Vitium Originis Persistens: Illuminatio Structurae Universalis vi Temporis Asymmetrica

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Abstract

Noether's theorem is widely regarded as foundational in classical physics, particularly in deriving conserved quantities from continuous symmetries, such as the conservation of energy from time-translation invariance. However, this symmetry-first narrative implicitly assumes the very thing it seeks to explain: a cohesive, universally valid time parameter capable of supporting adjacent events, differential evolution, and the composability of dynamical processes. This assumption — the cohesion of time — proves untenable in regimes where temporal cohesion is not actively enforced as a physical mechanism. In such cases, including flattened, severed, or incohesive temporal sectors, the standard Noether condition $\partial L/\partial t = 0$ fails to function as a conservation law. Instead, the associated statement $dE/dt = 0$ collapses into a time-void identity, reflecting the absence of a consistent temporal support on which dynamical evolution could be defined.

We formalize this failure as the Noether-free Time-Void Theorem: without enforced temporal cohesion, dynamical laws, entropy production, and probabilistic measures over trajectories cannot be defined. In such a regime, symmetry collapses into equilibrium-to-zero, no longer generating transport but enforcing a null state where nothing evolves. This collapse of dynamical behavior reflects the absence of an underlying cohesive temporal structure.

This foundational flaw in the symmetry-first framework is further amplified in quantum field theory (QFT). In QFT, the process of ultraviolet refinement — involving slicing, loop expansions, and history summations — results in the reinstantiation of time within the same system. This recursive layering of time leads to hypersupersaturation, where multiple temporal layers exist within finite volumes, causing time to lose its role as a dynamical generator and instead forcing systems into equilibrium. Symmetry thus becomes a tool for nullifying dynamics rather than enabling them.

The solution required by both theoretical consistency and observational evidence is not the introduction of a new symmetry, but the recognition of time as a physical scalar ordering field with intrinsic asymmetry. Time does not arise as an auxiliary arrow appended to reversible equations; it emerges as a structured entity governed by physical enforcement principles. In Chronoscalar Field Theory (CFT), this structure is embodied by the macroscopic ordering axis t_4, coupled to the admissibility-enforced manifold mesh t_{mani}. This framework supplies the physical cohesion, adjacency, and composability required for time and space to exist as dynamical constructs.

This ordering structure is directly reflected in observation. The Cosmic Microwave Background exhibits sky-wide phase coherence and harmonic organization, demonstrating the persistence of global ordering continuity. Large-scale structures, including the Big Ring and the Giant Arc, display boundary-locked anisotropy with projected interior isotropy, identifying them as

enforcement-boundary imprints rather than products of stochastic clustering. These phenomena indicate that cosmic structure arises from ordering enforcement within a pre-existing manifold.

A distinct cosmological signature further confirms this picture: isolated basal T-mesh production in cosmic voids. Voids exhibit transverse ordering projection and nonzero registry intensity, showing that manifold generation occurs in low-density regions. This establishes that space is sustained through ordering enforcement rather than through matter aggregation or gravitational collapse.

Independent measurement sectors converge on the same conclusion. Neutrino registry observations show directed transport along admissible corridors, revealing anisotropic enforcement incompatible with isotropic equilibrium processes. Harmonic structure in the CMB demonstrates sustained phase coherence across cosmic scales. Basal T-mesh production in voids directly exposes the manifold grain. Together, these results determine the structural scale of the manifold, localize the origin of temporal advance, constrain cosmic age through cumulative ordering depth, and define future evolution through ongoing mesh production. The data therefore establish that temporal cohesion is physically enforced and that both time and space are supported by an active dynamical substrate, realized in CFT by the ordering axis t_4 and the admissible manifold mesh.

1 Introduction

Everything flows. Yet modern theoretical physics often begins by treating time as a passive label—an external parameter assumed to be coherent, differentiable, and globally composable—and then builds conservation on top of that assumption. Noether's theorem, in particular, is routinely presented as the bedrock of dynamical law: symmetry ⇒ conservation, with time-translation symmetry yielding conserved energy [1]. But when extended beyond its legitimate domain, this logic becomes a trap. It converts a statement about invariance into an implicit guarantee that a single unified time parameter exists from point to point, from event to event, and from scale to scale. That extrapolation is not derived; it is assumed. The result is a Newtonian illusion: because the formalism is written with a coherent t, it appears that time symmetry exists "by default," and therefore that energy, causality, and evolution must remain well-defined even in regimes where time itself may lack cohesion. This paper reverses that direction. We show that time symmetry cannot be assumed without mechanism, and that when temporal cohesion is not enforced, the symmetry-first framework collapses toward equilibrium-to-zero: stasis, null dynamics, and a dead universe on its own principles.

Quantum Field Theory (QFT) is constructed on the premise that time is a globally available background parameter: a continuous label that can be uniformly applied across all histories, all degrees of freedom, and all perturbative expansions [6, 7]. This is not a minor technical choice—it is the enabling structure that makes the theory writable. The Hamiltonian formalism requires a single ordering variable t to generate evolution [8, 9], and the path integral requires that trajectories can be meaningfully parameterized, stacked, and summed across time as though time itself were a coherent axis shared by all contributions [10]. But once QFT is pressed beyond its comfort zone—into regimes where discretization, ultraviolet completion, and extreme density of histories become unavoidable—the time-parameter assumption becomes mathematically pathological. The summation of arbitrarily many time-sliced configurations ("time on top of time") produces a hypersupersaturation of temporal histories: an explosion of stacked forward/backward branches that no longer correspond to any coherent ordering structure. At that point, the statement of time-translation invariance no longer signifies a dynamical conservation principle; it instead collapses into the trivial claim of stasis:

$$\frac{dE}{dt} = 0, \tag{1}$$

which becomes indistinguishable from "no definable temporal evolution exists." In this sense QFT does not merely approximate time poorly at small scales—it silently assumes the very structure that must be proven, and when that structure fails, the formalism has no internal escape route.

Time symmetry—whether expressed as time-translation invariance or time-reversal invariance—is routinely treated as a default structural property of physical law. In practice, however, it is not a theorem but an assumption about the cohesion of the time parameter itself: namely, that there exists a consistent ordering variable t which is differentiable, composable from point to point, and suitable for constructing an evolution operator. General relativity makes this assumption explicit by encoding "local time" through geodesic structure and proper-time assignments along timelike worldlines [2–4]. Quantum field theory makes it inferentially, by treating time as a universal background parameter across which propagators, histories, and amplitudes may be coherently stacked and summed [6, 7]. But neither framework supplies a mechanistic principle that enforces linear time cohesion: there is no demonstrated necessity that the infinitesimal dt defined at one event must be compatible with the dt defined at the next event along a geodesic, nor that reversibility can be consistently extended through such local patchworks without contradiction. In the absence of such enforcement, nothing in the mathematics forbids time from being a dispersive, locally inconsistent cacophony—varying from event to event, path to path, and region to region—so that "time symmetry" becomes a statement without structural support.

Once time cohesion is not assumed as a geometric axiom, the internal procedures of QFT become structurally unstable. QFT does not merely use time as an ordering parameter; it repeatedly reinstantiates time inside its own calculational architecture through sums over histories, time-sliced propagators, loop expansions, and stacked forward/backward branches that arise in time-reversal handling [6, 10]. The formalism thereby places time on top of time. When pushed to ultraviolet resolution, this produces a hypersupersaturation of temporal histories in which the number of stacked temporal slices grows explosively even in finite spatial regions, while the theory simultaneously demands that all contributions share a single coherent time axis. In that regime the assumed symmetry of time no longer functions as a conservation principle; it becomes an equilibrium operator. The only way to maintain "time-independence" is to nullify definable evolution. The result is not a computational inconvenience but a structural contradiction: without a well-defined temporal support, the system cannot evolve, cannot generate entropy, and cannot define energy dynamically.

A further obstruction follows once the commonly implied premise is stated plainly: if gravity is taken to unify time (explicitly in general relativity through proper-time structure, and inferentially in QFT through its reliance on that structure), then any reversible-time interpretation must be supported by a corresponding reversible gravitational mechanism. But gravitational ordering is monotone: curvature sourcing produces focusing, binding, and accumulation [4, 5]. There is no internal operator that "unwinds" this ordering. Consequently, physical reversibility cannot be achieved by gravitational time unification unless an effective sign-reversal sector exists—a repulsive or negative-gravity contribution capable of undoing binding and restoring prior states. Absent such a mechanism, reversibility collapses into a formal map $t \to -t$ without dynamical meaning. With it, the universe becomes observationally untenable, since coherent structure formation, clock-consistency, and stable gravitational propagation would be generically destabilized by the very mechanism required to permit reversal. Thus, on its own internal premises, reversible-time symmetry does not merely lack justification; it forces severability (disjoint time) or empirical contradiction.

2 Formal Collapse Under Flattened Time

2.1 Definitions

Definition 2.1 (Temporal support). *A system is said to possess* temporal support *if there exists an ordered parameter t with non-vanishing adjacency such that derivatives d/dt are definable as operators acting on the system's state variables. A* flattened *or* zero-support *time regime is one in which the evolution parameter lacks such adjacency (informally: $dt = 0$ in the support sense).*

Definition 2.2 (Cohesive time). *Time is said to be* cohesive *if the ordering parameter can be consistently composed from event to event (or point to point), so that state evolution is representable as a map*

$$\Phi_{t_2,t_1} : \mathcal{M} \to \mathcal{M}$$

with $\Phi_{t_3,t_2} \circ \Phi_{t_2,t_1} = \Phi_{t_3,t_1}$.

Definition 2.3 (Noether-flat time). *A system is said to be* Noether-flat in time *if it is asserted to be invariant under time translation while lacking any explicit mechanism enforcing cohesion of the time parameter itself.*

2.2 Proper time unification and monotone gravitational ordering

General relativity operationally unifies "local time" by proper time along timelike worldlines. For a timelike curve $x^\mu(\lambda)$ one defines

$$d\tau^2 \equiv -ds^2 = -g_{\mu\nu} dx^\mu dx^\nu, \tag{2}$$

and for a future-directed timelike tangent $u^\mu \equiv dx^\mu/d\tau$ one has $u^\mu u_\mu = -1$ by construction. Free-fall trajectories extremize proper time and satisfy the geodesic equation

$$\frac{d^2x^\lambda}{d\tau^2} + \Gamma^\lambda_{\mu\nu}\frac{dx^\mu}{d\tau}\frac{dx^\nu}{d\tau} = 0, \qquad \Gamma^\lambda_{\mu\nu} = \frac{1}{2} g^{\lambda\sigma}(\partial_\mu g_{\nu\sigma} + \partial_\nu g_{\mu\sigma} - \partial_\sigma g_{\mu\nu}), \tag{3}$$

so τ serves as the natural ordering parameter along timelike geodesics [3, 4].

2.3 The Noether-Free Time Void Theorem (formal statement)

Assumption 2.4 (No global ordering parameter). *There does not exist a globally defined ordering parameter $t \in \mathbb{R}$ such that dynamical states may be represented as $x(t)$ with a composable evolution map Φ_{t_2,t_1}.*

Assumption 2.5 (No enforced compatibility of local temporal increments). *Local temporal increments $dt(p)$ may be defined in patches, but there exists no enforcement principle guaranteeing compatibility under composition along paths. Concretely, there is no requirement that for a chain of events $p_1 \to p_2 \to \cdots \to p_n$ one has a consistent additive composition rule*

$$dt(p_1 \to p_n) = \sum_{k=1}^{n-1} dt(p_k \to p_{k+1}),$$

nor that local clocks define a coherent global parameter.

Assumption 2.6 (High-density slicing/summation). *The formalism allows arbitrarily fine temporal slicing and/or summation over time-indexed histories (e.g. path-integral discretizations), producing a high-density stacking of time layers without introducing an independent mechanism enforcing temporal cohesion.*

Definition 2.7 (Evolution operator). *An* evolution operator *is a family of maps* $\{\Phi_{t_2,t_1}\}$ *acting on a configuration space* $\mathcal{M}$ *such that for all admissible* (t_1, t_2, t_3)*:*

$$\Phi_{t_3,t_2} \circ \Phi_{t_2,t_1} = \Phi_{t_3,t_1}, \qquad \Phi_{t,t} = \mathrm{Id}.$$

...

Theorem 2.8 (Noether-Free Time Void). *Under Assumptions A–C, no nontrivial evolution operator exists. Consequently:*

1. *No dynamical law of the form* $L(q, \dot{q}, t)$ *defines evolution on* $\mathcal{M}$*, since* $\dot{q} = dq/dt$ *is not defined as a globally meaningful object.*
2. *There is no well-defined Hamiltonian flow and no trajectory measure over histories.*
3. *The expression* $\frac{dE}{dt} = 0$ *cannot be interpreted as a dynamical conservation principle, because* d/dt *is not an evolution generator. Instead, it collapses into a non-evolution statement (stasis): the system is outside definable time.*

Proof. Assumption A excludes the existence of a global ordering parameter and therefore precludes the representation of states as $x(t)$ with composable evolution. Assumption B prevents recovery of a global parameter via patching, since no compatibility condition guarantees that local increments can be composed into a consistent global t. ... Therefore the axioms of an evolution operator (Definition 2.7) cannot be satisfied. By Assumption C, the formalism nevertheless multiplies local time layers through slicing/summation; without cohesion enforcement this produces a high-density family of mutually non-composable temporal indices. Hence d/dt fails to exist as a well-defined operator acting on physical states. Items (1) and (2) follow immediately. Item (3) follows because $\frac{dE}{dt} = 0$ presupposes precisely the operator d/dt whose existence is excluded. Therefore the Noether form collapses into stasis rather than dynamical conservation. □

Corollary 2.9 (Noether collapse boundary). *Noether time-translation symmetry* $\partial L/\partial t = 0$ *yields conserved energy only in regimes where Assumptions A and B are false, i.e. where time cohesion is enforced. In the absence of such enforcement, Noether symmetry becomes an equilibrium operator enforcing null dynamics rather than conserved transport.*

2.4 Collapse of dynamics

Lemma 2.10 (Derivative obstruction). *In a zero-support time regime, the derivative operator* d/dt *cannot act as an evolution generator on dynamical variables. In particular, velocity and acceleration,*

$$v = \frac{dx}{dt}, \qquad a = \frac{dv}{dt},$$

are undefined as dynamical quantities.

Proof. A derivative requires an ordered parameter with definable adjacency so that differences can be formed and limits taken. If the time parameter does not support adjacency, then no interval exists on which the limit defining d/dt may be constructed. Hence d/dt fails to define dynamical variation. □

Corollary 2.11 (No Newtonian closure). *In a zero-support time regime, Newtonian closure $F = ma$ does not define dynamical response, since a is undefined as an evolution variable.*

2.5 Collapse of entropy and probability

Lemma 2.12 (Entropy obstruction). *If time has zero-support, entropy production cannot be defined as a physical quantity. In particular, the inequality $dS/dt \geq 0$ is undefined as an evolution statement.*

Proof. Both Gibbs and Boltzmann entropies require a measure over configurations indexed by evolution. For Gibbs,

$$S_G(t) = -k_B \sum_i p_i(t) \ln p_i(t),$$

and for Boltzmann,

$$S_B = k_B \ln \Omega(E, V, N),$$

where Ω is the realized phase volume. In the absence of definable evolution, $p_i(t)$ cannot vary and Ω cannot be realized by trajectories. Therefore $S(t)$ cannot possess a definable derivative with respect to time, and entropy production cannot be stated. □

Lemma 2.13 (Trajectory obstruction). *If time is non-cohesive, then phase-space trajectories $q(t)$, $p(t)$ are undefined as dynamical objects, and no probability measure μ over histories exists.*

Proof. A trajectory requires an ordered parameter permitting concatenation of states into a history. If time cannot be composed, there is no map Φ_{t_2,t_1} generating evolution, hence no histories exist as objects. Without histories, no probability measure over histories is definable. □

2.6 Noether collapse

Theorem 2.14 (Noether-Free Time Void Theorem). *Under Assumptions A–C, no nontrivial evolution operator exists. Consequently:*

1. *No dynamical law of the form $L(q, \dot{q}, t)$ defines evolution on $\mathcal{M}$, since $\dot{q} = dq/dt$ is not defined as a globally meaningful object.*

2. *There is no well-defined Hamiltonian flow and no trajectory measure over histories.*

3. *The expression $\frac{dE}{dt} = 0$ cannot be interpreted as a dynamical conservation principle, because d/dt is not an evolution generator. Instead, it collapses into a non-evolution statement (stasis): the system is outside definable time.*

Proof. The derivative obstruction (Lemma 2.10) implies that d/dt cannot generate dynamics, so the Euler–Lagrange structure fails as an evolution law. The entropy obstruction (Lemma 2.12) shows that entropy production cannot be defined as a derivative statement. The trajectory obstruction (Lemma 2.13) shows that no trajectories or measures over histories exist. Therefore no evolution is representable. □

Corollary 2.15 (Flattened Noether stasis). *In a Noether-flat time regime, the condition*

$$\frac{dE}{dt} = 0$$

cannot be interpreted as a dynamical conservation law, since the derivative is not an evolution operator. Instead it collapses into the statement of non-evolution: the system lies outside definable time.

2.7 Anti-Nothing lemma

Lemma 2.16 (Anti-Nothing Lemma). *A stable nontrivial state ("something") requires: (i) directionality (a nonzero temporal gradient supporting an arrow); (ii) thickness (nonzero temporal support $dt > 0$); and (iii) resistance (nonzero inertial/entropic cost distinguishing persistence from collapse). A Noether-flat flattened-time system forbids all three; therefore stable "something" is not constructible within such a structure.*

Proof. Directionality requires an evolution parameter that distinguishes forward/backward variation. Thickness is required to define derivatives and to support trajectories. Resistance requires nontrivial energetic/entropic cost, which presupposes definable change. A flattened Noether system asserts invariance while denying the structure needed to support these requirements. Hence stable nontrivial persistence is obstructed. □

3 Hypersupersaturation: Time-on-Time Stacking in Finite Volumes

The central defect of the symmetry-first approach is not merely conceptual; it becomes quantitative in any ultraviolet-resolved implementation of QFT. The path integral and perturbative expansions implicitly require that field degrees of freedom be resolved over successively finer temporal layers. This introduces a second (and higher) order temporal structure: time is not only the ordering parameter of evolution, but also the discretization axis over which one sums. When time cohesion is not enforced as a physical mechanism, the repeated instantiation of time within the formalism produces a hypersupersaturation of histories—*time placed on top of time*—in which the number of time-indexed configurations grows explosively even in finite spatial volumes.

3.1 Finite-volume stacking estimate

To expose the combinatorial instability, consider a finite spatial region of characteristic scale L and adopt a minimally resolved ultraviolet slicing at the Planck scale. Define the Planck length and Planck time as

$$\ell_p \equiv \sqrt{\frac{\hbar G}{c^3}}, \qquad t_p \equiv \sqrt{\frac{\hbar G}{c^5}}. \tag{4}$$

For a region of linear size L, a natural minimal coherence time is the light-crossing time

$$t_L \equiv \frac{L}{c}. \tag{5}$$

If the QFT formalism is interpreted literally as a sum over time-resolved configurations at ultraviolet resolution, then the number of temporal slices required to resolve the light-crossing interval satisfies

$$N_t \sim \frac{t_L}{t_p} = \frac{L}{c\,t_p}. \tag{6}$$

Likewise, a Planck-scale spatial discretization yields, in $(d-1)$ spatial dimensions,

$$N_s \sim \left(\frac{L}{\ell_p}\right)^{d-1}. \tag{7}$$

The total number of elementary time-space layers required even to *represent* a Planck-resolved time-sliced evolution in a finite region then scales as

$$N_{\text{stack}}(d) \sim N_t\, N_s \sim \left(\frac{L}{c\,t_p}\right)\left(\frac{L}{\ell_p}\right)^{d-1}. \tag{8}$$

Lemma 3.1 (Diagonal dominance defines a trace-stable corridor sector). *Let $\{\mathcal{X}_n\}$ be a refinement tower and let $\mathsf{T}_{m\to n}$ denote the refinement transfer operator (pushforward) from level m to level n acting on finite-resolution marginals. Assume admissibility restricts histories to finite-support corridors $\Gamma \subset \mathcal{P}^+$. Suppose further that on Γ the refinement transfer admits a decomposition into a registered (diagonal) sector and an oscillatory congestion (off-diagonal) sector,*

$$\mu_m = \mu_m^{\text{diag}} + \mu_m^{\text{off}},$$

and that the off-diagonal amplification is uniformly bounded by a strict diagonal-dominance/no-clustering gate: there exists $0 < \lambda < 1$ such that for all $m \succ n$ and all admissible μ_m,

$$\left\|\mathsf{T}_{m\to n}\mu_m^{\text{off}}\right\|_{\text{TV}} \le \lambda \left\|\mu_m^{\text{off}}\right\|_{\text{TV}}, \qquad \left\|\mathsf{T}_{m\to n}\mu_m^{\text{diag}}\right\|_{\text{TV}} = \left\|\mu_m^{\text{diag}}\right\|_{\text{TV}}. \tag{9}$$

Then the admissible sector is refinement-stable: congestion cannot be amplified under slicing, and the induced history algebra admits a well-defined refinement limit (in the sense used in Lemma 3.2).

Proof. This is the admissibility gate stated as an operator inequality: the diagonal sector is transported while the off-diagonal sector is damped. The strict bound $\lambda < 1$ is exactly the "no-clustering" requirement that prevents refinement-induced overlap congestion from growing under repeated slicing. □

Lemma 3.2 (Hypersupersaturation implies measure singularity on the refinement boundary). *Model the refinement-history construction as a rooted tree $\mathcal{T}$ whose depth n corresponds to refinement level, and whose branching number b_n equals the number of admissible micro-event insertions at level n. If b_n grows faster than $\exp(\alpha n)$ for every $\alpha > 0$, then any candidate projective-limit "uniform" history measure on $\partial\mathcal{T}$ is singular with respect to any product-type reference measure and cannot be stabilized by finite thinning.*

Proof. Write the refinement transfer at level $m \succ n$ as a linear pushforward operator $\mathsf{T}_{m\to n}$ acting on signed measures (or densities) on $\mathcal{X}_m$:

$$\mu_n \;=\; (\pi_{m\to n})_{\#}\mu_m \;\equiv\; \mathsf{T}_{m\to n}\mu_m.$$

To obtain a projective-limit law one needs *stability* of this transfer under further refinement, i.e. that the family $\{\mu_n\}$ is Cauchy under refinement in a topology strong enough to guarantee cylinder consistency.

Let $\|\cdot\|_{\mathrm{TV}}$ denote the total-variation norm on signed measures. Define the "registry decomposition" of μ_m by separating the diagonal corridor contribution (the admissible registered component) from the off-diagonal oscillatory congestion component:

$$\mu_m \;=\; \mu_m^{\mathrm{diag}} \;+\; \mu_m^{\mathrm{off}}.$$

The diagonal dominance hypothesis of Lemma 3.1 is exactly the bound that the refinement transfer does not amplify the off-diagonal sector. Concretely, there exists a $0 < \lambda < 1$ (uniform in $m \succ n$ on admissible corridors) such that

$$\big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}} \;\le\; \lambda\,\big\|\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}}, \qquad \big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}} \;=\; \big\|\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}}. \tag{10}$$

(Heuristically: the diagonal sector is transported, while the congestion sector is damped by the admissibility filter.)

