The Modal Discipline of Cosmic Origin: a Critical–Propositional Analysis of the Big Bang Theory in Confrontation with the Theory of Objectivity

Vidamor Cabannas

Denivaldo Silva

Authors' Note

This article benefited from the analytical support of ChatGPT in bibliographic organization, in the comparative structuring between Big Bang cosmology and the Theory of Objectivity, and in the systematization of points of compatibility, tension, and testability.

Feira de Santana – Bahia – Brazil

2026

Contents

Abstract

This article presents an expanded critical–propositional analysis of the Big Bang Theory based on classical, technical, and observational cosmological bibliography, in confrontation with the foundational, recent, supporting, and dialogical bibliography of the Theory of Objectivity (TO). Its central aim is to examine to what extent standard cosmology satisfies the modal necessity requirements postulated by TO and at which points it remains ontologically insufficient. The paper argues that the Big Bang Theory is extraordinarily robust as a physical-observational description of the hot, expanding primordial universe, especially in light of the cosmic microwave background, primordial nucleosynthesis, metric expansion, and structure formation; yet such robustness does not amount to a complete ontology of the origin of the universe. From the Seven Absolute Truths of TO, phenomenic elements, Inductive Effects, Gödelian discipline, the Law of Logical Minimum, the cosmogonic theorem, and the cosmological Eras of the Theory of Objectivity, a reinterpretation is proposed according to which the Big Bang may be understood not as the absolute origin of being, but as a phenomenic phase of energetic, material, and informational exteriorization of a deeper genesis. In this perspective, the transcendent element is understood as knowledge or information produced in atomic relations and equivalent to atomic radiations. The article concludes that the relation between the Big Bang and TO should not be read as one of simple exclusion, but rather as one of epistemological and ontological hierarchy: standard cosmology may be preserved as a highly successful description of an observable phase of the cosmos, while TO claims the modal, logical, and ontological level of ultimate foundation.

Keywords: Big Bang; Theory of Objectivity; cosmology; modal ontology; cosmic radiation; nucleosynthesis; information; origin of the universe; Gödelian discipline; cosmological eras.

Resumo

Este artigo apresenta uma análise crítico–propositiva ampliada da Teoria do Big Bang a partir da bibliografia cosmológica clássica, técnica e observacional, em confronto com a bibliografia fundante, recente, de apoio e de diálogo da Teoria da Objetividade (TO). O objetivo central é examinar em que medida a cosmologia padrão satisfaz as exigências de necessidade modal postuladas pela TO e em que pontos ela permanece ontologicamente insuficiente. Sustenta-se que a Teoria do Big Bang é extraordinariamente robusta como descrição físico-observacional do universo primordial quente e em expansão, especialmente à luz da radiação cósmica de fundo, da nucleossíntese primordial, da expansão métrica e da formação de estruturas; contudo, essa robustez não equivale a uma ontologia completa da origem do universo. A partir das Sete Verdades Absolutas da TO, dos elementos fenomênicos, dos Efeitos Indutores, da disciplina gödeliana, da Lei do Mínimo Lógico, do teorema cosmogênico e das Eras cosmológicas da Teoria da Objetividade, propõe-se uma releitura segundo a qual o Big Bang pode ser interpretado não como origem absoluta do ser, mas como fase fenomênica de exteriorização energética, material e informacional de uma gênese mais profunda. Nessa perspectiva, o elemento transcendente é compreendido como conhecimento ou informação produzidos nas relações atômicas e equivalentes às radiações atômicas. O artigo conclui que a relação entre Big Bang e TO não deve ser pensada como simples exclusão, mas como hierarquização epistemológica e ontológica: a cosmologia padrão pode ser preservada como descrição altamente bem-sucedida de uma fase observável do cosmos, enquanto a TO reivindica o plano modal, lógico e ontológico de sua fundamentação última.

Palavras-chave: Big Bang; Teoria da Objetividade; cosmologia; ontologia modal; radiação cósmica; nucleossíntese; informação; origem do universo; disciplina gödeliana; eras cosmológicas.

1. Introduction

The Big Bang Theory has occupied, since the twentieth century, a central place in modern cosmology. In its mature scientific formulation, it does not designate a vulgar "explosion" in space, but rather a physical-mathematical framework that describes the evolution of the universe from an extremely hot and dense state, articulating cosmic expansion, the thermal physics of the primordial universe, the nucleosynthesis of light elements, the cosmic microwave background radiation, and the later formation of structures. NASA's institutional synthesis presents this cosmic history as a sequence including inflation, transfer of energy into matter and light, nucleosynthesis, recombination, radiative decoupling, and the development of structures [22, 20, 21]. The final results of the *Planck* collaboration continue to rank among the strongest confirmations of the ΛCDM framework, while the *Particle Data Group* review reaffirms primordial nucleosynthesis as one of the deepest and most reliable probes of the early universe [1, 15].

Yet the observational robustness of a cosmological theory does not automatically resolve its ontological sufficiency. A model may describe the evolution of the observable universe with great precision without answering, in logical and metaphysical terms, why a universe exists at all, why laws exist, why such laws are intelligible, or why mathematics itself fits the description of reality. It is precisely at this point that the Theory of Objectivity intervenes. Since its foundational bibliography, it has presented itself as a third theory of the origin of the universe, alternative to both the Big Bang Theory and creationism, proposing an axiological-modal system aimed not only at describing phenomena, but at explicating the necessary conditions of possibility of the universe itself [9, 10].

The recent bibliography deepens this program through Gödelian discipline, the Law of Logical Minimum, operational bridges with contemporary physics, the phenomenic table, and the articulation between modal ontology and testability [8, 4, 6, 5, 7]. Rather than competing with empirical cosmology at the same methodological level, TO seeks to investigate what makes any cosmology possible in the first place. What is at stake is not merely the description of the young universe, but the discipline of the very concept of origin.

