reality



Illustration: Relativism (left) versus Shared albeit Complex Reality (right). Images are from the public domain (internet memes). The elephant meme is possibly by TeePublic.

In postmodern discourse — and in many broader cultural settings — a common sentiment prevails: that there is no such thing as absolute truth. Each person, each party, each ideological faction is thought to possess its own “truth,” and thus no truth can claim superiority or objectivity over another [53]. Such a relativist assertion is often used rhetorically to neutralize criticism, suspend judgment, or justify epistemic isolation. It appears, on the surface, to align with the framework we have presented — a model of partial information, subjective projection, and perspectival compression. However, this appearance is misleading. Our model does not support relativism, because it does not collapse perspective into truth. Relativism collapses the distinction between perspective and truth. It asserts:

“Because we all have different perspectives, there is no single truth.”

But this misunderstands the nature of perspective. A perspective is not a truth; it is a **projection** — a limited and localized representation of something more complete [52]. Perspectives are real, meaningful, and necessary, but they do not exist in isolation. They derive their coherence and intelligibility from the reality they partially represent. Within the ontological-epistemic stance advanced by this work, the only truth that exists in the fullest sense is the whole truth — the universe itself. Everything else is a projection, a compression, a local expression of that singular totality.

Different perspectives are not incompatible truths; they are different *views* of the same objective reality [30]. The fact that we observe from different frames does not imply that there is no object of observation. On the contrary, it implies that our frames are *connected* — that there exists something *shared* and *stable* toward which all perspectives converge. The distinction matters because if we deny any common truth, dialogue loses its object. There is no shared reality to appeal to, and disagreement risks collapsing into strategic competition rather than common inquiry [54].

By contrast, if we accept that there is one underlying reality — and that each of us sees only part of it — then dialogue becomes meaningful. Exchange becomes possible. We can communicate not because we hold separate truths, but because we are exploring the same truth from different angles. This paradigm demands a deep humility: to recognize that our personal or collective “truths” are not ultimate, but contingent perspectives — filtered through cognitive, cultural, and historical lenses [55]. But it also offers a profound hope: that despite fragmentation, there is something that holds — something that unites all experience, all perception, all structure. That something is the universe —

not in its parts, but in its whole. Truth, then, is not subjective. It is not relative. It is absolute, but seen partially. It is one, but expressed multiply. It is stable, but approached incrementally.

Thus, we reject the relativist stance not out of dogmatism, but out of deeper fidelity to the structure of reality. There is only one truth — the whole. Our task is not to invent truths, but to uncover, exchange, and refine our views of that which is. In this endeavor, every perspective has value — not because it *is* truth, but because it *points toward* it.

5.2. Infinity as an Epistemic Placeholder: The Far Beyond

Having reinterpreted falsehood and randomness as boundary terms of finite understanding, we now turn to the notion of **infinity**. The concept of infinity appears across the disciplines as both a symbol of idealization and a source of contradiction. In mathematics, it is treated as a formal limit; in physics, as a convenient abstraction or problematic singularity; in theology and philosophy, as a notion of ultimate unknowability. But viewed within our epistemic framework, we can now make a deeper programme-level claim that infinity is not a real thing in the universe. It is a placeholder for the “far-far-away” — the unreachable end of a projection, the boundary beyond which our comprehension fades into undefined space.

Infinity serves the same function as the concepts of “falsehood” and “randomness”: it arises when the internal representation of a system attempts to reach beyond its informational horizon. Within this manifesto, falsehood, randomness, and infinity are treated as boundary terms that arise when a representational frame outruns its own power of enclosure. When we describe something as infinite — an infinite series, an infinite space, an infinite number of possible outcomes — we are acknowledging that our current mode of symbolic representation cannot contain or resolve the full structure within a bounded frame. Just as “false” marks what escapes coherence, and “random” marks what escapes pattern, so too does “infinity” mark what escapes enclosure.

