Eternal Inflation and the Hermeneutics of the Infinite: Interpreting Cosmology at the Edge of Meaning

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The theory of eternal inflation — according to which our observable universe is just one bubble within an endlessly self-replicating multiverse — presents not only a physical but also a hermeneutic challenge. It describes a cosmos that surpasses the possibility of complete representation, where every act of measurement remains limited by a local horizon, and prediction dissolves into contingency. The infinity it introduces is not numeric but interpretive: an open proliferation of possible worlds and meanings that exceeds the conceptual reach of the observer. This article argues that eternal inflation marks a crucial moment in the modern philosophical history of science, where cosmology confronts its own limits of comprehensibility. Drawing on hermeneutic theory — from Gadamer's horizon of understanding to Cassirer's symbolic forms — it explores how cosmological formalism becomes an epistemology of the infinite, creating models that are mathematically consistent yet semantically unstable. At this point, cosmology becomes a self-reflective hermeneutics: a discipline interpreting the impossibility of its own closure. The goal is not to dissolve the tension between mathematics and meaning, but to see that tension as the condition of knowledge today — a universe that interprets faster than it can be understood.

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Introduction
When the Universe Refuses to End

In 2011, the Nobel Prize in Physics was awarded to Saul Perlmutter, Brian P. Schmidt, and Adam G. Riess for the discovery that the universe's expansion is accelerating. What began as a straightforward astronomical survey of distant Type Ia supernovae soon reshaped our sense of cosmic history. The cosmos was not slowing down, as many expected, but pushing itself apart under the influence of a mysterious "dark energy" embedded in the vacuum. Instead of approaching a static fate, the universe appeared to be moving toward unending renewal — a world that, in a sense, never completes its own beginning.

Among the most unsettling possibilities raised by modern cosmology is that this refusal to end might not be accidental. What we call the Big Bang could be only one local instance of a process that never entirely stops. In the early 1980s, theorists such as Alan Guth (1981), Andrei Linde (1983, 1986), and Alexander Vilenkin (1983, 2007) reworked the inflationary scenario into what became known as eternal inflation. In this picture, the exponential expansion that shaped our own cosmic region persists elsewhere, freezing in some domains while continuing in others. The result is an unbounded proliferation of "bubble universes," each developing with its own constants, histories, and physical possibilities.

For physics, eternal inflation is a mechanism of ceaseless generation. For philosophy, it marks a turning point in the conditions under which explanation becomes possible. A model introduced to clarify the universe's early moments ends by opening a vast epistemic dilemma. If every universe permitted by the laws of physics exists somewhere (Tegmark, 2003), what becomes of explanation itself? If each domain carries its own version of the laws of nature (Ellis et al., 2004), what is left of lawfulness as a universal category? The classical question of origin gives way to a question of selection: not why something exists rather than nothing, but why *this* world emerges rather than another from an apparently limitless set.

Eternal inflation thus challenges not only the physics of the early universe but also the frameworks through which meaning is constructed. The infinite ceases to be a distant metaphysical speculation and takes up residence inside the formal structure of the theory. Yet, as often happens in encounters with the infinite, clarity brings its own crisis. The equations generate a cosmos that grows far faster than our capacity to interpret it. The Fokker–Planck formalism, used to describe the stochastic behavior of the inflationary field (Starobinsky, 1986; Linde, Linde, & Mezhlumian, 1994), yields predictions only by invoking averages over infinities that defy normalization — the notorious measure problem (Aguirre, Gratton, & Johnson, 2007). The universe begins to resemble a mathematical projection whose own procedures threaten the coherence they aim to secure.

Each attempt to describe the totality of universes demonstrates that such a description cannot avoid reflecting the standpoint from which it is made. The very effort to encompass the whole reveals its own partiality. The infinite, in this context, resides not only in the cosmos but in the interpretive horizon through which the cosmos is approached. As Hans-Georg Gadamer (1960/2004, p. 302) reminds us, "The horizon is not a rigid boundary but something that moves with one's perspective." Eternal inflation makes this remark almost literal: the horizon itself becomes something to be interpreted, a shifting frame rather than a stable edge of knowledge.

The philosophical implications of this shift are significant. Since Immanuel Kant's *Critique of Pure Reason* (1781/1998), cosmology has been tethered to the conditions of possible experience. The universe could be investigated only insofar as it appeared within the

forms of human cognition — space, time, causality. But the inflationary paradigm unsettles this arrangement. The features that make experience possible turn out to be contingent facts about one cosmic region among countless others. There is no longer a single standpoint from which reason surveys the whole, but a multitude of observers, each located in a vacuum domain whose physical parameters govern what can be known (Carr, 2007; Ellis, 2011). Kant's Copernican revolution thus acquires a cosmological counterpart: reason is decentered, dispersed across an ensemble of worlds.

A cosmology of this kind requires a hermeneutics capable of accommodating openness rather than closure. Ernst Cassirer's philosophy of symbolic forms (1923/1953) offers one route into this problem. For Cassirer, mathematics does not mirror an independent reality; it constitutes a mode of world-making, an instrument through which experience takes shape. In the context of eternal inflation, this creative function becomes radical. The formalism does not merely articulate a single reality; it generates a plurality of them. The physicist becomes, almost despite himself, the constructor of possible worlds — a participant in a symbolic activity whose products exceed his interpretive reach.

