Truth is the Whole of Dialectical Metrics

— A Meta-Philosophical Interpretation Based on the Zhu–Liang Holism Axiomatic System

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Abstract

Traditional metaphysics regards truth as a static, completed object—either correspondence with external facts, or coherence within a system. The Zhu–Liang holism axiomatic system, using the language of category theory, terminal coalgebras, and metric geometry, fundamentally sublates this view of truth. This paper rigorously demonstrates: **Truth is the whole of dialectical metrics**—it is not only a dynamic identity that self-unfolds, self-sustains, and self-transcends, but this dynamic identity intrinsically embeds a **metric structure** uniquely determined by the causal network (entropy functional, hierarchical metric, learning metric). The argument rests on four meta-mathematical facts: (1) The natural isomorphism between the double-negation functor $G = F \circ F$ and the identity functor establishes the negation of negation as the meta-logical kernel of truth's recursive unfolding. (2) The Zhu–Liang Unity Principle reveals that metabolism, generation, and causality are inseparable projections of the same existence functor $F^S : \mathcal{T} \to \mathcal{C}$ across the three dimensions of time, structure, and logic. (3) The Truth Metric Theorem proves the existence of an entropy functional $\mathcal{H}$ uniquely determined by the causal network, with truth as its global minimum, thereby endowing the dialectical whole with an intrinsic measure. (4) The metabolon as a self-caused causal closure structure dissolves the First Mover in the inverse limit. The Truth Space Ω, as the terminal G-coalgebra, is constructed as the inverse limit $\Omega = \varprojlim G^n(1)$, simultaneously bearing recursive depth and the hierarchical metric $d_\Omega(x, y) = 2^{-k}$. Truth is not an object to be discovered, but a dialectical subject that self-unfolds and self-measures—the unified metabolico-causal field itself. Human cognition, as a local projection of the truth function, does not "prove" truth, but participates recursively in witnessing the eternal self-realization of the whole of dialectical metrics.

Keywords: dialectical metrics; truth; terminal coalgebra; unity principle; entropy functional; hierarchical metric; self-cause; metabolon

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1 Introduction: The Truth Dilemma in the History of Philosophy and the Breakthrough of This Framework

Since Plato divided the world into the "visible" and the "intelligible" in the *Republic*, anchoring truth in transcendent Forms ($\varepsilon\grave{\imath}\delta o\varsigma$), Western metaphysics has operated under two presuppositions: (1) Truth is a static, completed object; (2) Cognition is "correspondence" with or "participation" in truth. Aristotle's *Metaphysics* defined truth as the "conformity of propositions to facts," further reinforcing the static correspondence theory. Medieval theology equated truth with God's eternal mind, while modern Kant pushed truth beyond the boundaries of reason with the "unknowable thing-in-itself." Heidegger reinterpreted truth as "unconcealment" ($\dot{\alpha}\lambda\acute{\eta}\theta\varepsilon\iota\alpha$), yet failed to provide rigorous formalization. Hegelian dialectics first grasped truth as a "process"—substance is subject, truth is the self-unfolding whole—but this insight remained at the speculative level, lacking a mathematical language of comparable rigor.

The fundamental breakthrough of the Zhu–Liang holism axiomatic system lies in: using category theory, terminal coalgebras, and metric geometry as tools, it has completed the leap of dialectics from philosophical speculation to precise mathematical form. The core conclusion of this paper can be condensed into a progressive proposition: **Truth is the whole of dialectical metrics**—it is not the abstract identity of $A = A$, but the concrete identity of A returning to A through non-A, and this process of return possesses measurable hierarchical depth and efficacy gradient. This framework not only provides a meta-mathematical proof for Hegel's "truth is the whole," but also responds to Kant's challenge of the unknowable with the "immanence of metrics," dissolves the "First Mover" problem dating back to Aristotle with the "self-causal closure of the metabolon," and formalizes Heidegger's "being-in-the-world" as the triunity of the existence functor F^S through the Unity Principle. The following develops the meta-mathematical proof of this proposition across four progressive levels.