We are not denying the value or utility of infinite constructs. But we are reframing them: as asymptotic gestures toward the whole, rather than literal descriptions of an external, infinite substance. Just as lines extend “to infinity” on paper, but in reality, all physical instantiations are finite, so too does infinity live in our models — not in the universe. To treat infinity as real is to confuse the edge of the map for the territory. To treat it as a placeholder is to understand its true power: not as a number or a space, but as a symbol for the unreachable and the unresolved.

6. Conclusions

Throughout this work, we have detailed an epistemological paradigm in which complexity, chaos, fractality, and quantum uncertainty are not markers of fundamental randomness or disconnection, but reflections of an underlying unity. These phenomena emerge when structured processes are represented through lower-complexity projections. We have extended this paradigm to quantum systems, cellular automata, and spacetime geometry. In each case, apparent separability and locality dissolve upon closer analysis, revealing that what we consider to be *individual systems* are in fact *expressions of the whole* — partial perspectives on the globally entangled dynamics of the universe.

From the emission of a photon on a distant star to the spark of human perception, the universe demonstrates that information is not confined by distance. The space between events is not a barrier but a medium of coherence. What appears to be far apart in space and time may, under null or entangled trajectories, be in direct contact at the level of informational structure.

This leads us to a final, holistic conclusion:

Everything within the universe — every particle, process, and observer — is a projection and expression of the entirety of the universe. What we perceive as individual things are compressed reflections of the totality, viewed from particular vantage points. The part does not merely participate in the whole; it is the whole, seen from within.

This vision reframes the universe not as a collection of parts interacting locally, but as a single indivisible process — vastly faceted, self-reflective, and coherent. Every subsystem is not a container

of information but a portal to the universe's full complexity, folded into form by the geometry of projection and the limits of observation. Understanding reality, then, is not a matter of building up from the bottom, but of unfolding from the top.

Across nonlinear dynamics, computational automata, and quantum physics, simple rules can yield behavior that appears intricate, unpredictable, and self-similar. The argument of this manuscript is that such complexity is better understood not as brute disorder, but as what becomes visible when richer finite structure is seen through reduced observational frames. On this view, mathematical, physical, biological, and cognitive systems are local expressions of a larger coherent whole whose structure exceeds what any subsystem can fully encode. The proposed description of the universe may therefore be conceived as a kaleidoscope — not in its decorative appearance, but in its structural essence. A kaleidoscope contains only a few discrete fragments: colored glass, polished stones, or shaped beads. These are the elemental components — simple, countable, finite. But they are enclosed within a chamber of mirrors — recursive, angled, and inter-reflective — that multiplies and refracts them into endless pattern.

Each rotation of the kaleidoscope reconfigures the arrangement of fragments, generating new symmetries, asymmetries, and emergent forms. The result is an ever-changing complexity, an intricate interplay of color, form, and structure that far exceeds the simplicity of the inputs. So it is with the universe.

What appears as infinite diversity — stars and cells, equations and languages, thoughts and lives — emerges from a finite set of foundational elements, reflected and refracted through the recursive architecture of spacetime, causality, and relation. The complexity we observe is not a product of an infinite number of things, but of the seemingly infinite ways in which a limited set of things can mirror and relate to one another.

The universe is not made of endless parts, but of a vast multitude of reflections of its singular totality.

Each perspective is a view into a different chamber, and every pattern we see is a configuration not of new things, but of new angles, new projections, and new relational alignments. Like the image in a kaleidoscope, no part exists independently. Every piece depends on the whole arrangement, and every pattern is a manifestation of totality — revealed through symmetry, distortion, and recursive depth.

As a final clarification of scope, this article has articulated that vision in manifesto form. The cited FRC corpus provides the current coherence base of the broader programme, while further formal development of several of its strongest implications remains ongoing.

Author Contributions: The sole author conceived the study, developed the programme framework, performed the literature review, prepared the figures, and wrote the manuscript.

Funding: This research received no external funding.