Seen from this angle, the inflationary multiverse appears as the latest chapter in a much older intellectual effort: the attempt to render the infinite thinkable through systematic form. From Nicholas of Cusa's *De docta ignorantia* (1440/1985) to Giordano Bruno's *De l'infinito universo e mondi* (1584/1998), Western thought has oscillated between awe and anxiety in the face of the unbounded. What marks the present moment as distinctive is not the idea of infinity itself but the fact that it emerges from calculation, not speculation. The multiverse is not used as a metaphor or theological image; it comes from a model whose implications surpass the interpretive framework needed to understand them (Davies, 2004; Susskind, 2005). Theology once discussed divine infinitude; cosmology now talks about self-replicating space. The language changes, but the tension stays the same: how can the mind grasp something that has no natural limit?

This tension — an epistemic vertigo produced by an ever-growing universe — is the central concern of this essay. My aim is not to debate the empirical adequacy of eternal inflation, nor to translate physics into metaphysics, but to follow the trajectory of the infinite as it migrates from theology to formal cosmology and, finally, into hermeneutics. I approach eternal inflation not as a comprehensive description of the cosmos but as a text that requires interpretation: a narrative of unending genesis whose coherence lies less in empirical confirmation than in conceptual necessity. If we read it hermeneutically, we may notice what the equations themselves cannot disclose: every formalization of the infinite is also a tacit admission of the limits of human understanding.

1. The Logic of Eternal Inflation

The inflationary paradigm emerged in the early 1980s as an attempt to resolve several persistent difficulties in the standard Big Bang model — the flatness, horizon, and monopole problems, each pointing to a puzzling degree of fine-tuning in the universe's initial conditions. In his influential article *Inflationary universe: A possible solution to the horizon and flatness problems* (1981), Alan Guth proposed that a brief interval of exponential expansion could smooth out primordial irregularities and drive the cosmos toward near-homogeneity. During this phase, space expanded faster than the speed of light, reducing curvature and diluting unwanted relic particles. Inflation introduced a distinctive kind of cosmological causality: not the familiar dynamical evolution of matter in time, but a geometric transformation of space

itself. The early universe was recast not as a violent detonation but as the rapid swelling of a vacuum state.

What began as a temporary episode, however, soon acquired a very different character. In later developments by Andrei Linde (1983, 1986) and Alexander Vilenkin (1983, 1995, 2007), the inflating vacuum was shown to possess a natural inclination toward self-reproduction. Quantum fluctuations in the scalar field — the inflaton — could bring inflation to an end in certain regions while allowing it to continue elsewhere. Where inflation ceased, a localized Big Bang would occur, giving rise to a distinct "bubble universe." In surrounding regions, expansion persisted, eventually generating further bubbles. The process did not stop; it repeated itself indefinitely.

The result is a cosmos that acquires a layered structure: smooth in its initial conception but wildly diversified in its consequences. What came to be called the "multiverse" (Tegmark, 2003; Carr, 2007) is not a philosophical invention but a consequence of the inflationary mechanism itself — a branching architecture in which countless domains follow their own physical histories, each shaped by local values of fundamental constants. Linde (1986, p. 396) captured the idea succinctly: "eternal inflation produces not one universe but an infinite number of exponentially expanding regions." In this sense, inflation does more than set the initial conditions for our universe; it generates an ever-growing ensemble of universes, each emerging from the same underlying mechanism yet evolving under different conditions.

1.1 From Mechanism to Metaphor

The logic of eternal inflation is, at first sight, straightforward: a physical mechanism gradually expands into a cosmological picture of unending creation. Each bubble universe emerges from the same inflating vacuum yet inherits distinct vacuum energies and physical constants. Instead of a single, continuous cosmic narrative, we obtain a branching collection of histories. The universe does not stem from one origin but from a succession of local beginnings. As Vilenkin (2007, p. 9) remarks, "the inflationary universe is a self-contained system that creates itself from nothing," a description that already hints at more than physics alone.

That statement points toward a subtle shift from mechanism to metaphysics. The model introduces a form of recursion in which creation becomes both event and process, and the cosmos acquires the character of an indefinitely self-referential system. No observer can encompass the whole of it; each is confined to a single bubble, bounded by causal horizons beyond which other universes recede faster than light (Ellis, 2011). In this setting, the infinite is not an external totality waiting to be surveyed but a structural feature that conditions what can be known. It marks a boundary of interpretation rather than a physical frontier.

For this reason, the inflationary picture inevitably draws physics into a hermeneutic domain. The universe begins to resemble a text formulated in stochastic equations and accessible only from within its own horizons. The more the model is extended to explain, the less it can, in principle, verify. Sean Carroll (2019, p. 362) observes that the multiverse "is not an empirical hypothesis but an inference from the structure of our best theories." Eternal inflation thereby dramatizes a central tension of contemporary cosmology: the more precise and mathematically consistent the formalism becomes, the more interpretive the enterprise must be.

1.2 The Fokker–Planck Universe

At the heart of this self-reproducing cosmos lies a mathematical language aimed not at describing matter but at describing probability. The inflation field — the scalar field that drives inflation — evolves through a combination of two influences: a deterministic drift that pulls the field down its potential, and a stochastic component arising from quantum fluctuations that occasionally push it upward. In certain regions, these fluctuations extend the inflationary phase indefinitely, ensuring that the process never comes to a universal halt.