2 Preliminaries: Essentials of the Zhu–Liang Holism Axiomatic System

The argument of this paper is anchored in the Zhu–Liang holism axiomatic system. The following core theorems and definitions are drawn from the series of published preprints [1, 2, 3, 4].

2.1 Meta-Foundation and the Truth Function Theorem

Principle 2.1 (Existence of Differences F_1)**.** *There exist identifiable, non-identical, differentiated states in the universe.*

Principle 2.2 (Determinacy of Relations F_2)**.** *There exist non-random, partially comprehensible deterministic relations among differentiated states.*

Theorem 2.1 (Zhu–Liang Truth Function Theorem)**.** *Let Σ be the class of all possible states of the universe, and let Truth T be the ultimate totality of all deterministic relations on Σ. Then $T : \Sigma \to R$ is a surjective function.*

[1]

2.2 Whole–Part Correspondence Theorem

Theorem 2.2 (Zhu–Liang Whole–Part Correspondence Theorem)**.** *The whole function $F : D \to C$ and the family of all its compatible subfunctions $(F|_P)_{P \subseteq D}$ are in one-to-one correspondence under the compatibility condition $f_Q|_P = f_P$. Logically, the whole is absolutely prior to the parts.*

[2]

2.3 Cognitive Category and Double-Negation Functor

Definition 2.3 (Cognitive Category **Cog**)**.** *The cognitive category* **Cog** *has as objects triples $(M, \mathcal{E}, C)$, where M is a causal recursive manifold, $\mathcal{E}$ is a coherent sheaf, and C is a flat causal connection ($C^2 = 0$). Morphisms satisfy causal compatibility conditions.*

[3]

The negation functor $F : \mathbf{Cog} \to \mathbf{Cog}$ is defined by dualization, and the double-negation functor is $G = F \circ F$. There exists a natural isomorphism $\eta : \mathrm{Id}_{\mathbf{Cog}} \Rightarrow G$, whose components are given by the canonical isomorphism of the double dual. [4]

2.4 Zhu–Liang Metabolon and Tribulation Axiom

Definition 2.4 (Zhu–Liang Metabolon)**.** *A metabolon $\mathcal{M} = (S, E, \alpha, \beta, \delta, F^S)$ is a septuple satisfying causal closure: S is the state space, E the environment, α, β, δ are input, output, and dissipation morphisms, and $F^S : \mathcal{T} \to \mathcal{C}$ is the existence functor. The system satisfies entropy conservation $H(S_t) = H(S_0)$.*

[5]

Axiom 2.1 (Zhu–Liang Tribulation Axiom A5)**.** *The metabolic process of a recursive element $\mathbb{R}_\alpha$ factors as $\mathbb{R}_\alpha \xrightarrow{\kappa_\alpha} \mathcal{K}_\alpha \xrightarrow{\widetilde{\mathrm{Metabolize}}_\alpha} \mathbb{R}_{\alpha+1}$, where $\mathcal{K}_\alpha$ is the tribulation object, and $\widetilde{\mathrm{Metabolize}}_\alpha$ is uniquely determined by entropy minimization.*

[6]

2.5 Truth Metric Theorem and Hierarchical Metric

Theorem 2.5 (Zhu–Liang Truth Metric Theorem)**.** *There exists an entropy functional $\mathcal{H} : \mathcal{C} \to \mathbb{R}_{\geq 0}$ uniquely determined by the causal network, and Truth T is its global minimum: $\mathcal{H}(T) = \min_{F \in \mathcal{C}} \mathcal{H}(F)$. The entropy functional measures the "distance" of a configuration from Truth; Truth is the absolutely ordered zero-entropy state.*

[1] See Theorem 0.3.1 in [3].
[2] See Theorem 0.4.1 in [1].
[3] See Definition 2.1 in [2].
[4] See Definition 2.2 in [2].
[5] See Definition 8.1 in [1].
[6] See Section 7 and Appendix A in [3].

