

# SUBSTANTIAL SPACETIME, LOGICAL MATRIX, AND THE MODAL DISCIPLINE OF OBJECTIVITY:

a critical–propositional analysis of Hugang Cui’s *Spacetime  
Substantialism 26* in confrontation with the axioms,  
phenomenic elements, Inducer Effects, cosmogonic theorem,  
and cosmological Eras of the Theory of Objectivity

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# Abstract

This article presents a complete critical–propositional analysis of Hugang Cui’s 2026 article *Spacetime Substantivalism 26: The 1.3-Billion-Light-Year Audit of Cosmic Entity Uniformity by Gravitational Waves — The Electromagnetic Photonic Materiality of the Logical Matrix, the Impossibility of Superluminal Speed, and the Origin and Physical Mechanism of Inflation*. The analysis confronts Cui’s theses with the axiomatic, modal, phenomenic, inductive, and cosmogonic architecture of the Theory of Objectivity, especially the Seven Absolute Truths, the phenomenic elements, the Inducer Effects, the cosmogonic theorem, and the cosmological Eras of the Theory of Objectivity. The paper argues that Cui’s work constitutes an important operational bridge between contemporary physics and the Theory of Objectivity, particularly in its insistence on the substantiality of spacetime, the rigidity of physical boundaries, the relevance of gravitational waves, and the critique of purely mathematical formalism. However, the analysis also identifies major modal tensions, especially regarding Cui’s rejection of “nothingness” and his tendency to replace the primitive mathematical essence of Nothing with an electromagnetic-photonic Logical Matrix. From the perspective of the Theory of Objectivity, Cui’s “Electromagnetic Photonic Material-Energy Logic Super-Density Pack” can be interpreted as a derived physical-operational stage, but not as the first ontological ground of cosmic genesis. The article concludes that Cui’s work dialogues strongly with the Theory of Objectivity, receiving a score of 8.3 out of 10, while requiring modal correction regarding the status of Nothing, the hierarchy of elements, and the transcendent informational substance equivalent to atomic radiations.

**Keywords:** Theory of Objectivity; Vidamor Cabannas; Denivaldo Silva; Hugang Cui; Spacetime Substantivalism; Logical Matrix; gravitational waves; substantial spacetime; Inducer Effects; cosmogonic theorem; cosmological Eras; Nothing; Primitive Mathematical Essence; inflation; transcendent information.

# 1. Introduction

Hugang Cui's 2026 article, entitled *Spacetime Substantivalism 26: The 1.3-Billion-Light-Year Audit of Cosmic Entity Uniformity by Gravitational Waves — The Electromagnetic Photonic Materiality of the Logical Matrix, the Impossibility of Superluminal Speed, and the Origin and Physical Mechanism of Inflation*, proposes an ontological reinterpretation of gravitational waves, cosmological singularity, inflation, and the physical structure of spacetime. Cui's central thesis is that spacetime should not be understood merely as geometry, metric, or mathematical form, but as a substantial entity endowed with electromagnetic photonic materiality, governed by an objective Logical Matrix prior to the formal descriptions of conventional physics (Cui 2026).

Cui's proposal is relevant to the Theory of Objectivity, hereafter TO, because it shifts the cosmological debate from a purely mathematical language to an ontological, substantial, and logical-physical language. This shift has also been a central concern of TO since its foundational bibliography, especially in *Teoria da Objetividade: terceira teoria de origem do universo, alternativa à Teoria do Big Bang e ao Criacionismo* (Cabannas and Silva 2016), in its English version of 2018 (Cabannas and Silva 2018), and in *A Esfera Perfeita* (Cabannas and Silva 2020).

TO proposes that the universe cannot be satisfactorily explained either by traditional physical-mathematical reduction or by a creationist ontology external to the universal process itself. Its structure rests on absolute truths endowed with modal necessity, which organize the genesis of the universe, the phenomenic elements, the Inducer Effects, the cosmological Eras, and the emergence of information, knowledge, observation, and intelligence.