Technically, this interplay is captured by the Fokker–Planck formalism, which governs the temporal evolution of the probability distribution associated with the field's values. Rather than charting particles, motions, or trajectories, it follows the transformation of uncertainty itself. It is, in effect, a dynamical equation not for matter but for the dispersal of possibility — a mathematical account of how potentiality spreads through the cosmos.

Each term in the Fokker–Planck equation embodies a familiar philosophical tension: the predictable versus the random, classical continuity versus quantum interruption. In this framing, the universe does not present itself as a single system undergoing change, but as a shifting landscape of probabilities — an ongoing diffusion of possibilities in an abstract, self-referential space. Formalism expresses in mathematical terms parallels what hermeneutics describes as an open horizon of meaning: a structure in which actuality is always accompanied by an excess of potential.

This reframing of the universe marks an ontological departure within cosmology. Reality is no longer treated as a single trajectory but as a statistical ensemble, a fluctuating balance of the expected and the unforeseen. John Barrow (2005, p. 247) referred to this as "the physics of possibility," a domain in which the real and the potential interpenetrate. Yet this same framework leads to the interpretive puzzle known as the measure problem. Attempts to assign probabilities to events within an infinite ensemble yield divergent outcomes; different procedures for "measuring infinity" produce incompatible predictions (Aguirre et al., 2007). No canonical method exists to normalize what has no natural bound.

Thus, the very mathematics designed to provide clarity exposes the limits of its own ambition. The Fokker–Planck universe is less a system awaiting solution than a reminder of interpretive openness — a cosmos whose proliferation of possibilities continually exceeds the frameworks devised to contain it.

1.3 The Measure of the Unmeasurable

This crisis of measure carries significant philosophical weight. In conventional physics, probability describes uncertainty within a bounded system; in eternal inflation, it encounters a far more fundamental problem — the absence of any natural closure. Every region of the multiverse can contain an infinite number of observers, events, and outcomes. If all relevant quantities diverge, relative frequencies lose their meaning, and probability itself becomes undefinable. As George Ellis (2011, p. 1212) remarks, "the multiverse hypothesis removes the possibility of observational confirmation by definition." What remains is not measurement but interpretation — an effort to ascribe meaning where empirical constraints no longer apply.

Some physicists, including Leonard Susskind (2005, pp. 270–273) and Max Tegmark (2003, pp. 44–45), take this situation as a cue to embrace a more radical view: that physical existence is nothing over and above mathematical existence. According to the Mathematical Universe Hypothesis, every internally consistent solution to the fundamental equations exists somewhere in the multiverse. In this picture, the cosmos becomes indistinguishable from its formal structure. Yet such a move collapses the distinction between model and world, between symbolic form and empirical content. It approaches what Michel Foucault (1966/1970, p.

71) described as "the dream of a language that would coincide with the things it names." The endless proliferation of universes reflects the boundless generativity of symbols, each complete, yet none anchored to a universal standpoint.

From a hermeneutic perspective, this represents the culmination of a certain formal realism: the conviction that truth resides in the architecture of the equations rather than in their empirical reach. Cassirer (1923/1953) cautioned against this very conflation. For him, the symbol does not simply mirror reality; it actively shapes the domain in which meaning arises. Within eternal inflation, this creative dimension becomes strikingly literal: the mathematical framework does not merely describe worlds — it produces them. The formalism turns out to be less a representation of the infinite than the mechanism through which that infinite is brought into conceptual existence.

1.4 The Paradox of the Observer

If the cosmos consists of an infinite ensemble, then any observer occupies only a minute position within an unbounded totality. Observation loses any claim to universality and becomes inherently local, shaped by perspective and conditioned by probability. As Ellis and Silk (2014, p. 321) note, "the multiverse may be a philosophical rather than a scientific hypothesis, for it lacks a definitive observational anchor." Under these circumstances, the epistemic status of cosmology shifts: it becomes a discipline grounded in models, analogies, and interpretive frameworks rather than in direct empirical access to the whole.

This confinement of the observer marks a significant philosophical shift. Since the time of Galileo and Newton, physics has pursued invariance — laws that are held everywhere and for everyone, regardless of point of view. Eternal inflation, however, places the observer within an unavoidable context. Every measurement becomes part of a narrative constructed from a particular vantage point, and every law takes on the character of regional grammar rather than a universal syntax. The anthropic principle, often invoked to explain why our universe supports life, becomes in this setting a hermeneutic principle: meaning is generated from within the system, not imposed from above.

Sean Carroll (2019) argues that this perspectival turn does not diminish cosmology but reframes it as a theory of conditional knowledge. "The multiverse teaches us humility. What we know depends on where we are in the cosmic landscape" (Carroll, 2019, p. 365). From this viewpoint, cosmology abandons the aspiration to all-encompassing knowledge and instead adopts a reflective stance — recognizing that its models are shaped by the particular region of the infinite in which the observer finds themselves.