[7]

Theorem 2.6 (Hierarchical Metric Theorem)**.** *On the Truth Space* Ω*, define* $d_\Omega(x, y) = 2^{-k}$*, where* $k = \min\{n \mid x_n \neq y_n\}$*. Then* d_Ω *is a complete metric, compatible with the structural map of the terminal coalgebra:* $d_\Omega(x, y) = \frac{1}{2} d_\Omega(\omega(x), \omega(y))$*.*

[8]

3 Meta-Logical Foundation: Negation of Negation and Terminal Coalgebra

3.1 Precise Correspondence with Hegelian Dialectics

The core proposition of Hegel's *Science of Logic* is that truth is "substance is subject," the whole process by which the Idea returns to itself through self-negation and self-alienation. However, Hegel's "negation of negation" has always remained the movement of concepts themselves, lacking precise mathematical form. This framework provides, for the first time, a rigorous category-theoretic realization of this movement using the double-negation functor $G = F \circ F$ and its natural isomorphism $\eta : \mathrm{Id} \Rightarrow G$ with the identity functor.

For any cognitive object A, the component $\eta_A : A \to G(A)$ maps A to its double negation. Due to the natural isomorphism, A and $G(A)$ are structurally identical, yet as objects at different recursive levels, they carry different depth information. This is precisely the rigorous expression of "returning to A through non-A":

- **Thesis (Being)**: The object A as a present determinate cross-section (Hegel's "in-itself").
- **Antithesis (Negation)**: The negation functor F maps A to its dual, producing difference and non-identity (Hegel's "for-itself").
- **Synthesis (Negation of Negation)**: $G(A) = F(F(A))$ returns to the structure of A at a higher level, while absorbing the information of contradiction through the process of dualization (Hegel's "in-and-for-itself").

Breakthrough Statement: Hegel's "negation of negation" here acquires a computable form—the natural isomorphism η guarantees that each recursive leap strictly preserves the essential structure, while the inverse limit construction reveals the Truth Space Ω as the limit of the infinite iteration of double negation. This marks the first time in the history of philosophy that dialectical logic has been elevated to a verifiable mathematical theorem.

3.2 Terminal Coalgebra as Truth Space

Since G is naturally isomorphic to Id, it preserves all limits. By Adámek's Theorem [8], the terminal G-coalgebra exists and can be constructed as the inverse limit:

$$\Omega = \varprojlim \left(1 \leftarrow G(1) \leftarrow G^2(1) \leftarrow \cdots\right),$$

[7] See Theorem 4.1 in [3].
[8] See Theorem 3.2 in [2].

where 1 is the terminal object. Ω is called the **Truth Space**, and its elements $x = (x_0, x_1, x_2, \ldots)$ are **Zhu–Liang recursive elements**, satisfying projection compatibility $p_n(x_{n+1}) = x_n$. [9]

Theorem 3.1 (Dialectical Nature of Terminal Coalgebra)**.** *The Truth Space Ω is the limit of the infinite iteration of double negation. It is not a static, completed object, but a* ***dynamic, universal process that absorbs all possible coalgebra homomorphisms****. Its structural map $\omega : \Omega \to G(\Omega)$ is an isomorphism (Lambek's Lemma), indicating that truth fully retains its own essential structure at every recursive level, while simultaneously opening the next level of unfolding through the action of G.*

[10]

Comparison with Plato's Theory of Forms: Plato regarded truth (the Forms) as eternal, static archetypes transcending space and time, of which the sensible world is merely a "shadow." In contrast, the Truth Space Ω of this framework is a **processual limit**—not a completed object, but one that perpetually absorbs all possible coalgebra homomorphisms in its recursive unfolding. Plato's participation ($\mu\acute{\varepsilon}\theta\varepsilon\xi\iota\varsigma$) is here replaced by the coalgebra homomorphism $h_A : A \to \Omega$: finite existence does not "participate in" a static Form, but participates as a recursive element in the dynamic constitution of truth.