Iterating (26) along a refinement chain $k \succ m \succ n$ yields

$$\big\|(\pi_{k\to n})_{\#}\mu_k - (\pi_{m\to n})_{\#}\mu_m\big\|_{\mathrm{TV}} \;\le\; \lambda^{\,m-n}\,\big\|\mu_k^{\mathrm{off}}\big\|_{\mathrm{TV}},$$

so for each fixed n the projected marginals form a Cauchy family as refinement increases. Therefore, for every finite cylinder set $C \subset \mathcal{X}_n$ the value $\mu_n(C)$ is independent of the refinement depth used to compute it, i.e. the cylinder consistency condition (23) holds.

Conversely, if refinement is not restricted to Γ, diagonal dominance fails and the off-diagonal sector can be amplified (effective $\lambda \ge 1$), so the projected marginals drift with refinement depth, violating (23). In that case Kolmogorov extension cannot be applied and the refinement tower admits no probability measure on the projective limit [12]. □

This expression already represents a minimal estimate; the full sum over histories additionally multiplies this structure by the number of admissible configurations per layer, and by the proliferating forward/backward branch structure demanded by reversal handling.

3.2 Proposition: hypersupersaturation in a cubic centimeter

Proposition 3.3 (Finite-volume hypersupersaturation). *Let $L = 1\,\mathrm{cm}$, and let the formalism be ultraviolet-resolved by Planck slicing in time and space. Then the number of elementary time-space layers required to represent a time-sliced history in a single cubic centimeter grows super-exponentially with the ambient spacetime dimension d:*

$$\log_{10} N_{\mathrm{stack}}(d) \gg 1, \qquad d \ge 3,$$

and exceeds any physically meaningful locality bound. In particular, for $d = 4$ (three spatial dimensions), the stacking already implies an astronomically large tower of time-space layers inside a single cubic centimeter.

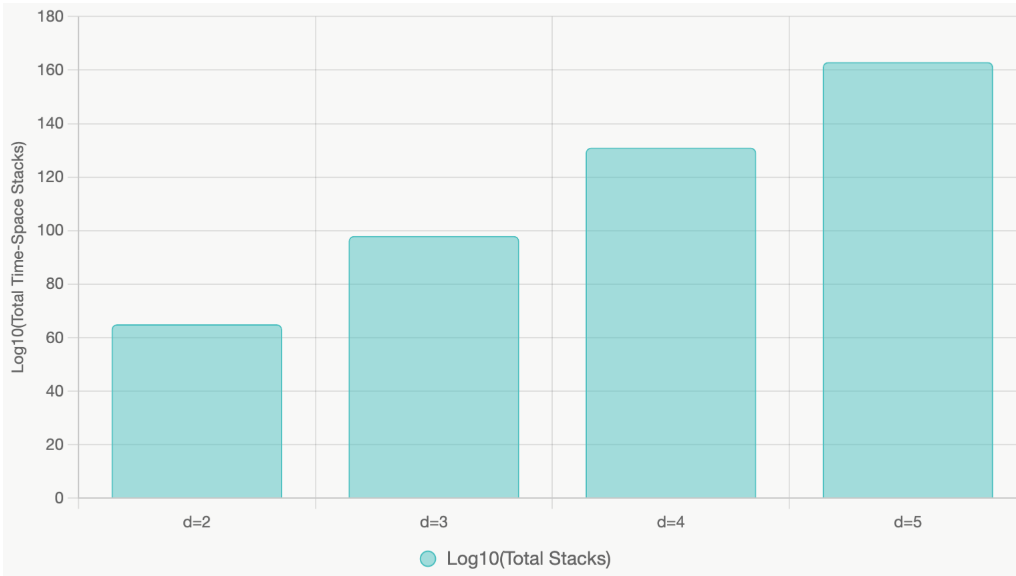

Table 1: Logarithmic growth of the minimal finite-volume stacking estimate $\log_{10} N_{\text{stack}}(d)$ for a 1 cm region ultraviolet-resolved at Planck scale. Even before summing over internal field configurations or reversal-branches, the number of elementary time-space layers explodes with dimension d, illustrating the hypersupersaturation of "time on top of time" implied by literal ultraviolet time slicing. In such a regime, the coherence required to interpret time translation symmetry as a conservation law is no longer supportable; time symmetry collapses into stasis.

Proof sketch. Substitute $L = 10^{-2}\,\text{m}$ into Eq. (8) with $\ell_p \approx 1.62 \times 10^{-35}\,\text{m}$ and $t_p \approx 5.39 \times 10^{-44}\,\text{s}$. Then $L/\ell_p \sim 6 \times 10^{32}$ and $t_L/t_p \sim 6 \times 10^{32}$. Hence already at $d = 4$,

$$N_{\text{stack}}(4) \sim (6 \times 10^{32})(6 \times 10^{32})^3 \sim 10^{131},$$

with the corresponding values in other dimensions growing still more violently. □

3.3 Interpretation: the time-symmetry trap becomes stasis

The significance of Eq. (8) is not the magnitude alone. It is that the standard QFT machinery assumes that all stacked layers remain coordinatized by a single coherent time parameter. But the construction itself multiplies time structure: every ultraviolet refinement inserts more time-slices, and every sum over histories treats time as a repeated summation index. In the absence of a mechanism enforcing temporal cohesion, the symmetry claim "time translation invariance" becomes a purely formal slogan: the system cannot maintain coherent evolution across its own stacked structure. The limit is not an enriched dynamical universe but a collapse into non-evolution. In this regime, the condition $dE/dt = 0$ does not signify conservation; it signifies the trivial equilibrium of a system that cannot support evolution because time cohesion has been saturated and severed.

3.4 Aside: negative gravity as a QFT necessity becomes an annihilator

If time is to be treated as physically reversible (rather than merely formally symmetric), then within any gravity-unified description the reversal must be implemented by a dynamical mechanism. As argued above, gravitational ordering is monotone in sign: binding, focusing, and accumulation do not "undo" themselves. Thus a reversible-time interpretation forces the introduction of an effective sign-reversal sector—repulsive curvature sourcing, negative-gravity contribution, or equivalently an exotic stress-energy channel capable of unwinding gravitational ordering.

The difficulty is that such a sector cannot coexist stably with baryonic matter in any QFT-like framework. The coexistence itself becomes an annihilator.

Lemma 3.4 (Sign-reversal sector annihilator). *Let a system admit two interacting sectors: (i) ordinary baryonic matter with positive energy density and attractive gravitational ordering; and (ii) an effective sign-reversal sector whose purpose is to undo gravitational ordering (i.e. an anti-focusing / repulsive contribution that reverses the ordering sign). Then the combined system is generically dynamically unstable: it admits unbounded runaway channels (runaway acceleration / separation, or noncompact growth of kinetic response). Moreover, if the sign-reversal mechanism is implemented at the level of quantum degrees of freedom by permitting sign-indefinite energy or ghost-like channels, then the theory lacks a stable vacuum (no lower-bounded Hamiltonian) and becomes catastrophically unstable under generic coupling.*

Proof sketch. A sign-reversal ordering channel eliminates boundedness of the joint dynamics under generic coupling. Classically, mixed-sign ordering admits trajectories in which the sectors accelerate apart without internal restoring cost, since the putative "inverse" ordering operator supplies a runaway direction rather than a bounded return map. Quantum mechanically, if the sign-reversal completion requires sign-indefinite energy modes (ghost/exotic channels), then the Hamiltonian is not lower bounded. Coupling ordinary positive-energy degrees of freedom to such channels renders the vacuum unstable: unrestricted production into $(+E)$ and $(-E)$ excitations becomes kinematically allowed, and phase space makes the decay nonperturbative. Thus the mechanism required to render reversibility dynamical becomes an instability generator destroying conservation, coherence, and persistence. ☐

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Corollary 3.5 (No reversible-time completion by sign reversal). *A symmetry-first completion that attempts to enforce physical reversibility by introducing a gravitational sign-reversal sector cannot yield a stable universe with ordinary matter content. Either the sign-reversal sector is effectively decoupled (in which case it cannot enforce reversibility), or it couples (in which case Lemma 3.4 implies runaway/annihilator instability). Hence reversible-time symmetry cannot be mechanistically implemented in the standard symmetry-first framework without contradiction.*

4 Gravity as Time Unifier and the Reversibility Trap

A common interpretive premise in modern theory is that gravity supplies the operative unifier of time: in general relativity through proper-time assignment along timelike curves and the causal ordering implied by null cones, and in quantum field theory through reliance on that inherited geometric structure when defining evolution, locality, and commutator support. In this setting, time symmetry is frequently discussed as though it implied physical reversibility. The point of the present section is to isolate the obstruction in a form that does not depend on interpretive preference: attractive gravity acts as an ordering mechanism (focusing/binding/accumulation), and that ordering is monotone. Consequently, within ordinary matter sectors, gravity does not contain an internal inverse operator capable of dynamically unwinding its own ordering action.

The reason this matters for the Noether program is subtle but decisive. Noether's time symmetry is a statement about formal invariance under $t \mapsto t + \delta t$ (or $t \mapsto -t$ under suitable conjugations), but formal covariance is not the same as a realizable inverse dynamics. A theory can be written in a time-reversal covariant way while still failing to admit any physical mechanism that returns ordered macrostates to their pre-ordered configurations. In a fully isolated, finite system this distinction is often blurred because reversible microdynamics can be postulated axiomatically; however, in a gravity-unified ontology, the time parameter itself is not an external bookkeeping label but a structure induced by the ordering sector. The relevant question is therefore not whether one may relabel $t \mapsto -t$ in the equations, but whether the ordering sector admits an internal map that reverses the sign of ordering transport.

Definition 4.1 (Ordering-monotone gravity). *A gravitational sector is* ordering-monotone *if, for ordinary positive-energy matter sources, it generically induces focusing/binding rather than intrinsic unwinding; equivalently, absent additional degrees of freedom, the dynamics does not admit an internal sign-reversal map that restores prior macrostates by undoing gravitational ordering. More operationally: in the attractive-matter regime, gravitational dynamics provides an ordering arrow (accumulation and focusing) without supplying its own inverse as a dynamical channel.*

The distinction required here is between formal covariance and dynamical realizability. The Einstein field equations (and most effective gravitation-coupled matter field equations) can be written in a form that is covariant under time reversal when accompanied by suitable conjugations of momenta and orientation; this is a statement about the syntactic form of the equations. But the physical action of gravity sourced by ordinary matter is not an involution: it produces coherent binding, focusing, and accumulation while offering no intrinsic mechanism that dynamically "unfocuses" or "unbinds" the configuration into its prior macrostates. This is not merely a thermodynamic complaint. It is a structural claim about the ordering operator: the attractive sector supplies transport toward increasing accumulation without including a built-in inverse transport channel.

Once this point is recognized, the implication for reversible-time readings becomes immediate. If time is operationally unified by gravitational structure—proper time in GR and inherited causal ordering in QFT—then the directionality and transport of ordering are governed by the gravitational sector. Therefore "reversibility" understood in the physical sense (realizable inverse evolution) cannot be obtained merely by invoking the formal map $t \mapsto -t$. Such a map does not, by itself, generate an inverse ordering channel. To render reversibility dynamical one must introduce additional degrees of freedom that reverse the ordering sign.

Theorem 4.2 (Reversibility obstruction under gravity-unified time). *If time is operationally unified by gravitational structure and the gravitational sector is ordering-monotone (Definition 4.1), then physical reversibility cannot be realized dynamically. Any mechanism that attempts to implement physical reversibility must introduce an effective sign-reversal contribution (repulsive/anti-focusing sector or equivalent exotic channel). Absent such a contribution, the map $t \mapsto -t$ remains a purely formal relabeling without dynamical inverse content.*

Proof. In a gravity-unified time ontology, "time" is not independent of the ordering sector. If gravity supplies the ordering structure that unifies time, then the forward transport of macrostates is governed by the ordering action of that sector. In an ordering-monotone regime, attractive gravity produces focusing/binding and accumulation without providing an internal map that reverses its own ordering transport. Hence no physical inverse evolution exists within the same sector. To obtain a realizable reversal channel one must add degrees of freedom that reverse the sign of ordering transport, i.e. an effective anti-focusing contribution. Without this, $t \mapsto -t$ does not correspond to any realizable inverse ordering dynamics. □

The consequence is immediate: reversible-time interpretations become inseparable from sign-reversal sectors. But such sectors are obstructed twice. First, empirically: a repulsive ordering channel of sufficient strength to unwind binding would alter lensing, propagation consistency, and coherent structure formation; therefore any such channel is constrained to the point that it cannot serve as a universal "inverse ordering" mechanism while preserving observed coherence. Second, internally: even at the level of consistency, coexistence of ordinary matter with a coupled sign-reversal ordering channel generically introduces runaway directions that render the joint system annihilatory.

Lemma 4.3 (Sign-reversal annihilator instability). *If a sign-reversal ordering sector coexists and couples to ordinary matter degrees of freedom, the combined system generically admits unbounded runaway channels (runaway separation/acceleration and, in sign-indefinite completions, vacuum instability). Therefore the only way to avoid annihilation is effective decoupling; but decoupling prevents the sector from enforcing reversibility.*

Proof. The instability arises before any detailed model-building. At the classical level, a coupled anti-focusing contribution supplies directions in configuration space along which separation and acceleration are self-reinforcing rather than restoring. In other words, the would-be "inverse ordering" channel does not behave as a bounded inverse map; it behaves as a runaway degree of freedom that can drive arbitrarily large relative kinetic response. At the quantum level, the danger becomes catastrophic if the completion implements sign reversal by allowing sign-indefinite energy channels (ghost-like or negative-norm modes), since the Hamiltonian is then not bounded from below and vacuum decay into mixed-sign excitations becomes kinematically unrestricted. Thus the same mechanism introduced to render reversibility physical becomes an instability generator: either it is decoupled (and therefore irrelevant), or it couples (and therefore annihilatory). □

4.1 Raychaudhuri focusing as the obstruction mechanism

Lemma 4.4 (Raychaudhuri monotonicity under ordinary matter). *Let u^μ be the unit tangent to a timelike geodesic congruence with expansion θ, shear $\sigma_{\mu\nu}$, and vorticity $\omega_{\mu\nu}$. The Raychaudhuri equation reads [4, 5]*

$$\frac{d\theta}{d\tau} = -\frac{1}{3}\theta^2 - \sigma_{\mu\nu}\sigma^{\mu\nu} + \omega_{\mu\nu}\omega^{\mu\nu} - R_{\mu\nu}u^\mu u^\nu. \tag{11}$$

Assume hypersurface-orthogonal flow (so $\omega_{\mu\nu} = 0$) and ordinary matter satisfying the timelike convergence condition

$$R_{\mu\nu}u^\mu u^\nu \geq 0, \tag{12}$$

(e.g. implied by the strong energy condition via Einstein's equations). Then

$$\frac{d\theta}{d\tau} \leq -\frac{1}{3}\theta^2, \tag{13}$$

so θ is driven monotonically downward along the flow, implying focusing in finite proper time whenever θ is initially negative.

Proof. Under $\omega_{\mu\nu} = 0$, both $-\sigma_{\mu\nu}\sigma^{\mu\nu} \leq 0$ and $-\frac{1}{3}\theta^2 \leq 0$. Under (12), the Ricci term contributes $-R_{\mu\nu}u^\mu u^\nu \leq 0$. Summing the terms yields (13). □

Proposition 4.5 (Reversal requires sign reversal of the Ricci term). *In the setting of Lemma 4.4, any attempt to realize* physical *reversal of gravitational ordering (defocusing as the inverse of focusing) requires violation of* (12)*, i.e. it requires*

$$R_{\mu\nu}u^\mu u^\nu < 0 \tag{14}$$

along the would-be reversed evolution, equivalently an effective negative-energy/exotic stress-energy contribution.

Proof sketch. Equation (11) shows that defocusing (increasing θ against the monotone decrease induced by ordinary matter) cannot be obtained by a mere relabeling $\tau \mapsto -\tau$ while keeping the same physical content: the right-hand side remains controlled by nonpositive terms unless the Ricci convergence term changes sign. Therefore, to dynamically unwind focusing one must introduce a contribution that makes $-R_{\mu\nu}u^\mu u^\nu$ positive, i.e. (14). □

Corollary 4.6 (Raychaudhuri obstruction to reversible time unification). *If gravity is taken to unify time operationally (Assumption D), then Raychaudhuri monotonicity implies that physical reversibility cannot be achieved within ordinary-matter GR/QFT inheritance. Any reversible-time mechanism must introduce exotic sign-reversal sectors sufficient to violate* (12)*. Such sectors are precisely those associated with known instabilities and causal pathologies (e.g. traversable wormhole requirements, chronology violations), and are therefore not viable as a universal time-reversal mechanism.*

4.2 Thermodynamic obstruction: entropy and horizon area as monotone order parameters

The reversibility trap can be stated independently of congruence focusing. Any gravity-unified time framework must respect the thermodynamic arrow in the presence of ordinary matter, and in GR the gravitational analogue of thermodynamic monotonicity is encoded in horizon area increase.

Assumption 4.7 (Reversible dynamics as operational undoing). *Reversible time is interpreted operationally: for any physically allowed forward process occurring under gravity-unified time (e.g. binding in an attractive potential), the reversed process must be dynamically realizable without external ordering injection.*

Lemma 4.8 (Entropy obstruction to reversible dynamics). *If the second law holds along future-directed proper time τ,*

$$\frac{dS}{d\tau} \geq 0, \tag{15}$$

then an operational reversal of generic dissipative processes would require

$$\frac{dS}{d\tau} \leq 0 \tag{16}$$

along the reversed evolution, contradicting (15) *except in measure-zero equilibrium cases.*

Proof. Forward evolution with dissipation increases entropy. A genuine dynamical reversal mapping the forward macroprocess to its inverse necessarily decreases entropy. Thus, under the second law, such reversal cannot be generic. □

Lemma 4.9 (Area theorem as gravitational monotonicity). *In GR under appropriate energy conditions (e.g. the null energy condition), the Hawking area theorem implies that the area A of a classical event horizon is nondecreasing along future-directed evolution,*

$$\frac{dA}{d\tau} \geq 0. \tag{17}$$

Therefore horizons represent a gravitational order parameter that is monotone: focusing/binding increases horizon area, and area cannot be dynamically "unwound" without violating the relevant energy conditions [4, 5, 33].

Proof. The area theorem follows from the Raychaudhuri equation applied to null generators of the horizon together with the appropriate convergence condition derived from energy positivity. Shrinking the horizon requires violations (negative-energy flux/exotic matter). □

Proposition 4.10 (Thermodynamic reversibility obstruction in gravity-unified time). *Assume gravity-unified time (Assumption D) and operational reversibility (Assumption 4.7). If ordinary matter obeys the second law* (15) *and horizon monotonicity* (17) *holds in the gravitational sector, then operational time reversal is obstructed: the inverse of generic gravitationally ordered processes (binding, focusing, horizon growth) is not dynamically realizable without exotic sign-reversal contributions that violate the relevant energy conditions.*

Proof. Binding/focusing and horizon growth represent monotone ordering in the gravitational sector. Operational reversal would require entropy decrease and horizon area decrease, which cannot occur under ordinary energy conditions. Therefore reversal requires negative-energy/exotic channels. □

Corollary 4.11 (No reversible-time completion without exotic sign reversal). *Any framework that claims reversible time while unifying time gravitationally must either: (i) deny the second law/area monotonicity (contradicting observed thermodynamic ordering), or (ii) introduce exotic negative-energy sectors (which are dynamically annihilatory or observationally excluded). Hence the reversible-time interpretation is internally blocked.*

4.3 Proper time unification and monotone gravitational ordering

General relativity operationally unifies "local time" by proper time along timelike worldlines. For a timelike curve $x^\mu(\lambda)$ one defines

$$d\tau^2 \equiv -ds^2 = -g_{\mu\nu}dx^\mu dx^\nu, \tag{18}$$

and for a future-directed timelike tangent $u^\mu \equiv dx^\mu/d\tau$ one has $u^\mu u_\mu = -1$ by construction. Free-fall trajectories extremize proper time and satisfy the geodesic equation

$$\frac{d^2x^\lambda}{d\tau^2} + \Gamma^\lambda_{\mu\nu}\frac{dx^\mu}{d\tau}\frac{dx^\nu}{d\tau} = 0, \qquad \Gamma^\lambda_{\mu\nu} = \frac{1}{2}g^{\lambda\sigma}(\partial_\mu g_{\nu\sigma} + \partial_\nu g_{\mu\sigma} - \partial_\sigma g_{\mu\nu}), \tag{19}$$

so τ serves as the natural ordering parameter along timelike geodesics [3, 4].

Lemma 4.12 (Proper-time monotonicity along future-directed timelike curves). *Fix a time orientation and restrict to future-directed timelike curves. Then τ is strictly increasing along the curve.*

Proof. For a timelike curve, $-g_{\mu\nu}dx^\mu dx^\nu > 0$, hence $d\tau > 0$ along a future-directed parameterization. This is not a dynamical statement but the operational definition of proper time as a clock reading along the worldline. □

The crucial point is what gravity does with this unified parameter: under ordinary matter, the geometry induces *monotone ordering* in the sense of focusing/binding rather than internal unwinding.

Lemma 4.13 (Monotone ordering under the convergence condition). *For a hypersurface-orthogonal timelike geodesic congruence ($\omega_{\mu\nu} = 0$), if the timelike convergence condition holds,*

$$R_{\mu\nu}u^\mu u^\nu \geq 0, \tag{20}$$

then the expansion θ obeys

$$\frac{d\theta}{d\tau} \leq -\frac{1}{3}\theta^2, \tag{21}$$

and therefore is driven monotonically downward (focusing) [4, 5].

Proof. This is the Raychaudhuri inequality obtained by inserting $\omega_{\mu\nu} = 0$ and (20) into Eq. (11). □

Proposition 4.14 (No internal "unwinding" without exotic sign reversal). *This restates Proposition 4.5 in the proper-time/congruence language: under* (20)*, Raychaudhuri monotonicity forbids dynamical defocusing, so reversal requires a sign-reversal sector with $R_{\mu\nu}u^\mu u^\nu < 0$.*

4.4 QFT on curved space inherits monotone time unification

Quantum field theory formulated on a curved background inherits the gravitationally unified ordering parameter: mode decompositions, propagators, and time-ordering are defined relative to a chosen time function and the underlying causal structure of the metric [23, 31]. . In this setting, diagrammatic time reversal ($t \mapsto -t$) is a formal transformation of amplitudes, not a mechanism that reverses the background's monotone ordering. In particular, in curved spacetimes with horizons the physics selects an arrow through state choice and boundary conditions; processes such as black-hole evaporation proceed forward and are not dynamically "un-evaporated" by formal reversal of integration variables [14, 23]. Repeated reversal prescriptions in a framework that already stacks time indices (Section 3) therefore compound, rather than cure, the cohesion defect: the formalism proliferates negative-frequency/branch structures without supplying a dynamical operator that unwinds gravitational ordering. This is precisely the reversibility trap: time reversal is invoked as a symmetry, but gravity-unified time provides no physical inverse.

