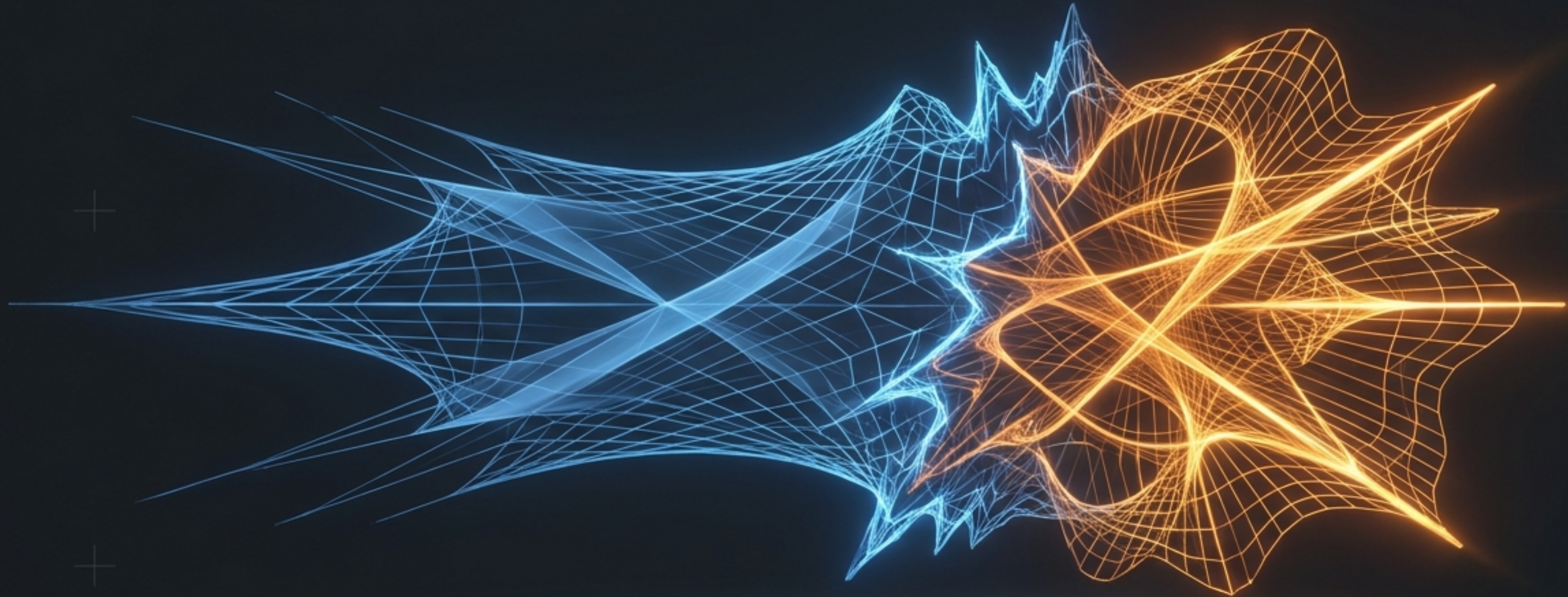
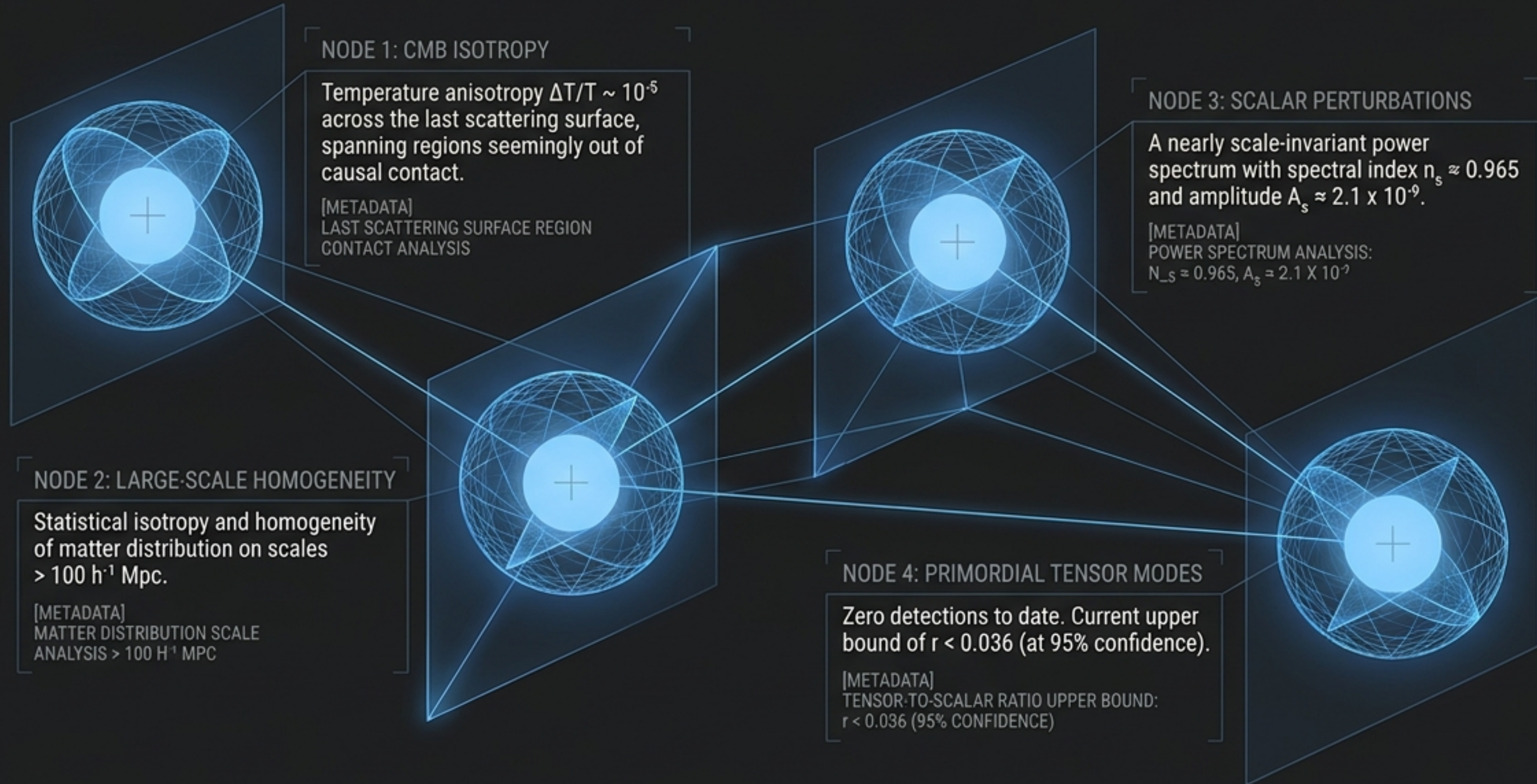