This article argues that the confrontation between the Big Bang and TO should not be conducted as a simplistic antagonism between science and metaphysics, nor as an easy absorption of one by the other. The decisive issue is one of explanatory hierarchy. To what extent does standard cosmology, powerful as it is, provide only a theory of phase? And to what extent does TO seek to describe not one physical episode among others, but the modal grammar without which no physical episode becomes intelligible? Answering this will require examining compatibilities, tensions, insufficiencies, heuristic convergences, and possibilities of operational bridging.

In this sense, the contribution of this text is twofold. First, it preserves the scientific force of contemporary cosmology, avoiding caricatures. Second, it submits that force to a more radical modal discipline, interrogating not only the observable structure of the cosmos, but also its logical possibility, its ontological limits, and its informational-transcendent dimension.

2. The Big Bang Theory in Classical, Technical, and Observational Cosmological Bibliography

Modern cosmological bibliography presents a remarkably stable picture regarding the hard core of the Big Bang Theory. In introductory and reference works such as those by Liddle, Ryden, Peebles, Weinberg, Dodelson and Schmidt, and Kolb and Turner, standard cosmology is constructed upon several pillars: Friedmann–Lemaître–Robertson–Walker geometries, general relativity as the gravitational background structure, the thermodynamics of the primordial universe, the nucleosynthesis of light elements, the cosmic microwave background, and the gravitational growth of structures [19, 26, 23, 28, 27, 12, 17].

Pedagogically, the Big Bang has become the name of the framework according to which the universe was, in the past, in a state far hotter, denser, and more homogeneous than the one observed today. The essential concept is not an explosion into a preexisting space, but the expansion of physical spacetime itself. This distinction, repeated in technical works and in NASA's contemporary presentation, is decisive for avoiding popular misunderstandings. When NASA describes cosmic history, it organizes it as a sequence of phases: inflation, transfer of energy into matter and light, nucleosynthesis, the formation of atoms, the release of the light now observed as the CMB, and the subsequent growth of structures [22, 20].

At the observational level, the model has received extraordinary support from the CMB. The cosmological-parameters paper of the *Planck* collaboration presents the final results of full-mission measurements of the anisotropies of the cosmic background, combining temperature, polarization, and lensing reconstruction, and finds strong consistency with the spatially flat six-parameter ΛCDM model [1]. This does not mean that all cosmological problems have been definitively closed, but it does mean that standard cosmology has reached a rare level of convergence among theory, statistical inference, and high-precision observation.

Primordial nucleosynthesis is another essential pillar. The 2025 *Particle Data Group* review describes it as the deepest reliable probe of the primordial universe precisely because it rests upon well-understood physics and yields quantitative predictions about the abundances of deuterium, helium, and lithium [15]. In addition, Cooke's synthesis reinforces the centrality of BBN as a point of connection among particle physics, thermal cosmology, and observed abundances [11].

Large-scale structure formation also reinforces the consistency of the framework. The small anisotropies of the CMB function as seeds for subsequent gravitational growth. The history of the observable universe, therefore, is not one of absolute discontinuity between the primordial plasma and the structured cosmos, but of chained evolution. In terms of standard cosmology, there is a physical genealogy; in terms of TO, this already suggests a partial affinity with Truth 6, according to which every element is composed of prior elements.

However, recent bibliography shows that the scenario is not entirely pacified. JWST has been revealing very luminous and apparently very massive galaxies at high redshifts, rekindling debates about star-formation rates, mass inferences, dark matter halos, and the limits of usual modeling. Part of the recent literature speaks of a challenge to ΛCDM; another part insists that refinements in IMF, star-formation histories, and halo models may reduce the tension without requiring abandonment of the background framework [14]. In other words, JWST has not refuted standard cosmology, but it has made more visible the distinction between a robust cosmological framework and astrophysical models still under adjustment.

This situation is methodologically important for TO. It shows that even theories very strong at the empirical level remain open in their interpretation and in their limits. From this point onward, TO's modal critique need not assume the naive role of overthrowing the Big Bang on the basis of local anomalies; on the contrary, it can recognize the extraordinary solidity of the model as a phase-description precisely in order then to question its ontological completeness.

3. The Modal Framework of the Theory of Objectivity and Its Criteria of Examination

The Theory of Objectivity does not present itself as merely a rival physical hypothesis. It proposes itself as a modal ontology founded on Seven Absolute Truths, understood as necessary conditions for the intelligibility of the universe. In summarized form: (1) Nothingness is a Primitive and Eternal Mathematical Essence; (2) every element possesses its own field that singularizes it; (3) infinity represents the non-element necessary for the logical definition of the universe; (4) two distinct elements require at least one boundary line between them; (5) an element only exists fully if observed by at least two others; (6) every element is composed of prior elements; and (7) there is no existential universe without a substance transcendent to its quantum.

In the foundational bibliography, TO already appeared as an alternative to origin narratives that either absolutize the Big Bang or appeal to theological creation [9, 10]. What matters, however, is to note the later development of the program. In recent works, Cabannas and Silva make explicit the need for a discipline of levels: the modal sphere must not be confused with immediate empirical prediction, and quantitative physics must not be confused with ultimate foundation [8, 4, 6]. The record *From Modal Axioms to Empirical Contact* formulates precisely this methodological problem, articulating Gödelian discipline, the Law of Logical

Minimum, and operational bridges [4]. Meanwhile, *Modal Ontology and Testability* presents TO as a modal grammar in disciplined dialogue with contemporary physics [6].

This means that TO's criterion does not ask merely whether a theory works with the data, but whether it satisfies minimal logical requirements for the intelligibility of reality. Standard cosmology, for instance, may be highly successful in describing the universe after a certain initial thermal phase and yet remain ontologically incomplete. TO shifts the question from "how does the observable universe evolve?" to "what must be true for any universe to emerge, differentiate itself, preserve memory, and attain full existence?"