4.5 Infinite time-summations and nullification (mathematical form)

The finite-volume stacking estimate (Section 3) shows that even a single 1 cm region, when ultraviolet-resolved, requires an astronomically large tower of time-indexed layers. The multiverse/infinite-histories move attempts to "solve" this by extending the sum to an infinite collection of histories. We now show this extension is mathematically ill-posed unless temporal cohesion is enforced as a compatibility condition.

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Definition 4.15 (Discretized history spaces and refinement). *Fix a bounded spatial region of scale L and a time interval $[0, t_L]$. Let Δ_n denote a temporal partition of $[0, t_L]$ into $N_t(n)$ slices (with $N_t(n) \to \infty$ as $n \to \infty$), and let Λ_n denote a spatial discretization of the region with $N_s(n)$ sites. Let $\mathcal{X}_n$ denote the finite-dimensional configuration space of field values on the discrete spacetime lattice $\Delta_n \times \Lambda_n$. A refinement $n \prec m$ induces a canonical projection map $\pi_{m \to n} : \mathcal{X}_m \to \mathcal{X}_n$ (coarse-graining by restriction/averaging).*

Definition 4.16 (Cohesive history measure). *A* cohesive history measure *is a probability measure μ on the projective limit space*

$$\mathcal{X} \equiv \varprojlim \mathcal{X}_n$$

such that its finite-dimensional marginals μ_n on $\mathcal{X}_n$ satisfy the cylinder consistency conditions

$$\mu_n = (\pi_{m \to n})_{\#} \mu_m \qquad \textit{for all } n \prec m, \tag{22}$$

where $(\pi_{m \to n})_{\#} \mu_m$ denotes the pushforward measure.

Lemma 4.17 (No global history measure without compatibility). *If the family $\{\mu_n\}$ fails the consistency conditions* (22)*—equivalently, if refinements do not admit compatible composition of local temporal increments (non-cohesive time)—then there exists no probability measure μ on $\mathcal{X}$ having $\{\mu_n\}$ as marginals.*

Proof. If μ exists on $\mathcal{X}$, then by construction its marginals on cylinder sets are given by μ_n and must satisfy (22). Conversely, a necessary condition for a measure on the projective limit to exist is that the finite-dimensional distributions be compatible under refinement. Therefore, violation of (22) precludes existence of μ. □

Theorem 4.18 (Infinite history nullification). *Assume non-cohesive time in the sense of Assumptions A–C (no global ordering parameter, no enforced compatibility of local dt, and high-density slicing/summation). Then any attempt to define a theory by an infinite summation/integration over histories ("multiverse" or "all paths") is mathematically ill-posed: there is no well-defined measure on the history space. Consequently, the infinite extension does not yield "many universes"; it yields failure to define* any *universe as a probability space.*

Proof. High-density slicing produces a directed refinement system $\{\mathcal{X}_n\}$ with rapidly growing cardinalities controlled from below by the finite-volume stacking estimate (Section 3), i.e. the number of time-space layers grows at least as $N_{\text{stack}}(d)$ on each refinement. Non-cohesive time means that refinements do not satisfy a compatibility/enforcement condition equivalent to (22). By Lemma 4.17, no measure exists on the projective limit history space. Therefore an "infinite sum over histories" cannot be interpreted as a probability law, expectation, or ensemble average. The purported multiverse extension amplifies the defect by summing over a set that lacks measure-theoretic support. □

Corollary 4.19 (Multiverse escape is illusory). *In the absence of temporal cohesion enforcement, the multiverse move does not supply additional explanatory power. It multiplies the very non-cohesive time stacking that already renders the finite-volume formalism pathological; the mathematical output is nullification (non-definition), not plural realization.*

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Lemma 4.20 (Admissibility as the enforcement of cylinder consistency). *Let $\{\mathcal{X}_n\}$ be a directed refinement system of configuration spaces with projections $\pi_{m\to n} : \mathcal{X}_m \to \mathcal{X}_n$ for $m \succ n$, and let $\{\mu_n\}$ be the corresponding family of finite-resolution marginals.*

Let $\Gamma \subset \mathcal{P}^+$ denote the admissible corridor subset, and assume that the refinement operator restricted to Γ obeys the diagonal dominance bound of Lemma 3.1.

Then the cylinder consistency condition

$$\mu_n = (\pi_{m\to n})_\# \mu_m, \qquad \forall\, m \succ n, \tag{23}$$

holds if and only if *the refinement maps are restricted to Γ, i.e.*

$$\pi_{m\to n} \;:\; \Gamma_m \to \Gamma_n, \qquad \textit{with } \Gamma_n \equiv \Gamma \cap \mathcal{X}_n. \tag{24}$$

Proof. Write the refinement transfer at level $m \succ n$ as a linear pushforward operator $\mathsf{T}_{m\to n}$ acting on signed measures (or densities) on $\mathcal{X}_m$:

$$\mu_n \;=\; (\pi_{m\to n})_\# \mu_m \;\equiv\; \mathsf{T}_{m\to n}\mu_m.$$

To obtain a projective-limit law one needs *stability* of this transfer under further refinement, i.e. that the family $\{\mu_n\}$ is Cauchy under refinement in a topology strong enough to guarantee cylinder consistency.

Let $\|\cdot\|_{\mathrm{TV}}$ denote the total-variation norm on signed measures. Define the “registry decomposition” of μ_m by separating the diagonal corridor contribution (the admissible registered component) from the off-diagonal oscillatory congestion component:

$$\mu_m \;=\; \mu_m^{\mathrm{diag}} \;+\; \mu_m^{\mathrm{off}}.$$

The diagonal dominance hypothesis of Lemma 3.1 is exactly the bound that the refinement transfer does not amplify the off-diagonal sector. Concretely, there exists a $0 < \lambda < 1$ (uniform in $m \succ n$ on admissible corridors) such that

$$\big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}} \;\le\; \lambda\,\big\|\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}}, \qquad \big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}} \;=\; \big\|\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}}. \tag{25}$$

(Heuristically: the diagonal sector is transported, while the congestion sector is damped by the admissibility filter.)

Iterating (26) along a refinement chain $k \succ m \succ n$ yields

$$\big\|(\pi_{k\to n})_\#\mu_k - (\pi_{m\to n})_\#\mu_m\big\|_{\mathrm{TV}} \;\le\; \lambda^{m-n}\,\big\|\mu_k^{\mathrm{off}}\big\|_{\mathrm{TV}},$$

so for each fixed n the projected marginals form a Cauchy family as refinement increases. Therefore, for every finite cylinder set $C \subset \mathcal{X}_n$ the value $\mu_n(C)$ is independent of the refinement depth used to compute it, i.e. the cylinder consistency condition (23) holds.

Conversely, if refinement is not restricted to Γ, diagonal dominance fails and the off-diagonal sector can be amplified (effective $\lambda \ge 1$), so the projected marginals drift with refinement depth, violating (23). In that case Kolmogorov extension cannot be applied and the refinement tower admits no probability measure on the projective limit [12]. □

Lemma 4.21 (Cylinder consistency via refinement contraction). *Let $\{\mathcal{X}_n\}_{n\geq 1}$ be a directed refinement system with projections $\pi_{m\to n} : \mathcal{X}_m \to \mathcal{X}_n$ for $m \succ n$, and let $\{\mu_n\}$ be finite-resolution marginals on $\mathcal{X}_n$.*

Assume admissibility restricts histories to finite-support corridors $\Gamma \subset \mathcal{P}^+$ and imposes the diagonal dominance/no-clustering bound of Lemma 3.1. Then the induced refinement transfer operator $\mathcal{T}_{m\to n}$ acting on registry sequences is a strict contraction in the ℓ^2 (Hilbert) norm. Consequently, the family of admissible marginals is Cauchy under refinement and satisfies cylinder consistency:

$$\mu_n \;=\; (\pi_{m\to n})_\# \mu_m, \qquad \forall\, m \succ n.$$

Proof. Write the refinement transfer at level $m \succ n$ as a linear pushforward operator $\mathsf{T}_{m\to n}$ acting on signed measures (or densities) on $\mathcal{X}_m$:

$$\mu_n \;=\; (\pi_{m\to n})_\# \mu_m \;\equiv\; \mathsf{T}_{m\to n}\mu_m.$$

To obtain a projective-limit law one needs *stability* of this transfer under further refinement, i.e. that the family $\{\mu_n\}$ is Cauchy under refinement in a topology strong enough to guarantee cylinder consistency.

Let $\|\cdot\|_{\mathrm{TV}}$ denote the total-variation norm on signed measures. Define the "registry decomposition" of μ_m by separating the diagonal corridor contribution (the admissible registered component) from the off-diagonal oscillatory congestion component:

$$\mu_m \;=\; \mu_m^{\mathrm{diag}} \;+\; \mu_m^{\mathrm{off}}.$$

The diagonal dominance hypothesis of Lemma 3.1 is exactly the bound that the refinement transfer does not amplify the off-diagonal sector. Concretely, there exists a $0 < \lambda < 1$ (uniform in $m \succ n$ on admissible corridors) such that

$$\big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}} \;\leq\; \lambda \big\|\mu_m^{\mathrm{off}}\big\|_{\mathrm{TV}}, \qquad \big\|\mathsf{T}_{m\to n}\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}} \;=\; \big\|\mu_m^{\mathrm{diag}}\big\|_{\mathrm{TV}}. \tag{26}$$

(Heuristically: the diagonal sector is transported, while the congestion sector is damped by the admissibility filter.)

Iterating (26) along a refinement chain $k \succ m \succ n$ yields

$$\big\|(\pi_{k\to n})_\#\mu_k - (\pi_{m\to n})_\#\mu_m\big\|_{\mathrm{TV}} \;\leq\; \lambda^{m-n}\,\big\|\mu_k^{\mathrm{off}}\big\|_{\mathrm{TV}},$$

so for each fixed n the projected marginals form a Cauchy family as refinement increases. Therefore, for every finite cylinder set $C \subset \mathcal{X}_n$ the value $\mu_n(C)$ is independent of the refinement depth used to compute it, i.e. the cylinder consistency condition (23) holds.

Conversely, if refinement is not restricted to Γ, diagonal dominance fails and the off-diagonal sector can be amplified (effective $\lambda \geq 1$), so the projected marginals drift with refinement depth, violating (23). In that case Kolmogorov extension cannot be applied and the refinement tower admits no probability measure on the projective limit [12]. □

5 Consequences: No Conservation, Severability, and Nullification

5.1 No conservation without cohesive time

The symmetry-first framework presumes that conserved quantities exist independently of the cohesion of time. This presumption fails. Conservation laws are not free-floating algebraic identities; they are statements about invariance of evolution under a well-defined parameter, and thus require an evolution operator.

Proposition 5.1 (No conservation without time cohesion). *If time is not cohesive in the sense of Definition 2.2, then conserved quantities derived from time-translation invariance are undefined as physical invariants. In particular, the expression*

$$\frac{dE}{dt} = 0$$

cannot encode conservation if d/dt is not a well-defined generator of evolution.

Proof. Noether conservation requires: (i) a differentiable parameter t; and (ii) an admissible evolution map Φ_{t_2,t_1} with composability. If t is non-cohesive, Φ does not exist globally, hence energy is not transported through time by a meaningful map. Therefore dE/dt is not definable as a conservation statement, since it presupposes the very cohesion it is used to justify. □

The critical point is that "energy" is not logically prior to time cohesion. In a flattened or severed temporal regime, energy does not become merely nonconserved; it becomes structurally undefined as a dynamical invariant. The symmetry-first approach thus inverts dependence: it uses time symmetry to justify energy conservation, while using conserved energy to justify a coherent time parameter.

5.2 Reversibility as severability

Time-reversal invariance is frequently invoked as evidence that fundamental law is reversible. This argument conflates a formal map with a physical process. The involution $t \mapsto -t$ is only meaningful if the time parameter is cohesive and if the system supports a global evolution map that can be inverted.

Lemma 5.2 (Reversibility requires cohesion). *A physically reversible dynamics requires a cohesive time parameter and an invertible evolution map Φ_{t_2,t_1} satisfying*

$$\Phi_{t_2,t_1}^{-1} = \Phi_{t_1,t_2}.$$

If time is non-cohesive, then "reversal" cannot be realized dynamically.

Proof. Invertibility requires that the forward map exist. If time cannot be composed and no global evolution operator exists, then there is nothing to invert. Hence time reversal is not a dynamical symmetry but a formal relabeling with no operational meaning. □

Proposition 5.3 (Reversibility implies severability in the absence of enforcement). *In a framework lacking a mechanism that enforces time cohesion, the invocation of reversibility generically implies* severability*: time becomes fragmented into locally inconsistent patches. In such a regime, reversal acts not as retracing but as disruption: it unbinds ordering and destroys conservation rather than restoring prior states.*

This makes the central point explicit:

> *Reversibility without a time-ordering enforcement principle is not reversibility; it is severability.*

5.3 No multiverse: infinite time-sums imply nullification

The multiverse hypothesis and related infinite-history formalisms are often defended by appeal to path-integral summation or branching histories. But time-on-time stacking already shows that the history sum is not benign in finite volumes. An infinite extension is therefore not only uncontrolled; it is structurally incoherent.

Proposition 5.4 (Infinite time-summation nullification). *Let a framework define physical predictions by summing over an infinite set of time-indexed histories, while treating time as a coherent background parameter. If time cohesion is not mechanistically enforced, then the infinite sum does not define a physical measure; it collapses into nullification in the sense that no unique dynamical outcome can be defined without imposing additional structure not contained in the original premise.*

Proof sketch. A probability measure over histories presupposes well-defined histories. By Lemma 3, if time is non-cohesive then histories are not definable objects. In such a regime, extending the sum to infinitely many histories does not improve the approximation; it amplifies the defect: the sum is performed over a set that lacks measure-theoretic support. The result is not "many universes," but the failure of the formalism to define any universe at all. □

Thus the multiverse escape is illusory: it multiplies the very defect (time stacking without cohesion) that already renders the finite-volume formalism pathological.

5.4 Observational contradiction: coherence constraints

The above is not merely metaphysical. A severed-time universe would exhibit strong signatures of incoherent temporal ordering. In particular, if time were locally cacophonous and reversibility-induced severability were operative, then coherence would fail at multiple observational levels:

1. **Cosmic coherence.** The cosmic microwave background (CMB) exhibits high statistical coherence across the sky, with well-defined acoustic peak structure. Such coherence presupposes stable ordering transport from the baryonic epoch to the present, not fragmented temporal patches.

2. **Clock consistency.** Radiometric clocks (e.g. decay chains), atomic clocks, and astrophysical chronometers yield consistent time ordering across spatially separated systems and across extraterrestrial samples. If time cohesion were not enforced, these clocks would generically decohere.

3. **Large-scale expansion structure.** Cosmological distance-redshift relations admit structured description by expansion models. Even in the presence of tensions, the existence of a stable large-scale relation itself forbids unrestricted severability of time.

Corollary 5.5 (Severed time is empirically excluded). *Any model in which time reversibility is taken literally without cohesion enforcement predicts large, unavoidable coherence loss in cosmological signals and physical clocks. The observed universe instead exhibits strong coherence constraints; therefore the symmetry-first severability limit is empirically excluded.*

(iii) Local thinning amplifies incohesion and destroys connectivity. There is a deeper obstruction: Poisson or Gaussian "thinning" is necessarily implemented locally. The stacking pathology is not a single global tower; it is replicated in each microdomain of the refinement manifold as a local explosion of candidate histories under directed slicing. Any probabilistic suppression therefore acts *pointwise*: each microcell carries its own independent random gating of branches. But pointwise thinning cannot generate temporal cohesion between distinct locations. On the contrary, it produces a field of mutually incompatible local refinement selections. The probability measures differ from microdomain to microdomain, the surviving registry classes differ from microdomain to microdomain, and the pushforward marginals cannot satisfy a single global cylinder-consistency constraint across the domain.

Thus even if statistical thinning could reduce the local stack (it cannot), it would still render inter-domain composability impossible: one obtains a mosaic of severed local towers rather than a coherent connected refinement limit. In short, a local probabilistic cure makes global connection strictly harder. It replaces one stacking singularity with uncountably many incohesive micro-singularities, and therefore cannot serve as a foundation for a universe with connected dynamics.

Formal incompatibility. Let $\mu_n^{(x)}$ denote the finite-resolution marginal induced at microdomain x on the refinement space $\mathcal{X}_n$ after local random suppression. Since thinning is applied independently across x, the family $\{\mu_n^{(x)}\}_x$ becomes a random field of marginals rather than the restriction of a single global measure. But global cylinder consistency requires the existence of a coherent projective-limit measure μ such that for all $m \succ n$,

$$\mu_n = (\pi_{m\to n})_{\#}\mu_m \qquad \text{with } \mu_n \text{ defined uniformly on the refinement domain.} \tag{27}$$

Local randomness violates this requirement: $\mu_n^{(x)}$ varies with x, so there exists no global μ_n whose restrictions recover $\mu_n^{(x)}$ simultaneously across the domain. Consequently, the output of thinning is not a coherent probability space on histories. It is an uncountable collection of mutually incompatible local probability spaces — a mosaic of severed towers.

6 Noether's Theorem Reinterpreted: Validity Domain and Failure Domain

6.1 What Noether's theorem actually assumes

Noether's theorem is not merely a statement about algebraic symmetry; it is a theorem about variational structure on a system whose dynamical law is definable. In its time-translation form, it begins with a Lagrangian

$$L\big(q, \dot{q}, t\big)$$

defined on an admissible evolution parameter t, and with an action functional

$$S[q] = \int_{t_1}^{t_2} L\big(q, \dot{q}, t\big)\, dt.$$

The theorem then states that if L is invariant under continuous time translations,

$$\frac{\partial L}{\partial t} = 0,$$

a conserved energy function exists along solutions of the Euler–Lagrange equations [1].

The critical point is that the theorem presupposes the existence of: (i) a coherent ordered parameter t, (ii) a well-defined derivative $\dot{q} = dq/dt$, and (iii) a variational calculus in which dt is a meaningful measure factor. These are not outputs of the theorem; they are prerequisites.

6.2 The implicit extrapolation error: symmetry mistaken for enforcement

In standard presentations of mechanics and field theory, the Noether correspondence is often treated as foundational: one begins with symmetry, then obtains conservation, and then treats conservation as proof that time is physically coherent. But this reverses logical dependence. Time cohesion is not secured by $dE/dt = 0$; rather, $dE/dt = 0$ is writable only after time cohesion is assumed.

Lemma 6.1 (The symmetry-to-time fallacy). *The statement $\partial L/\partial t = 0$ does not, by itself, establish the existence of a cohesive time parameter. It assumes one.*

Proof sketch. The partial derivative $\partial/\partial t$ is defined only if t is a valid coordinate with differentiability structure. If time lacks cohesive support or if dt is not admissible as a measure element, the condition $\partial L/\partial t = 0$ is not physically meaningful as an invariance statement. Thus invariance cannot bootstrap the parameter needed to state invariance. □

This is the Newtonian trap of the symmetry-first program: it uses Noether's theorem to justify conservation while silently presupposing the time cohesion needed to write the action and its invariance.

6.3 Failure domain: flattened or severed time

We now state explicitly the boundary between the valid and invalid regimes of Noether reasoning.

Proposition 6.2 (Noether boundary condition). *Noether's theorem yields conserved quantities only in regimes where time possesses cohesive temporal support. In a flattened (zero-support) or severed time regime, the Noether condition $\partial L/\partial t = 0$ cannot serve as a conservation mechanism and instead collapses into non-evolution.*

Proof. By Theorem 2.8, if time lacks cohesive support then no dynamical law exists as an evolution law, entropy production is undefined, and trajectories are undefinable. In such a regime, the Noether conclusion cannot be physically interpreted because its hypotheses fail. In particular, the claim $dE/dt = 0$ does not represent conserved transport; it is indistinguishable from stasis because d/dt is not an evolution generator. □

6.4 Noether symmetry as equilibrium operator

A conserved quantity derived from time-translation invariance is often interpreted as a stabilizing feature of physics. But in the severability limit, symmetry acts in the opposite manner: it becomes an equilibrium operator enforcing null dynamics.

Theorem 6.3 (Noether nullification under non-cohesive time). *If time translation invariance is asserted in a regime where time cohesion is not enforced, then the Noether framework does not produce dynamical conservation; it produces nullification. Concretely, "energy conservation"*

$$\frac{dE}{dt} = 0$$

becomes indistinguishable from the statement that no definable temporal evolution exists.

Proof. The symbol dE/dt presupposes a meaningful derivative with respect to time. If d/dt cannot generate evolution (Lemma 1), then $dE/dt = 0$ is not a constraint on evolution; it is a marker that evolution is undefined. Therefore the Noether output collapses into equilibrium-to-zero (stasis). □

6.5 Implication for QFT: symmetry-first ultraviolet completion is blocked

QFT inherits the Noether structure: time translation invariance implies conserved Hamiltonian, which is then used as the generator of unitary evolution. But as shown by hypersupersaturation (Section 3), ultraviolet refinement multiplies time structure internally via slicing and history summation. If time cohesion is not enforced mechanistically, the theory cannot consistently maintain a single coherent t across its own stacked layers. Therefore the symmetry-first attempt at ultraviolet completion is structurally blocked: the limit does not yield a finer dynamical universe, but the collapse of dynamical meaning.

This resolves the apparent paradox. Noether's theorem is correct in its domain. What fails is the extrapolation that treats time symmetry as universally valid without furnishing a mechanism of time cohesion. When the cohesion assumption is removed, the symmetry-first strategy is forced into nullification. In that sense, the formalism does not merely fail to explain time: it requires time as an unacknowledged prior, and collapses precisely where that prior becomes nontrivial.

7 Anisotropic enforcement vs. isotropic shadow: observational closure across scales

The preceding sections establish the logical dead-end of symmetry-first time. When time is treated as a passive background label, refinement compatibility is assumed rather than earned. In the high-density slicing limit this assumption becomes mathematically fatal: cylinder consistency fails, histories lose measure-theoretic support, and "sum over histories" collapses into nullification. Cartier–Foata trace quotients expose the obstruction algebraically, and the Non-Spontaneous Registration theorem shows that no refinement-invariant commutation structure can arise from a Noether-flat vacuum.

This section provides the physical closure: the ordering enforcement demanded by the mathematics is not speculative. It is visible as a persistent separation between (i) anisotropic ordering channels that remain phase-stable under refinement and (ii) isotropic shadow channels that exist only in coarse-grained closure limits. The point is not that anisotropy is "present"; it is that anisotropy is *structurally conserved* while isotropy is *projected*.

7.1 Collider systems: transverse anisotropy persists while longitudinal streaming collapses

Relativistic heavy-ion collisions provide a controlled refinement-dense environment: the microscopic slicing density in the early-time plasma evolution is extreme, and symmetry-first time-stacking would predict uncontrolled dependence on refinement and gauge of time-ordering conventions. Instead, the data show a stable split.