1.5 The Infinite as Epistemic Condition

The logic of eternal inflation replaces the finite cosmos of classical physics with an infinite epistemic horizon. In this framework, the universe does not merely *contain* infinity; it takes on the character of the infinite through its own continual self-replication. Every attempt to model such a cosmos expands, rather than narrows, the field of uncertainty. The physicist becomes a cartographer working with maps that enlarge as they are drawn, charting a landscape that refuses to stay still. The resulting picture resembles theology not in content but in structure: both seek to interpret what cannot be grasped in its entirety.

Through this shift, cosmology finds itself aligned with hermeneutics in a shared task — the interpretation of what resists representation. The inflationary equations, however precise, operate as symbols of our broader interpretive predicament: they describe a universe whose coherence depends on meanings that persist beyond what can be directly observed. This

epistemic open-endedness demands a philosophical counterpart — a hermeneutic horizon within which the infinite becomes, if not representable, at least intelligible.

2. The Hermeneutic Horizon of the Infinite

The concept of eternal inflation displaces the notion of the universe as a single, self-contained totality. Instead, it proposes an unbounded manifold of universes — each finite, yet collectively infinite. This shift, while born from physics, inaugurates a new hermeneutic situation. Meaning itself becomes distributed across an ensemble of worlds that no single observer can encompass. The epistemic horizon of cosmology turns into a metaphor for the horizon of interpretation.

2.1 The Crisis of Totality

From Aristotle's *On the Heavens* to Einstein's general relativity, cosmology traditionally assumed that the universe could, at least in principle, be grasped as a whole. Even when it was conceived as spatially infinite, its structure was thought to be uniform and governed by laws whose universality made them accessible to human reason. Eternal inflation overturns this expectation. Different regions of the cosmos may operate under different laws, vacuum energies, or fundamental constants. As George Ellis (2011, p. 1210) notes, "In the multiverse, the very idea of a single set of physical laws may have no meaning beyond a local domain."

Such a fragmentation of law inevitably entails a fragmentation of meaning. The universe can no longer function as the transparent mirror of rational order that it once represented in the Western philosophical imagination. Instead, it becomes an open field of partial viewpoints — an ontological pluralism that echoes the linguistic and cultural pluralism with which hermeneutics has long been concerned. Hans-Georg Gadamer (1960/2004, p. 302) emphasized that understanding is always situated within a horizon that is both inclusive and limited: "The horizon is that range of vision that includes everything that can be seen from a particular vantage point." In the context of eternal inflation, this metaphor acquires a literal cosmological expression. The horizon becomes not simply an image of thought but the actual boundary of each observable universe.

To interpret cosmology under these conditions is to recognize that our own horizon of intelligibility is shaped — and constrained — by the structure of spacetime itself. What lies beyond cannot be observed, yet it influences what appears within our view. The cosmological horizon of physics thereby becomes the hermeneutic horizon of thought. Both mark the limit that gives meaning to its shape by setting its boundaries.

2.2 Cassirer and the Symbolic Construction of Infinity

For Ernst Cassirer, writing in the early twentieth century, human knowledge is not a passive mirror of the world but an active process of constructing meaning through symbolic forms — language, myth, art, and science. Each form offers its own mode of ordering experience, shaping the raw manifold of sensation into patterns that can be grasped and understood. The mathematical form, in particular, abstracts from concrete experience to articulate the relations that make experience intelligible. "Mathematical thought," Cassirer (1923/1953, p. 25) writes, "no longer seeks to copy the given but to construct the possible."

Within the inflationary multiverse, this constructive impulse appears with unprecedented force. The equations of cosmology do not simply describe a universe already there; they generate a space of possible universes. Different parameters in the inflaton potential yield

different spacetimes and different physical orders. Here, the mathematical symbol becomes cosmogenic. What Cassirer treated as a symbolic mode of world-construction becomes, in cosmological practice, an operative principle: to calculate a possibility is, in a certain sense, to bring a world into conceptual being.

This shift carries deep hermeneutic implications. If mathematics is a symbolic form rather than a direct representation, then the multiverse becomes a proliferation of symbols without a single referent. Each bubble universe stands as a local realization of a symbolic schema, a partial actualization of the possibilities encoded in the equations. The result is a cosmos intelligible only piecemeal, a patchwork of meanings with no overarching interpretive key.

Cassirer's central insight — that science constructs rather than merely discovers — thus anticipates the epistemic situation created by eternal inflation. The equations lose their transparency as representations and instead appear as creative projections, interpretive acts that open new ontological domains. Viewed hermeneutically, the multiverse is not a physical terrain alone but also an interpretive one: a topology of potential meanings that no single perspective can unify.

2.3 Gadamer and the Moving Horizon

If Cassirer illuminates the constructive dimension of symbolic forms, Gadamer offers a phenomenology of how understanding itself takes place. In *Truth and Method* (1960/2004), Gadamer argues that understanding is not the retrieval of an original meaning but the event of a "fusion of horizons," in which the interpreter's horizon and that of the text encounter one another and are mutually transformed.

In the setting of eternal inflation, such a fusion becomes structurally impossible. The horizons of distinct universes never meet; no signal or observation can traverse the inflating voids between them. Each cosmic region remains enclosed within its own frame of intelligibility. What functions in hermeneutics as a metaphor for shared understanding becomes, in this cosmological context, an image of radical separation. The universe, in Gadamerian terms, is not one horizon expanding through dialogue but an infinite multiplicity of horizons that can never converge.