At this point, TO enters into dialogue with certain classical philosophical intuitions, even though it is not reducible to any of them. Einstein insisted that the intelligibility of the world is a profoundly notable fact [13]; Heisenberg perceived that modern physics does not eliminate the need for reflection on the status of reality [16]; Bohm examined implicate orders [2]; Penrose preserved the demand for deep mathematical structure [24]; Prigogine and Stengers thematized the emergence of order [25]; Kuhn reminded us that major scientific changes reconfigure criteria of intelligibility [18]. TO radicalizes this entire set by treating modal necessity not as an external commentary on physics, but as a precondition of any physics whatsoever.

Moreover, TO's framework is inseparable from a relational ontology. The universe does not emerge as a collection of ready-made substances, but as a web of distinctions, boundaries, compositions, observations, memory, and informational transcendence. Therefore, from this perspective, the question of the Big Bang does not end with density, temperature, and expansion. The true problem is: how do difference, relation, composition, and information become possible?

4. Structural Compatibilities between the Big Bang and the Theory of Objectivity

Critical–propositional analysis does not lead to the thesis of absolute incompatibility between the Big Bang and TO. On the contrary, it reveals a series of structural compatibilities, though these are almost always asymmetrical. The Big Bang can be read as a phenomenic description of structures that TO considers logically necessary.

The first compatibility appears in Truth 4: two distinct elements require at least one boundary line between them. Standard cosmology is, to a large extent, a cosmology of progressive differentiation. There is separation between physical regimes, between thermal phases, between plasma and decoupled radiation, between regions of greater and lesser density, between fluctuations and subsequent gravitational condensation. The anisotropies of the CMB, measured with great precision by *Planck*, are empirical traces of minimal differentiation, that is, statistical boundary lines from which later cosmic structure becomes possible [1].

The second compatibility is related to Truth 6, according to which every element is composed of prior elements. Standard cosmology is deeply genealogical. Particles, light nuclei, atoms, stars, heavy elements, chemistry, planets, biochemistry, and observers arise in a chain of anteriority. The Big Bang does not provide a final ontology of this genealogy, but its physical-historical narrative confirms the importance of temporal and structural composition.

The third compatibility is epistemological and touches upon Truth 5. Without adopting an anthropomorphic reading, one may say that the full scientific existence of a cosmological phenomenon depends on its insertion into a web of confirmatory relations. The Big Bang is sustained not by one isolated datum, but by the convergence of expansion, CMB, BBN, structure formation, and complementary observations. In TO terms, this suggests that the full knowable existence of a phenomenon requires multiple observational relations.

The fourth compatibility involves Truth 2. Contemporary physics thinks of the primordial universe in terms of fields, interactions, proper signatures, potentials, and regimes. TO universalizes ontologically the idea of elemental singularity by way of its own field; standard cosmology works this out in a physical-operational key. There is no identity here, but there is conceptual resonance.

A fifth, more subtle, compatibility arises in the treatment of radiation. Standard cosmology considers radiation not merely as residue, but as a means of intelligibility of the young universe. TO, in thinking of information and atomic radiations as expressions of the transcendent, radicalizes this point. The compatibility here is not doctrinal, but heuristic: both recognize that the universe becomes knowable through its radiative traces, although TO attributes to this a deeper ontological density.

Finally, the very distinction between observable phase and ultimate foundation may be seen as partially compatible with the prudent attitude of the best contemporary physics. The *Planck* collaboration speaks of cosmological parameters of the standard model; the PDG speaks of probes of the primordial universe; NASA describes observable cosmic history [1, 15, 22]. None of these sources claims, by itself, to offer an integral metaphysics of being. TO enters precisely into that open space between successful description and unarticulated foundation.

5. Ontological and Modal Tensions between the Big Bang and the Theory of Objectivity

If there are structural convergences, the ontological tensions are profound. The first and main one concerns explanatory sufficiency. The Big Bang Theory describes the evolution of the universe from a very hot and dense state; it does not demonstrate, in its own terms, why there is something rather than nothing, why there are laws, why there is mathematical regularity, or why the initial parameters assume certain values. It is an extraordinarily powerful theory of "how it evolves," but a much quieter one regarding "why it can exist."

The second tension concerns Truth 1 of TO: "Nothingness is a Primitive and Eternal Mathematical Essence." The Big Bang, even in inflationary or quantum-cosmological versions, does not offer an ontology of Nothingness. Its "void" is generally a physical vacuum, a field, a potential, or a quantum regime, not TO's modal Nothingness. The difference is decisive. The physical vacuum is a structure of being; modal Nothingness is a logical condition prior to physicality itself.

The third tension involves Truth 3, according to which infinity is the non-element necessary for the logical definition of the universe. Standard cosmology uses limits, extrapolations, and historically the notion of singularity. However, more careful contemporary physics treats the initial singularity as a sign of breakdown in the classical formalism, not as a positive metaphysical entity. TO agrees in rejecting naive reification of singularity, but goes further: it requires that infinity be reinscribed as a logical boundary condition rather than as a physical object.

The fourth tension concerns Truth 7: there is no existential universe without a substance transcendent to its quantum. In the formulation assumed in this article, the transcendent element is knowledge or information produced in atomic relations and equivalent to atomic radiations. Standard cosmology measures physical information, entropy, radiation, anisotropies, and signals, but it does not elevate them to the status of necessary transcendent principle. TO transforms what physics usually treats as a property or a messenger into a constitutive dimension of full existence.

The fifth tension is methodological. Standard cosmology, as an empirical science, does not require explicit modal discipline in order to operate. It can build inferences, fit parameters, and make predictions without answering for ultimate ontological foundations. TO regards this absence not as neutrality, but as a limit. For TO, any theory of the origin of the universe that does not thematize the problem of the possibility of the universe itself remains incomplete.