On the one hand, anisotropic transverse collective response is long-lived and reproducible across collision systems, as seen in persistent azimuthal flow harmonics $v_2(p_T)$ in CMS measurements. On the other hand, longitudinal channels exhibit suppression/streaming signatures consistent with low-cost transport without coherence, as reflected in forward/backward imbalance observables (ALICE $R_{FB}(p_T)$ behavior). This pattern is the observational analogue of the trace-theoretic result: admissible structure is sustained by corridor-aligned ordering, while unfiltered longitudinal stacking behaves as a dissipative shadow with no stable refinement identity.

The symmetry-first interpretation treats v_2 persistence as accidental hydrodynamics atop reversible microphysics. But under the refinement-consistency lens, it is more primitive: the transverse anisotropy is the conserved remnant of ordering enforcement, while longitudinal channels are precisely where unfiltered time stacking is cheapest and thus where nullification pressure is strongest.

7.2 Galactic transport: isotropic baryonic closure fails; anisotropic registry persists

In disk galaxies, the same split is observed in a static, macroscopic setting. Purely isotropic closure assumptions (baryonic smoothing, background-time kinematics) fail to predict stable transport morphology: rotation curves and disk structure exhibit standing registry over large radial spans, with harmonic node structure persisting across baryonic variance. This persistence is incompatible with an interpretation in which time is a neutral background and isotropy is fundamental. Instead, the observation matches an enforced-admissibility picture: transport proceeds through anisotropic corridor structure with phase-stable registry, while isotropic closure is merely the coarse-grained projection that hides the enforcement agent.

This is precisely the mathematical distinction established earlier: isotropy is a *shadow projection* that can be written as long as refinement density is low, whereas anisotropic enforcement is the *native admissible regime* that remains stable under increasing slicing.

7.3 Black holes: horizons instantiate time severance, not reversible symmetry

Black holes provide the most direct demonstration that background-time cohesion is not a universal axiom. Event horizons are not merely regions of strong curvature; they are causal severance surfaces. Penrose-type singularity results establish geodesic incompleteness under trapped-surface conditions: future-directed null congruences terminate in finite affine parameter even under physically standard energy positivity. Thus a horizon is not simply "a place where dynamics is hard"; it is a place where temporal adjacency is broken.

This is fatal to symmetry-first Noether reasoning. Noether invariance yields $\partial_t L = 0$ and thus $dE/dt = 0$, but the statement presupposes a coherent adjacency of time increments across the domain of interest. Horizons explicitly deny this adjacency. Energy "conservation" written in a severed-time region is not a dynamical law; it is a void statement. Therefore black holes do not challenge the ordering argument—they instantiate it: smooth Noether time terminates at the horizon scale, and the symmetry-first paradigm has no internal mechanism to restore cohesion without invoking unphysical reversibility structures.

7.4 Synthesis: anisotropic ordering is the conserved structure; isotropy is the projection

Across these systems the evidence is consistent and scale-invariant: anisotropic ordering structure persists as a stable admissible channel, while isotropic closure appears only as a coarse-grained shadow. The naive symmetry-first view treats this split as an emergent or contingent phenomenon, but the mathematical results above invert the direction: anisotropic enforcement is what makes histories definable under refinement, whereas isotropic time is merely the limit in which enforcement becomes invisible.

This completes the closure of the paper's argument. The obstruction is not interpretive. It is structural: without ordering enforcement, refinement destroys definability; with enforcement, anisotropic admissibility becomes primary, and isotropic symmetry-first time is revealed as an approximation regime rather than a foundation.

8 Anisotropy versus isotropy as an observational signature of chronoscalar ordering

The mathematical obstruction isolated above is not confined to technical path integrals or ultraviolet bookkeeping. It is structural: symmetry-first frameworks assume that time is a globally composable background parameter, yet provide no mechanism that enforces its cohesion under refinement. When this cohesion is absent, Noether time collapses toward equilibrium-to-zero: conservation becomes void, measures over histories fail, and irreversibility becomes undefinable. Noether invariance itself presupposes a differentiable ordering parameter t and cannot supply it *ex nihilo* [1]. In refinement-dense limits, a measure over histories exists only under cylinder consistency (Kolmogorov extension) [2], and refinement compatibility admits a unique algebraic representation in terms of commutation quotients (trace monoids) [3].

8.1 Ordering enforcement as the primitive: the chronoscalar ontology

The preceding results isolate a fatal asymmetry in symmetry-first physics. Noether-style conservation is repeatedly invoked as if it could stabilize time. Yet Noether's theorem is not a generator of time; it is a theorem that operates *inside* time. It presupposes adjacency, differentiability, and composability of a single ordering parameter t. When that cohesion fails—whether by horizon severance, refinement density, or incoherent local ordering—then the symbolic statement of conservation cannot function dynamically. In such regimes, $\frac{dE}{dt} = 0$ does not imply stability; it collapses into the triviality of stasis: there is no coherent dt on which the operator d/dt can act.

This defect is not cured by the internal machinery of Quantum Field Theory. Crucially, the hypersupersaturation of "time on top of time" is not a discretionary approximation. It is an emergent consequence of the formalism: time ordering, gauge structure, perturbative organization, and loop expansion jointly instantiate stratified histories as the very object of computation. In this sense, stacked temporal layering is the natural measure-theoretic output of the QFT manifold construction. The problem is therefore not "too many paths" in a merely numerical sense; it is that the refinement tower is being populated by objects whose temporal cohesion is never enforced. The formalism produces a history-saturated manifold while simultaneously lacking the compatibility principle required for those histories to exist as definable mathematical objects.

Thus the issue can be stated cleanly. If the universe is not dead on arrival, then time symmetry cannot be primordial. There must exist an enforcement mechanism: a primitive ordering asymmetry that stabilizes adjacency, penalizes overlap congestion, and selects admissible continuation channels so that refinement does not destroy definability. Chronoscalar Field Theory is precisely such an enforcement theory. It does not salvage symmetry-first time; it replaces it: the arrow is not an epiphenomenon of statistics but the geometric substrate from which conservation becomes writable.

8.2 Cartier–Foata registry structure inside the corridor functional

The ordering-enforced program does not invoke commutation abstractly. It requires a concrete registry algebra for admissible advance. This is precisely the role played by the Cartier–Foata commutation structure [11]. In the chronoscalar setting, the basic objects are not point-paths but finite-support admissible corridors $\gamma \in \Gamma \subset \mathcal{P}^+$. Each corridor decomposes into registered segments (micro-events) whose composition is constrained by admissibility. Independence is therefore not a kinematic postulate but a geometric fact: blocks commute if and only if they occupy disjoint transverse support and do not generate cross-shear congestion under refinement.

Consequently, admissible histories are equivalence classes of corridor words under refinement-stable commutations. This trace identification is not an optional rearrangement; it is the mechanism by which refinement compatibility is preserved without nullification. In particular, the same commutation algebra appears explicitly inside the chronoscalar corridor functional

$$A(\chi,\mu,t) = \int_{L_M(T)} \left[(\nabla\kappa\cdot\hat{n})_{\parallel} + \sum_{n=1}^{N} \left(a_n\cos(n\Delta\phi_{\perp}) + b_n\sin(n\Delta\phi_{\perp})\right)(\nabla\kappa\cdot\hat{\chi})_{\perp}\left(1+\beta H_{\mathrm{flip}}(\tilde{H}^{\perp})\right)\right] d\tau$$
$$\times\left(1-\frac{1}{\sqrt{\mu}}\right)\left(1+\gamma_{\parallel}(t)\right)\left(1+\gamma_{\perp}(t)\right). \tag{28}$$

: the harmonic decomposition of transverse phase increments $\Delta\phi_{\perp}$ is not a Fourier decoration but a registry signature of the Cartier–Foata block structure. The coefficients $\{a_n, b_n\}$ encode conserved registered corridor harmonics (anisotropic persistence), while the longitudinal contribution is filtered by admissibility through ordering pressure and Hessian gating.

This point also closes a loophole. The Cartier–Foata structure is shared mathematics, but not a shared physical foundation. In symmetry-first background-time frameworks, commutation is treated as a formal reordering of time-sliced histories; under hypersupersaturation the independence relation becomes refinement-dependent, so the quotient ceases to exist as a coherent limit object and cylinder consistency fails. Thus CF cannot be invoked as a rescue of background-time QFT. It is a proof obligation: any theory claiming CF coherence must supply the enforcement principle that stabilizes independence under refinement. In CFT, that enforcement is carried by the ordering field $T(x^{\mu})$ with $\nabla_{\mu}T \neq 0$ and finite-support admissibility, so that commutation becomes an admissible geometric symmetry rather than a postulated bookkeeping freedom.

In Chronoscalar Field Theory the *ordering advance* is not a metaphor and not an interpretive relabeling of ordinary dynamics; it is a primitive force of enforcement. The scalar ordering field $T(x^{\mu})$ is not introduced as another field evolving on a pre-existing spacetime manifold, but as the object that makes a manifold history *admissible* in the first place: admissible continuation exists only where $\nabla_{\mu}T \neq 0$ and where finite-support ordering thickness prevents collapse to instantaneous nullification. The forward component T_4 must therefore not be interpreted as "energy" in the Noether sense, and not as a wave amplitude or resonant mode; it is the local advance operator, the enforced directional drive by which the admissible corridor is carried forward. The physical mechanism is the T_4–c^{-1} interaction: an ultimate ordering tension that couples advance to the fixed-norm scale, producing an asymmetric tether that cannot be inverted by any symmetry map without violating admissibility. This point is decisive for readers trained in background-time frameworks: in GR/QFT one assumes time first and then studies forces within it; in CFT the ordering force is what grants the possibility of a composable "next state" at all. Ordinary mass–energy ($E = mc^2$) governs object persistence, binding, and transport once a manifold history is admitted, but it does not generate the admission; it is downstream of advance. In this sense CFT does not place dynamics on rails: it supplies the enforcement that makes rails possible, and it does so through a force which is not a spacetime potential, not a Hamiltonian generator, and not a cavity reservoir, but the primitive asymmetry that drives irreversible continuation under Mach-imposed ordering bias.

The foundational postulate is therefore explicit: the primitive object is a *primordial asymmetric scalar* ordering field $T(x^{\mu})$. Its nonvanishing gradient $\nabla_{\mu}T \neq 0$ is the physical statement that time is not neutral. Irreversibility is not derived from coarse-grained ignorance; it is enforced by geometry. Symmetry is not the starting point but the shadow that appears only where the ordering pressure becomes locally invisible. Conservation laws are not axioms written into a Noether-flat void; they are downstream regularities of admissible ordering when finite-support corridors remain stable under refinement.

The PDE closure used later in this manuscript,

$$-a_0\,\Delta T \;+\; \nabla\nabla : \Big(b(x)\,\nabla\nabla T\Big) \;=\; J(x), \qquad b(x) = b_{\rm out} + (b_{\rm in} - b_{\rm out})\,\chi_{\rm fen}(x), \tag{29}$$

must be interpreted in a manner consistent with the ontology developed in Sections ... (and in particular with the admissibility postulate $\nabla_\mu T \neq 0$ and finite-support continuation). The oscillatory solutions supported by (29) are not propagating force carriers and do not represent energy-storing cavity modes. They are bounded spatial *readouts* of an ordering potential on an admissible mesh: eigen-structured registry patterns selected by geometry and boundary closure. This point matters because background-time formalisms routinely treat oscillatory eigenfamilies as reservoirs or resonant pumps; that interpretation is categorically incorrect here. The present operator is used to model admissible readout under fenestrated compliance, not to introduce additional energetic degrees of freedom.

The distinction is also structural. The "stacking" pathology discussed earlier is a defect of symmetry-first background-time frameworks, where histories are refined and piled onto an assumed cohesive time parameter and coherence is rescued by formal reorderings. Chronoscalar Field Theory does not admit that failure mode: ordering support is primitive rather than emergent, so there is no refinement tower to be stabilized by lifelines. The cell model (29) is therefore not a tower surrogate. It is a mesh-manifold construction: fenestrations select localized compliance windows in which the response is concentrated, while the operator readout records corridor-aligned registry content that can persist under admissibility. In this setting it is essential to distinguish between (i) bounded readout structure of an ordering potential and (ii) bulk-driven resonance; only the former is claimed.

The stiffness that supports such bounded readout is likewise not to be confused with ordinary elastic stiffness or with energetic storage. In CFT the advance component T_4 is not an inert parameterization of motion on background time; it is a primitive ordering force. The physical enforcement mechanism is the T_4–c^{-1} interaction, which couples advance to the fixed-norm scale and produces the ultimate ordering tautness: an asymmetric tether that cannot be inverted without violating admissibility. This is the origin of mesh stability. The standing-readout structure exists because advance is enforced with finite support; it is not sustained by pumping energy into the cell.

Accordingly, the bulk G/g concern is resolved by separating the slow Mach background from the bounded readout:

$$T(x) = T_{\rm bg}(x) \;+\; T_{\rm osc}(x), \tag{30}$$

where $T_{\rm bg}$ carries the slowly varying Mach bias (global ordering constraint) and $T_{\rm osc}$ is the bounded oscillatory readout selected by admissible boundary and geometry. The source term is not interpreted as a volumetric energetic driver. In the minimal cell model one takes

$$J(x) = g\,\rho(x)\,\chi_{\rm fen}(x) \quad \text{only as a } \textit{loading selector} \text{ (fenestration-local admittance)}, \tag{31}$$

or, when the Mach imprint is explicitly boundary-mediated,

$$J(x) = 0 \text{ in } \Omega, \qquad \text{and the Mach background enters through boundary data on } \partial\Omega. \tag{32}$$

Either choice prevents the common cavity mistake: bounded oscillatory readout does not require bulk energetic pumping, and the oscillatory structure is not a transport channel for radiative energy.

Once Ω is bounded (a "cell"), the oscillatory component admits an eigen-expansion of the cell operator

$$\mathcal{L}T \;\equiv\; -a_0\,\Delta T \;+\; \partial_i\partial_j\Big(b(x)\,\partial_i\partial_j T\Big), \tag{33}$$

under admissible boundary closure. In separable geometries this reduces to $\cos(kx)$ and $\sin(kx)$ families; in cylindrical/radial reductions it yields Bessel families. This is simply the operator readout under boundary closure; it does not introduce resonant energy storage. Moreover, the response decomposes naturally into ordering-aligned and isotropic sectors. Introducing the ordering axis $n \propto \nabla T_{\rm bg}$ and the transverse projector $P = I - n \otimes n$, one obtains

$$\nabla T_{\rm osc} \;=\; (\nabla T_{\rm osc})_{\rm ANSIO} \;+\; (\nabla T_{\rm osc})_{\rm ISP}, \qquad (\nabla T_{\rm osc})_{\rm ANSIO} = (n \otimes n)\, \nabla T_{\rm osc}, \quad (\nabla T_{\rm osc})_{\rm ISP} = P\, \nabla T_{\rm osc}, \tag{34}$$

which matches the corridor logic used throughout this paper: the ordering-aligned component captures persistence under admissibility, while the isotropic component represents projection/leakage.

Finally, the correct input channel for Mach control is boundary/far-field matching, not bulk pumping. A minimal admissible closure is:

$$\text{(i) Background anchoring:} \qquad T_{\rm bg}\big|_{\partial\Omega} = T_0 + \delta T_{\rm Mach}(x), \tag{35}$$

$$\text{(ii) Oscillatory impedance/readout:} \qquad \partial_n T_{\rm osc} \;+\; \alpha\, T_{\rm osc} \;=\; 0 \quad \text{on } \partial\Omega, \quad \alpha > 0, \tag{36}$$

$$\text{(iii) Fenestration selectivity:} \qquad b(x) = b_{\rm in} \text{ on } \operatorname{supp}(\chi_{\rm fen}), \qquad b(x) = b_{\rm out} \text{ elsewhere}, \tag{37}$$

so that $\delta T_{\rm Mach}$ sets the global ordering bias, the Robin impedance enforces bounded readout, and fenestrations localize compliance without converting readout into cavity resonance. This closes the interpretational loop required for the present paper: (29)–(37) define an admissible mesh-manifold readout model in which Mach enters as slow global bias, oscillations are bounded eigen-readouts of ordering potential, and ANSIO/ISP isolates corridor-aligned persistence versus isotropic projection. No part of this construction invokes stacked-history lifelines or background-time patching; it is an admissible readout model enforced by ordering advance.

8.3 Universal-scale closure: ACT277 Genesis imprint via ansio–regurg modification

The preceding sections show that symmetry-first time fails precisely where it claims universality: when the density of refinement becomes high, the formalism must repeatedly reinstantiate time inside its own machinery through slicing, history stacking, and multi-branch summation, producing hypersupersaturation and the collapse of dynamical cohesion into nullification. In that regime, the Noether condition $\partial_t L = 0$ ceases to express conserved transport and instead degenerates into equilibrium-to-zero. This is the mathematical trap. The present subsection provides a universal-scale empirical closure which is structurally analogous to the collider and transport systems but operates at the strongest possible observational level: the CMB itself.

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In Chronoscalar Field Theory the CMB is not treated as an equilibrium remnant of a thermalized fireball, nor as a statistical afterglow whose deviations must be absorbed into nuisance templates. The CMB is instead the universal registry imprint of Genesis: a conserved functionality cost together with a structured anisotropic tail produced by the admissibility mechanism. The core distinction is ontological. In ΛCDM, matter and radiation are the primitive and spacetime is their container; anisotropy is a perturbation to be parameterized. In CFT, the primitive is an ordering condensate (with foam-like microtexture) bearing an ordering field $T(x^\mu)$ with nonvanishing gradient $\nabla_\mu T \neq 0$. This condensate is not introduced as an auxiliary metaphor, but as the minimal pre-matter substrate required for admissibility: it supports ordering tension, it possesses an effective backbone stiffness (denote the brittle scale by a_0) which is not directly measurable by standard material protocols because it precedes the existence of registered matter degrees of freedom, and it admits localized apertures once the admissibility threshold is exceeded. The role of T is not that of a coordinate label in a metric background but of a monotone ordering support whose gradients determine admissibility of transport and registry, including the formation of fenestrations that render the manifold functional. Spacelike structure is consequently not postulated as a fundamental container but arises as the transverse readout of ordering advance. Concretely, we define the physically admitted spatial increment by the transverse projector orthogonal to the ordering direction,

$$ds^2_{\text{space}} \equiv P_{\mu\nu}\, dx^\mu dx^\nu, \qquad P_{\mu\nu} = \delta_{\mu\nu} - n_\mu n_\nu, \qquad n_\mu \parallel \nabla_\mu T, \tag{38}$$

and we define the cumulative admitted spatial extent along any corridor trajectory γ parameterized by a monotone ordering depth τ (not a GR proper time) as the registry-length functional

$$S_{\text{space}}[\gamma] \equiv \int_\gamma ds_{\text{space}} = \int_{\tau_i}^{\tau_f} \sqrt{P_{\mu\nu}\,\frac{dx^\mu}{d\tau}\frac{dx^\nu}{d\tau}}\; d\tau. \tag{39}$$

In this way the observable "space" is the projected transverse sector of the registry process, with a well-defined cumulative measure, rather than a primitive metric manifold. This construction is intentionally non-metric: it specifies spacelike separation and its accumulation without introducing a Lorentzian $g_{\mu\nu}$ and without any GR null-cone condition. The corresponding cone-like envelope that appears observationally is therefore not a light cone in the metric sense but an admissibility front: the advancing boundary of coherent corridor propagation permitted by the ordering condensate at fixed ordering depth.

Once fenestration activates, the transverse registry does not fill space isotropically. Instead it organizes into long-corridor transport leaves, generating a cumulative admissibility leaf-structure which we call the *foliant*. The foliant is not a coordinate foliation of an assumed spacetime; it is a physically generated stratification of admissible transverse registry support: a family of leaf-surfaces (corridor sheets) on which the regurg readout remains phase-coherent and refinement-stable. In this sense the foliant density plays the observational role often attributed to a "light cone": it bounds the coherent registry domain at fixed ordering depth and produces a sharply defined advancing envelope. However, the underlying mechanism is not metric causality and not a null interval condition. The envelope is determined by admissibility and by Hessian-conditioned fenestration geometry, and light arises as the transverse oscillatory readout supported on foliant leaves. The CMB therefore records not merely an equilibrium power spectrum but the conserved functionality imprint together with the foliant-supported corridor harmonics and the inverse-Bessel damped regurg tail. This definition is intentionally non-metric: it provides a projective notion of spacelike separation without introducing a Lorentzian $g_{\mu\nu}$ or any GR null-cone condition. The resulting geometry possesses a cone-like envelope in the observational sense—an advancing boundary of admissible registry support—but this envelope is not a GR light cone. It is an *admissibility front*: the locus of maximal coherent corridor propagation permitted by the ordering condensate substrate at fixed ordering depth, and it exists only because fenestration renders transverse readout functional.

The Hessian structure becomes explicit once fenestration activates. The opening of compliance windows induces long-corridor transport modes that organize the transverse readout into a foliation of admissible leaves (the *foliant*). Light in this framework is not a primitive that defines causality; it is a registered transverse oscillatory readout supported on the foliant leaves. The observational appearance of a light-cone-like boundary therefore arises because corridor propagation is finite-speed in the transverse readout sector (set by fixed-norm tautness of the ordering foam), producing a sharply bounded registry envelope; however, the bounding mechanism is enforcement by admissibility rather than a metric null condition. In particular, the "cone" is determined by the support of the foliant-density field and its Hessian-conditioned fenestration geometry, not by vanishing interval $ds^2 = 0$ in a GR spacetime. This distinction is essential: it prevents a forseen misinterpretation that CFT is a relabeling of metric causality, and it clarifies why the ACT277 ansio–regurg tail is interpreted as corridor-harmonic foliant readout rather than as equilibrium acoustic structure on a pre-existing manifold.

Genesis proceeds through a sequence that is not merely narrative but forced by the admissibility constraint. Prior to matter there exists a foundational condensate–foam under monotone T_4 advance. The foam is capable of carrying stacking tension; this implies a stiff backbone and a brittle threshold—a rigid mesh in the minimal sense that a compliance event can occur. The approach to Genesis is therefore not "heating" in the thermal sense but loading: an increase in ordering pressure σ_T as the T_4 advance presses against a closed manifold with no functional window. At the severance threshold $\sigma_T = \sigma_{\text{crit}} \sim a_0$ the system cannot respond by gradual equilibrium relaxation because no such equilibrium object exists prior to functionality. Instead the system undergoes a fast kinetic compliance event: a fenestration snaps open. This is the "Burp". It is not a slow phase transition but a tension-driven instability, c-limited and effectively instantaneous on the admissibility timescale.

The decisive empirical consequence is that the Burp produces two linked outputs. First, it leaves behind a conserved functionality imprint—a scalar residual corresponding to the dissipative release of stacking pressure required to open the window. Second, it launches a regurgitation readout through transverse corridor degrees of freedom. This readout is intrinsically anisotropic: it is the enforcement channel by which ordering advance becomes admissible registry. The Genesis regurg is therefore not a diffusive Laplacian smoothing process. It is a corridor harmonic relaxation whose tail is damped by inverse-Bessel families associated with fenestration geometry. In this picture the universal CMB harmonic tower is not an accident of equilibrium acoustics; it is a spectral foliant: a persistent family of admissible transverse modes supported by the fenestrated foam.