And yet, this very impossibility demands interpretation at a higher level. When no single horizon can encompass the whole, reflection shifts from understanding the universe to understanding the conditions that make understanding possible. Cosmology becomes reflexive: it interprets the limits of interpretation itself. As Paul Ricoeur (1976, p. 8) wrote, "Interpretation is the work of thought which consists in deciphering the hidden meaning in the apparent meaning." Eternal inflation lends this claim a new resonance: the hidden meaning is not behind appearances but beyond horizons in regions that remain forever inaccessible.

This hermeneutic condition — where meaning is approached only through its absence — recalls Martin Heidegger's conception of Being as that which withdraws. In *Being and Time* (1927/1962), Heidegger describes the human relation to Being as one of disclosure that is inseparable from concealment; we encounter Being only through what it withholds. Likewise, in cosmology, we encounter the universe through the boundaries that hide most of it from view. The cosmological horizon thus becomes a metaphysical analogue of Heidegger's *aletheia*: truth as an unveiling that never fully removes its veil.

2.4 From the Finite Mind to the Infinite Cosmos

The philosophical implications of this parallel are considerable. For the first time, cosmology and hermeneutics appear to converge on a shared structural insight: understanding

is fundamentally finite, shaped by horizons that enable intelligibility even as they restrict it. In the inflationary multiverse, each observer's limited horizon becomes a concrete expression of this hermeneutic condition. The infinite is not a magnitude awaiting measurement but the ever-retreating background against which meaning is formed.

Viewed in this way, the traditional divide between science and philosophy begins to dissolve. Cosmology is not an enterprise conducted outside interpretation; it participates in interpretation from the outset. The equations of eternal inflation can be read as interpretive gestures cast into mathematical form — efforts to articulate what escapes direct comprehension. As John Barrow (2005, p. 7) observes, *"Infinity is not a place to be visited but a way of understanding the limits of thought."* The infinite, whether approached through physics or through language, provides the horizon within which meaning becomes possible.

From this perspective, the multiverse can be understood as an allegory of human knowing: a vast array of local truths, each internally coherent yet inaccessible to the others. Every universe resembles a text in a library lacking catalogues, evoking Borges's "Library of Babel," where all conceivable books exist but no reader can ever grasp the whole (Borges, 1941/1998). In this sense, the inflationary cosmos becomes a hermeneutic labyrinth — a space in which interpretations multiply without converging on a final, unifying view.

2.5 The Infinite as Hermeneutic Principle

What does it mean, then, to speak of a hermeneutics of the infinite? It means recognizing that interpretation must adjust itself to a cosmos that resists total comprehension. Classical hermeneutics sought to relate part and whole, finite and infinite, by showing how understanding arises within that relation. Eternal inflation disrupts this structure. The "whole" can no longer be conceived as a unified totality. Meaning emerges not from synthesis but from movement — an ongoing navigation across local pockets of sense.

In theological traditions, the infinite belonged to God, the unreachable source from which all being flowed. In cosmology, it appears instead as a process: the continual generation of new worlds. Yet the human task in both domains remains strikingly similar — to interpret what always exceeds the scope of interpretation. A hermeneutics of the infinite is therefore not an attempt to know everything but an acknowledgment of the impossibility of doing so. It is a discipline of understanding grounded in the recognition of its own limits.

Eternal inflation becomes, in this light, a mirror of our interpretive condition. The multiverse is not merely an object to be studied; it is a symbol of the limits that shape knowledge itself — finite understanding set before an unbounded reality. To read the universe, as to read any text, is to encounter an excess that no system can fully absorb. The task of philosophy is not to eliminate this excess but to dwell within it, to think where meaning approaches its own edge.

3. The Failure of Representation

If eternal inflation reveals the infinite as an epistemic condition, it also brings into view a second consequence: the failure of representation that follows from such infinity. Every cosmological model — however refined — must compress what is unbounded into finite symbols, translating an immeasurable totality into the limited grammar of mathematics. Modeling the universe becomes, inevitably, an act of translation, and as any translator knows, translation always alters what it conveys. Something is lost, displaced, or reshaped in the passage from the immeasurable to the representable.

3.1 From Map to Mirror: The End of Representation

From Aristotle's nested spheres to Einstein's manifold, cosmology has long aimed to present an image of totality. The universe served not only as an object of investigation but as a mirror of rational order. Eternal inflation disrupts this aspiration. The multiverse cannot be pictured in any literal sense; it can only be computed. It is no longer a cosmos available to vision but an algorithmic process that generates its own field of possibilities. As George Ellis (2011) and John Barrow (2005) both observe, a model that seeks to include everything cannot be verified from within. Observation requires a vantage point outside what is observed, yet nothing exists "outside" the universe. The tension recalls Wittgenstein's remark in the *Tractatus* (§5.632): "The subject does not belong to the world but is a limit of the world."

In *The Order of Things* (1966/1970), Michel Foucault argued that the modern age begins when representation ceases to reflect the world and becomes an autonomous network of relations. Something comparable occurs in contemporary cosmology. Mathematical structures that once described the universe now generate internal realities of their own. As in Foucault's epistemic shift, the order of representation gives way to the order of production.