For this reason, the disagreement between the Big Bang and TO is not really about the central observational data; it is about the status of what counts as sufficient explanation. Standard cosmology may reply that it is not its task to solve the metaphysics of being. TO will answer that, without such metaphysics, no cosmology of origin reaches the totality of the problem it claims to name.

6. The Problem of Nothingness, Infinity, and the Condition of Possibility of the Universe

Perhaps TO's greatest originality, in confrontation with the Big Bang, lies in shifting the cosmological question from the plane of the event to the plane of possibility. The problem ceases to be merely "when does expansion begin?" and becomes "what makes any cosmic emergence possible at all?"

In standard cosmology, the treatment of the "beginning" is notoriously cautious. Pedagogical language speaks of the young universe, the primordial universe, the first second, nucleosynthesis, and recombination. NASA, for example, describes the observable chronology in terms of inflation, transfer of energy into matter and light, primordial soup, and subsequent evolution [22, 20]. This is a narrative of physical phases, not an ontology of Nothingness.

TO, by contrast, states that Nothingness is not mere verbal absence, but a primitive and eternal mathematical essence. This means that nothingness cannot be equated with the quantum vacuum or with empty space. The vacuum of field theory is a nontrivial physical structure, something already saturated with properties, fluctuations, and possibilities. TO's modal Nothingness is prior to that. It functions as the logical condition of possibility for the distinction between being and phenomenic non-being.

Truth 3 completes this structure: infinity is the non-element necessary for the logical definition of the universe. This formulation allows TO to reject two frequent simplifications: first, the reification of physical singularity; second, the elimination of the problem of limit. Infinity, in this key, is not a "thing" existing among things, but a logical boundary condition without which the universe cannot be defined.

The importance of this is great for reading the Big Bang. If the initial singularity is merely an indication of the failure of the classical formalism, then it cannot serve as ontological foundation. What TO proposes is to reinterpret this boundary-point not as a positive physical event, but as a sign that empirical description touches a frontier beyond which the question becomes modal and ontological.

From the philosophical point of view, this shift brings TO closer to traditions that refuse to confuse mathematical formalism with full reality. Bohm, for example, insisted on implicate orders; Penrose spoke of structural intelligibility; Heisenberg recognized the role of the relation between concept and observation [2, 24, 16]. TO radicalizes this move by affirming that not even an empirically victorious cosmological theory can dispense with an examination of nothingness, infinity, and the possibility of the universe itself.

7. Phenomenic Elements, Inductive Effects, and the Re-reading of the Primordial Universe

Recent TO bibliography introduces and develops phenomenic elements and Inductive Effects as an apparatus for understanding the passage from minimal logical structures to observable forms [8, 4, 6]. This apparatus is especially fertile when applied to the primordial universe described by the Big Bang.

In standard cosmology, the early universe passes through successive regimes of high temperature, symmetry breaking, intense interaction between matter and radiation, nuclear synthesis, radiative decoupling, and the later growth of perturbations. Physical language describes this in dynamic and thermodynamic terms; TO proposes to read it as a chain of induction, reduction, stabilization, and manifestation.

Primordial nucleosynthesis, for example, may be reread as the first great compositional stabilization of the material universe. The PDG review insists on its character as a reliable probe of the early universe because the predicted and observed abundances preserve the memory of the physics of the first minutes [15]. TO may treat this memory not merely as a physical record, but as a phenomenic trace of a compositional order stabilized through inductive effect.

Likewise, the CMB may be reinterpreted. In standard cosmology, it is fossil radiation released when the universe became transparent, today observed in microwaves due to cosmological redshift. NASA presents it precisely as the light released when the cosmos cooled enough to form neutral atoms, allowing radiation to decouple [22]. For TO, this radiation is also a global phenomenic memory: not a mere residue, but an observable index of a stage at which the exteriorization of the cosmos attained a stable regime of legibility.

Inductive Effects also allow a rereading of structure formation. What physical cosmology describes as the gravitational growth of small perturbations may be interpreted, in TO terms, as a process of relational intensification: from minimal difference to organized complexity. Here gravity ceases to be only force or geometry and may be thought, in dialogue with recent TO bibliography, as a phenomenic expression of structural convergences [5].

This type of rereading does not seek to replace cosmological calculations with philosophical vocabulary. Its purpose is another: to show that processes already empirically established can receive a denser ontological interpretation. Instead of viewing the primordial universe only as an extreme energetic state, TO reinscribes it as a chain of phenomenization in which memory, relation, boundary, composition, and information become progressively legible.

8. The Cosmogonic Theorem of TO and the Reinscription of the Big Bang as a Phenomenic Phase

The cosmogonic theorem of TO, as developed in the authors' corpus, functions as an axis for the reinterpretation of universal genesis. Its central point is that the universe cannot be adequately explained by a theory that begins already at the phenomenic-energetic plane, as though this were equivalent to absolute origin. The genesis of the real requires a prior, modal layer in which nothingness, infinity, boundary, relation, composition, and transcendence are articulated.

From this point of view, the Big Bang may be preserved, but reinscribed. It ceases to be the absolute origin of the universe and instead appears as the first empirically traceable phase of the thermal, radiant, and material exteriorization of the cosmos. The equations of standard cosmology would then describe the internal dynamics of this observable phase, while TO's cosmogonic theorem would treat the plane of possibility that renders such a phase conceivable.

The advantage of this move is methodological. Instead of denying the CMB, nucleosynthesis, or expansion, TO absorbs them as indicators of a stage already advanced in genesis. The divergence, therefore, does not fall upon the occurrence of expansion or cosmic radiation, but upon their status. The Big Bang would not be the first being; it would be the first great phenomenic illumination of being.