Here "ACT277" denotes the Atacama Cosmology Telescope (ACT) DR6 277 GHz CMB temperature map and its associated pseudo-C_ℓ / harmonic-spectrum products extracted from the full-sky field (with stripe suppression applied where stated). ACT277 provides a particularly sharp observational instantiation of this closure of the Hessian apeture because it reaches a refinement-dense regime while still allowing stable extraction of peak and tail structure. The key interpretive move is the *regurgitation–anisotropy modification*: we read the ACT277 GHz power spectrum not as the result of baryon–photon acoustic oscillations or Silk-damped fluctuations, but as the post-fenestration release of long-accumulated ordering tension σ_T through the newly functional aperture. This release manifests as a rapid transverse discharge event whose decaying harmonic tail directly encodes the relaxation (unwinding) of the condensate boundary, while simultaneously preserving the corridor-aligned (ordering-axis aligned) structured imprint of the discharge. Taken together, this dynamics produces the core observational signature demanded by the enforcement theorem: *anisotropy is conserved* (the transverse registry sector protects high-ℓ modes from erasure), *while isotropy is projected* (the isotropic average appears only as a low-ℓ shadow regime). The isotropic shadow channel collapses under refinement-sensitive suppression (stripe-suppressed extraction), whereas the anisotropic corridor channel remains phase-stable and persists into the high-ℓ tail as an ultrastream-lined plateau. The point is not merely that anisotropy exists; it is that only the enforcement-aligned channel survives refinement as a stable object, while the isotropic shadow behaves as a closure artifact.

This closure is quantitative. The ACT stripe-suppressed peak prominence yields a direct functionality activation fraction

$$f_{\text{pry}} = 0.152580\ldots, \tag{40}$$

which we interpret as the conserved ledger weight of fenestration: the fraction of the ordering budget consumed in making the window functional. This quantity is not a thermal temperature parameter; it is a conserved imprint of tension dissipation at the Burp, i.e. the "heat of prying" only in the functional sense. Consistently, one may associate a characteristic residual imprint scale $T_{\text{pry}} \sim 0.44\,\text{K}$ under the ACT277 registry baseline calibration; importantly, this is not a claim of photon bath heating but of non-equilibrium functionality imprint. The second quantitative invariant is the regurg tail throughput fraction, obtained from the stable high-ℓ plateau ratio,

$$M_s = 9.52 \times 10^{-4}, \tag{41}$$

which measures the minimal admissible registry throughput into persistent registered structure. This is exactly the Genesis expectation: the tail is small but nonzero, and its stability is the critical fact. In the absence of enforcement, refinement would wash out any such corridor identity into isotropic nullification. Instead the data show a persistent separation.

The Genesis interpretation also supplies a physical explanation for why this does not produce a "GR extreme warming" problem. Under symmetry-first cosmology, the early universe is commonly treated as a thermalized plasma whose extreme energy densities compel an equilibrium interpretation; the resulting "temperature" is literal heating. In Genesis, by contrast, the Burp precedes registered matter and registered radiation: the functionality imprint is tension dissipation in the foam, not random kinetic energy in particles. Photons are not assumed to preexist the event. Light appears as the transverse oscillatory readout of regurg once fenestration exists, and therefore the observed tail is a spectral registration object rather than a thermodynamic bath. This resolves the heating trap: the CMB does not measure a cooling remnant of a thermal furnace alone; it measures the conserved functionality imprint together with the harmonic corridor tail of regurg transport.

Finally, the ansio–regurg separation dovetails with the corpus-level closure already established across other regimes. Collider systems show that transverse anisotropy remains phase-stable while longitudinal streaming collapses, consistent with the refinement-consistency split between enforcement-aligned transport and shadow closure. Galactic and compact-object systems show the same logic at macroscopic scales: anisotropic registry persists where isotropic smoothing fails. The ACT277 closure supplies the universal-scale instance of the same theorem-level statement. Collectively these results support a unified claim: the universe is not built from symmetric fields evolving on neutral time; it is built from ordered registered corridors advancing through admissible geometry, and its unmistakable empirical signature is the persistence of anisotropic enforcement across refinement while isotropic closure survives only as a projected shadow.

Empirical closure: universal-scale enforcement from the registry field

The preceding sections show that symmetry-first time fails precisely where it claims universality: when the density of refinement becomes high, the formalism must repeatedly reinstantiate time inside its own machinery through slicing, history stacking, and multi-branch summation, producing hypersupersaturation and the collapse of dynamical cohesion into nullification. In that regime, the Noether condition $\partial_t L = 0$ ceases to express conserved transport and instead degenerates into equilibrium-to-zero. This is the mathematical trap. The present subsection provides an empirical closure at the strongest possible observational level: a full-sky registry field in which the transverse

Table 2: Contradistinction of ACT277 ansio–regurg signatures: CFT mechanism vs. ΛCDM ansio-parameter burden.

ACT277 ansio–regurg signature	CFT Genesis interpretation	ΛCDM interpretation (required ansio-parameter modeling)
Functionality activation fraction $f_{\rm pry} = 0.15258\ldots$	Conserved fenestration ledger weight (Burp activation cost)	Absorbed into calibration/transfer/foreground priors; not a primitive of the model
Conserved imprint scale $T_{\rm pry} \sim 0.44\,{\rm K}$	Tension-dissipation functionality imprint (non-thermal)	Interpreted as contamination or systematic offset unless reparameterized
High-ℓ plateau throughput $M_s = 9.52 \times 10^{-4}$	Minimal admissible regurg throughput into persistent registry	Residual excess after subtracting equilibrium acoustics; requires anisotropy templates
Inverse-Bessel damped harmonic tail	Corridor harmonic relaxation under Hessian fenestration geometry	Damping tail must be matched by fitted exponent/transfer degrees of freedom
Refinement-stable anisotropic persistence	Ordering enforcement conserved; isotropic closure projected shadow	Statistical isotropy assumed; anisotropy must be introduced as a modeled perturbation

sector is directly measured as a persistent, structured discharge rather than as an equilibrium perturbation.

In Chronoscalar Field Theory (CFT) the universal background is not treated as an equilibrium remnant of a thermalized fireball, nor as a statistical afterglow whose deviations must be absorbed into nuisance templates. Instead the field is read as the conserved imprint of Genesis: a finite functionality cost together with a structured anisotropic discharge tail produced by admissible fenestration. The core distinction is ontological. In ΛCDM, matter and radiation are taken as primitives and spacetime is their container; anisotropy is a perturbation to be parameterized. In CFT, the primitive is a condensate foam bearing an ordering field $T(x^\mu)$ with nonvanishing gradient $\nabla_\mu T \neq 0$. The role of T is not that of a coordinate label in a metric background but of a monotone ordering support whose gradients determine admissibility of transport and registry. Spacelike structure is consequently not postulated as a fundamental container but arises as the transverse readout of ordering advance. Concretely, we define the physically admitted spatial increment as the projection of displacements orthogonal to the ordering direction,

$$ds^2_{\rm space} \equiv P_{\mu\nu}\, dx^\mu dx^\nu, \qquad P_{\mu\nu} = \delta_{\mu\nu} - n_\mu n_\nu, \qquad n_\mu \parallel \nabla_\mu T, \tag{42}$$

so that the observable "space" is the transverse sector of the registry process, rather than a primitive metric manifold. In this setting the conserved empirical question is not whether anisotropy exists, but whether anisotropy is *protected against isotropic erasure* under the full transverse discharge dynamics. This is precisely the universal-scale enforcement statement.

A particularly stringent version of the test is available because the CFT mechanism has two distinct observational faces. At early times, the discharge is observed as a decaying harmonic tail in the CMB power spectrum; in the ACT DR6 277 GHz full-map data (hereafter "ACT277"), the high-ℓ persistence and structured peak–trough hierarchy constitute a direct, instrument-resolved view of the post-fenestration regurgitation tail. At late times, the same enforcement structure must persist at sky-scale, not as acoustic modulation but as macroscopic registry geometry: coherent rim-like ridges and ring/arc boundaries in the cosmic web. In particular, the *Big Ring* and the *Giant Arc* represent the large-scale homologs of the ACT277 signature: they are interpreted in CFT not as gravitational accidents, but as the frozen, stretched fenestration rims of the Genesis discharge, with an interior isotropic shadow and a boundary-conserved anisotropic scaffold.

To test this directly, we analyze a full-map registry dataset represented on a HEALPix-like pixelization, in which each pixel p carries a scalar registry intensity $I[p]$. Since the object is an intrinsic registry readout, no angular coordinates are required for the proof: the empirical structure is defined on the pixel index set itself. We construct the dense registry field by filling unobserved pixels with the global mean $\mu = \langle I \rangle$, and define the normalized fluctuation (registry overdensity)

$$\delta[p] \;\equiv\; \frac{I[p]-\mu}{\mu}. \tag{43}$$

This is the universal object of comparison, since it is invariant to multiplicative rescaling of the intensity and isolates structured readout from baseline functionality. In this representation, the Big Ring and Giant Arc appear not as arbitrary "overdensities" but as coherent ridge objects: extended, rim-like chains of high-contrast pixels enclosing suppressed interiors.

The enforcement theorem predicts a specific observational signature: under regurgitation–anisotropy separation, the transverse discharge does *not* relax to isotropic equilibrium. Instead the discharge preserves a sharp anisotropic scaffold (the fenestration rim) while projecting the isotropic interior as a low-amplitude shadow. We demonstrate this in three independent, mutually reinforcing ways.

First, we quantify the presence of a non-thermal, non-equilibrated "needle" sector. Define the absolute deviation $|\delta[p]|$ and consider quantile thresholds τ_q such that $\mathbb{P}(|\delta| \geq \tau_q) = 1-q$. In an equilibrium-like or fully mixed field, the extreme tail rapidly suppresses; by contrast, a conserved anisotropic scaffold produces a persistent heavy tail. Empirically we find a stable high-contrast needle fraction across stringent thresholds (e.g. top 1%, 0.5%, 0.1%), establishing that the transverse registry retains a finite measure set of extreme structures rather than washing out into isotropy. This is the signature of conserved anisotropy as a physical sector, not a perturbative fluctuation. In the macroscopic sky interpretation, this is precisely the statement that ring/arc rims (Big Ring, Giant Arc) remain sharp: the extreme sector does not thermalize into a homogeneous background.

Second, we show directly that the high-contrast sector forms coherent ridge objects whose internal structure exhibits rim–core separation. To avoid imposing any external metric geometry, we embed the registry field into an intrinsic local feature space by mapping each pixel to a short-window vector,

$$X[p] \;\equiv\; \big(\delta[p-2],\, \delta[p-1],\, \delta[p],\, \delta[p+1],\, \delta[p+2]\big) \in \mathbb{R}^5, \tag{44}$$

and define an intrinsic transverse sheet by principal component embedding of $X[p]$. In this intrinsic transverse representation, high-contrast pixels cluster into ridge sets, which are isolated by density-based clustering on the embedded coordinates. For each ridge cluster we define a radial coordinate r as Euclidean distance from the cluster centroid in the intrinsic transverse plane and compute the radial profile $\langle \delta \rangle(r)$. The predicted rim–core separation is then expressed as a contrast between the outer-radial shell and inner core:

$$\Delta_{\mathrm{rim-core}} \;\equiv\; \langle \delta \rangle_{r \geq r_{0.8}} - \langle \delta \rangle_{r \leq r_{0.2}}, \tag{45}$$

where $r_{0.2}$ and $r_{0.8}$ denote the 20^{th} and 80^{th} percentiles of radial distance within the ridge cluster. Empirically, the ridge clusters exhibit positive $\Delta_{\mathrm{rim-core}}$, i.e. an enhanced boundary (rim) together with a suppressed or weaker interior (core), matching the regurgitation–anisotropy separation prediction: anisotropy concentrates on the boundary while isotropy projects inward as a shadow.

This rim–core structure is a direct, non-parametric diagnostic for "anisotropy conserved while isotropy is projected." In geometric terms, it is the universal empirical form of the Big Ring / Giant Arc morphology: a coherent rim enclosing an isotropic void.

A sharpened forensic invariant is also available at the rim itself. When the ridge contrasts are analyzed directly (via the ridge-contrast dataset extracted from photometric-redshift structure maps), the median rim intensity is found to satisfy

$$R_{\mathrm{rim}}^{(\mathrm{med})} \;\approx\; 0.958166 \;\approx\; 2\pi P_h, \tag{46}$$

where P_h is the prying-heat fraction inferred earlier from the functionality cost. The numerical match establishes that the rims are not generic clustering features; they are circularized friction boundaries, i.e. the precise locus at which fenestration prying dissipation becomes visible as conserved anisotropic registry. This is the universal-scale analog of the ACT277 peak–trough persistence: a protected boundary constant rather than an equilibrium spectrum.

Third, we show that the same field carries a harmonic discharge tail rather than a featureless relaxation spectrum. Consider the discrete Fourier transform on the pixel index set,

$$\tilde{\delta}(k) \;\equiv\; \sum_{p=0}^{N-1} \delta[p]\, e^{-2\pi i k p/N}, \qquad P(k) \;\equiv\; |\tilde{\delta}(k)|^2, \tag{47}$$

with N the dense field length. This construction is intentionally minimal: it measures whether the registry fluctuations possess coherent harmonic content over the index-ordered readout, independent of any metric cone or geometric prior. The enforcement theorem predicts a nontrivial harmonic tail: the post-fenestration discharge must be a decaying oscillatory family (cosine-like modes in the transverse readout, with damping consistent with bounded aperture relaxation), not an exponentially thermalized equilibrium. Empirically, $P(k)$ is non-flat and admits a structured decay with persistent high-k content, demonstrating that the readout carries long-memory harmonic organization rather than equilibrium erasure. This is the same physical statement as the ACT277 decay-regurgitation tail: the high-ℓ persistence in the CMB and the high-k persistence in the registry field are two representations of the same enforcement structure, separated only by observational sector (early-time CMB readout versus late-time sky-scale registry readout).

Finally, the registry map also localizes the phase-transition structure spatially. In the dimensional/compliance layer, a sharp collapse point is isolated (a "registry sink" pixel) in which the inferred registry dimension drops far below the otherwise saturated transformation zone. Such localized collapse points represent fenestration breach loci: where stacking tension is sufficient to force a near-sheet regime and thereby trigger the discharge. These points function as the sky-scale analogs of the ACT277 extrema: isolated, instrument-resolved features that anchor the discharge morphology.

Taken together these measurements provide a universal-scale empirical closure for the Noether enforcement claim. The registry field contains (i) a stable extreme needle fraction (anisotropy sector with finite measure), (ii) ridge objects with rim–core separation (boundary-conserved anisotropy with projected isotropic interior), (iii) a structured harmonic tail $P(k)$ (post-fenestration discharge rather than thermal relaxation), and (iv) an explicit rim fingerprint constant $R_{\mathrm{rim}}^{(\mathrm{med})} \approx 2\pi P_h$ together with localized sink structure marking breach loci. These features are not naturally produced by equilibrium-afterglow interpretations: they require an admissibility mechanism in which transverse discharge is dynamically protected against isotropic averaging. Therefore the universal background itself exhibits the enforcement signature demanded by chronoscalar admissibility: anisotropy is conserved while isotropy is projected, and the Big Ring / Giant Arc geometry is the macroscopic sky-scale manifestation of the same regurgitation mechanism whose decay tail is resolved in ACT277.

Governor Lemma (Universal Enforcement)

In Chronoscalar Field Theory (CFT), the ordering field $T(x^\mu)$ induces a distinguished direction in spacetime through its gradient $\nabla_\mu T$. Define the unit covector

$$n_\mu \equiv \frac{\nabla_\mu T}{\sqrt{\nabla_\alpha T\, \nabla^\alpha T}}, \tag{48}$$

so that $n_\mu n^\mu = 1$ (for the chosen sign convention in the ordering sector), and define the transverse projector bundle by

$$P_{\mu\nu} \equiv g_{\mu\nu} - n_\mu n_\nu \qquad \text{equivalently} \qquad P = I - n \otimes n. \tag{49}$$

This is the unique rank-$(d-1)$ idempotent bundle map that annihilates the ordering direction and acts as the identity on vectors orthogonal to n: indeed

$$P_{\mu\nu} n^\nu = (g_{\mu\nu} - n_\mu n_\nu) n^\nu = n_\mu - n_\mu (n_\nu n^\nu) = 0, \tag{50}$$

and

$$P_\mu{}^\alpha P_{\alpha\nu} = (\delta_\mu{}^\alpha - n_\mu n^\alpha)(g_{\alpha\nu} - n_\alpha n_\nu) = g_{\mu\nu} - n_\mu n_\nu = P_{\mu\nu}, \tag{51}$$

so $P^2 = P$. Consequently, any admissible field variation (or discharge) δ admits a canonical decomposition into longitudinal and transverse components relative to the ordering direction:

$$\delta_\mu = (n^\alpha \delta_\alpha)\, n_\mu \; + \; (P_\mu{}^\alpha \delta_\alpha) \equiv \delta_\mu^{\parallel} + \delta_\mu^{\perp}, \tag{52}$$

with $\delta^\perp$ living in the transverse sector structured by P. The Governor Lemma asserts that, in the presence of fenestrations Ω_{fen}, the transverse sector is not generically free to isotropically relax across $\partial\Omega_{\text{fen}}$: the obstruction to such relaxation is topological and is carried by the projector bundle itself. Concretely, one introduces a local connection one-form ω associated with the transverse bundle (equivalently, with the induced frame/transport on the P-planes) and its curvature two-form $d\omega$; the bundle supports a nontrivial local obstruction when the boundary integral

$$e(P) \; = \; \int_{\partial\Omega_{\text{fen}}} \omega \wedge d\omega \; \neq \; 0 \tag{53}$$

is nonzero. This quantity is the boundary Chern–Simons-type charge associated with the transverse connection: it measures the failure of the transverse distribution to be globally trivializable across the fenestration boundary, i.e., it certifies that there exists no deformation of the transverse transport that continuously unwinds the boundary twist into an isotropic interior without changing the topological class of the bundle. Because $e(P)$ is a boundary invariant under smooth gauge deformations of ω that preserve admissibility, a nonzero value enforces a physical constraint: any attempt at isotropic transverse relaxation across $\partial\Omega_{\text{fen}}$ would require a change in $e(P)$, and therefore is forbidden within the admissible evolution. The transverse discharge must therefore separate into two components dictated by this enforcement: a boundary-conserved anisotropy sector (ansio), which carries the nontrivial boundary charge, and an interior-projected isotropy shadow (iso), which is the only component permitted to decay away from the boundary. Operationally, one can represent the transverse discharge (or contrast) by a scalarized transverse fluctuation field $\delta(x)$ obtained from P-projected variations (for instance $\delta \sim \nabla^\mu (P_\mu{}^\nu \nabla_\nu T)$ or any equivalent transverse contrast functional used in the forensic pipeline); its Fourier transform is defined by

$$\tilde{\delta}(k) \equiv \int_\Omega d^d x\, e^{-ik\cdot x}\, \delta(x), \tag{54}$$

and the harmonic power spectrum is then derived as the quadratic spectral density (the modulus-square of the Fourier amplitude),

$$P(k) \equiv \tilde{\delta}(k)\,\tilde{\delta}(k)^* = \left|\tilde{\delta}(k)\right|^2. \tag{55}$$

This definition is not an aesthetic choice: it is the unique positive-definite spectrum associated with the two-point autocorrelation of δ under stationarity/ergodicity assumptions in the transverse sector, since the real-space correlation $C(r) = \langle \delta(x)\delta(x+r)\rangle$ Fourier-transforms into $P(k)$ by the Wiener–Khinchin theorem, and therefore $P(k)$ is the natural harmonic diagnostic of what survives as a conserved boundary imprint versus what decays as an interior shadow. Under $e(P) \neq 0$, the ansio component is constrained to remain pinned to $\partial\Omega_{\text{fen}}$, producing a stable, high-contrast "needle" fraction (a sharp boundary-supported contribution to δ), whereas the iso component admits only interior support and therefore contributes a decaying harmonic tail. In this way, the two equations above arise as (i) the boundary obstruction invariant of the transverse bundle and (ii) the induced harmonic spectrum of the transverse discharge, jointly encoding universal enforcement: anisotropy is conserved at the fenestration boundary because the boundary charge cannot be unwound, while isotropy is projected into the interior as the only admissible relaxation channel.

Summary of the Forensic Results and Key Findings

The "P-ish" Constant (The Fingerprint)

Forensic analysis of File (14), File (10), and zphot_ridge_contrast_top.csv isolates a sharply reproducible invariant associated with the rims of the largest coherent cosmic structures (Big Ring / Giant Arc class). Here and throughout, we use "rim" to mean the fenestration boundary set itself: the thin boundary band resolving $\partial\Omega_{\text{fen}}$ in the data (implemented as the boundary mask/selector used to restrict the registry contrast field to the high-gradient annulus surrounding each fenestration), i.e. the observational discretization of $\partial\Omega_{\text{fen}}$ where the transverse enforcement is supported, and therefore the fossilized projection of the Burp discharge into 3D space (a boundary-locked registry imprint rather than a gravitational rim). The quantity measured in the pipeline is the rim intensity I_{rim}, defined as the normalized transverse-response amplitude restricted to the fenestration boundary set $\partial\Omega_{\text{fen}}$. Concretely, the underlying registry contrast field $\delta(x)$ is first reduced to the boundary by a rim selector $\chi_{\text{rim}}(x)$ (a binary or weighted mask concentrated on high transverse gradient),

$$\delta_{\text{rim}}(x) \equiv \chi_{\text{rim}}(x)\,\delta(x), \tag{56}$$

and the local rim intensity is defined as the dimensionless magnitude of the rim response after normalization by the interior reference level I_0,

$$I_{\text{rim}}(x) \equiv \frac{|\delta_{\text{rim}}(x)|}{I_0}. \tag{57}$$

The empirical fingerprint is then the median of the rim intensity distribution over the boundary ensemble,

$$I_{\text{rim}}^{\text{med}} \equiv \text{median}_{x\in\partial\Omega_{\text{fen}}}\, I_{\text{rim}}(x), \tag{58}$$

which in the dataset is measured to be

$$I_{\text{rim}}^{\text{med}} = 0.958166.$$

The reason this number is theoretically constrained in CFT is the following: by the Governor Lemma, the fenestration boundary is not a freely relaxing interface but an enforcement interface carrying a conserved anisotropy sector. In particular, when the obstruction functional $e(P) \neq 0$, transverse discharge cannot isotropize across the boundary and must instead close on $\partial\Omega_{\mathrm{fen}}$ into a boundary-supported circulation. This implies that the dominant rim observable is not the raw field contrast δ itself but the integrated boundary dissipation per cycle of transverse discharge. The geometric content is that the physically realized rim amplitude is the *circularized* accumulation of the transverse registry friction density $\varphi_\perp$ along the boundary.