Beyond the Inflaton: A New Taxonomy of Early-Universe Smoothing

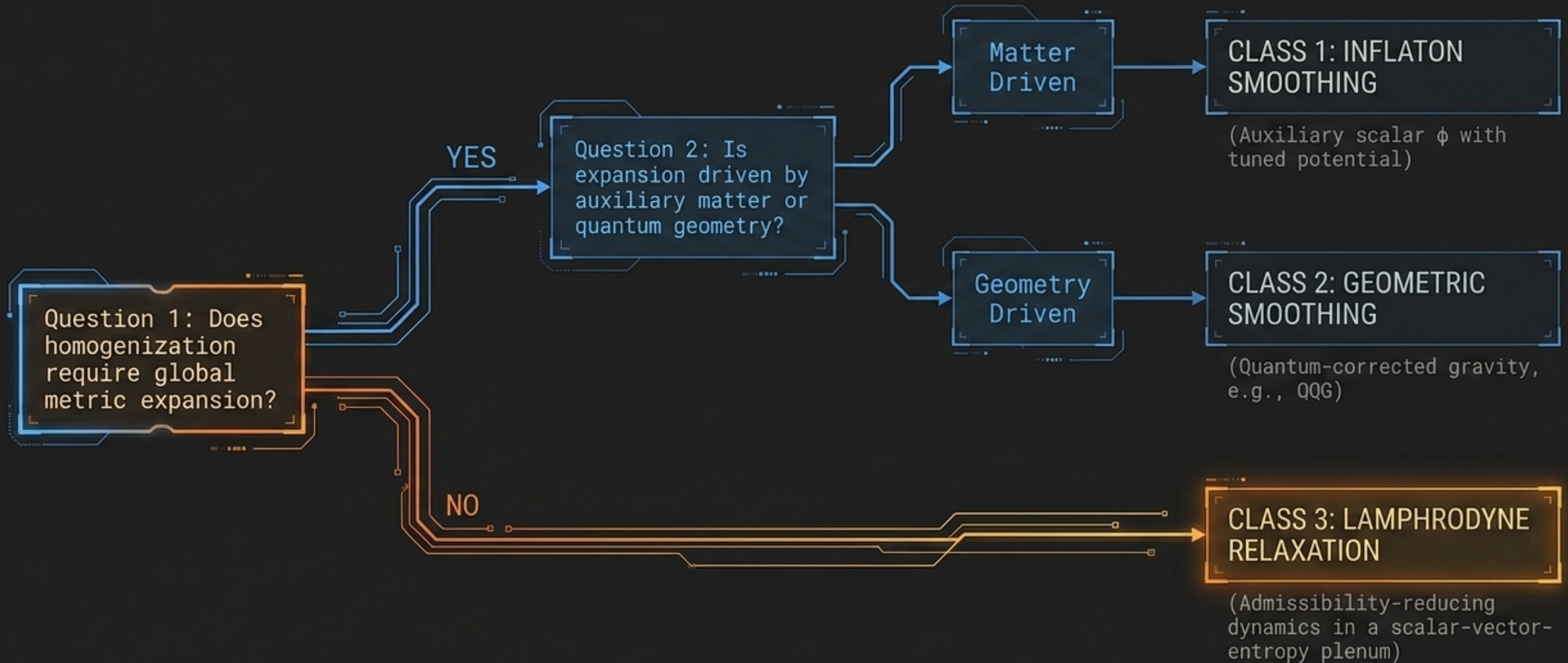
Formalizing the Relativistic Scalar-Vector Plenum (RSVP) against historical benchmarks and Quadratic Quantum Gravity.