This reinscription also protects TO from a common objection: that a modal ontology would improperly rival observational physics. That is not what is at stake. TO does not need to produce a second angular power spectrum of the CMB in order to justify itself; it needs to show why any observable curve already presupposes intelligibility, boundary, composition, and information. Its field is not the same as that of quantitative cosmology, although it must remain in dialogue with it.

In this sense, the cosmogonic theorem provides the principal hermeneutic key of this article: the Big Bang may be true at the level of phase and insufficient at the level of foundation. TO does not destroy it; it hierarchically lowers it from absolute origin to primordial observable episode.

9. The Cosmological Eras of TO and Their Articulation with Standard Cosmology

The comparison between TO's cosmological Eras and the Big Bang narrative is one of the most fertile parts of the propositional analysis, because it makes it possible to observe where standard cosmology has an adequate language and where it remains ontologically silent.

9.1. The Antagonistic Era

The Antagonistic Era finds no direct equivalent in standard cosmology. Even inflationary models, bounce scenarios, or quantum-cosmological formulations generally begin from some minimally given physical structure. They lack a language for the pre-logical regime in which the problem is not yet matter, energy, or field, but the very condition of distinction between possibility and manifestation. This absence marks one of the limits of standard cosmology as ontology.

9.2. The Era of Logical Tracks

The Era of Logical Tracks may be related, by analogy, to the establishment of structural constraints without which laws, symmetries, and regularities could not operate. Physics assumes such regularities as given or as emergent from some formalism; TO treats them as an ontological phase in their own right. This point is decisive, for it shows that TO does not merely add one more temporal stage before the Big Bang, but introduces another type of description: not chronological, but modal.

9.3. The Era of Logical Currents of Tertiary Plasma

Here the approximation to the physics of the primordial universe becomes more visible. NASA describes the post-inflationary phase as an extremely hot soup of light and particles in which matter and radiation interact intensely [22, 20]. This allows a heuristic bridge between TO vocabulary and the language of physical cosmology. The difference, however, remains: plasma, in TO, is not merely a thermodynamic state, but a manifestation of logical and relational exteriorization.

9.4. The Centrifugal Era

The Centrifugal Era dialogues immediately with the expansion of the universe. The rarefaction, distancing, and differentiation empirically observed may be read as phenomenic manifestations of this stage. The dominant cosmological narrative describes precisely the passage from a denser and hotter universe to a cosmos undergoing expansion, cooling, and structure formation [22, 21]. TO may preserve this datum as the empirical manifestation of a deeper centrifugal dynamic.

9.5. The Era of Units of Intelligence

Finally, the Era of Units of Intelligence concerns the emergence of systems capable of memory, interpretation, and science. The Big Bang, taken strictly, arrives at this through a late evolutionary chain; TO, however, assigns to this point decisive ontological value. The universe reaches full exteriorization when it produces units capable of reflexively reconstructing its own order.

The advantage of this comparison is twofold. First, it shows that TO need not deny the standard empirical chronology. Second, it shows that standard cosmology covers only part of the total process that TO seeks to describe. TO's Eras function as an ontological amplification hierarchically superior to the observable physical narrative.

10. Observational Evidence, Empirical Tensions, and Operational Bridges

A serious modal analysis cannot ignore the force of empirical evidence. The *Planck* collaboration consolidated a highly precise observational picture of the CMB and cosmological parameters; BBN remains a deep probe of the early universe; observation of cosmic expansion, large-scale structure, and other observational windows reinforce the hard core of standard cosmology [1, 15].

At the same time, the contemporary picture is less static than some didactic presentations suggest. JWST has brought new interpretive pressure regarding galaxies at high redshift. Recent articles discuss very luminous and apparently very massive candidates at early epochs, some presenting this as a challenge to usual ΛCDM expectations, others suggesting that revisions in halo models, IMF, and star-formation histories may explain a substantial part of the problem without abandoning the basic cosmological framework [14].

This scenario is particularly favorable to TO's recent strategy. If TO seeks empirical contact, it need not begin by denying the dominant data; it may reorder them according to its modal discipline. The starting point ceases to be "where did physics go wrong?" and becomes "in what kinds of observables can a modal ontology establish disciplined interpretive bridges?"

Some possibilities already appear in TO's recent bibliography. The first is the study of radiation as a carrier of memory and information. The second is the rereading of plasma, vacuum, fields, convergence, and boundary as phenomenic exteriorizations of modal structures. The third is attention to cosmological anomalies not as hasty proof of TO, but as zones where the physical model shows the need for greater interpretive depth [4, 6, 5, 7].

In programmatic terms, at least four operational bridges may be formulated:

1. **Radiative bridge**: analyze cosmic radiation as a vestige not only thermal, but relational-informational.

2. **Compositional bridge**: reread primordial abundances and material genealo-

gies as exteriorization of Truth 6.

3. **Convergence bridge**: examine gravity, collapse, lensing, and structure formation under the concept of convergence zones.

4. **Anomalous bridge**: use observational tensions as sites for testing the interpretive insufficiency of strict physicalism.

TO must, however, remain prudent. It is not enough to appropriate any anomaly and proclaim it confirmation. Its strength will depend upon preserving the discipline of levels: modal necessity is not direct astrophysical prediction, but it may orient which types of patterns, correlations, or insufficiencies demand deeper explanation.

11. Big Bang, Information, Transcendence, and Atomic Radiations

One of the most original points of this analysis lies in the formulation according to which the transcendent element must be understood as knowledge or information produced in atomic relations and equivalent to atomic radiations. This thesis makes it possible to build a strong conceptual bridge between TO and observational cosmology.

In Big Bang science, radiation is central. The CMB constitutes a cosmic archive of the decoupling phase; electromagnetic signals, chemical abundances, relic neutrinos in principle, and gravitational waves form the web of information about the universe. NASA emphasizes precisely that we observe today the same light released when the universe became transparent, now stretched by expansion into a cold microwave glow [22].