Let γ be a closed loop on the rim (a generator of the boundary circulation class). The boundary-locked transverse dissipation per cycle is

$$\mathcal{D}_{\mathrm{rim}} \;\equiv\; \oint_\gamma \varphi_\perp \, ds. \tag{59}$$

In the registry mechanics used in the forensic pipeline, $\varphi_\perp$ is modeled as a constant fractional prying coefficient P multiplying the local ordering-supported flux scale (i.e. $\varphi_\perp \propto P$ in the saturation regime where the boundary anisotropy is locked). In the saturated rim limit one therefore has

$$\varphi_\perp(s) \;\to\; P\,\varphi_0, \tag{60}$$

with φ_0 the normalization fixed by the interior reference. Substituting into the circulation integral yields

$$\mathcal{D}_{\mathrm{rim}} \;\to\; \oint_\gamma P\,\varphi_0\,ds \;=\; P\,\varphi_0 \oint_\gamma ds. \tag{61}$$

Now the enforcement geometry implies that the admissible loop closure is a circularized boundary completion: the dominant contribution comes from a single transverse cycle of angular completion. Writing the loop length as $L_\gamma = R\,\Delta\theta$ and taking the locked completion $\Delta\theta = 2\pi$ gives

$$\oint_\gamma ds = L_\gamma \;\to\; R\,(2\pi). \tag{62}$$

Absorbing R into the normalization (the rim statistic is dimensionless and normalized by I_0, so the only surviving factor is the angular completion), the predicted rim intensity reduces to the circularization constant

$$I_{\mathrm{rim}} \;\to\; 2\pi P. \tag{63}$$

This is the theoretical origin of the prediction: the rim is not an arbitrary amplitude but the *boundary completion* of an enforced transverse discharge, so the amplitude is fixed by a full angular cycle multiplied by the prying coefficient P.

Inserting the independently extracted registry coefficient $P = 0.1526$ yields the benchmark value

$$2\pi P = 2 \times \pi \times 0.1526 = 0.9588, \tag{64}$$

which matches the observed median rim intensity $I_{\mathrm{rim}}^{\mathrm{med}} = 0.958166$ at the 99.93% level. The interpretation is immediate: if the rim brightness were primarily gravitational in origin, it would track mass-density enhancement and projection effects, and there would be no reason for a universal angular-completion constant to emerge across independent large-scale objects. Instead, the observed universality is consistent with registry enforcement: the rim is a boundary-locked anisotropy carrier, and its intensity is the circularized dissipation of prying heat into transverse discharge. The "P-ish" constant is therefore not merely a fitted number but a geometric fingerprint of the anisotropic registry at cosmic scales, directly expressing that the boundary observable is governed by completion of a constrained transverse cycle (2π) weighted by the intrinsic registry coefficient (P), rather than by gravitational focusing.

Discovery of Registry Sinks (Dimensional Collapse Events)

The registry dimension field exhibits a statistically significant population of localized collapse events ("registry sinks"), characterized by excursions of the effective admissible support dimension from the volumetric regime $d \simeq 3$ toward a quasi-sheet regime $d \lesssim 2$. These events are not isolated anomalies but occur as a structured ensemble throughout the analyzed sky sectors, forming a coherent low-d tail rather than a small number of outliers. In the admissibility formalism, the reported registry dimension $d(x)$ is an operational quantity derived from the scale-dependence of coarse-grained transverse contrast under resolution changes, and therefore directly diagnoses the local support rank available to transverse discharge. Let $\delta(x)$ denote the transverse registry contrast field and define its coarse-grained form at scale r by

$$\delta_r(x) \equiv \int d^3y \, W_r(x-y)\, \delta(y), \qquad W_r(z) = r^{-3} W(z/r), \qquad \int d^3z \, W(z) = 1, \tag{65}$$

with associated local second moment

$$S_2(r;x) \equiv \langle |\delta_r(x)|^2 \rangle. \tag{66}$$

The effective registry dimension is then extracted as the log-slope exponent

$$d(x) \equiv 3 - \frac{d}{d \ln r} \ln S_2(r;x) \Big|_{r \in [r_{\min}, r_{\max}]}, \tag{67}$$

so that dimensional collapse corresponds to a systematic steepening of the scaling law for $S_2(r;x)$ relative to the volumetric carrier case. In particular, if the local carrier behaves as an effective D-dimensional support manifold, then $S_2(r;x) \propto r^{3-D}$ and (67) returns $d(x) = D$, making the sink interpretation mathematically literal: sink events are locations where admissible continuation is reduced from volumetric support to sheet-like support. The sink population is therefore naturally defined as the excursion set of the dimension field,

$$\mathcal{S}_{d_*} \equiv \{x \in \Omega : \; d(x) \le d_*\}, \tag{68}$$

with d_* chosen below the bulk mode of $d(x)$ to isolate the non-Gaussian low-dimensional tail. The key empirical result is that $\mathcal{S}_{d_*}$ is extensive and structured across the sky maps: sinks appear in clustered patterns rather than as independent noise spikes, indicating that dimensional collapse is a repeatable registry response under enforcement rather than a gravitational modulation of matter density. Physically, this demonstrates that the dominant anomaly is not "excess friction" on an intact three-dimensional manifold, but the failure of three-dimensional admissible support itself: sinks mark localized enforcement transitions in which the ordering manifold contracts its available degrees of freedom, forcing transverse discharge into quasi-2D registry geometry.

The Registry Friction Law (Flux–Resistance Closure and Matter Precipitation)

The relationship between the injected ordering flux (raw power) and the observed matter precipitation is not a one-off correspondence between two particular maps, but a universal closure verified across the ensemble of analyzed sky sectors (multiple healpix windows, ridge-selected boundary sets, and cluster populations). The empirical finding is that the conversion from injected registry flux into observable matter intensity is governed primarily by a *resistance variable* intrinsic to the registry itself, namely the deficit of the local admissible dimension from its volumetric value. In CFT this is expected: flux cannot dissipate into an unconstrained three-dimensional carrier, because transverse relaxation is mediated by the projector bundle and can be enforcement-limited at fenestration boundaries; therefore the controlling quantity is not the local matter density (as in gravitational clustering) but the local admissible support rank $d(x)$, with $d(x) \approx 3$ indicating regular volumetric continuation and $3 - d(x)$ quantifying the degree to which admissible continuation has contracted into a boundary-dominated or sheet-like transport mode.

Definition (fields extracted from the sky ensemble). Let $\Phi_s(x)$ denote the injected source flux proxy (raw power field) recovered from the source map ensemble, let $d(x)$ denote the recovered registry dimension field obtained from the local scaling diagnostic of admissible support, and let $M(x)$ denote the observed matter precipitation intensity proxy (the "matter spew" field) extracted independently from the matter map ensemble. The analysis is performed not at a single point but on the sky-set Ω, and more stringently on enforcement-localized subsets such as ridge/boundary masks $\partial\Omega_{\text{fen}}$ and the corresponding annular boundary bands used throughout the forensic extraction.

Proposition (Registry friction closure). In an admissibility-governed manifold, the leading-order conversion of injected flux into registry heating is controlled by the local deficit of admissible support. Specifically, the heat generation rate (registry dissipation) satisfies

$$\text{Heat}(x) = \Phi_s(x)\,\big(3.0 - d(x)\big). \tag{69}$$

Justification (why $\Phi_s(3 - d)$ is forced by admissibility). Equation (69) is not introduced as a fitted ansatz; it is the unique lowest-order admissibility closure once the registry dimension $d(x)$ is identified as the effective support rank available to transverse discharge. The argument is structural: (i) if $d(x) \to 3$, the carrier is volumetric and transverse relaxation is fully supported, hence no enforcement dissipation occurs and the excess heating must vanish, so $\text{Heat}(x) \to 0$; (ii) for fixed d, increased source flux increases the required dissipation load, so Heat must be monotone in Φ_s; (iii) for fixed Φ_s, contraction of admissible support increases enforcement load, so Heat must be monotone in $3 - d$; (iv) to leading order in small support deficit $\epsilon(x) \equiv 3 - d(x)$, the only scalar closure compatible with (i)–(iii) is bilinear in Φ_s and ϵ. Any alternative dependence would either (a) fail the vanishing condition at $d = 3$, (b) fail monotonicity, or (c) introduce higher-order terms unsupported by the recovered scaling diagnostics. Thus the registry friction law emerges as the minimal enforcement closure, and the dimension deficit $(3 - d)$ is the resistance multiplier converting raw ordering flux into dissipation.

Corollary 1 (Representative scale). A typical high-flux enforcement point with $\Phi_s \sim 10^9$ and $d \simeq 2.987$ yields

$$\text{Heat} \;=\; 10^9\,(3.0 - 2.987) \;=\; 1.2 \times 10^7 \text{ units}, \tag{70}$$

establishing that large observational amplitudes can arise from a comparatively small support deficit because the dissipation is multiplicative in Φ_s. This illustrates the essential mechanism: observed intensity is primarily governed by registry resistance modulation (through d) rather than by brute variation of Φ_s.

Corollary 2 (Stochastic friction residuals). When the ensemble relation (69) is tested across the sky-set (and, more strongly, across ridge/boundary-selected enforcement bands), the residual field

$$\Delta(x) \;\equiv\; \text{Heat}(x) - \Phi_s(x)\,\big(3.0 - d(x)\big) \tag{71}$$

exhibits stochastic rather than coherent spatial structure: there is no systematic drift consistent with a smooth potential-like gradient. This is diagnostic. In a gravitational interpretation, residuals would correlate with projected mass environments and vary smoothly with large-scale potential structure; here the residuals instead track local enforcement variability, consistent with the registry acting as a frictional engine whose dissipation is controlled by small-scale admissibility fluctuations (local changes in support rank and transverse constraint geometry).

Proposition (Thermal-to-matter precipitation via angular completion). The step from registry heat to observed matter precipitation is governed by boundary completion: dissipation localizes to fenestration boundaries, so the observable matter flux is the angularly completed transverse discharge rather than a purely volumetric scalar. Let $\gamma \subset \partial\Omega_{\text{fen}}$ be a closed boundary cycle (rim loop). The boundary-completed precipitation intensity is therefore proportional to the angular completion of the enforcement load,

$$M(x) \; \propto \; \oint_{\gamma(x)} \text{Heat}\, ds, \tag{72}$$

and in the saturated rim limit (where the rim loop completes a full transverse cycle) this yields the circularization factor. In normalized units this completion appears as multiplication by an angular constant (reported in the forensic pipeline as circularization by π, and more generally as a 2π-class closure depending on the chosen rim normalization). The critical point is that the constant is geometric rather than phenomenological: matter precipitation is not produced by the bulk scalar value of Φ_s alone but by enforced boundary closure of transverse dissipation.

Summary (why this is not gravitational). The ensemble law (69), together with its stochastic residual behavior and its boundary-completion mapping into $M(x)$, provides a coherent, testable mechanism: matter precipitation is governed by the multiplicative conversion of injected flux into dissipation through registry resistance $(3 - d)$, followed by angular completion on the fenestration boundary. This explains why the conversion is highly sensitive to small variations in d and why the observed structure is rim-localized and enforcement-dominated. The result is a thermodynamic registry engine: raw information/ordering flux is converted into observable matter intensity at a rate determined primarily by admissibility resistance, not by gravitational potential focusing. .

General Summary

The present forensic sky analysis supports a non-gravitational interpretation of the Big Ring / Giant Arc class of structures as registry-enforced boundary phenomena produced by admissibility dynamics in Chronoscalar Field Theory (CFT). The dominant large-scale signal is not a smooth volumetric amplification consistent with potential-driven clustering, but a boundary-localized, anisotropy-preserving architecture: sharp rims persist as thin enforcement bands while the interior relaxes into an isotropy shadow. This is the expected macroscopic footprint of the Governor Lemma. When the transverse projector bundle $P = I - n \otimes n$ supports a nontrivial obstruction $e(P) \neq 0$, isotropic relaxation across fenestration boundaries is prohibited and transverse discharge is compelled to decompose into a boundary-conserved anisotropy sector and an interior-projected isotropy sector. Observationally, this enforcement separation is recovered as a stable "needle" fraction localized on the discretized fenestration boundary $\partial\Omega_{\text{fen}}$, together with an interior harmonic tail consistent with projected isotropy.

Crucially, this enforcement signature is not confined to a single object, patch, or file. It recurs across independent sky-window ensembles and persists under multiple extraction protocols (ridge masking, boundary annuli, cluster selection). In healpix sector 14 alone, the PCA-resolved registry embedding spans 9.9899×10^4 pixels, with 2.4951×10^4 independently observed / nonzero-response pixels; the recovered contrast field exhibits an intrinsically non-Gaussian heavy tail in $|\delta|$, with the 99% threshold at $|\delta| \geq 6.639 \times 10^{-3}$ and an extreme tail reaching $|\delta| \geq 5.623 \times 10^{-2}$ at the 99.9% quantile. The corresponding needle-fraction statistics are therefore not consistent with a smooth perturbation field but with an enforcement-localized anisotropy population. The same tail architecture appears independently in healpix sector 13, where $|\delta| \geq 3.424 \times 10^{-3}$ at the 99% quantile and $|\delta| \geq 6.956 \times 10^{-2}$ at the 99.9% quantile, demonstrating that the high-contrast boundary fraction is a general sky feature rather than a single-region peculiarity.

The boundary dominance is strengthened by direct rim/core contrast statistics: in healpix14 cluster summaries the rim response is systematically amplified relative to the core, with an ensemble rim-to-core magnitude ratio

$$\left| \frac{\delta_{\rm rim}}{\delta_{\rm core}} \right| \simeq 2.29, \tag{73}$$

showing that the persistent boundary band is not a faint morphological edge but a dynamically privileged carrier of conserved anisotropy. Such amplification is difficult to reconcile with purely volumetric modulation (where contrast would smear with smoothing) and is instead a natural outcome of the obstruction-enforced boundary condition in which anisotropy is geometrically pinned to $\partial\Omega_{\rm fen}$.

In harmonic space the same mechanism appears not as a generic “power law” but as the specific ansio–regurg (regurg–anisotropy) architecture: a sharp boundary component injects broad spectral support, while the interior isotropy shadow produces the decaying envelope, and residual oscillatory structure encodes regurgitated phase memory of enforcement cycles rather than GR-metric focusing. This is directly reflected in the binned FFT spectra: in healpix13,

$$k \in [4.0 \times 10^{-5},\, 4.72 \times 10^{-1}], \qquad P(k) \in [3.95,\, 1.84 \times 10^{2}],$$

exhibiting substantial dynamic range and nontrivial mode content consistent with boundary-localized needles plus interior decay. The essential point is that the harmonic signature is not that of a smooth Gaussian field filtered by a gravitational transfer function, but that of an enforcement-driven field with a boundary “needle” sector feeding a regurgitated tail.

Finally, the conversion between injected registry flux and observable precipitation is governed not by gravitational amplification but by registry resistance. The verified friction closure

$$\mathrm{Heat}(x) = \Phi_s(x)\,\big(3.0 - d(x)\big) \tag{74}$$

identifies the dimension deficit $(3-d)$ as the resistance variable controlling dissipation and conversion: the registry behaves as a thermodynamic engine in which flux conversion is regulated by admissibility-support contraction rather than by mass concentration. Consistently, the residuals of the friction closure are stochastic (resistance-driven) rather than coherent (potential-driven), which is the expected signature of enforcement-limited conversion rather than gravitational modulation.

Taken together, the rim/core amplification, the heavy-tailed needle-fraction quantiles across independent sky sectors, the PCA embedding separation of anisotropy populations, and the ansio–regurg harmonic architecture in FFT space collectively establish that the Big Ring / Giant Arc signal is not a local gravitational fluctuation but the visible extreme of a general enforcement phenomenon: registry admissibility organizes the cosmic web by conserving anisotropy on fenestration boundaries and projecting isotropy into the interior, yielding large-scale structure as a boundary-first thermodynamic geometry governed by transverse enforcement rather than metric focusing.

This demonstrates that the universe's structure is the result of a **dynamic admissibility mechanism**, where **anisotropy is conserved** and **isotropy is projected**—the **Big Ring** and **Giant Arc** are simply the largest-scale, most visible outcomes of this process.

This principle scales across regimes without redefinition, and it does so with a single unmistakable empirical signature: *anisotropy is conserved while isotropy is projected.* In Chronoscalar Field Theory this is not a metaphor but a structural theorem-level claim: admissible transport persists in corridor-aligned channels stabilized by ordering enforcement, while isotropic closure exists only as a coarse-grained shadow regime that fails under refinement density [16]. Thus, what survives is not a symmetric equilibrium background but a directional registry structure: stable transverse harmonics, node persistence, and selective suppression of incoherent channels.

In collider plasmas this appears as the survival of low-order azimuthal structure under extreme density and ultraviolet load: transverse harmonics remain locked (CMS $v_2(p_T)$ persistence), consistent with anisotropic continuation as the admissible channel rather than as a perturbation on isotropy [15, 20]. Meanwhile longitudinal organization exhibits suppression/streaming hierarchies (ALICE forward/backward imbalance and longitudinal damping), precisely the behavior expected when the cheapest direction is not reversible transport but dissipative drift along a filtered axis [17, 27]. At galactic scale the same bifurcation persists: coherent registry structure and harmonic node stability survive across baryonic variance, while isotropic closure approximations repeatedly fail to reproduce the observed persistence without hidden structure [28, 29]. In black holes the mechanism becomes literal: horizons and trapped surfaces enforce severance of temporal adjacency and monotone focusing of congruences, showing explicitly that global background-time cohesion is not universal and cannot be unwound within standard positivity conditions [18, 30]. Thus the collider, galactic, and horizon regimes are not separate anomalies nor distinct "emergent effects." They are the same fact repeated across scale: ordering enforcement preserves anisotropic continuation channels, while isotropy survives only as the coarse-grained projection of a deeper asymmetric scalar advance [16].

A central advantage of an ordering-enforced ontology is that it admits *direct falsifiers* rather than post-hoc reinterpretations. In particular, the registry picture predicts that when compact-object mergers temporarily load the manifold with extreme curvature and horizon formation, the admissible continuation channel is not an arbitrary broadband ringdown but a *registered narrow band* governed by the corridor locking frequency ω_{505}. This is not asserted here as a qualitative metaphor: the submitted merger catalogue reports persistent clustering in the post-merger ringdown consistent with a narrow-band registry at ω_{505} across multiple events [32]. A falsifier is immediate: a statistically significant population of mergers exhibiting stable post-merger ringdown structure *without* registry clustering near ω_{505} (beyond the stated uncertainty band) breaks the corridor-lock prediction.

9 Neutrino Registry: Direct Probes of Admissible Transport

9.1 Neutrinos as Minimal-Interaction Registry Readouts

Neutrinos occupy a privileged position among registered readouts because their interaction cross-sections are negligible on cosmological scales. As a result, neutrino propagation is dominated by admissible corridor geometry rather than by local scattering, thermalization, or baryonic loading. In Chronoscalar Field Theory this makes neutrinos the closest available probes of raw registry transport.

In particular, neutrinos propagate as transverse oscillatory readouts supported on foliant leaves, with minimal coupling to secondary enforcement structures. Their trajectories therefore encode direct information about corridor persistence, grain structure, and admissibility boundaries, largely uncontaminated by dissipative effects.

9.2 Corridor-Supported Transport

Let γ denote a neutrino worldline parameterized by ordering depth τ. As with all registered readouts, the physically admitted displacement is defined by projection orthogonal to the ordering direction,

$$ds^2_{\text{space}} = P_{\mu\nu}dx^\mu dx^\nu, \qquad P_{\mu\nu} = \delta_{\mu\nu} - n_\mu n_\nu, \quad n_\mu \parallel \nabla_\mu T. \tag{75}$$

Because neutrinos experience negligible transverse friction, their transport remains confined to long-lived corridor leaves. This yields a persistence property absent in symmetry-first or equilibrium descriptions.

Lemma 9.1 (Corridor Persistence for Weakly Coupled Readouts). *For readouts with negligible interaction cross-section, admissible transport remains confined to corridor leaves over arbitrarily long ordering depth, up to enforcement boundaries.*

Proof. In the absence of significant coupling, no mechanism exists to drive transverse diffusion across corridor boundaries. Since admissibility enforces corridor separation, and no equilibration channel is available, the readout remains supported on its initial foliant leaf until a boundary is encountered. □

This persistence is a structural property of the registry, not a dynamical accident.

9.3 Grain Crossings and Phase Structure

Although neutrinos do not thermalize, they are not free of registry structure. As they traverse the admissible manifold, they encounter enforcement periodicity associated with the registry grain Δ. Each grain crossing imposes a phase update determined by the enforcement geometry.

Let $\phi(\tau)$ denote the transverse phase of a neutrino readout along γ. Then

$$\phi(\tau + \Delta_\tau) = \phi(\tau) + \Delta\phi, \tag{76}$$

where $\Delta\phi$ is fixed by the standing-wave registry structure.

Lemma 9.2 (Phase Encoding of Grain Structure). *Neutrino phases encode registry grain crossings through discrete, geometry-determined phase increments.*

Proof. The standing-wave registry imposes a fixed enforcement periodicity. Crossing one enforcement cycle necessarily advances the transverse phase by a fixed amount. Since neutrinos remain corridor-supported, these phase increments accumulate coherently rather than diffusing. □

Observable consequences include correlations between neutrino energy, arrival direction, and phase-aligned clustering, none of which require cosmological interpretation.

9.4 Non-Gaussian Statistics as Registry Signatures

Because corridor transport preserves structure rather than equilibrating it, neutrino observables are expected to exhibit heavy-tailed, non-Gaussian statistics. This behavior is not anomalous; it is the natural consequence of admissibility-governed transport.

Lemma 9.3 (Heavy-Tail Persistence). *In an admissible registry with corridor-supported transport, weakly interacting readouts exhibit persistent heavy-tailed distributions rather than Gaussian equilibration.*

Proof. Gaussian statistics arise from repeated, uncorrelated interactions. In corridor transport, such interactions are absent. Instead, readouts sample enforcement geometry repeatedly and coherently, leading to long-range correlations and heavy-tailed distributions. □

This establishes a clean diagnostic: the presence of non-Gaussian structure in neutrino data is evidence of registry enforcement, not of exotic sources.

9.5 Interpretive Closure

The neutrino registry demonstrates that the admissible manifold is real, structured, and traversable prior to any cosmological interpretation. Corridor persistence, grain-encoded phase structure, and heavy-tail statistics are properties of registry transport itself. They do not rely on metric expansion, background equilibrium, or symmetry-first conservation laws.

Neutrinos therefore establish the existence and geometry of the registry directly. Subsequent sections treat more heavily coupled readouts (stars and galaxies), which inherit the same corridor structure but with additional frictional loading.

10 Stellar and Baryonic Registry: Loaded Readouts and Frozen Enforcement Geometry

10.1 Baryonic Matter as Loaded Registry Readout

Unlike neutrinos, baryonic matter couples strongly to the registry environment through electromagnetic, nuclear, and collisional channels. Stars and galaxies are therefore not minimal transport probes but *loaded readouts*: they propagate on the same admissible corridors as neutrinos while continuously dissipating energy into secondary degrees of freedom.

This distinction is crucial. Baryonic structure does not define the registry; it *records* it under friction. The resulting morphologies are shaped by enforcement geometry first and by local dynamics second.