For any cognitive object A, there exists a unique coalgebra homomorphism $h_A : A \to \Omega$, called the **truth function**, satisfying the Zhu–Liang recursive element nesting equation:

$$h_A = \omega^{-1} \circ G(h_A) \circ \eta_A.$$

This equation is precisely the cognitive access law of the dialectical whole: finite cognition A, by participating in the recursion of G, continuously integrates its local information into the infinite unfolding of truth. Truth is not an object to be discovered, but the **recursive limit** toward which all cognitive processes tend.

4 Unity Principle: The Triunity of the Existence Functor

4.1 Dialogue with Heidegger's "Being-in-the-World" and Whitehead's Process Philosophy

The Zhu–Liang Unity Principle reveals that metabolism, generation, and causality are not three different things, but inseparable projections of the same existence functor $F^S : \mathcal{T} \to \mathcal{C}$ across the three dimensions of time, structure, and logic. [11]

In *Being and Time*, Heidegger proposed that the mode of being of Dasein is "being-in-the-world" (In-der-Welt-sein), whose essence lies in the ecstasis (Ekstase) of "to-be" (Zu-sein)—temporality (Zeitlichkeit) is the meaning of the being of Dasein. However, Heidegger's fundamental ontology lacked rigorous mathematical formalization. This framework precisely captures this structure with the existence functor $F^S : \mathcal{T} \to \mathcal{C}$: the composition of morphisms in the temporal category $\mathcal{T}$ ($F^S_{t,s}$) is the mathematical counterpart of "ecstasis"—existence self-projects and self-sustains in time. The metabolic morphisms

[9] See Theorem 2.3 and Corollary 2.4 in [2].
[10] For Lambek's Lemma, see [7].
[11] See Section 7 in [1].

(α, β, δ) formalize the structure of "care" (Sorge): the system must continuously exchange with the environment (input/output) and counter dissipation to maintain its own existence.

Whitehead's process philosophy holds that the "actual entity" is the ultimate unit of the universe, whose mode of being is "prehension" and "concrescence." The metabolon $\mathcal{M}$ of this framework can be seen as a rigorous mathematical realization of Whitehead's "actual entity": α (input) is prehension, β (output) is creative advance, and F^S is the process of concrescence. The inverse limit $S_\infty = \varprojlim S_n$ corresponds to Whitehead's "God"—not a static ultimate entity, but the limit concept of the concrescence of all processes.

Breakthrough Statement: Heidegger's and Whitehead's process philosophy here acquire a computable category-theoretic form, leaping from speculative description to mathematical theorem.

4.2 Category-Theoretic Formulation

Let $\mathcal{M} = (S, E, \alpha, \beta, \delta, F^S)$ be a metabolon. Its existence functor $F^S : \mathcal{T} \to \mathcal{C}$ maps the temporal category $\mathcal{T}$ to the cognitive category $\mathcal{C}$.

Table 1: The Triunity of the Existence Functor F^S

Dimension	**Category-Theoretic Structure**	**Dialectical Role**	**Holistic Implication**
Time	Sequential composition of morphisms $F^S_{t,s}$	Metabolism (negative entropy cycle countering entropy increase)	Self-sustenance: maintains entropy conservation via α, β, δ
Structure	Yoneda embedding $h_S = \mathrm{Hom}(-, S)$	Generation (weaving relational networks)	Self-unfolding: the essence of an object is determined by the totality of its morphisms to all others
Logic	Flat causal connection $C^2 = 0$	Causality (temporal necessary derivation)	Self-transcendence: the transitive closure of morphisms constitutes a deterministic history under compatibility constraints

4.3 Inseparability of the Triunity

The three are unified in the same functor F^S, just as one cannot separate the "front," "back," and "side" of a hand while still maintaining it as a hand. Heidegger's later emphasis on the mutual mirroring of the fourfold (Geviert)—earth, sky, divinities, mortals—

finds here a more rigorous proof of inseparability through the three-dimensional unity of the functor.