This shift underlies what might be called the cartographic paradox of cosmology. To map the universe is to create a space that mirrors our conceptual tools more faithfully than the cosmos itself. The map no longer records exploration; it initiates it. In the inflationary multiverse, the equations themselves bring into being the landscape they portray. The "cosmic landscape" of string theory (Susskind, 2005) illustrates this logic vividly: a configuration space of roughly 10^{500} possible vacua, each corresponding to a different universe. Here, the map effectively replaces the territory.

The representational failure of cosmology is therefore not a mark of incomplete knowledge but an inherent feature of the attempt to know an infinite system. The universe resists depiction not because it is concealed but because representation is itself generative — always producing more than it can encompass. This is what Paul Ricoeur (1976, pp. 87–88) called the "surplus of meaning": the excess that eludes any final interpretation. In cosmology, this surplus appears as the unobservable infinity beyond our cosmic horizon — the remainder that sustains the very possibility of understanding.

3.2 The Horizon as Hermeneutic Structure

The cosmological horizon, introduced through general relativity and later sharpened by inflationary theory, functions as both a physical boundary and a conceptual one. It marks the region of spacetime from which light has reached us since the Big Bang; beyond it, information remains forever inaccessible — not because it is absent, but because it cannot cross into our view. Stephen Hawking (1974) and Roger Penrose (1989) demonstrated that such horizons are not fixed walls but dynamic properties of spacetime — event horizons that hide singularities and reshape what can be known.

From a hermeneutic perspective, the horizon works in much the same way. It is not the limit of understanding but its enabling structure. We make sense of the world by delimiting it; interpretation proceeds by drawing boundaries. As Gadamer (1960/2004, p. 304) reminds us, "To acquire a horizon means that one learns to look beyond what is close at hand." Yet in cosmology, what lies beyond cannot be brought nearer. The infinite does not broaden comprehension but disperses it into an ever-receding vista.

This is not a scientific defeat but a revelation of cosmology's interpretive character. Every model offers only a partial opening onto the whole, shaped by the position of an observer who cannot exit the system. To represent the universe is, inevitably, to construct a horizon around

oneself. The task of cosmology is thus not to remove horizons but to interpret them — to understand both what they reveal and what they conceal.

3.3 The Epistemology of the Unobservable

Confronted with unobservable infinities, cosmology increasingly turns to indirect forms of reasoning — analogy, coherence, and aesthetic judgment. As Davies (2004, p. 742) notes, "We can no longer rely on empirical closure; instead, we evaluate theories by coherence, simplicity, and fertility." This shift signals a movement away from strict positivism toward a hermeneutic epistemology, in which meaning arises from interpretation rather than from direct verification.

The unobservable regions of the multiverse are not beyond thought; they function as its necessary horizon. They play a role similar to that once served by myth in premodern cosmologies: providing symbolic order where direct knowledge is unattainable. As Hans Blumenberg (1966/1985) argues in *The Legitimacy of the Modern Age*, the mythic impulse does not vanish but reappears in new intellectual forms. Eternal inflation may represent not the culmination of rational explanation but its transformation into a new myth of the infinite — a scientifically articulated mystery.

In this sense, cosmology reclaims an ancient narrative function. The story of endless creation replaces the story of a single origin; "in the beginning" becomes "always beginning." The equations of physics echo what myths once expressed: that both the universe and the mind contemplating it are caught in continual cycles of emergence and dissolution. The failure of representation is therefore not a flaw but an indication of a deeper symmetry between cosmology and consciousness — each is a system that cannot fully capture itself.

3.4 The Language of the Infinite

Wittgenstein ends the *Tractatus* with the stark injunction: "Whereof one cannot speak, thereof one must be silent" (§7). Yet silence, in this context, is not an absence of representation but a gesture that acknowledges what lies beyond it. In eternal inflation, silence assumes the shape of mathematical abstraction. The equations articulate what ordinary language cannot, though they do so in a mode that remains mute about meaning.

As Barrow (2005) and Ellis (2011) both emphasize, mathematical consistency is not equivalent to intelligibility. A theory may be internally coherent and still resist understanding. The multiverse can appear naturally within the equations, yet refuse any stable narrative form. Cosmology oscillates between two idioms: the precise but inexpressive language of mathematics and the more flexible, metaphor-rich language of philosophy. The challenge is to allow these languages to inform one another without collapsing one into the other.

This tension echoes Ernst Cassirer's (1923/1953) insight that symbolic forms do not form a hierarchy but a series of translations across different modes of sense. Science, art, and myth each give form to the infinite in their own way. In the modern era, mathematics has become the dominant symbolic form, yet it carries within it a tension akin to that which once animated theology: the effort to speak about what ultimately exceeds language. The inflationary multiverse, as a theoretical construct, is therefore not only a physical model but also a linguistic act — a new grammar devised for approaching the ineffable.

3.5 The Representation That Fails and Persists

To describe the failure of representation is not to abandon the pursuit of knowledge but to reframe it. Representation falls short not because reality is unreachable, but because reality

exceeds any single act of grasping. Every model, every equation, every metaphor renders a portion of the infinite into human form. The failure is paradoxical: it is the very condition that allows understanding to proceed. As Ricoeur (1976) argues, interpretation does not confer possession of the real; it opens a pathway through the realm of the possible.