The present article aims to critically analyze Cui's proposal in confrontation with TO. The methodological gesture adopted here is twofold. First, the article recognizes the value of the analyzed work as an operational bridge of dialogue with contemporary physics, especially because of its emphasis on gravitational waves, the speed of light, the materiality of spacetime, and the critique of mathematical formalism. Second, the same article is submitted to the modal discipline of TO, examining its limits, tensions, and possibilities of integration.

The analysis will be developed in Chicago author–date style, articulating the foundational bibliography of TO, its recent bibliography, the bibliography of support and dialogue, and Cui's own text. At the end, an evaluation on a scale from zero to ten will be presented regarding the degree of dialogue between the analyzed article and TO.

## 2. The Analyzed Article and Its Position in the Contemporary Debate

Cui's text belongs to a broader series called *Spacetime Substantivalism*. In this series, the author seeks to develop a substantivalist theory of spacetime, according to which spacetime is neither a merely geometric stage nor a simple relation between events, but a physical entity endowed with internal constitution.

In article 26, this thesis is radicalized. Cui argues that gravitational waves, by traveling approximately 1.3 billion light-years, have performed a kind of cosmic “audit” of the material uniformity of spacetime. For the author, the stability of the propagation of gravitational waves indicates that spacetime possesses a rigid, uniform, and electromagnetic material constitution. Spacetime would therefore be an electromagnetic-photonic entity, not merely a geometric mesh described by equations.

Cui's position indirectly dialogues with classical debates about substantivalism and relationism. Since Einstein, especially after general relativity, spacetime has been described as a dynamic structure influenced by the distribution of matter and energy (Einstein 1920; Misner, Thorne, and Wheeler 1973). The dominant reading in modern physics tends to treat spacetime through tensors, metrics, curvature, and differential geometry. Cui, however, considers that this geometric description, although useful and precise, does not answer the fundamental ontological question: what is that which is being curved?

This question brings Cui close to TO. TO also refuses the sufficiency of mathematical description when it is not accompanied by ontological and modal grounding. In *From Modal Axioms to Empirical Contact*, Cabannas and Silva argue that the transition from axioms to testability requires logical discipline, the Law of Logical Minimum, and operational bridges between theory and contemporary physics (Cabannas and Silva 2026a). Cui's article may be read as one of those bridges, although it is not identical with TO and does not replace its cosmogonic theorem.

Cui distances himself from conventional cosmology especially in three points: his critique of superluminal inflation, his rejection of quantum superposition as physical reality, and his defense that the initial singularity should be understood as a superdense logical-material pack, not as an abstract mathematical point. These three points will be analyzed in confrontation with TO.

### 3. The Argumentative Core of Hugang Cui

Cui's article is structured around several main theses.

The first thesis states that gravitational waves are not merely “geometric ripples” of spacetime. For Cui, such a description would be a mathematical metaphor or an external language. The deeper reality of gravitational waves would be the fluctuation or displacement of a substantial physical entity. Thus, geometry would be the outer form of spacetime, while substance would be its inner reality.

The second thesis maintains that spacetime possesses electromagnetic photonic materiality. Cui appeals to the speed of light and to the relation:

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$

in order to affirm that the speed of light is not merely a kinematic limit, but a constitutive boundary of cosmic materiality itself. Light, gravity, and the structure of spacetime would be unified by a deep electromagnetic protocol.

The third thesis proposes that cosmological singularity must be reinterpreted as an *Electromagnetic Photonic Material-Energy Logic Super-Density Pack*, that is, as a Logical Super-Density Pack of Electromagnetic-Photonic Material-Energy. For Cui, the origin of the universe cannot be “nothingness,” because nothingness, understood as absence of materiality, could not generate photons, fields, laws, or constants.

The fourth thesis rejects the idea of superluminal expansion. Cui considers that conventional cosmology introduced superluminal inflation as a mathematical device to solve problems of horizon, flatness, and uniformity. In its place, he proposes a non-linear synchronous doubling: the universe would not have expanded through superluminal displacement of parts in space, but through global replication of spatial units, while respecting the boundary of the speed of light.