TO radicalizes this fact: if the information produced in atomic relations is equivalent to atomic radiations, then radiation is not merely a messenger, but an index of transcendence in operation. This does not imply supernaturalism. It means that the quantum, in order to attain full existence, must be accompanied by a relational-informational dimension that exceeds it without abandoning it.

This formulation allows fertile rereadings. The CMB may be understood simultaneously as physical data and as phenomenic ontological memory. Primordial nucleosynthesis, beyond being a thermonuclear process, becomes the first stable compositional grammar of the material universe. The formation of stars and galaxies, beyond gravitational dynamics, appears as the intensification of networks of production, storage, and retransmission of information.

In the supporting bibliography, there are indirect affinities with this perspective. Bohm insists that the real is not exhausted by the manifest order; Heisenberg recognizes the importance of the relation between observation and structure; Penrose preserves mathematical intelligibility as a trait of the universe; Prigogine and Stengers show that order and history are inseparable [2, 16, 24, 25]. TO gathers these intuitions and converts them into its own formulation: transcendence not as a region external to reality, but as an informational density necessary for full existence.

For this reason, the confrontation between the Big Bang and TO should not be read as an opposition between matter and spirit, nor between science and philosophy. It is, rather, a matter of asking whether radiative information is merely a physical by-product or whether it constitutes an index of a deeper ontological layer. TO answers affirmatively to the second hypothesis.

12. Gödelian Discipline, the Law of Logical Minimum, and the Problem of Foundation

Recent TO bibliography introduces two fundamental instruments for the rigorous treatment of this relation between physics and ontology: Gödelian discipline and the Law of Logical Minimum [4, 6]. The record *From Modal Axioms to Empirical Contact* presents this distinction as a methodological solution for avoiding categorical leakage between non-empirical necessity and empirical prediction. In simple terms: the plane of foundation must not be confused with the plane of measurement, but neither may it be arbitrarily disconnected from it.

Gödelian discipline, in this context, may be understood as the insistence that truth and demonstrability, foundation and formalization, ontology and prediction do not automatically coincide. The Big Bang, as a physical theory, may be formally powerful and empirically successful; it does not follow from this that it is ontologically complete. TO uses this dissociation as a critique: the formal success of a theory is not enough to exhaust being.

The Law of Logical Minimum, in turn, requires that no cosmological explanation be accepted as sufficient if it omits minimal logical conditions of possibility. In TO language, a cosmology that begins already with laws, fields, parameters, and geometries without asking what makes such structures possible incurs an insufficiency of foundation.

This point helps clarify the status of TO's critique. It does not deny the value of standard cosmology; it denies that such value implies ultimate foundation. Methodologically speaking, the critique is not anti-empirical, but anti-reductionist. The problem arises when the phenomenic-quantitative level presents itself as sufficient in itself.

Applied to the Big Bang, this yields a precise reading: standard cosmology satisfies excellently the criteria of empirical fit, statistical inference, internal coherence, and predictive fecundity, but it does not satisfy, by itself, the criterion of logical minimum demanded by TO. Rather than treating this as a moral defect of cosmology, it is more accurate to treat it as a delimitation of scope. Standard cosmology describes regimes; TO asks about the foundation of regimes.

In this sense, Gödelian discipline is not a mere philosophical ornament of the TO system. It operates as a demarcation rule between local scientific success and global ontological sufficiency.

13. The Perfect Sphere, Geometric Intelligibility, and the Question of Cosmic Form

Another important point in the expansion of this article is the articulation with the bibliography of the "perfect sphere" [3]. In *A Esfera Perfeita*, Cabannas and Silva develop a geometric formalization that functions as an ontological image of intelligibility. Even when it is not applied directly as a physical model of observed cosmological metric, it plays a disciplinary role: to remind us that form, limit, surface, interiority, and maximum circumference are not merely geometric notions, but categories of intelligibility of the universe.

The perfect sphere, with its own logic of parts and relations, is relevant here for three reasons.

First, it reinforces the centrality of boundary. If Truth 4 requires a boundary line between distinct elements, then any minimally adequate ontological geometry must thematize difference not as accident, but as principle. Standard cosmology describes anisotropies and separations of regimes; the perfect sphere offers ontological language for thinking distinction as necessity.

Second, it reinforces the idea of non-chaotic totality. The universe is not a mere aggregate of disconnected events. Even when observed across multiple regimes, it presents itself as a field of articulated intelligibility. Standard cosmology suggests this through its unifying success; the perfect sphere turns it into a principle of the TO framework.

Third, it helps avoid the simplistic reification of the initial singularity. Instead of imagining origin as an absolute material point, TO prefers to think in terms of limits, surfaces, relations, and the distribution of parts according to a richer logic. This does not replace general relativity or observational cosmology, but it disciplines the conceptual imagination with which one speaks of origin.

The articulation between the perfect sphere and standard cosmology may therefore be formulated as follows: physics describes the expansion and structures of the observable universe, while TO asks what minimal geometric intelligibility makes such description thinkable without falling either into absolute chaos or into a naive metaphysical point.

14. The Epistemological Status of the Big Bang under Modal Hierarchy

At this point, one may state more precisely the epistemological status of the Big Bang under TO's discipline.

The Big Bang must be preserved as a highly successful physical-observational theory. The convergence among the CMB, BBN, expansion, and large-scale structure justifies this judgment [1, 15, 22]. It is not a fragile historical hypothesis, but one of the most robust edifices of contemporary science.

At the same time, the Big Bang must not be elevated without examination to the status of final ontology of origin. Its principal domain is that of the phases of the observable universe and of what may be inferred from traces. When standard cosmology is transformed, by improper extrapolation, into a total answer to the question "why is there a universe?", it leaves its proper scope.