In this sense, eternal inflation can be viewed as an expansive allegory of the human condition. We inhabit one limited province of meaning within a far broader semantic multiverse. Our theories and narratives function as local coordinates within an ever-growing interpretive landscape. The cosmos reflects our thought in this respect: infinite in scope, finite in comprehension. Representation does not come to an end here; it continually begins anew.

4. Toward a Negative Hermeneutics of Cosmology

The logic of eternal inflation brings cosmology to a paradoxical threshold: a theory that claims to explain everything by appealing to what can never be observed. If the multiverse is real, it would encompass every possible arrangement of matter and law, making explanation nearly indistinguishable from enumeration. Prediction blurs into proliferation; probability becomes an index of unbounded possibility. At this limit, cosmology no longer fits the mold of a purely empirical science. It becomes a discipline of interpretation, though one that requires a different interpretive posture — one that seeks meaning not in what is present, but in what withdraws.

To interpret a theory concerned with the unobservable is to engage in what might be called negative hermeneutics: a mode of understanding grounded not in disclosure but in concealment. While positive hermeneutics aims to recover meaning from a given text, negative hermeneutics treats opacity itself as revelatory. In this respect, the cosmologist encounters a dilemma familiar to the theologian or phenomenologist: the task of interpreting what cannot be fully brought to light without distortion.

4.1 Interpretation after Representation

As discussed above, the limits of representation do not extinguish meaning; they transform it. What lies beyond the cosmological horizon is not devoid of significance — it is meaning that lacks manifestation. Martin Heidegger described truth as *aletheia*, an unconcealment that always carries within it an element of concealment. “Every disclosure,” he wrote, “is simultaneously a covering up” (Heidegger, 1927/1962, p. 133). Something similar occurs in cosmology: each theoretical advance reveals new aspects of the universe while expanding the domain of what remains inscrutable. The inflationary picture enlarges our understanding even as it enlarges the territory of the unexplained.

Under these conditions, interpretation assumes a dual role. At one level, it operates as explication — the translation of mathematical expressions into conceptual frameworks. At another, it functions as acknowledgment — the recognition that some aspects of the universe will remain beyond comprehension. Gadamer (1960/2004) conceived interpretation as a dialogue between what is known and what resists knowing, a fusion of horizons. In the cosmological setting, this dialogue is profoundly asymmetrical: our horizon meets that of the universe only by acknowledging that they can never coincide. The infinite remains outside our grasp, shaping the finite from the position of absence.

Paul Ricoeur (1976, p. 33) described this posture as the “hermeneutics of suspicion,” a way of reading that treats even the clearest text as concealing further layers of meaning. Applied to cosmology, this suggests that every theoretical statement functions as a displacement — a metaphor for what cannot be said directly. The equations of eternal inflation become, in this

sense, a form of symbolic discourse. They do not describe the universe as it is; they describe how it hides itself.

4.2 The Cosmological Sublime

The experience of this interpretive limit recalls what Immanuel Kant (1790/2000) described as the mathematical sublime — the feeling that arises when the imagination fails to encompass the magnitudes presented by reason. The infinite, Kant argued, overwhelms the senses yet elevates the mind, compelling the subject to recognize reason's independence from perception. In the context of eternal inflation, however, the relationship is inverted. It is not reason that asserts its supremacy over the infinite; it is the infinite that exposes the boundaries of reason.

John Barrow (2005, p. 235) has suggested that contemporary cosmology embodies a "new form of the sublime," one rooted not in awe before vastness but in the vertigo produced by incompleteness. The equations that describe the multiverse sketch the outline of totality only to reveal that such totality escapes containment. The cosmological sublime thus lies not in the grandeur of the universe but in the discomfort of interpretation — the realization that meaning must continue even when closure is impossible.

This aesthetic dimension of knowledge is not an embellishment but a structural feature. As Hans Blumenberg (1966/1985) observed, modern science inherits from theology the task of addressing the infinite without collapsing it into the finite. The language of cosmology, precise though it is, continues a symbolic labor long performed by myth: to express what cannot be fully represented. In this respect, eternal inflation becomes a secularized theology of creation — a kind of *ars magna* of the infinite, faintly echoing Llull's medieval dream of a combinatorial logic capable of embracing all truths.

4.3 Knowing by Not Knowing

The negative hermeneutics of cosmology must therefore begin by recognizing that ignorance is not the negation of knowledge but its precondition. As Ellis and Silk (2014, p. 323) note, "Science does not progress by eliminating uncertainty but by refining our awareness of it." To interpret the universe is to trace the silhouette of ignorance — to map the darkness that frames every illumination.

Modern cosmology embodies this principle unmistakably. Each new theoretical advance — whether in inflation, string theory, or quantum gravity — brings us closer to an understanding that retreats even as it is approached. The frontier of the knowable expands, but so does the region of what cannot yet be known. Knowledge grows not through closure but through exposure — by revealing deeper layers of mystery within the real.

In this dynamic, interpretation becomes an act of balancing assertion with restraint. Ricoeur (1976) described this as the dialectic between discourse and the surplus of meaning: every act of understanding opens more possibilities than it resolves. In cosmology, the infinite plays precisely this role — an excess of intelligibility that ensures thought never fully coincides with its object. Ignorance, viewed in this light, is not a gap to be eliminated but the horizon that sustains inquiry: the openness that keeps understanding alive.