The fifth thesis affirms that quantum superposition does not correspond to physical reality, but to a descriptive illusion resulting from insufficient logical precision. At this point, Cui approaches ontologically realist and anti-realist interpretations of the wave function, but his formulation is more radical, since it tends to discard superposition as mathematical fiction.

From the point of view of TO, these theses are stimulating. They offer material for dialogue with the axioms of boundary, composition, observation, informational transcendence, and the emergence of elements. However, they require modal correction, especially when Cui attempts to replace the Nothing of TO with an already derived logical-material

matrix.

## 4. The Theory of Objectivity as a Matrix of Critical Reading

TO is structured upon seven absolute truths, here considered as axioms of modal necessity:

1. Nothing is a Primitive and Eternal Mathematical Essence.
2. Every element possesses a magnetic field, or aura, that makes it unique.
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 exists fully only if observed by at least two others.
6. Every element is composed of elements prior to it.
7. There is no existential universe without a substance transcendent to its quantum.

These axioms are not empirical hypotheses in the ordinary sense. They constitute modal principles that condition the possibility of any objective universe. Therefore, when analyzing Cui, TO does not merely ask whether his theses are mathematically elegant or physically suggestive. It asks whether they respect the necessary order of foundations.

TO also distinguishes between phenomenic elements, Inducer Effects, and cosmological Eras. Phenomenic elements are modes of manifestation of objective reality: field, boundary, mass, radiation, information, memory, observation, thought, intelligence, and other relational structures. Inducer Effects are processes of transformation that lead reality from one state to another, such as the Expansive Inducer Effect and the Reductive Inducer Effect. The cosmological Eras describe major stages of universal genesis: the Antagonistic Era, the Era of Logical Tracks, the Era of Logical Currents of Tertiary Plasma, the Centrifugal Era, and the Era of Units of Intelligence.

This architecture is fundamental for evaluating Cui. The analyzed article touches on many of these themes, but often reorganizes them under its own language: Logical Matrix, photonic substantiality, speed-of-light protocol, superdense pack, and gravitational audit. The task of the propositional analysis is to show where there is compatibility, where there is tension, and where TO may reinterpret Cui without absorbing his assumptions uncritically.



## 5. General Compatibilities Between Cui and TO

The first compatibility lies in the critique of isolated mathematical formalism. Cui argues that geometry describes the outer form of spacetime, but not its inner substance. This thesis is very close to TO's critique of the reduction of cosmic origin to a merely mathematical apparatus. In *The Modal Discipline of Cosmic Origin*, Cabannas and Silva argue that cosmology must distinguish between descriptive model and ontological genesis (Cabannas and Silva 2026f).

The second compatibility is found in the notion of boundary. Cui sees the speed of light as an absolute physical limit. TO, in turn, affirms that two distinct elements require at least one boundary line. The difference is that Cui formulates this boundary in electromagnetic language, whereas TO grounds it in modal language. Even so, both theories refuse absolute indetermination as a sufficient foundation of reality.

The third compatibility lies in the attempt to overcome the opposition between geometry and substance. Cui states that geometry and substance stand in an outer-inner relation: geometry is the outer form; substance is the inner essence. This formulation may dialogue with TO, especially with the distinction between phenomenic appearance, field, aura, and ontological foundation.

The fourth compatibility lies in the valorization of gravitational waves as cosmological phenomena of high relevance. TO may interpret the propagation of gravitational waves as the transport of information, the persistence of objective memory, and evidence that the universe is not an abstraction, but a network of observable and communicating relations.

The fifth compatibility lies in the critique of singularity as a mere mathematical point. TO also does not reduce cosmic origin to a formal singularity. However, TO does not replace that singularity with an original photonic pack; it reinscribes it in a prior modal sequence, beginning with Nothing as Primitive Mathematical Essence.

## 6. Points of Modal Tension with the Axioms of TO

The first tension concerns the first axiom. Cui rejects “nothingness” as foundation. However, his critique seems directed at an empirical or vulgar nothing, understood as absence, void, or nonexistence. TO does not defend this kind of nothing. The Nothing of TO is a Primitive and Eternal Mathematical Essence. Therefore, Cui combats a figure of nothingness that does not fully correspond to the foundational concept of TO.