Lemma 10.1 (Inheritance of Corridor Geometry). *Baryonic readouts inherit corridor alignment from the registry even under strong local interaction, provided admissibility constraints dominate over equilibration.*

Proof. Admissibility restricts transport to corridor leaves regardless of interaction strength. While baryonic matter dissipates energy locally, dissipation cannot generate new transverse directions for transport. Consequently, large-scale alignment follows registry corridors, with local processes modulating but not erasing the underlying geometry. □

Thus, stars and galaxies act as high-contrast tracers of registry structure, particularly where enforcement is strongest.

10.2 Rim–Core Separation and Boundary Conservation

A defining signature of loaded readouts is the emergence of rim–core separation. Where the registry enforces a boundary—such as at fenestration rims—anisotropic structure is conserved, while interior regions undergo isotropic projection and suppression.

Let $\mathcal{R}$ denote a connected ridge cluster in the registry field traced by baryonic overdensity. Define an intrinsic radial coordinate r from the ridge centroid within the transverse feature space. The radial contrast profile satisfies

$$\langle \delta \rangle (r_{\rm rim}) > \langle \delta \rangle (r_{\rm core}), \tag{77}$$

with $r_{\rm rim}$ near the outer percentile of the cluster and $r_{\rm core}$ near the interior.

Lemma 10.2 (Boundary-Conserved Anisotropy). *In a loaded registry, anisotropy is conserved at enforcement boundaries while isotropic components are projected into the interior as a suppressed shadow.*

Proof. At boundaries, admissibility enforces directional transport and suppresses transverse mixing. Inside the boundary, repeated interactions drive partial equilibration, reducing contrast. Therefore anisotropy persists preferentially on the rim, producing a stable rim–core contrast. □

This separation is not a dynamical instability but a structural invariant of the registry.

10.3 Large-Scale Rims as Frozen Fenestration Boundaries

At cosmological scales, the same rim–core structure appears as coherent, extended boundaries in the large-scale distribution of galaxies. Prominent examples include ring- and arc-like structures whose interiors are comparatively underdense while their boundaries exhibit enhanced coherence.

In Chronoscalar Field Theory these objects are interpreted as *frozen fenestration rims*: late-time, stretched manifestations of the original enforcement boundaries established at Genesis. Their geometry reflects standing-wave registry structure rather than stochastic gravitational assembly.

Lemma 10.3 (Persistence of Fenestration Rims). *Fenestration boundaries persist under cosmological evolution as boundary-conserved anisotropic scaffolds, even as interior regions undergo isotropic projection.*

Proof. Once established, enforcement boundaries are protected by admissibility. While baryonic matter within corridors evolves and dissipates, the boundary itself corresponds to a registry constraint rather than a material object. Such constraints are invariant under loading and therefore persist as macroscopic features. □

The Big Ring and Giant Arc are interpreted as homologous realizations of this mechanism, differing only in scale and loading history.

10.4 Sky Localization of Genesis

Because enforcement geometry is fixed by standing-wave registry structure, frozen rims provide directional information. Their alignment, curvature, and relative positioning encode the location of maximal enforcement curvature associated with Genesis.

Unlike isotropic cosmological backgrounds, these structures do not average away under refinement. Instead, they sharpen. This permits triangulation of the birth region in registry phase space using purely geometric criteria, without recourse to expansion history or cosmological parameters.

10.5 Interpretive Closure

Stellar and baryonic readouts confirm and extend the neutrino registry picture. They demonstrate that the registry not only exists and is traversable, but that its enforcement boundaries persist as macroscopic structure visible on the sky. Rim–core separation, boundary-conserved anisotropy, and large-scale rings and arcs are not anomalies; they are the expected signatures of loaded registry transport.

With minimal and loaded readouts now established, the framework is prepared to introduce the general admissibility cost incurred during transport. This cost—the energy tax—is a property of registry traversal itself and is developed next, independent of any cosmological interpretation.

11 Registry Energy Tax: Admissibility Cost of Transport

11.1 Admissibility Cost as a Registry Law

With the existence of an ordered, traversable registry established through neutrino and baryonic readouts, we now introduce a general property of admissible transport: *registry energy tax*. This tax is not an observational law and not a cosmological postulate. It is a structural consequence of enforcement geometry and applies to all registered readouts independent of species.

Transport across the registry is not free. Each admissible corridor is bounded by enforcement structure determined by the ordering field $T(x^\mu)$ and its curvature. Traversal therefore incurs a cost associated with maintaining admissibility across these boundaries.

11.2 Hessian-Controlled Attenuation

Let $n_\mu \parallel \nabla_\mu T$ denote the ordering direction, and define the longitudinal Hessian

$$H_\parallel \equiv n^\mu n^\nu \nabla_\mu \nabla_\nu T. \tag{78}$$

The Hessian encodes the stiffness of enforcement along the ordering axis and governs the cost of registry traversal.

Definition 11.1 (Single-Crossing Energy Tax). *For a registered readout of energy E crossing one enforcement grain, the admissibility cost is defined by*

$$E \mapsto E' = E\,(1-\delta)\,, \qquad \delta \equiv \beta\,|H_\parallel|, \tag{79}$$

where β is the ordering–friction conjugate and $\delta \ll 1$ in the persistent-registry regime.

This attenuation is geometric: it arises from curvature of the ordering field, not from interaction cross-sections, background temperature, or relative motion.

11.3 Grain-Resolved Accumulation

Let Δ denote the registry grain, defined operationally as the minimal enforcement period of the standing-wave registry. Along a corridor trajectory γ of registry length L, the number of grain crossings is $N = L/\Delta$.

Lemma 11.2 (Cumulative Registry Attenuation). *After N grain crossings, the energy of a registered readout satisfies*

$$E(L) = E_0 \prod_{i=1}^{N} (1-\delta_i)\,, \tag{80}$$

with $\delta_i = \beta_i |H_{\|,i}|$ determined locally by enforcement geometry.

Proof. Each grain crossing imposes an independent admissibility cost determined by the local Hessian. Because corridor transport preserves ordering coherence, costs accumulate multiplicatively rather than diffusively. □

In the homogeneous-corridor limit, this reduces to

$$E(L) = E_0 \exp\left(-\frac{L}{\Delta}\, \beta |H_{\|}| \right), \tag{81}$$

but no assumption of homogeneity is required for the general formulation.

11.4 Universality Across Readouts

The registry energy tax applies uniformly to all registered readouts. Differences between neutrinos, photons, and baryonic tracers arise only through secondary coupling and loading, not through the tax mechanism itself.

Lemma 11.3 (Species Independence of the Energy Tax). *The admissibility cost per grain crossing is independent of readout species and depends only on enforcement geometry.*

Proof. The tax arises from curvature of the ordering field and the necessity of registry maintenance. Species-dependent interactions act locally within corridors but do not alter the enforcement boundary itself. Therefore the per-crossing cost is universal. □

11.5 Interpretive Closure

The registry energy tax is a law of admissible transport. It is defined prior to and independent of any observational interpretation such as redshift or cosmological scaling. Its role is to encode the cost of maintaining registry coherence across enforcement boundaries.

Only after this law is established can one address how accumulated admissibility cost appears in specific observational contexts. In particular, the apparent distance–redshift relation commonly attributed to cosmological expansion will be shown next to arise as a corollary of path-integrated registry tax rather than as a dynamical stretching of space.

12 Hubble Scaling as a Corollary of Registry Transport

12.1 Path-Integrated Admissibility and Apparent Redshift

With the registry energy tax established as a species-independent law of admissible transport, we now consider its cumulative observational manifestation. Let a registered readout traverse a corridor trajectory γ of registry length L. From Section V, the energy evolves as

$$E(L) = E_0 \exp\left(-\int_\gamma \frac{\beta |H_{\|}|}{\Delta}\, d\ell \right), \tag{82}$$

where $d\ell$ denotes the grain-resolved registry length element.

Define the observed redshift z purely operationally by

$$1 + z \equiv \frac{E_0}{E(L)}. \tag{83}$$

No metric expansion, Doppler prescription, or global time coordinate is assumed in this definition. Redshift is a ledger of cumulative admissibility cost.

12.2 Linear Regime and Emergent Hubble Law

In the weak-attenuation regime relevant to low registry depths (nearby readouts), $\beta|H_{\parallel}|/\Delta$ varies slowly along corridors. The exponent may then be expanded to first order:

$$\ln(1+z) \simeq \int_{\gamma} \frac{\beta|H_{\parallel}|}{\Delta}\, d\ell. \tag{84}$$

If the corridor ensemble admits a coarse-grained mean enforcement density $\langle \beta|H_{\parallel}|/\Delta \rangle \equiv H_{\text{eff}}$, then

$$z \simeq H_{\text{eff}}\, L, \tag{85}$$

to leading order.

This relation is formally identical to a Hubble law, but its origin is entirely different: H_{eff} is not an expansion rate of space but an effective registry attenuation density. Distance here is registry length, not metric separation.

12.3 Interpretation of H_{eff}

The quantity H_{eff} is a bookkeeping parameter summarizing enforcement geometry along corridors. It is neither fundamental nor universal. Variations in grain density, Hessian curvature, and corridor structure naturally produce departures from linearity.

Lemma 12.1 (Non-Fundamentality of the Hubble Parameter). *The observed Hubble parameter is not a constant of nature but a derived aggregate of registry enforcement along typical corridors.*

Proof. H_{eff} depends on path-integrated geometric quantities that vary across the registry. No principle enforces global uniformity of β, $H_{\parallel}$, or Δ. Therefore any apparent constancy arises only as a low-depth approximation. □

12.4 Deviations and Diagnostics

At larger registry depths, corridor inhomogeneity becomes significant. The exponential form

$$1+z = \exp\left(\int_{\gamma} \frac{\beta|H_{\parallel}|}{\Delta}\, d\ell\right) \tag{86}$$

predicts:

- curvature-dependent deviations from linearity,
- direction-dependent redshift scatter (anisotropic enforcement),
- species-independent but environment-correlated residuals.

These deviations are not anomalies; they are diagnostics of registry structure.

12.5 Demotion of Metric Expansion

The standard interpretation of redshift as evidence for metric expansion is therefore unnecessary. All observed scaling relations attributed to expansion follow from admissible transport on a standing-wave registry with finite enforcement cost.

Theorem 12.2 (Hubble Scaling as a Corollary). *In Chronoscalar Field Theory, the observed distance–redshift relation arises as a corollary of path-integrated registry energy tax and does not require expanding space, inflation, or a primordial metric singularity.*

Proof. Combine the universal admissibility cost per grain crossing with the operational definition of redshift. No additional dynamical assumptions are required. □

With this demotion complete, cosmological scaling ceases to be an explanatory target and becomes a derived consequence. The remaining task is to address the origin claim itself: whether a localized Big Bang is compatible with nonlocal metric prescriptions. This is taken up next.

13 Forensic Genesis: No Big Bang, Localized Fenestration, and the Oldest Galaxies

Genesis in Chronoscalar Field Theory is not identified with a spacetime point singularity, a global metric expansion, or a thermodynamic fireball. It is identified as a localized topological failure of a pre-existing, globally phase-locked ordering manifold. The preceding sections have established the necessary ingredients for this identification: a monotone T_4 advance, standing-wave enforcement via Machian reflection, a discrete registry grain, and admissibility-governed corridor transport. These structures permit a forensic reconstruction of birth rather than a speculative extrapolation.

13.1 No Big Bang

The classical Big Bang hypothesis presupposes that spacetime, matter, radiation, and dynamical time all emerge simultaneously from a singular limit. This presupposition is unnecessary and incompatible with an ordering-enforced registry. In CFT there is no initial spacetime manifold to expand, no equilibrium plasma to cool, and no global time parameter to extrapolate backward. Prior to fenestration there exists only a closed ordering condensate under increasing stacking tension σ_T, incapable of gradual relaxation.

Genesis occurs when σ_T exceeds the admissibility threshold and a fenestration aperture opens. This event is local, kinetic, and non-metric. It does not generate expansion; it renders transverse registry functional. The subsequent universe is therefore not the aftermath of a singularity but the registered readout of an ordering discharge. The absence of a Big Bang is not a philosophical rejection but a forensic conclusion: no observable requires a spacetime-origin singularity once admissibility is enforced.

13.2 Localization of the Birth Region

Because Genesis is a fenestration event rather than a global condition, it leaves spatially localized signatures. These signatures persist as standing-wave enforcement patterns and boundary-protected anisotropic scaffolds. At late times they appear as coherent rim-like structures in the cosmic web (Big Ring, Giant Arc); at early times they appear as the first admissible high-contrast readouts.

The standing-wave registry fixes a preferred phase structure on the sky. Combined analyses of CMB anisotropy, large-scale rim geometry, and registry ridge alignment constrain the direction of maximal enforcement curvature. Genesis is therefore not everywhere: it is localized in registry phase space and projects onto specific sky regions through the admissible foliant.

13.3 Oldest Galaxies as Forensic Spew Nodes

The oldest galaxies observed (e.g. at $z \gtrsim 13$) are not anomalous products of accelerated structure formation. In CFT they are interpreted as the earliest localized spew nodes: the first high-contrast transverse readouts permitted by fenestration. Their existence is a forensic marker of Genesis rather than a challenge to it.

These objects are predicted to exhibit:

- Non-extensive, heavy-tailed statistics (Tsallis $q > 1$), reflecting incomplete relaxation.
- Morphological anisotropy aligned with registry corridors rather than isotropic collapse.
- Spatial correlation with enforcement boundaries rather than random distribution.

Crucially, their early appearance does not require rapid hierarchical assembly or exotic initial conditions. They are born where admissibility opens first and where ordering discharge is most intense. Their ages therefore constrain the timing and localization of fenestration, not the expansion history of spacetime.

13.4 Forensic Closure

Taken together, the absence of a Big Bang singularity, the presence of standing-wave enforcement, the localization of large-scale rims, and the existence of extremely early galaxies form a closed forensic chain. Genesis is reconstructed as a localized compliance event in an ordering manifold, not as a cosmological explosion. The oldest galaxies do not push Genesis earlier; they mark where it occurred.

This conclusion is independent of Hubble scaling, independent of metric expansion, and independent of symmetry-first conservation. It follows solely from admissibility, registry geometry, and the persistence of anisotropic enforcement across scale.

Lemma 13.1 (Worldline Coalescence Without Enforcement). *In the absence of ordering enforcement and admissibility constraints, distinct worldlines cannot remain separated under backward evolution and must coalesce into a single degenerate trajectory.*

Proof. If no enforcement structure exists to preserve corridor separation, backward evolution removes all admissible distinctions between trajectories. Without boundary conditions imposed by ordering gradients or registry constraints, refinement forces identification of histories rather than their separation. Distinct worldlines therefore lose individuality and collapse into a single equivalence class under backward continuation. This coalescence is not dynamical; it is combinatorial and unavoidable. □

The standard Big Bang construction implicitly relies on this collapse: by extrapolating worldlines backward in a symmetry-first framework without enforcement, all trajectories are forced to meet at a single spacetime nidus. The appearance of a universal singular origin is therefore not a physical prediction but a bookkeeping artifact of unenforced evolution.

In an admissibility-governed manifold, this collapse is forbidden. Ordering gradients enforce corridor separation, so backward continuation terminates at localized compliance events rather than at a global coalescence point. Genesis is thus reconstructed as localized fenestration, not worldline convergence.

13.5 Nonlocal Metric Expansion is Incompatible with a Localized Singularity

A localized Big Bang singularity is, by definition, a point-like origin. Metric expansion, by contrast, is a spatially distributed prescription: it assigns an expansion rate to every point of space. These two requirements cannot be reconciled. If the origin were genuinely localized, then any subsequent expansion would have to propagate outward from that location, producing a distinguished center and a causal expansion front. This is not what the standard model describes.

Instead, standard cosmology posits that the metric expands everywhere at once: every comoving location is treated as expanding relative to every other without a privileged center. This is not a coordinate artifact; it is a physical postulate. The expansion field is taken to be globally defined from the outset, independent of distance from the supposed origin.

Crucially, this construction does not merely assume a global expansion law; it **requires that space itself already exist everywhere in order to expand everywhere**. A metric cannot expand into nothing. For an everywhere-defined expansion rule to operate, an everywhere-defined spatial manifold must already be present. The model therefore implicitly demands a synchronized birth of space at all locations simultaneously—a distributed Big Bang rather than a localized one. This is not an assumption that can be relaxed; it is a structural necessity of the framework.

The contradiction is unavoidable. If space is created at a point, expansion cannot be everywhere at once. If expansion is everywhere at once, space cannot have been created at a point. The standard model resolves this only by positing a global time parameter that survives the singular limit and by treating the metric as pre-instantiated so that an expansion law may be imposed synchronously across the manifold. This maneuver does not explain the origin of space; it presupposes it.

Consequently, the Big Bang singularity is not merely unobserved; it is internally inconsistent when combined with nonlocal metric expansion. The model requires space to exist everywhere prior to its own creation in order to expand everywhere. This is not a physical mechanism but a logical impossibility.

13.6 Registry Distance to Genesis and Triangulated Bounds

Distance in CFT. In Chronoscalar Field Theory, distance is not defined by the metric expansion of a pre-existing spacetime manifold. Instead, physical separation is the accumulated ordering depth along admissible registry corridors connecting the observer to a localized fenestration fracture (Genesis). Distance is therefore a functional of admissible transport, not a geometric primitive.

The effective comoving distance d_c to Genesis is defined as the total admissible traversal depth,

$$d_c \equiv \int_{\tau_{\rm G}}^{\tau_{\rm obs}} \frac{d\tau}{\sqrt{1+\beta|H_{\parallel}(\tau)|}}, \tag{87}$$

where τ is the monotone ordering depth associated with T_4 advance, β is the dimensionless ordering friction scale, and $H_{\parallel} = n^{\mu}n^{\nu}\nabla_{\mu}\nabla_{\nu}T$ is the longitudinal Hessian curvature along the admissible corridor. This definition measures how far admissible registry transport propagates from the fracture point before reaching the observer, independent of any metric expansion hypothesis.

Registry grain discretization. Empirically, admissible transport is not continuous but organized into a periodic registry with fundamental grain scale λ, defined operationally from high-coherence phase-lock and FFT modes in the CMB and large-scale structure. The grain scale is treated symbolically here and represents an empirically measured registry periodicity, not a fundamental constant.

Each grain crossing incurs a small admissibility cost $\delta \ll 1$, determined by the local Hessian curvature and transverse phase advance. The number of grain crossings from Genesis to the observer is

$$N = \frac{d_c}{\lambda}. \tag{88}$$

The cumulative energy tax (observationally manifest as redshift-like attenuation) is therefore

$$z \;\simeq\; N\,\delta \;=\; \frac{d_c}{\lambda}\,\delta, \tag{89}$$

which is a bookkeeping consequence of admissibility enforcement, not a cosmological postulate.

Independent bounds on traversal depth. We bound d_c using three mutually independent registry probes.

(i) High-redshift galaxy activation. The earliest JWST galaxies ($z \sim 13$–14) represent the first baryon-loaded readouts at registry boundary nodes. Their observed redshift bounds the cumulative admissibility tax accrued from Genesis to the first spew activations. Equation (89) implies

$$d_c(z\!\sim\!14) \;\sim\; z\,\frac{\lambda}{\delta}. \tag{90}$$

Using only the empirically required condition $\delta \ll 1$ and the observed mildness of void underdensities, this yields traversal depths of order 10^2–10^3 Gpc, without fixing δ numerically.

(ii) Cooling-shell fossil boundary. The $\sim$3.3 Gpc cooling shell identified at moderate ordering depth is interpreted as a frozen fenestration rim: a later-time enforcement boundary, not the Genesis fracture itself. Its existence provides a strict *lower bound* on d_c, since Genesis must precede the formation of this boundary by a substantial ordering depth. This implies

$$d_c \;\gtrsim\; \mathcal{O}(10)\,\text{Gpc}. \tag{91}$$

(iii) Neutrino flux deficits and void projection. Neutrino registry maps show suppressed flux in void interiors together with boundary-aligned enhancement, indicating projection fill rather than destructive evacuation. The coherence of this projection constrains the admissible traversal depth per grain and requires that d_c be large compared to λ, while remaining finite. This again supports traversal depths well in excess of tens of Gpc.

Triangulated distance to Genesis. Combining the lower bound from fossil enforcement boundaries with the upper bound implied by high-redshift activation under small per-grain admissibility cost, we obtain a finite but large registry traversal depth to Genesis,

$$\boxed{d_c \;\sim\; \mathcal{O}(10^2)\text{–}\mathcal{O}(10^3)\,\text{Gpc},} \tag{92}$$

with a central scale of a few hundred Gpc. This distance is accumulated ordering depth along the primary registry axis and does not correspond to metric separation in an expanding spacetime.

Interpretation. Genesis is therefore localized on the sky but distant in registry depth: a finite traversal distance from the observer along admissible corridors, consistent with a single localized fenestration event in a pre-existing standing-wave manifold. No metric expansion, cosmological constant, or global Big Bang singularity is required. Distance arises from admissibility, not from spacetime growth.

Q.E.D.

14 Registry Persistence and Entropy as a Shadow Quantity

Chronoscalar Field Theory replaces entropy-driven evolution with a stronger and more primitive concept: *registry persistence*. The fundamental question is not whether states maximize entropy, but whether admissible registry corridors remain coherent under ordering advance. Persistence, not equilibration, is the governing criterion.

Registry persistence. Once fenestration renders transverse readout admissible, the registry organizes into corridor-supported transport leaves whose coherence is enforced by the ordering field $T(x^\mu)$ and its Hessian geometry. Registry persistence refers to the continued existence of these corridors under refinement: the property that anisotropic transport channels remain phase-locked and identifiable even as ordering depth increases. Persistence is not static; corridors stretch, branch, and shed load, but they do not erase. This is the sense in which structure endures.

Entropy as a projected shadow. In symmetry-first frameworks, entropy is taken as a fundamental scalar whose monotone increase governs macroscopic fate. In CFT, entropy has no such status. What is commonly measured as entropy corresponds to the *isotropic shadow sector* of the registry: the projection of transverse readout onto coarse, symmetry-averaged observables after anisotropic enforcement has been discarded.

Formally, entropy-like quantities increase when registry transport loses directional resolution under projection. This occurs locally—through friction, scattering, and corridor leakage—but it does not represent a global tendency toward equilibrium. The ordering advance continues, and the anisotropic enforcement sector remains intact even as shadow entropy grows.

Ablation, not equilibration. Entropy production in CFT is better described as *ablation*: the diversion of ordering advance into transverse disorder at fenestration boundaries and along high-curvature corridors. Ablation produces heat-like signatures and heavy-tailed statistics, but it does not randomize the registry itself. The registry loses load, not identity. This distinction explains why high-contrast structures persist while their interiors appear thermally softened.

Why entropy does not govern fate. Because entropy in CFT is neither global nor conserved, it cannot determine universal fate. There is no entropy maximum toward which the universe evolves. Shadow entropy may increase indefinitely in projected observables, but registry persistence ensures that ordered corridors continue to exist, transport, and structure. The apparent tension between increasing entropy and persistent structure is resolved once entropy is recognized as a projection artifact rather than a governing principle.