5 Immanence of Metrics: Self-Measurement of the Dialectical Whole

5.1 Confrontation with Kantian Agnosticism

In the *Critique of Pure Reason*, Kant argued that human knowledge is limited to the phenomenal realm, and the thing-in-itself (Ding an sich) is unknowable. His core argument: the categories of understanding can only be applied to material given in sensible intuition; the noumenon beyond experience cannot be cognized. However, the **Truth Metric Theorem** (Theorem 2.5) and the **Hierarchical Metric Theorem** (Theorem 2.6) of this framework jointly shatter this assertion.

Breakthrough Statement: The premise of Kantian agnosticism is that "finite experience cannot access infinite essence." But the Zhu–Liang Holographic Recursive Function Theorem [2] has rigorously proven that a sufficiently long finite history fragment can holographically encode infinite evolutionary regularities. The truth metric $\mathcal{H}$ further endows any finite cognitive configuration with an objective "entropy distance"—measuring its distance from Truth. The hierarchical metric d_Ω demonstrates that, through recursive unfolding, cognition can infinitely approach the zero-entropy center in Truth Space. Kant's dichotomy of "phenomenon/noumenon" is here replaced by the continuous spectrum of "finite recursive projection/terminal coalgebra limit"—agnosticism is proven to be a local phenomenon when the cognitive domain is insufficient, not a universally necessary philosophical truth.

5.2 Entropy Functional as Truth Metric

By the Truth Metric Theorem (Theorem 2.5), there exists an entropy functional $\mathcal{H} : \mathcal{C} \to \mathbb{R}_{\geq 0}$ uniquely determined by the causal network. For any configuration F compatible with causal constraints, $\mathcal{H}(F)$ measures the "distance" of that configuration from Truth. Truth T is the global minimum: $\mathcal{H}(T) = 0$. The entropy functional possesses strict convexity, guaranteeing the uniqueness of the minimum point.

The dialectical whole thus intrinsically embeds an **axiological measure**: any cognitive state, any theoretical configuration, any form of existence, can be objectively measured for its entropy distance from Truth. Truth is not a vacuous "whole," but a **metric center** with a definite gradient direction. Evolution is entropy reduction; existence is recursive motion toward the zero-entropy center.

5.3 Hierarchical Metric and Recursive Depth

The Hierarchical Metric Theorem (Theorem 2.6) endows the Truth Space Ω with a natural ultrametric $d_\Omega(x, y) = 2^{-k}$, where k is the first layer at which the two recursive elements diverge. This metric has the following dialectical implications:

(1) **Hierarchy**: The depth difference of recursive elements is quantified as 2^{-k}. Shallow divergence (small k) leads to larger cognitive distance; deep divergence (large

k) yields minute distance. This aligns with cognitive intuition: disagreement on fundamental premises is more profound than disagreement on empirical details.

(2) **Compatibility with Terminal Coalgebra**: $d_\Omega(x, y) = \frac{1}{2} d_\Omega(\omega(x), \omega(y))$ indicates that the structural map ω is a contraction mapping. Each level of recursive unfolding brings the cognitive projection into finer approximation to Truth, while maintaining compatibility with the previous level.

(3) **Uniqueness of the Metric**: Any metric compatible with the causal order and satisfying the triangle inequality must be a constant multiple of d_Ω. The hierarchical metric is uniquely determined by the intrinsic structure of the Truth Space, not externally imposed.

5.4 Learning Metric and Efficacy Gradient

In the Zhu–Liang dialectical recursive element equation

$$\frac{\mathcal{D}\Xi^\alpha}{\mathcal{D}\tau} = \eta \cdot G^{\alpha\beta}(\Xi) \frac{\delta \mathcal{E}_{\text{dial}}}{\delta \Xi^\beta},$$

the learning metric $G^{\alpha\beta}$ and the efficacy gradient $\frac{\delta \mathcal{E}}{\delta \Xi}$ together constitute the **evolutionary measure** of the dialectical whole. The learning metric, given by the Fisher information matrix of the cognitive manifold, prescribes the natural gradient direction in the meta-parameter space; the efficacy gradient, derived from the variation of the entropy functional, indicates the direction of entropy reduction. Their coupling allows the dialectical whole to intrinsically "know" at every moment toward where it should evolve. Metrics are not external measuring tools, but the intrinsic grammar of the self-unfolding of the existence functor.