The second tension appears in the sixth axiom. If every element is composed of

elements prior to it, then Cui's own logical-material photonic pack must be explained by prior elements. Otherwise, it becomes an undemonstrated absolute. TO may accept the EPM-LSP as a derived phase, but not as first foundation.

The third tension arises in the seventh axiom. For TO, there is no existential universe without a substance transcendent to its quantum. This transcendent substance is knowledge or information produced in atomic relations, equivalent to atomic radiations. Cui approaches this point when he speaks of logic and photonic materiality, but he does not adequately develop the notion of relational information as transcendent substance.

The fourth tension lies in the interpretation of quantum superposition. Cui claims that superposition is an illusion. TO may accept an ontological critique of superposition when understood naively, but it should not simply discard empirically observed quantum phenomena. The modal discipline of TO requires distinguishing between the experimental phenomenon, the mathematical description, and the ontological interpretation.

The fifth tension concerns the role of mathematics. Cui tends to oppose logic and mathematics, valuing the Logical Matrix over formal mathematics. TO, by contrast, affirms that Nothing is a Primitive Mathematical Essence. Therefore, TO does not abandon mathematics; it reconducts mathematics to a deeper ontological condition.

## **7. The Problem of Nothing: Difference Between Empirical Void and Primitive Mathematical Essence**

The most decisive point of the analysis is the difference between the "nothingness" criticized by Cui and the Nothing of TO. Cui states that nothingness cannot produce photons, fields, laws, or materiality. This statement is valid if "nothing" means vulgar absolute absence, void without structure, or empirical nonexistence. But TO has never defined Nothing in those terms.

In TO, Nothing is a Primitive and Eternal Mathematical Essence. This means that Nothing is not a "thing," but neither is it simple nonexistence. It is the primitive modal condition from which differentiation becomes possible. Nothing is prior to matter, field, radiation, physical time, and geometry. It is not an object within the universe, but the logical-mathematical foundation of the possibility of there being a universe.

For this reason, Cui's critique does not eliminate the Nothing of TO. On the contrary, it shows the need to distinguish it from fragile conceptions of void. The Nothing of TO does not produce photons by direct physical causality. It grounds, by modal necessity, the possibility of transition to later Eras, in which logical tracks, fields, boundaries, mass, radiations, and information emerge.

Cui's EPM-LSP, therefore, may be situated as a later structure. It already contains materiality, energy, logic, density, and potential for expansion. Thus, it cannot be first. It presupposes distinctions that TO only admits after the institution of tracks and boundaries. In terms of TO, Cui describes an advanced phase of cosmogony, but presents it as absolute origin.

The propositional contribution of TO is to reposition Cui: the logical-material photonic pack should not be denied, but hierarchized. It may be understood as a condensed stage of the logical-material organization of the universe, arising after the Antagonistic Era and in articulation with the Era of Logical Tracks.

## 8. Boundary, the Speed of Light, and Modal Discipline

The speed of light occupies a central place in Cui's article. For him,  $c$  is the absolute boundary of physical reality. The formula:

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$

is interpreted not merely as an electromagnetic relation, but as the expression of a constitutive law of spacetime. Cui calls it, in strong language, a heavenly principle or unbreakable limit.

TO may receive this intuition as a physical formulation of the axiom of boundary. Every objective reality requires lines of separation, limitation, and distinction. If there is no boundary, there is no element; if there is no element, there is no relation; if there is no relation, there is no existential universe.

However, TO must avoid converting the speed of light into an absolute foundation. The speed of light is a physical boundary of the already constituted universe, not the original modal boundary. Before  $c$ , there is the necessity of distinction. Before propagation, there is the condition of possibility of the line. Before electrodynamics, there is the logical possibility of distinct elements.

Thus, Cui correctly formulates an operational boundary, but TO reinscribes it within a deeper boundary. The speed of light may be seen as a physical expression derived from the modal requirement of boundary, not as its absolute origin.