Data Availability Statement: No new empirical data were created or analysed in this study.

Acknowledgments: The author thanks the reviewers for their careful reading and constructive remarks.

Conflicts of Interest: Author Yosef Akhtman was employed by the company Gamma Earth Sàrl and declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Zeilberger, D. "Real" Analysis Is a Degenerate Case of Discrete Analysis. In *New Progress in Difference Equations*; Aulbach, B.; Elaydi, S.; Ladas, G., Eds.; Taylor & Francis: London, 2004.
2. Russell, B. *The Principles of Mathematics*; Cambridge University Press, 1903.
3. Turing, A. On Computable Numbers, with an Application to the Entscheidungsproblem. *Proceedings of the London Mathematical Society* **1936**, *42*, 230–265.

4. Gödel, K. Über formal unentscheidbare Sätze der Principia Mathematica und verwandter Systeme I. *Monatshefte für Mathematik und Physik* **1931**, *38*, 173–198.
5. Weinberg, S. The Cosmological Constant Problem. *Reviews of Modern Physics* **1989**, *61*, 1–23.
6. Aristotle. *On the Heavens*; Oxford University Press (modern editions), circa 384 BCE.
7. Copernicus, N. *On the Revolutions of the Heavenly Spheres*; Johannes Petreius, 1543.
8. Einstein, A. On a Heuristic Point of View Concerning the Production and Transformation of Light. *Annalen der Physik* **1905**, *17*, 132–148.
9. Einstein, A. On the Electrodynamics of Moving Bodies. *Annalen der Physik* **1905**, *17*, 891–921.
10. Planck, M. On the Law of Distribution of Energy in the Normal Spectrum. *Annalen der Physik* **1901**, *4*, 553–563.
11. Akhtman, Y. Relativistic Algebra over Finite Ring Continuum. *Axioms* **2025**, *14*, 636. <https://doi.org/10.3390/axioms14080636>.
12. Akhtman, Y. Geometry and Constants in Finite Ring Continuum. *Preprints* **2026**.
13. Akhtman, Y. Euclidean-Lorentzian Dichotomy and Algebraic Causality in Finite Ring Continuum. *Entropy* **2025**, *27*, 1098. <https://doi.org/10.3390/e27111098>.
14. Akhtman, Y. Universal Latent Representation in Finite Ring Continuum. *Entropy* **2026**, *28*. <https://doi.org/10.3390/e28010040>.
15. Akhtman, Y. Paradoxes of Infinity as Reductio ad Absurdum. *Preprints* **2025**. <https://doi.org/10.20944/preprints202508.1744.v1>.
16. 't Hooft, G. *The Cellular Automaton Interpretation of Quantum Mechanics*; Springer: Cham, 2016. <https://doi.org/10.1007/978-3-319-41285-6>.
17. Wolfram, S. A Class of Models with the Potential to Represent Fundamental Physics. *Complex Systems* **2020**, *29*, 107–536. <https://doi.org/10.25088/ComplexSystems.29.2.107>.
18. Bombelli, L.; Lee, J.; Meyer, D.; Sorkin, R.D. Space-time as a Causal Set. *Physical Review Letters* **1987**, *59*, 521–524. <https://doi.org/10.1103/PhysRevLett.59.521>.
19. Loll, R. Quantum Gravity from Causal Dynamical Triangulations: A Review. *Classical and Quantum Gravity* **2020**, *37*, 013002. <https://doi.org/10.1088/1361-6382/ab57c7>.
20. Lev, F.M. Introduction to a Quantum Theory over a Galois Field. *Symmetry* **2010**, *2*, 1810–1845. <https://doi.org/10.3390/sym2041810>.
21. Chang, L.N.; Lewis, Z.; Minic, D.; Takeuchi, T. Galois Field Quantum Mechanics. *Modern Physics Letters B* **2013**, *27*, 1350064. <https://doi.org/10.1142/S0217984913500644>.
22. Kastner, R.E. *The Transactional Interpretation of Quantum Mechanics: The Reality of Possibility*; Cambridge University Press, 2012.
23. Noether, E. Invariante Variationsprobleme. *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen, Mathematisch-Physikalische Klasse* **1918**, pp. 235–257.
24. Aristotle. *Metaphysics*; Oxford University Press (modern editions), circa 350 BCE.
25. Kant, I. *Critique of Pure Reason*; Cambridge University Press (modern editions), 1781.
26. Whitehead, A.N. *Process and Reality*; Macmillan, 1929.
27. Bergson, H. *Creative Evolution*; Henry Holt and Company, 1911.
28. Prigogine, I. *Order Out of Chaos: Man's New Dialogue with Nature*; Bantam Books, 1984.
29. Kauffman, S. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*; Oxford University Press, 1993.
30. Bohm, D. *Wholeness and the Implicate Order*; Routledge, 1980.
31. von Neumann, J. *Theory of Self-Reproducing Automata*; University of Illinois Press, 1966.
32. Shannon, C.E. A Mathematical Theory of Communication. *Bell System Technical Journal* **1948**, *27*, 379–423.
33. Smolin, L. *The Life of the Cosmos*; Oxford University Press, 1997.
34. Barad, K. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*; Duke University Press, 2007.
35. Boltzmann, L. *Statistical Mechanics*; Springer, 1877.
36. Darwin, C. *On the Origin of Species*; John Murray, 1859.
37. Nakamoto, S. Bitcoin: A Peer-to-Peer Electronic Cash System, 2008.
38. Barrow, J.D. *The Constants of Nature: From Alpha to Omega*; Vintage, 2007.
39. Carter, B. Large Number Coincidences and the Anthropic Principle in Cosmology. *IAU Symposium* **1974**, *63*, 291–298.
40. Feynman, R.P.; Leighton, R.B.; Sands, M. *The Feynman Lectures on Physics*; Addison-Wesley, 1964.