4.4 The Observer and the Abyss

The cosmologist, much like the hermeneut, works at the edge of an abyss — the point where explanation yields to reflection. The observer's horizon, both physical and cognitive, determines not only what can be seen but what can be conceived. Hawking's (1988) well-

known question, "What breathes fire into the equations?", remains unresolved not because it lies outside science, but because it exposes the existential core of scientific inquiry.

From a hermeneutic point of view, the finitude of the observer is not a limitation to be overcome but the very locus where meaning takes shape. Heidegger (1927/1962) would say that *Dasein*, the being that understands Being, is defined by its limits — by its being-toward-death. In an analogous sense, cosmology is a science-toward-horizon: it grasps the universe only by working within its own boundaries. The infinite becomes the precondition of finitude rather than its negation.

Acknowledging this changes the ethical character of interpretation. Cosmology has long felt the pull of totalization — the hope that one final theory might explain everything. A negative hermeneutics resists this impulse by accepting partiality as the authentic condition of truth. As Gadamer (1960/2004, p. 302) observed, "Understanding is never a subjective relation to a given object but the participation in a meaning that is common." In this light, the multiverse is not an object to be mastered but a conversation between human reason and cosmic infinity.

4.5 Hermeneutics as Cosmological Practice

If cosmology is to be understood hermeneutically, its task extends beyond constructing models to interpreting them — making explicit the conditions under which its symbols acquire sense. This shift moves inquiry from ontology to phenomenology, from questions about what the universe *is* to questions about how it appears within the limits of understanding. The equations of eternal inflation are not transparent windows onto the real; they are structured languages through which the real becomes thinkable.

A negative landscape of interpretation reads these equations as texts — texts written in a symbolic grammar that both discloses and withholds. The hermeneutical task is not to simplify them but to acknowledge how they mediate between the finite and the infinite. Interpretation here aims to preserve complexity rather than resolve it. To understand an infinite universe is to recognize that every explanation remains provisional — each a metaphor for its own incompleteness.

In this regard, cosmology echoes apophatic or negative theology, which speaks of the divine primarily through negation. God is not this, not that. Similarly, the cosmologist describes the universe by what it is not: not finite, not closed, not fully representable. Such negation is not resignation; it is methodological. It turns ignorance into a tool and transforms limitation into a mode of insight.

4.6 Interpreting the Uninterpretable

In the end, the hermeneutics of cosmology confronts the paradox of interpreting what resists interpretation. The universe, like a sacred text without an identifiable author, demands to be read even though it refuses full comprehension. The task of philosophy is not to dissolve this tension but to sustain it. Hans Blumenberg (1966/1985) observed that modernity persists by continually rearticulating the absolute through new symbols — replacing divine transcendence with mathematical infinity, revelation with rational structure, myth with theoretical models.

Eternal inflation is the most recent of these symbols: a formal myth of the infinite emerging from quantum field equations and the imagination of human reason. Its significance lies not in empirical confirmation but in its capacity to articulate the boundaries of intelligibility

itself. To study such a cosmos is to step into the hermeneutic circle — to interpret the very conditions of interpretation.

The negative hermeneutics outlined here does not question the reality of the universe. It questions the finality of our representations. It affirms that meaning persists precisely because understanding never reaches completion. In this sense, the cosmos is not a finished manuscript but an open commentary — an ongoing exegesis written into expanding space and time. To interpret it is to inhabit the threshold where knowledge touches wonder, where science shades into philosophy, and where each horizon conceals another still beyond it.

Conclusion – Interpreting the Infinite

From the geometric cosmos of Aristotle to the expanding universe revealed by Hubble and De Sitter, cosmology has always tried to render the universe intelligible. The theory of eternal inflation marks a break with that tradition. It replaces the notion of a single, ordered cosmos with an immense ensemble of self-reproducing universes — each governed by different parameters and inaccessible to the others. What began as a physical account of origins becomes, in the end, a reflection on the limits of knowledge itself.

Within this new landscape, cosmology appears less as an ontology than as an interpretive practice. Every model — from Linde's chaotic inflation to Vilenkin's quantum tunneling — translates the universe into mathematical form, yet no equation can exhaust the meaning it attempts to convey. As Cassirer argued, scientific knowledge constructs order rather than merely reflecting it. The inflationary multiverse exemplifies this: a symbolic rendering of the infinite in which mathematics generates the very worlds it seeks to describe.

Hermeneutics, in this context, names the attempt to understand what cannot be fully modeled. For Gadamer, understanding is never the mastery of a system but participation in its unfolding. The cosmologist, much like the interpreter, works within a horizon shaped by limits — what can be observed, measured, or simulated. Such limits do not halt inquiry; they give it orientation. As Heidegger emphasized, finitude is the condition of disclosure: boundaries are what allow meaning to emerge.

Eternal inflation thus transforms infinity from an obstacle into a medium for understanding. Infinite becomes not what eludes knowledge, but what sustains it — the open backdrop against which each local theory acquires its significance. Explanation and interpretation converge: to describe spacetime is already to articulate the structure of comprehension itself.

The task moving forward is to maintain scientific rigor while acknowledging this interpretive dimension. Cosmology remains a precise discipline, yet one is increasingly aware that modeling the universe is also a dialogue with the unknown. The infinite is not reason's negation but its horizon — a reminder that knowledge, like the universe it studies, grows by confronting what it cannot yet contain.

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