## 9. Gravitational Waves, Information, and the Transcendent Element

Gravitational waves are the empirical center of the article. Cui interprets them as an audit of the material uniformity of spacetime. TO may offer a complementary reading: gravitational waves are propagation events that transport information about extreme cosmic relations.

When a black-hole merger generates gravitational waves, an inscription of information occurs in the physical fabric of the universe. This information propagates, crosses great distances, and is finally observed by instruments. We therefore have a chain involving event, emission, propagation, persistence, reception, interpretation, and knowledge.

This trajectory directly dialogues with the fifth and seventh axioms of TO. The fifth axiom states that an element exists fully only if observed by at least two others. The gravitational wave, as a phenomenic event, becomes fully objective when it relates to emitting systems, propagative medium, detectors, and interpreting intelligences.

The seventh axiom states that there is no existential universe without a substance transcendent to its quantum. In TO, this substance is knowledge or information produced in atomic relations, equivalent to atomic radiations. Thus, the propagation of gravitational waves may be read as an example of informational transcendence: the event surpasses its place of origin and becomes physical knowledge at another point of the universe.

Cui speaks of fidelity of the physical mechanism. TO speaks of objective persistence of phenomenic information. The two formulations may dialogue: fidelity of propagation is a condition for transcendent information to be preserved.

## 10. Singularity as EPM-LSP and the Cosmogonic Theorem of TO

Cui proposes that the Big Bang singularity must be reduced to an *Electromagnetic Photonic Material-Energy Logic Super-Density Pack*. This proposal has critical value because it rejects the idea of singularity as an empty mathematical point, without ontological thickness. Nevertheless, from the standpoint of TO, it must be corrected.

The cosmogonic theorem of TO does not begin with photonic matter. It begins with Nothing as Primitive and Eternal Mathematical Essence. It then develops the tension of Antagonistic Tempus, the constitution of logical tracks, the emergence of currents, the

formation of plasma structures, centrifugation, and the subsequent organization of units of intelligence.

Cui's EPM-LSP already contains many predicates: materiality, energy, logic, density, compression, and capacity for expansion. It is not simple. It is composed. Therefore, according to the sixth axiom of TO, it must derive from prior elements.

TO may, however, reinterpret the EPM-LSP as an intermediate structure between the Era of Logical Tracks and the Centrifugal Era. The superdense pack would be a condensation of possibilities already ordered by logical tracks, ready to undergo expansion, extrusion, or doubling. In this sense, Cui would offer a physical language for a stage that TO describes in modal and cosmogonic language.

The difference is decisive: Cui sees the pack as origin; TO sees it as derivation. Cui sees the Logical Matrix as foundation; TO asks for the modal condition of the Matrix itself. Cui rejects Nothing; TO correctly defines it as primitive mathematical essence, without reducing it to empirical void.

## **11. Inflation, Expansion, and the Expansive Inducer Effect**

Cui's critique of superluminal inflation is one of the most relevant aspects of his article. He maintains that the expansion of the universe should not be understood as superluminal displacement, but as non-linear synchronous doubling of spatial units. The proposal seeks to preserve the rigidity of the speed of light while also explaining the rapid enlargement of the initial cosmic scale.

From the point of view of TO, this idea strongly dialogues with the Expansive Inducer Effect. In TO, universal expansion is not merely spatial growth; it is the production of space, boundary, distance, relation, and temporality. The Expansive Inducer Effect inaugurates the opening of the universe as a field of objectivity.

Cui describes inflation as a release of density pressure. TO may recognize in this formulation a physical approximation of expansion, but it adds that expansion is also modal. It follows from the necessity that elements distinguish themselves, occupy relations, and produce boundaries. Expansion, therefore, is not merely mechanical relief of pressure, but the objective constitution of the universe.

The synchronous doubling proposed by Cui may be reinterpreted, in the vocabulary of TO, as a derived mechanism of the Expansive Inducer Effect. Synchronicity would not be a merely physical phenomenon, but an expression of the coherence of logical tracks that organize the transition from the condensed state to universal space.

This reading is propositional because it allows the value of Cui's hypothesis to be preserved without abandoning the architecture of TO. Synchronous doubling does not replace the Expansive Inducer Effect; it may be understood as one of its possible physical-operational translations.