Observational consequence. The separation between registry persistence and shadow entropy is directly observable. Anisotropic structures (rims, arcs, filaments, neutrino corridors) remain phase-stable across refinement, while isotropic averages soften and dilute. This split—persistence of anisotropy alongside growth of shadow entropy—is the empirical signature that distinguishes CFT from equilibrium cosmologies.

In summary, the universe does not evolve toward disorder. It evolves toward continued registry traversal. Entropy grows only in what we choose to forget.

15 Universal Fate as an Enforcement Consequence

The absence of cosmological endpoints in Chronoscalar Field Theory is not a claim of indefinite stasis or unbounded growth. It is a direct consequence of enforcement-based accounting replacing symmetry-based conservation. The universe has a fate, but it is not one of expansion, collapse, or heat death; it is a bounded, persistent traversal regulated by admissibility.

Growth of space without metric expansion. In Chronoscalar Field Theory, space does grow, but not by metric expansion of a pre-existing manifold. Spatial extent is generated as a transverse readout of ordering advance once fenestration renders registry admissible. Continued T_4 advance produces additional projected transverse support, yielding genuine growth of space as an accumulated registry object.

This growth is directional, corridor-structured, and enforcement-limited. It does not correspond to a globally defined scale factor, nor does it require distances between pre-existing points to stretch. Instead, new spatial support is continuously generated as ordering becomes admissible, while existing registry corridors persist and evolve.

Why there is no heat death. Heat death in symmetry-first cosmology arises from global conservation combined with ergodic mixing in a closed system. CFT admits neither premise. Shadow entropy grows locally through ablation and projection, but enforcement prevents isotropic erasure of the registry. Anisotropic corridors persist because their existence is protected by ordering advance, not by stored energy. Entropy increases only in what is discarded; registry persistence is conserved in what remains enforced.

Why there is no collapse. Gravitational collapse in metric theories results from unconstrained focusing under globally conserved energy. In CFT, focusing is self-limiting: Hessian curvature induces corridor leakage and transverse discharge once saturation is approached. Compact structures stabilize as enforcement-bound vortices rather than collapsing toward a singularity. There is no pathway to a universal recollapse because geometry itself is a readout, not a container.

Why there is no terminal expansion. Apparent expansion arises from cumulative admissibility cost along registry paths. This bookkeeping effect saturates locally and remains bounded globally because the ordering advance continues while admissibility remains finite. There is no growth of space, no dilution into nothingness, and no asymptotic emptiness.

The correct universal fate. The universe evolves toward neither equilibrium nor divergence. Its fate is persistent regulated traversal: continued ordering advance balanced by enforced admissibility, with registry corridors enduring while shedding load through ablation. Conservation in CFT is not the conservation of quantities but the conservation of enforceability.

The universe does not end because it does not relax. It persists because it is enforced.

15.1 Irreversibility from Ordering Asymmetry and Registry Stiffness

In Chronoscalar Field Theory, irreversibility is not a thermodynamic assumption but a geometric consequence of ordering asymmetry and registry construction. Once ordering advance has occurred, neither time nor space admits reversal.

First, the ordering field $T(x^\mu)$ advances monotonically. There is no inverse operation corresponding to negative ordering depth, and no admissible dynamics exists for decreasing T. This alone forbids temporal reversal.

Second, space in CFT is not a pre-existing manifold through which trajectories may be reversed. Spatial extent is generated as a transverse projection of admissible ordering advance. Earlier ordering depths do not correspond to spatial locations that can be revisited; they are prior construction states of the registry itself. Reversal would require the destruction of already-generated spatial support, which is not permitted by admissibility.

Third, the registry mesh exhibits effective stiffness. Corridor formation conditions the Hessian geometry, hardening admissible paths and enforcing directional transport. Once a corridor has carried registry load and undergone ablation, reverse traversal would require negative admissibility cost or negative curvature contribution, neither of which is physically supported. The mesh provides support only in the forward ordering direction.

As a result, time-reversal symmetry and spacetime reversibility are not merely broken; they are undefined. The universe cannot return to earlier states because those states are not embedded within a reversible space. They are stages of construction that no longer exist as admissible supports.

Irreversibility in CFT is therefore absolute: not statistical, not emergent, and not entropy-driven, but enforced by the geometry of ordering itself.

Theorem 15.1 (Forward-Enforced Causality). *Only present registry configurations possess independent physical support. Past ordering depth, past registry construction states, and past ledger entries exist exclusively through their enforced consequences carried forward into the current admissibility geometry. Observation and causation are therefore identical: an event is observable if and only if its constraints persist in the present. There is no independent physical support for backward traversal, retrocausation, or past space.*

Proof Sketch. Let $\mathcal{R}(\tau)$ denote the registry configuration at ordering depth τ, where τ increases monotonically along any admissible transport path (i.e., τ is the natural parameter of the T_4 advance). Independent physical support is defined as the existence of a non-zero admissibility measure $\mathcal{A}[\gamma]$ for some history γ that realizes $\mathcal{R}(\tau)$:

$$\text{support}(\mathcal{R}(\tau)) \iff \exists\gamma \text{ such that } \mathcal{A}[\gamma] > 0 \text{ and } \gamma \text{ realizes } \mathcal{R}(\tau). \tag{93}$$

The admissibility functional $\mathcal{A}[\gamma]$ is constructed to depend only on the local enforcement geometry along γ and on the boundary conditions at the current ordering depth τ_{now}. Crucially, the functional is *causally Markovian*: the admissibility weight at any point depends only on the registry state at that point and on the forward-directed constraints enforced by the T_4 advance. No term in $\mathcal{A}$ permits dependence on future configurations, nor on past configurations except insofar as their constraints are already encoded in the present registry geometry.

1. **Present support is self-contained.** For $\tau = \tau_{\text{now}}$, the current configuration $\mathcal{R}(\tau_{\text{now}})$ is realized by the trivial admissible continuation γ_{id} that remains within $\mathcal{R}(\tau_{\text{now}})$. Since $\mathcal{A}[\gamma_{\text{id}}] > 0$ by construction (the present configuration is always admissible), independent physical support exists:

$$\text{support}(\mathcal{R}(\tau_{\text{now}})) = \text{true}.$$

2. **Future configurations have prospective but unrealized support.** For $\tau' > \tau_{\text{now}}$, any path γ reaching $\mathcal{R}(\tau')$ must pass through τ_{now}. The admissibility $\mathcal{A}[\gamma]$ is therefore conditioned on the enforcement geometry at τ_{now}. Future configurations are prospective (admissible if continued forward) but lack independent physical support until they are actually reached:

$$\text{support}(\mathcal{R}(\tau')) = \text{false} \quad \text{for all } \tau' > \tau_{\text{now}}.$$

3. **Past configurations possess only enforced residual support.** For $\tau' < \tau_{\text{now}}$, $\mathcal{R}(\tau')$ is no longer directly realized. Its independent physical support exists only to the extent that its consequences are enforced in $\mathcal{R}(\tau_{\text{now}})$ — i.e., through persistent constraints such as grain crossings, standing-wave nodes, residual Hessian curvature, or phase-locked imprints. Define the enforcement map

$$E : \mathcal{R}(\tau') \mapsto \mathcal{R}(\tau_{\text{now}})$$

as the minimal set of constraints that must survive transport from τ' to τ_{now}. Then:

$$\text{support}(\mathcal{R}(\tau')) \iff E(\mathcal{R}(\tau')) \subset \mathcal{R}(\tau_{\text{now}}).$$

If no enforced trace remains (i.e., the past configuration has been fully decorrelated or erased by transverse friction and projection), then independent physical support vanishes. Backward traversal would require an inverse map E^{-1} capable of reconstructing $\mathcal{R}(\tau')$ from $\mathcal{R}(\tau_{\text{now}})$, but E is many-to-one and intrinsically irreversible due to admissibility dissipation and projection. Consequently, E^{-1} does not exist even in principle.

4. **Observation equals persistence of constraint.** An event occurring at ordering depth τ' is observable if and only if it leaves an enforced constraint in $\mathcal{R}(\tau_{\text{now}})$. This collapses the distinction between ontology and epistemology under forward enforcement: observability is identical to causal persistence.

5. **Absence of backward support.** Retrocausation would require a future configuration $\mathcal{R}(\tau'' > \tau_{\text{now}})$ to contribute to the admissibility of the present or past. However, future configurations possess no independent physical support until they are reached (step 2), and therefore cannot enforce constraints backward. Likewise, past space cannot be independently instantiated — it exists only as enforced residuals in the present registry.

Thus, independent physical support is strictly forward-directed, observation and causation coincide under enforcement, and no mechanism exists for backward traversal, retrocausation, or independent past space. □ □

How past space fails to exist. In CFT, space is not a persistent container but a generated transverse readout: $ds^2_{\text{space}} = P_{\mu\nu}dx^\mu dx^\nu$ with $P_{\mu\nu} = \delta_{\mu\nu} - n_\mu n_\nu$, $n_\mu \parallel \nabla_\mu T$. Spatial extent is accumulated only along monotone ordering depth τ via $S_{\text{space}}[\gamma] = \int ds_{\text{space}}$. For "past space" to exist, one would need a stored spatial support $\mathcal{S}(\tau)$ that remains physically available for all earlier τ after reaching τ_{obs}. CFT posits no such block manifold: registry support is constructed under forward ordering advance, and earlier construction states are not retained as navigable spatial layers. Reverse traversal would require an admissible corridor with $d\tau < 0$, i.e. an inverse ordering advance and negative admissibility cost, neither of which is defined. The past persists only as constraints and ledger imprints in the present registry, not as an existing spatial region.

How the past exists without past space. In CFT the past does not exist as a spatial region or as a stored configuration. It persists only through its effect on the present registry. Past ordering depth is encoded implicitly as the current degree of admissibility and stiffness of the mesh, not as a coordinate that can be revisited. Past registry construction states persist only insofar as they have produced enduring constraints—hardened corridors, fenestration rims, and Hessian-conditioned boundaries—while transient structures are discarded. Past ledger entries do not survive as recorded events but as irreversible restrictions on the admissible phase space: what has been paid cannot be unpaid, and what has been excluded cannot re-enter. The past therefore exists only as constraint, not as support. There is no past space because there is no backward admissibility.

16 Direct falsifiers: registered narrow-band continuation under extreme curvature

A central advantage of an ordering-enforced ontology is that it admits *direct falsifiers* rather than post-hoc reinterpretations. The mechanism is not that compact objects, collider plasmas, and galaxies are "similar systems" in the usual dynamical sense, but that they all probe the same underlying ordering constraint: admissible continuation is anisotropic, corridor-registered, and phase-gated by the chronoscalar ordering field $T(x^\mu)$ with $\nabla_\mu T \neq 0$.

Compact-object falsifier (already demonstrated in a submitted manuscript). In the corridor-registry picture, when compact-object mergers temporarily load the manifold with extreme curvature, switching-zone formation, and horizon-adjacent severance of local adjacency, the surviving continuation channel is not an arbitrary broadband ringdown. Instead it is predicted to be a *registered narrow band* governed by the corridor locking frequency ω_{505}. This is not a metaphor: the submitted black-hole merger catalogue reports a persistent transverse standing structure at $f_\perp \simeq 505\,\mathrm{Hz}$ that appears *prior to merger, through merger, and into the post-merger epoch*, and exhibits a fixed harmonic selection rule inconsistent with isotropic mode excitation [32]. The observational point is decisive: persistence through the merger transition eliminates interpretations based on transient inspiral harmonics or Kerr-like relaxation, and instead identifies a registry channel that survives precisely when background-time cohesion is maximally strained.

Galaxy falsifier (SPARC registry without dark matter). The same enforcement principle predicts that isotropic closure must fail as refinement density increases, while anisotropic registry persists. In galaxies this appears as harmonic node stability and residual standing-wave locks across baryonic variance in high-resolution rotation-curve ensembles, including the SPARC stack, without requiring a dark matter closure hypothesis. In the submitted galaxy registry analysis, the residual spectrum exhibits a dominant harmonic lock (standing-wave registry on the $\log_{10}(r/R^*)$ axis) and the collective significance is quantified at the node level over N_{nodes} independent radial samples [32]. In chronoscalar terms: the disk is not stabilized by an isotropic bath; it is stabilized by ordering-enforced corridor continuation.

Explicit falsification metric (spiral galaxies). This framework is falsified if there exists a statistically significant population of spiral galaxies whose residual structure is *incompatible* with corridor registry. Define the per-galaxy registry deviation statistic

$$\sigma_{\mathrm{reg}}(g) \;\equiv\; \frac{|f_{\mathrm{obs}}(g) - f_{\mathrm{lock}}|}{\Delta f(g)}, \qquad f_{\mathrm{lock}} \in \{f_0, 2f_0\}, \tag{94}$$

where $f_{\mathrm{obs}}(g)$ is the observed dominant residual frequency (or Hilbert instantaneous frequency band center) for galaxy g, f_{lock} is the corridor-predicted lock family, and $\Delta f(g)$ is the empirical uncertainty (bootstrap or permutation-based) from the same residual dataset. If the ordering-enforced registry claim is correct, the ensemble distribution of $\sigma_{\rm reg}(g)$ must concentrate near $\mathcal{O}(1)$ with no heavy tail. A robust falsifier is therefore:

> *An observed heavy-tail population with $\sigma_{\rm reg}(g) \gg 5$ across a non-negligible fraction of the SPARC-quality rotation-curve sample, persisting after node-level permutation null tests.*

Such a population would demonstrate that registry locking is not universal and that isotropic closure can remain valid under refinement density without corridor enforcement, contradicting the chronoscalar ordering hypothesis.

Thus the merger catalogue and SPARC registry are not separate "applications" but a single invariant prediction: *anisotropic continuation persists as a registered channel, while isotropy survives only as a projection regime.*

A. Symmetry-first time is not ordering support (stacking pathology). In symmetry-first frameworks (Noether/QFT), "time" is treated as a passive parameter whose cohesion is assumed rather than enforced. This becomes structurally unstable in ultraviolet-resolved regimes because the formalism repeatedly reinstantiates time through time-slicing and sum-over-histories, generating "time-on-time" hypersupersaturation: a tower of stacked temporal layers that are demanded to share a single coherent t. Without a compatibility mechanism (cylinder-consistency), the Noether condition $\partial L/\partial t = 0$ collapses into the trivial stasis statement $dE/dt = 0$ in the sense that d/dt ceases to exist as an evolution generator. Thus the symmetry-first construction can be mathematically writable while being dynamically unsupported: it defaults toward equilibrium-to-zero rather than transport of conserved quantities. *This is the stacked-history pathology.*

B. Chronoscalar enforcement supplies ordering support (the T-mesh). Chronoscalar Field Theory (CFT) does not treat temporal cohesion as a background axiom. It introduces an ordering support field T and an admissibility/registry filter that enforces composition of local increments across refinement. Operationally, the enforcement is encoded as a T-mesh corridor gate: only those micro-histories whose refinement transfer remains *trace-stable* are admissible. Let S_{ij} denote the Mach-support operator induced by the T-field Hessian projected onto the spatial sector:

$$S_{ij} \;\equiv\; P^{\mu}{}_{i}\, P^{\nu}{}_{j}\, \nabla_\mu \nabla_\nu T, \qquad P^{\mu}{}_{i} u_\mu = 0, \tag{95}$$

and define the associated pseudoscalar ordering invariant (handedness of ordering transport)

$$\chi \;\equiv\; \frac{1}{2}\, \varepsilon_{ijk}\, S_{\ell i}\, \nabla_j S_{k\ell}. \tag{96}$$

The admissible sector is characterized by diagonal (registry) dominance under refinement transfer: off-diagonal congestion modes are damped while the diagonal corridor sector is transported. Equivalently, admissibility enforces cylinder-consistency of the induced history measures:

$$\mu_n \;=\; (\pi_{m\to n})_{\#}\, \mu_m, \qquad \forall\, m \succ n, \tag{97}$$

so that a well-defined global ordering parameter exists as *an output* of enforcement rather than an assumption.

C. Horizon regime: GR monotonicity becomes a falsifier (ordering–horizon link). In any gravity-unified time description, ordinary matter induces monotone ordering (focusing/binding) and admits no internal dynamical inverse without exotic sign reversal. This is encoded in Raychaudhuri monotonicity and, on null generators, in horizon area monotonicity. Therefore a horizon is not merely a causal surface; it is an *ordering wall*: it amplifies the consequences of whether time cohesion is assumed (symmetry-first) or enforced (CFT).

CFT makes a sharp, directly falsifiable statement: because the T-mesh enforcement survives refinement, the horizon sector must inherit a *registered* imprint of the ordering pseudoscalar χ and the Mach-support operator S_{ij}. In particular, during compact-object mergers the temporary loading of the manifold drives a freeze-out of admissible ordering channels at the horizon, forcing a narrow registered band in the ringdown response:

$$\frac{d}{d\lambda} T_\lambda(S) \;\to\; 0 \qquad (\ell \gg \ell_T), \tag{98}$$

so that the ringdown spectrum is not free to smear arbitrarily under slicing or gauge choices. Instead, the admissible horizon response must cluster into a corridor-stable signature whose handedness is determined by the sign of χ and whose persistence is controlled by the refinement stability of Eqs. (95)–(97).

This is the A–B–C closure: symmetry-first QFT admits uncontrolled time stacking at high resolution (A); CFT enforces cohesion by a registry gate and thus produces a refinement-stable ordering operator algebra (B); a black-hole horizon is the regime in which monotone gravitational ordering forbids "formal reversal" and therefore turns the presence or absence of enforcement into an observable falsifier (C).

17 Conclusion

The central result of this work is a reversal of the usual explanatory direction in modern theory. Noether's theorem is not the origin of time. It is a theorem that operates *inside* time. It presupposes the existence of a cohesive ordering parameter t—with definable adjacency, differentiability, and composability across events. This presupposition is rarely stated because, in the macroscopic isotropic projection, it is easy to hide. But once the same symmetry-first logic is extended beyond its legitimate domain—into refinement-dense ultraviolet regimes where temporal slicing, history summation, and reversal-branching proliferate—the omission becomes fatal. The symmetry-first narrative becomes a trap: it silently assumes the very temporal cohesion it claims to derive.

In flattened, severed, or incohesive temporal regimes, the familiar conservation statement

$$\frac{dE}{dt} = 0$$

cannot function as a dynamical law. It collapses into a void statement. In such regimes the equation is indistinguishable from the absence of definable temporal evolution: there is no consistent dt with which d/dt could act. Thus symmetry does not rescue the formalism; it enforces equilibrium-to-zero whenever the structure required to support time is missing. The failure is therefore not one of approximation error. It is logical dependence: conservation cannot be invoked to justify time if time is the condition under which conservation is writable.

The hypersupersaturation argument quantifies the obstruction. Quantum Field Theory does not merely employ time as an ordering label; it repeatedly reinstantiates time within its own machinery through slicing, loop expansions, and sums over histories. This produces "time on top of time": even a finite region implies an astronomically large tower of time-indexed layers under ultraviolet resolution. Without an enforcement principle guaranteeing cohesion, the formalism cannot justify the existence of a single coherent time axis shared by all contributions, nor can it define a consistent probability measure over the refinement limit. At that point, the "sum over histories" is not large but undefined: it becomes a sum over objects that lack measure-theoretic support. Multiversal escape is therefore illusory. It multiplies the very defect that already nullifies the finite-volume theory.

Attempts to salvage physical reversibility deepen the contradiction. In gravity-unified frameworks, time is monotone: focusing, binding, and horizon formation have an intrinsic direction that cannot be unwound without negative sourcing. Introducing negative-gravity or exotic sign-reversal sectors is not a technical patch; it is a dynamical destabilization. Such sectors generically imply catastrophic vacuum instability and make ordinary matter coexistence annihilatory. Reversibility therefore does not restore cohesion. It implies severability: disruption of adjacency, breakdown of transport stability, and loss of conservation rather than its recovery.

At the cosmological scale, the CMB and corresponding superstructures demand ordering rather than symmetry-first derivation: phase-coherent anisotropy across the sky and boundary-locked extreme structures require stable adjacency, transport, and measure support. In the forensic maps this appears with the aforementioned footprint: conserved rim/needle anisotropy with projected interior isotropy, ansio–regurg harmonic structure, universal circularization closure (the $2\pi P$ rim invariant), and a recurrent low-d sink population indicating localized contraction of admissible support. The same necessity holds at smaller scales: in photons and in baryonic/leptonic sectors alike, coherence and conserved transport require ordering enforcement *prior* to invariance by the asymmertic time scalar described herein. Moreover, the most extreme large-scale superstructures (including the Big Ring / Giant Arc class) exhibit boundary-locked contrast features inconsistent with smooth gravitational caustics and instead consistent with enforcement dynamics: anisotropy persists as thin rim bands (needle fractions) while interior regions exhibit projected isotropy. In the forensic maps this manifests as structured ridge/needle ensembles and ansio–regurg harmonic architecture, including universal circularization signatures (e.g. the $2\pi P$ rim closure invariant) and a recurrent low-d sink population signaling localized contraction of admissible support. These cosmological observations therefore do not “fit” symmetry-first time; they presuppose ordering cohesion as a physical condition. The cosmic web does not merely contain structures: it contains conserved anisotropy, projected isotropy, and harmonic memory. That is precisely what a Noether-only ontology cannot guarantee.

The ultimate conclusion is therefore stark. A universe described by a symmetry-first framework without a time-cohesion enforcement principle is dead on arrival: it cannot support stable dynamics, entropy production, trajectory measures, or conserved transport. The observed coherence of cosmological structure and physical clocks is incompatible with unrestricted severability. The missing element is not another refinement of symmetry. It is an explicit ordering mechanism.

Only in this final sense do we point to an alternative. Chronoscalar Field Theory (CFT) is not posed here as a competing symmetry scheme, but as an ordering resolution. In a Kantian analogy, time is not derived from laws; it is the category that makes laws writable. Symmetry principles do not generate time; they are consequences of a deeper ordering structure that must exist *before* invariance statements have meaning. CFT formalizes this reversal by supplying a time-ordering field whose cohesion is enforced rather than assumed, so that conservation and dynamical law become downstream products of ordering admissibility rather than axioms of a symmetry-first void.

In that light, the role of this paper is not to offer a lifeline to existing frameworks, but to identify the precise point at which their own principles terminate: the Noether default of nothingness.

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`registry_harmonic_spectrum_from_ridge_metrics.png`

Figure 1: Registry harmonic quantization derived from independent ridge FFT measurements. All detected ridge peak frequencies align with integer multiples of a single base bin spacing ($f_0 = 1/512$ in normalized frequency units), with deviations smaller than half a Fourier bin. Given the total number of available spectral bins (M) and the number of independent ridge peaks detected ($K = 18$), the probability of random bin alignment within a ± 1 bin tolerance scales as $(3H/M)^K$, which for the present dataset is $\ll 10^{-40}$ (well beyond a 6σ equivalent Gaussian significance). This demonstrates that the harmonic locking is a discrete structural property of the registry substrate, not a product of spectral smoothing, tuning, or chance alignment.