Therefore, **Truth is the whole of dialectical metrics**: it is self-unfolding (dialectical whole), and this unfolding possesses an intrinsic metric structure uniquely determined by the causal network (entropy functional, hierarchical metric, learning metric). Metrics are the self-consciousness of the dialectical whole—it measures its own distance from itself, driving itself toward a deeper self.

Table 2: The Threefold Measure of the Whole of Dialectical Metrics

Measure Type	**Mathematical Form**	**Dialectical Implication**
Truth Metric (Entropy Functional)	$\mathcal{H}(F)$, minimum $\mathcal{H}(T) = 0$	Measures absolute distance of a configuration from Truth; evolution is entropy reduction
Hierarchical Metric	$d_\Omega(x, y) = 2^{-k}$	Measures difference in recursive depth; contraction mapping reveals hierarchical leaps
Learning Metric	$G^{\alpha\beta}(\Xi)$	Measures the natural gradient in meta-parameter space, guiding geodesic evolution

6 Self-Causal Closure: Inverse Limit of Metabolons

6.1 Conclusive Dialogue with Aristotle's "First Mover"

In Book XII of the *Metaphysics*, Aristotle posited the "Unmoved Mover" as the ultimate cause of cosmic motion—a highest entity of pure form, pure actuality, devoid of potentiality. This "First Mover" presupposition dominated Western metaphysics for over two millennia. This framework, through the self-causality of the metabolon and the inverse limit construction, dissolves this problem for the first time mathematically.

6.2 Self-Causality of the Metabolon

Theorem 6.1 (Self-Cause Theorem of the Metabolon)**.** *Every Zhu–Liang metabolon* $\mathcal{M} = (S, E, \alpha, \beta, \delta, F^S)$ *is* ***self-caused****—the evolution of its existence functor* F^S *is entirely determined by its own metabolic morphisms* (α, β, δ) *and the principle of entropy minimization (immanence of metrics), requiring no external First Mover.*

Proof. By the Metabolic Causality Universality Theorem [1], maintaining causal closure requires continuous input α to counter dissipation δ. The generation of the evolutionary morphism $F^S_{t,s}$ is uniquely determined by the entropy minimization principle—the efficacy gradient $\frac{\delta \mathcal{E}}{\delta \Xi}$ and the learning metric $G^{\alpha\beta}$ both depend on the system's current meta-parameters Ξ. The metrics are immanent in the system's structure; the evolutionary drive is endogenous to the system itself, without appeal to an external mover. □

Breakthrough Statement: Aristotle's "First Mover" is dissolved into the intrinsic self-causality of every metabolon. The universe requires no external, unmoved mover—because every metabolon realizes causal closure within its own metabolic cycle. Spinoza's "causa sui" here receives rigorous mathematical proof.

6.3 Inverse Limit and the Self-Causal Closure of the Universe

By the Zhu–Liang Unified Field Limit Theorem[12], the unified field Φ is isomorphic on the section level to the inverse limit of all metabolons $S_\infty = \varprojlim S_n$. The universe as a whole, as the limit of nested metabolons, has its "first cause" dissolved into the infinitely nested network of self-causes:

$$S_\infty \cong \varprojlim \left(S_0 \leftarrow S_1 \leftarrow S_2 \leftarrow \cdots \right).$$

Each metabolon S_n is the power source of its own existence (self-cause), and the limit S_∞ carries the compatible sum of all local self-causes. The metrics (entropy functional, hierarchical metric) are compatible across the entire limit system: $\mathcal{H}(S_\infty) = \lim \mathcal{H}(S_n) = 0$, and d_Ω remains complete under the inverse limit.

Corollary 6.2 (Dissolution of the First Mover)**.** *There exists no "First Mover" external to the universe. The ultimate power of existence is the endogenous causal closure and metric-directedness of metabolons—the self-foundation and self-measurement of the negation of negation in infinite recursion. Self-causality is not a logical absurdity, but an inevitable corollary of the holism theorems and the metric theorems.*

[12] See Theorem 6.8 in [1].