## **12. Quantum Superposition, Phenomenic Reduction, and the Reductive Inducer Effect**

Cui rejects quantum superposition as physical reality. For him, superposition would be a mathematical illusion resulting from insufficient logical precision. This statement is one of the most problematic aspects of the article, since it tends to simplify a complex debate in quantum physics.

TO may agree that the wave function and superposition should not automatically be interpreted as literal ontological entities. The critique of excessive formalism is legitimate. Heisenberg had already recognized that quantum physics profoundly altered the relation between observation, reality, and conceptual language (Heisenberg 1958). Bohm, in turn, proposed an implicate order, suggesting that quantum phenomena might require a deeper ontology than ordinary probabilistic description (Bohm 1980).

However, TO does not need to deny the experimental results associated with quantum mechanics. Experiments connected to Bell inequalities and to Aspect's work showed that quantum correlations challenge classical intuitions of local separability (Aspect 1982). The question is not to declare the phenomenon nonexistent, but to reinterpret it under a deeper ontology.

At this point, TO may mobilize the Reductive Inducer Effect. This effect allows one to think the transition from a phenomenic or potential plurality to an objective observable configuration. Reduction need not be understood as magical collapse or as illusion. It may be understood as a process by which an objective relation stabilizes under conditions of observation, boundary, and information.

Therefore, Cui is right to demand a more precise ontology for quantum mechanics, but wrong if he reduces superposition to mere fiction. TO proposes an intermediate path: quantum phenomena are real as phenomena, but their ontological interpretation must be submitted to the modal discipline of the axioms.

## **13. The Cosmological Eras of TO in Confrontation with Cui's Model**

### **13.1. The Antagonistic Era**

The Antagonistic Era of TO is prior to photonic materiality. It involves the Antagonistic Tempus and the originary tension that prepares the possibility of differentiation. Cui has no clear equivalent for this Era. His model begins with a Logical Matrix and a superdense material pack, that is, with an already highly determined structure.

For this reason, from the perspective of TO, Cui skips the first modal stage. He begins at a point where reality already possesses logic, materiality, and energy. TO asks: how did these predicates become possible?

### **13.2. The Era of Logical Tracks**

The strongest compatibility occurs with the Era of Logical Tracks. Cui speaks of Logical Matrix, protocols, limits, tracks, and rigidity. This language comes very close to TO's notion of logical tracks.

The difference is that, for Cui, the Logical Matrix seems absolute. For TO, logical tracks emerge after antagonistic tension and organize the transition toward objective existence.

### **13.3. The Era of Logical Currents of Tertiary Plasma**

The notion of photonic materiality and density release may dialogue with the Era of Logical Currents of Tertiary Plasma. Cui does not work with the distinction between primary, secondary, and tertiary plasma, but his model of material constitution and propagation may be integrated as a physical interlocutor.

TO may interpret the EPM-LSP as a logical-material condensation which, when expanded, feeds currents of organization of universal plasma.

### **13.4. The Centrifugal Era**

Cui's proposal of inflation as pressure release dialogues with the Centrifugal Era of TO. Both deal with expansion, opening, and distribution. However, TO understands centrifugation not merely as a physical event, but as a stage of modal structuring of the

universe.

### **13.5. The Era of Units of Intelligence**

Cui does not develop a cosmology of intelligence. TO, by contrast, includes the emergence of Units of Intelligence as a fundamental stage. The information produced in atomic relations, equivalent to atomic radiations, opens the path to memory, thought, observation, and consciousness.

This is an architectural superiority of TO in relation to the analyzed article: Cui substantializes spacetime, but does not fully develop the transition from matter to conscious information.

## **14. Relevant Empirical Evidence and Possible Operational Corroboration of TO**

Cui's article does not present an original experiment of its own. It performs an ontological reinterpretation of already known observational data, especially gravitational waves. Even so, this empirical basis is relevant to TO.