41. Lorenz, E.N. Deterministic Nonperiodic Flow. *Journal of the Atmospheric Sciences* **1963**, *20*, 130–141.
42. Schrödinger, E. Quantisierung als Eigenwertproblem. *Annalen der Physik* **1926**, *384*, 361–376.
43. Takens, F. Detecting strange attractors in turbulence. *Lecture Notes in Mathematics* **1981**, *898*, 366–381.
44. Packard, N.H.; Crutchfield, J.P.; Farmer, J.D.; Shaw, R.S. Geometry from a time series. *Physical Review Letters* **1980**, *45*, 712.
45. Strogatz, S.H. *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering*; Westview Press, 1994.
46. van der Maaten, L.; Hinton, G. Visualizing data using t-SNE. *Journal of Machine Learning Research* **2008**, *9*, 2579–2605.
47. McInnes, L.; Healy, J.; Melville, J. UMAP: Uniform Manifold Approximation and Projection for Dimension Reduction. *arXiv preprint arXiv:1802.03426* **2018**.
48. Maldacena, J.M. The large-N limit of superconformal field theories and supergravity. *Advances in Theoretical and Mathematical Physics* **1998**, *2*, 231–252.
49. Wolfram, S. *A New Kind of Science*; Wolfram Media, 2002.
50. Cook, M. Universality in elementary cellular automata. *Complex Systems* **2004**, *15*, 1–40.
51. Ilachinski, A. *Cellular Automata: A Discrete Universe*; World Scientific, 2001.
52. Tarski, A. The Concept of Truth in Formalized Languages. *Logic, Semantics, Metamathematics* **1936**.
53. Lyotard, J.F. *The Postmodern Condition: A Report on Knowledge*; University of Minnesota Press: Minneapolis, 1984.
54. Habermas, J. *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society*; Beacon Press: Boston, MA, 1984.
55. Kuhn, T.S. *The Structure of Scientific Revolutions*; University of Chicago Press, 1962.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.