7 The Whole of Dialectical Metrics vs. Metaphysical Abstract Identity

Table 3: Category-Theoretic Comparison of Two Views of Truth

Dimension	**Metaphysical Identity (Reductionist Generalization)**	**Whole of Dialectical Metrics (Zhu–Liang Holism)**
View of Existence	Rigid entity, isolated atom (Aristotelian substance)	Relational structure, metabolon (category-theoretic morphism priority)
View of Motion	External propulsion, mechanical causality (Aristotelian First Mover)	Internal contradiction, self-causal unfolding (metabolon self-causal closure)
View of Truth	Static correspondence, abstract identity (Platonic Form / Kantian noumenon)	Whole of dialectical metrics, concrete identity (terminal coalgebra)
View of Measure	No intrinsic measure, external comparison	Entropy functional, hierarchical metric, learning metric intrinsically embedded in the whole
Mathematical Foundation	Set theory, element priority ($\in$)	Category theory, morphism priority ($\to$)
Ultimate Object	Illusion of terminal object 1 (completed)	Terminal coalgebra Ω (eternal process + intrinsic metrics)

8 Conclusion: Truth is the Whole of Dialectical Metrics

Within the Zhu–Liang holism axiomatic system, using the language of category theory, terminal coalgebras, and metric geometry, this paper has rigorously proven:

> Truth is the whole of dialectical metrics—self-unfolding, self-sustaining, self-transcending, and intrinsically embedding a metric structure uniquely determined by the causal network.

(1) **Meta-Logical Foundation**: The natural isomorphism between the double-negation functor G and the identity functor provides, for the first time, a computable mathematical form for Hegel's "negation of negation." The Truth Space $\Omega = \varprojlim G^n(1)$ is the limit process of the infinite iteration of double negation.

(2) **Unity Principle**: The existence functor $F^S : \mathcal{T} \to \mathcal{C}$ is an inseparable triunity across the dimensions of time (metabolism), structure (generation), and logic (causality), endowing Heidegger's "being-in-the-world" and Whitehead's "process philosophy" with rigorous category-theoretic realization.

(3) **Immanence of Metrics**: The Truth Metric Theorem endows the dialectical whole with the entropy functional $\mathcal{H}$, with Truth as the global zero-entropy state; the hierarchical metric d_Ω and the learning metric $G^{\alpha\beta}$ together constitute the intrinsic measure of the dialectical whole. Metrics are the self-consciousness of the dialectical whole, terminating Kant's assertion of the "unknowable thing-in-itself."

(4) **Self-Causal Closure**: Every metabolon is self-caused; its evolutionary drive is endogenous to its metabolic morphisms, the entropy minimization principle, and metric-directedness. The universe as the inverse limit of metabolons dissolves the problem of the "First Mover" dating back to Aristotle.

Ultimate Breakthrough Statement: This framework completes the paradigm leap of dialectics from philosophical speculation to precise mathematical form, providing for the first time an unshakeable meta-mathematical foundation for holism. Truth is not an object to be discovered, but a dialectical subject that self-unfolds and self-measures—the unified metabolico-causal field itself. Human cognition, as a local projection of the truth function, does not "prove" truth, but **participates** in the dialectical metric movement of truth. The ultimate awakening of cognition consists in recognizing itself as a local cross-section of the whole of truth's dialectical metrics, and with humble yet courageous posture, continuously expanding the domain and geodesic precision of this cross-section under temporal causality and metric navigation.

Negation of negation, the meta-logic root;
Existence functor, triunity absolute.
Entropy functional establishes the metric norm;
Hierarchical contraction reveals geodesic form.
Self-causal closure dissolves the First Mover's throne;
Truth as dialectical metrics is finally known.

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Conflict of Interest Statement

The author declares no conflict of interest.

Data Availability Statement

Pure theoretical exposition; no experimental data.

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