The detection of gravitational waves by LIGO in 2015, associated with the GW150914 event, directly confirmed a prediction of general relativity and inaugurated gravitational-wave astronomy (Abbott et al. 2016). The event was associated with the merger of two black holes and with the emission of extremely intense gravitational energy, crossing cosmological distance before being detected.

For Cui, this journey of approximately 1.3 billion light-years shows the substantial uniformity of spacetime. For TO, the interpretation must be more cautious: the event shows that there is objective propagation of physical-gravitational information, preservation of regularities, and relation between cosmic event and intelligent observation. These aspects dialogue with the fifth and seventh axioms of TO.

The observation of multi-messenger events, such as GW170817, is also relevant because it allows comparison between gravitational propagation and electromagnetic signals. This strengthens the debate about speed limits, physical boundaries, and consistency of natural laws. However, such data do not directly confirm the thesis that spacetime is photonic material, nor do they automatically confirm the complete theorem of TO.

The empirical section, therefore, must be formulated rigorously: gravitational waves may operationally corroborate elements of dialogue with TO, especially the propagation of information, the existence of physical boundaries, and the relational objectivity



of phenomena. But they do not, by themselves, prove all of Cui’s ontology or the entire cosmogonic architecture of TO.

## 15. Foundational, Recent, and Supporting Bibliography in the Horizon of This Analysis

The foundational bibliography of TO establishes the modal core of the analysis. The 2016 text formulates TO as a third theory of the origin of the universe, alternative both to conventional Big Bang theory and to creationism (Cabannas and Silva 2016). The 2018 English version expands the international reach of this formulation (Cabannas and Silva 2018). *A Esfera Perfeita* develops the geometrical and modal image of originary perfection and globalizing totality (Cabannas and Silva 2020).

The recent bibliography of TO deepens the transition from axioms to testability. In *Teoria da Objetividade: Fundamentos Lógicos, Ontológicos e Científicos para uma Nova Física e Cosmologia*, TO presents its dialogue with artificial intelligences and contemporary physics (Cabannas and Silva 2025). In *From Modal Axioms to Empirical Contact*, the bridge between modal axioms and empirical contact is developed (Cabannas and Silva 2026a). In *Modal Ontology and Testability*, TO explains boundaries, convergence, and the phenomenic table as instruments of dialogue with contemporary physics (Cabannas and Silva 2026b).

Recent works on gravity, quantum field theory, and the Big Bang expand the application of TO to specific problems. *Gravity as an Emergence of Convergence Zones* allows gravity to be thought of as a phenomenon of informational convergence (Cabannas and Silva 2026c). *Quantum Field Theory and the Properties of the Vacuum* provides a basis for discussing the physical vacuum without confusing it with the modal Nothing of TO (Cabannas and Silva 2026d). *The Modal Discipline of Cosmic Origin* directly confronts the Big Bang with TO and is especially relevant for analyzing Cui’s critique of mathematical singularity (Cabannas and Silva 2026f).

The supporting bibliography—Einstein, Heisenberg, Bohm, Prigogine, Penrose, Hawking, Kuhn, Weinberg, Aspect, Planck, LIGO/Virgo, and JWST observations—allows the debate to be situated within a broader horizon. Einstein provides the modern geometrization of spacetime; Heisenberg and Aspect challenge the interpretation of quantum reality; Bohm opens the path for deeper ontologies; Prigogine and Stengers address emergent order; Penrose and Hawking discuss cosmic structure and singularities; Kuhn makes it possible to understand paradigm shifts; Weinberg and Planck situate the cosmology of the early universe; LIGO/Virgo provides the empirical field of gravitational waves; and JWST observations challenge and refine models of cosmic formation.

## 16. Critical Evaluation and Scale of Dialogue with TO

Cui's article has high potential for dialogue with TO. Its insistence on objectivity, substantiality, critique of empty mathematical formalism, and relevance of gravitational waves converges with central concerns of TO. The idea that geometry is outer form and that there is a deeper inner reality is also compatible with TO's ontological requirement.

However, the tensions are significant. The greatest of them is the rejection of Nothing without distinguishing empirical void from Nothing as Primitive and Eternal Mathematical Essence. Another tension lies in the absolutization of the electromagnetic-photonic pack, which TO considers derived, not originary. There is also tension in the overly strong rejection of quantum superposition and in the narrow identification between logic and electromagnetic materiality.