TO then proposes a hierarchy of levels:

1. **Phenomenic-observational description**. Here standard cosmology operates.
2. **Structural-relational intelligibility**. Here boundary, composition, observation, memory, and convergence are articulated.
3. **Modal foundation**. Here Nothingness, infinity as non-element, and informational transcendence enter.
4. **Integral ontological cosmogony**. Here the whole of the Eras and of the cosmogonic theorem is organized.

This hierarchy prevents two symmetrical errors. The first is cosmological scientism, which takes empirical success as the totality of reality. The second is disconnected metaphysics, which ignores the disciplining power of observational data. TO seeks to occupy a third place: to accept physics as the science of regimes while at the same time denying that regimes exhaust being.

In this framework, the Big Bang ceases to be an external adversary of TO and becomes instead a paradigmatic case of a phase theory that demands modal reinscription. Its value does not diminish; its scope is redefined.

15. Conclusion

The analysis developed in this expanded article makes it possible to propose a conclusion at several levels.

First, the Big Bang Theory remains one of the most well-confirmed scientific constructions of modernity when taken as a physical-observational cosmology of the hot and expanding primordial universe. The cosmic microwave background, primordial nucleosynthesis, and metric expansion continue to strongly sustain this framework, and the final results of *Planck*, together with recent syntheses by NASA and the PDG, remain fundamental landmarks of that consensus [1, 15, 22].

Second, this success does not amount to ontological completeness. The Big Bang does not resolve, in its own terms, the problem of Nothingness, the logical necessity of laws, the ontological function of infinity, the modal individuation of elements, the relational requirement of full existence, and the informational transcendence of the universe. TO identifies precisely these points as decisive.

Third, the relation between TO and the Big Bang need not be read in terms of simple exclusion. It may be formulated as a relation between distinct epistemological levels. The Big Bang describes with high precision an observable phase of the cosmos; TO claims the level of modal and cosmogonic foundation of that same reality.

Fourth, phenomenic elements, Inductive Effects, Gödelian discipline, the Law of Logical Minimum, the cosmogonic theorem, and TO's Eras provide instruments for reinterpreting standard cosmology as an internal phase of a broader process. In such a rereading, the Big Bang ceases to be absolute origin and becomes instead the phenomenic irruption of a universe whose condition of possibility depends upon nothingness, infinity, boundary, relation, composition, memory, transcendence, and information.

Fifth, the definition of the transcendent element as knowledge or information produced in atomic relations and equivalent to atomic radiations provides one of the most promising points of future articulation between TO and empirical cosmology. In this key, cosmic radiation is not merely physical data; it is also relational memory of the universe.

Sixth, recent observational tensions, including discussions opened by JWST observations of high-redshift galaxies, should not be hastily instrumentalized as "proofs" of TO. They should be treated as reminders that even a very robust cosmology remains interpretively open and philosophically non-exhaustive [14].

For all these reasons, the Theory of Objectivity may be understood not as a simple external opposition to the Big Bang, but as a proposal for the modal discipline of its intelligibility. The result is not the annulment of modern cosmology, but its reinscription within a broader logical-ontological horizon.

A. Appendix in TO Style

A.1. Expanded Modal Scheme of the Reading of Cosmic Origin under the Discipline of the Theory of Objectivity

A.1. General Principle

No theory of the origin of the universe is sufficient if it describes only phenomenic evolution without demonstrating the minimal logical conditions of possibility of the universe itself. The physical description of the process must be subordinated to the modal discipline of being.

A.2. Re-reading the Big Bang in TO Terms

In TO reading, the Big Bang does not constitute the absolute origin of the universe, but rather the first empirically traceable phase of the thermal, radiant, and material exteriorization of the cosmos. The hot primordial universe corresponds, in this rereading, to a phase already posterior to the deep logical conditions of reality.

A.3. Schematic Correspondence between TO and Standard Cosmology

Truth 1 requires a modal concept of Nothingness; the Big Bang does not adequately provide it.

Truth 2 requires elemental singularity by its own field; field physics offers a partial echo.

Truth 3 requires infinity as delimiting non-element; standard cosmology uses mathematical limits, but does not satisfactorily ontologize them.

Truth 4 finds phenomenic expression in the anisotropies, boundaries, and differentiations of the primordial cosmos.

Truth 5 finds epistemological echo in the convergent network of observables that sustains modern cosmology.

Truth 6 is compatible with the physical genealogy of particles, nuclei, atoms, stars, and galaxies.

Truth 7 finds a partial point of contact in the cosmological centrality of radiation, but requires its elevation to the status of transcendent informational principle.

A.4. Expanded Synthetic Cosmogonic Formulation

From Nothingness as primitive and eternal mathematical essence, through the logical delimitation of infinity as non-element, minimal boundaries of distinction emerge; from these boundaries come relations; from relations, compositions; from compositions, memory; from memory, information; from information, radiant exteriorization; from radiant exteriorization, plasma; from plasma, matter; from matter, complexity; from complexity, Units of Intelligence; and from Units of Intelligence, the reflexive reconstitution of the meaning of the cosmos.

A.5. Phenomenological Proposition

Every atomic radiation is simultaneously physical manifestation and informational index.

Every observable phenomenon of the cosmos is a vestige of relation.

Every material composition preserves memory of anteriority.

Every phenomenic boundary bears witness to minimal ontological distinction.

Every scientific intelligibility presupposes a modal structure prior to measurement.

A.6. Epistemological Consequence

Standard cosmology must be preserved as the science of the observable phenomenic phase of the universe. TO claims the modal, logical, and ontological plane as foundation. Dialogue between the two must occur through operational bridges, not through unilateral reduction.

A.7. Final Thesis in TO Style

The universe does not begin where measurement begins.

The universe is not exhausted where the equation works.

The universe is not fully explained where radiation is only residue.

The universe attains integral intelligibility only when the empirical plane is reinscribed into the modal plane.

References

[1] N. Aghanim et al. “Planck 2018 Results. VI. Cosmological Parameters”. In: *Astronomy & Astrophysics* 641 (2020), A6. URL: https://www.aanda.org/articles/aa/abs/2020/09/aa33910-18/aa33910-18.html.

[2] David Bohm. *Wholeness and the Implicate Order*. London: Routledge, 1980.

[3] Vidamor Cabannas and Denivaldo Silva. *A Esfera Perfeita (Comentário Número 9 à Teoria da Objetividade)*. 2020. DOI: 10.5281/zenodo.17013728. URL: https://doi.org/10.5281/zenodo.17013728.

[4] Vidamor Cabannas and Denivaldo Silva. *From Modal Axioms to Empirical Contact: Gödelian Discipline, the Law of Logical Minimum, and Operational Bridges in the Theory of Objectivity (2.0)*. 2026. DOI: 10.5281/zenodo.18154295. URL: https://doi.org/10.5281/zenodo.18154295.

[5] Vidamor Cabannas and Denivaldo Silva. *Gravity as an Emergence of Convergence Zones: A Critical–Propositional Examination of Information Flux Theory in Light of the Theory of Objectivity (TO) (1.0)*. 2026. DOI: 10.5281/zenodo.18306977. URL: https://doi.org/10.5281/zenodo.18306977.

[6] Vidamor Cabannas and Denivaldo Silva. *Modal Ontology and Testability: Boundaries, Convergence, and the Phenomenic Table of the Theory of Objectivity in Dialogue with Contemporary Physics and AI-Assisted Operational Bridges (1.0)*. 2026. DOI: 10.5281/zenodo.18257429. URL: https://doi.org/10.5281/zenodo.18257429.

[7] Vidamor Cabannas and Denivaldo Silva. *Quantum Field Theory and the Properties of the Vacuum: A Critical–Propositional Reading under the Modal Discipline of the Theory of Objectivity (TO) (1.0)*. 2026. DOI: 10.5281/zenodo.18370212. URL: https://doi.org/10.5281/zenodo.18370212.

[8] Vidamor Cabannas and Denivaldo Silva. *Teoria da Objetividade: Fundamentos Lógicos, Ontológicos e Científicos para uma Nova Física e Cosmologia (Diálogo com as Inteligências Artificiais)*. 2025. DOI: 10.5281/zenodo.17295496. URL: https://doi.org/10.5281/zenodo.17295496.

[9] Vidamor Cabannas and Denivaldo Silva. *Teoria da Objetividade: terceira teoria de origem do universo, alternativa à Teoria do Big Bang e ao Criacionismo.* 2016. DOI: 10.5281/zenodo.17306198. URL: https://doi.org/10.5281/zenodo.17306198.

[10] Vidamor Cabannas and Denivaldo Silva. *Theory of Objectivity: Third Theory of the Origin of the Universe, Alternative to the Big Bang Theory and Creationism.* 2018. DOI: 10.5281/zenodo.17012791. URL: https://doi.org/10.5281/zenodo.17012791.

[11] Ryan Cooke. "Big Bang Nucleosynthesis". In: (2024). arXiv: 2409.06015. URL: https://arxiv.org/abs/2409.06015.

[12] Scott Dodelson and Fabian Schmidt. *Modern Cosmology.* 2nd ed. Amsterdam: Academic Press, 2020.

[13] Albert Einstein. *Relativity: The Special and the General Theory.* London: Methuen & Co., 1920.

[14] Saeed Fakhry, Reyhaneh Vojoudi Salmani, and Javad T. Firouzjaee. "High-redshift Galaxies from JWST Observations in More Realistic Dark Matter Halo Models". In: (2025). arXiv: 2507.23742. URL: https://arxiv.org/abs/2507.23742.

[15] Brian D. Fields, Paolo Molaro, and Subir Sarkar. "Big-Bang Nucleosynthesis". In: *Particle Data Group Review* (2025). URL: https://ccwww.kek.jp/pdg/2025/reviews/rpp2025-rev-bbang-nucleosynthesis.pdf.

[16] Werner Heisenberg. *Physics and Philosophy: The Revolution in Modern Science.* New York: Harper & Row, 1958.

[17] Edward W. Kolb and Michael S. Turner. *The Early Universe.* Redwood City: Addison-Wesley, 1990.

[18] Thomas S. Kuhn. *The Structure of Scientific Revolutions.* Chicago: University of Chicago Press, 1962.

[19] Andrew Liddle. *An Introduction to Modern Cosmology.* 3rd ed. Chichester: Wiley, 2015.

[20] NASA Science. *Big Bang and the Evolution of the Universe*. 2025. URL: https://science.nasa.gov/astrophysics/programs/physics-of-the-cosmos/big-bang-and-the-evolution-of-the-universe/.

[21] NASA Science. *Cosmic History*. URL: https://science.nasa.gov/universe/overview/.

[22] NASA Science. *The Big Bang*. 2024. URL: https://science.nasa.gov/universe/the-big-bang/.

[23] P. J. E. Peebles. *Principles of Physical Cosmology*. Princeton: Princeton University Press, 1993.

[24] Roger Penrose. *The Road to Reality: A Complete Guide to the Laws of the Universe*. London: Jonathan Cape, 2004.

[25] Ilya Prigogine and Isabelle Stengers. *Order Out of Chaos: Man's New Dialogue with Nature*. New York: Bantam, 1984.

[26] Barbara Ryden. *Introduction to Cosmology*. 2nd ed. Cambridge: Cambridge University Press, 2017.

[27] Steven Weinberg. *Cosmology*. Oxford: Oxford University Press, 2008.

[28] Steven Weinberg. *The First Three Minutes: A Modern View of the Origin of the Universe*. New York: Basic Books, 1993.