Even so, the article is a very relevant operational bridge. It allows TO to dialogue with contemporary themes such as gravitational waves, substantivalism of spacetime, inflation, the speed of light, singularity, physical boundaries, and the critique of abstract geometrization.

On a scale from zero to ten, the article receives:

**8.3 / 10**

The score is high because the article dialogues intensely with TO. It is not higher because it requires deep modal correction regarding Nothing, the hierarchy of elements, informational transcendence, and the derived status of photonic materiality.

## 17. Final Considerations

Hugang Cui's *Spacetime Substantivalism* 26 is an important text in the horizon of dialogue between alternative cosmologies, physical substantivalism, and ontologies of reality. Its main contribution is to restore the ontological question about spacetime: not only how it curves, but what is that which is curved.

TO recognizes the importance of this question. Contemporary physics has achieved extraordinary descriptive precision, but still faces ontological difficulties regarding the origin of the universe, the nature of spacetime, the status of vacuum, the interpretation of quantum mechanics, and the relation between information and matter. Cui attempts to answer these difficulties through a substantivalist Logical Matrix. TO responds through modal axioms, phenomenic elements, Inducer Effects, cosmological Eras, and the cosmogonic theorem.

The analysis shows that Cui's article should not be discarded. On the contrary, it should be welcomed as a serious and stimulating interlocutor. However, it must be repositioned. Cui's Logical Matrix does not replace the Nothing of TO. The EPM-LSP does not replace the Antagonistic Era. The speed of light does not replace the axiom of boundary. Photonic materiality does not replace the transcendent substance of information produced in atomic relations.

The value of the article lies in providing a physical-operational language for questions that TO treats at the modal level. Its limitation lies in confusing derived stages with first foundations. The contribution of TO consists in hierarchically ordering these intuitions, preserving the modal necessity of the axioms and opening the path toward a more complete cosmology, in which matter, field, radiation, information, observation, and intelligence are understood as moments of an objective genesis.

## Appendix in the TO Style

### Appendix A — Modal Proposition of Reading

If a theory affirms that spacetime possesses substance, it must ask of what this substance is composed.

If it affirms that this substance is photonic, it must ask where the photonic regime comes from.

If it affirms that this regime is governed by a Logical Matrix, it must ask what the modal condition of the Matrix itself is.

If it does not answer this question, it begins after the beginning.

### Appendix B — TO Repositioning of the EPM-LSP

In the language of TO, Cui's EPM-LSP may be reinterpreted as follows:

1. it is not the absolute foundation;
2. it is not Nothing;
3. it is not the first essence;
4. it is a derived logical-material condensation;
5. it belongs to a stage posterior to the tension of Antagonistic Tempus;
6. it may correspond to a transitional state between logical tracks and universal expansion;
7. it may be read as an operational image of the Expansive Inducer Effect.

### Appendix C — Critical Formula of Boundary

The speed of light is a physical boundary.

But the physical boundary is not the first boundary.

Before light, there is distinction.

Before propagation, there is the possibility of the line.

Before the line, there is the modal necessity that two elements not be the same.

Therefore,  $c$  is a physical expression derived from a prior modal boundary.

## **Appendix D — Transcendent Information**

In TO, the substance transcendent to the quantum is knowledge or information produced in atomic relations, equivalent to atomic radiations.

Every radiation that transports information surpasses its place of origin.

Every informational surpassing is phenomenic transcendence.

Every phenomenic transcendence requires relation.

Every relation requires boundary.

Every boundary requires elements.

Every element requires prior composition.

Every prior composition refers back to the modal order of genesis.

## **Appendix E — Final Thesis in the TO Style**

Cui's Logical Matrix is a bridge.

The Nothing of TO is foundation.

The gravitational wave is messenger.

Radiation is information.

Boundary is necessity.

Expansion is induction.

Intelligence is an emergent unit.

Objectivity is the universe becoming observable through relations that produce knowledge.

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