THE OBSERVATIONAL TARGETS OF EARLY COSMOLOGY



DERIVING THE THREE CLASSES OF SMOOTHING

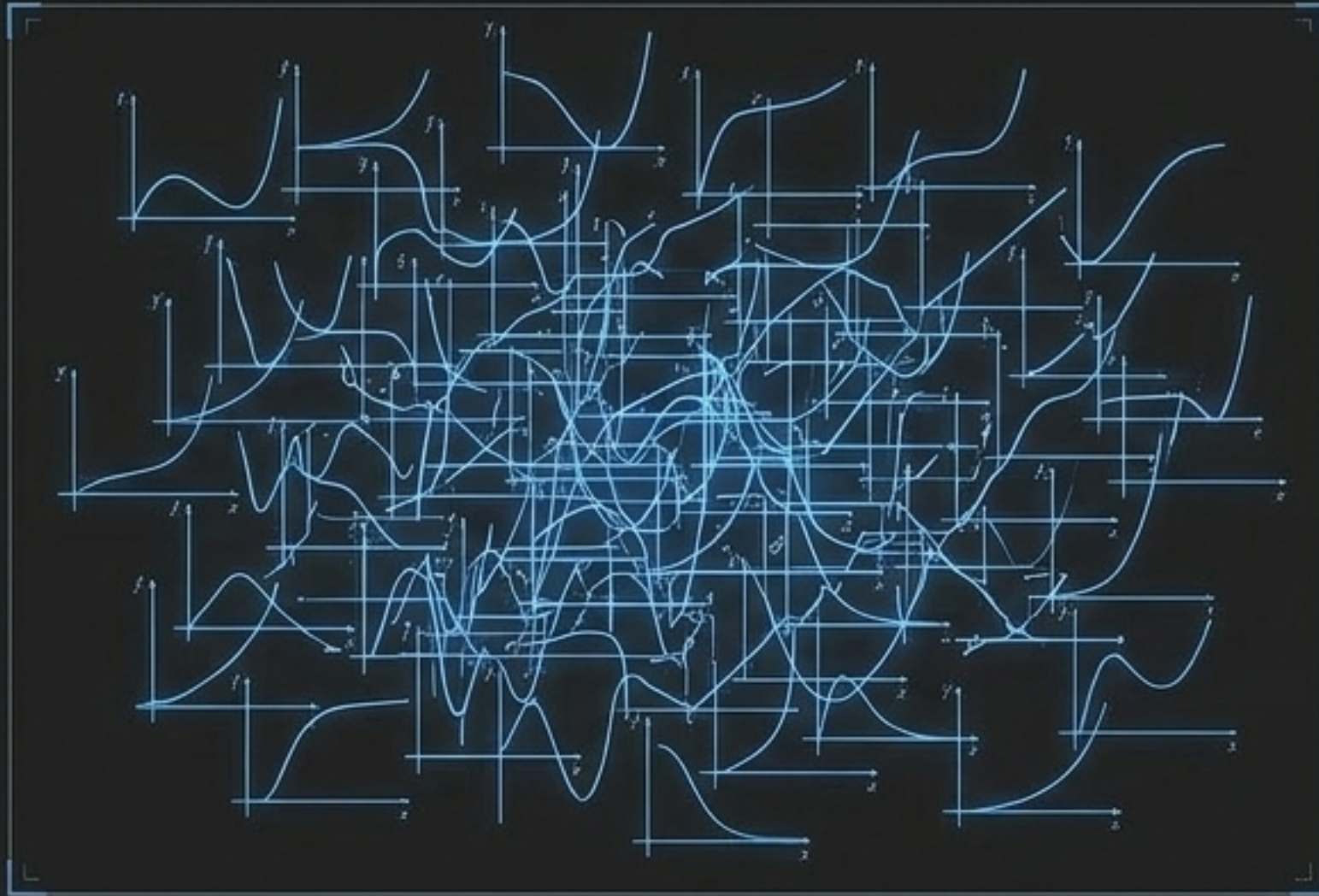


THE MACRO TAXONOMY MATRIX

	CLASS 1 (INFLATON)	CLASS 2 (GEOMETRIC)	CLASS 3 (LAMPHODYNE)
DRIVER	Auxiliary scalar ϕ	Quantum-corrected gravity / RG Flow	Admissibility relaxation
EXPANSION REQUIRED?	Yes	Yes	No
SOURCE OF TENSOR MODES	De Sitter metric vacuum fluctuations	De Sitter metric vacuum fluctuations	Anisotropic stress tensor of the relaxing plenum
FREEZE-OUT CONDITION	Hubble horizon crossing $k = aH$	Hubble horizon crossing $k = aH$	Admissibility horizon crossing $k \cdot d_A(t) \sim 1$

THE EXPANSION PARADIGMS AND THEORETICAL LIABILITIES

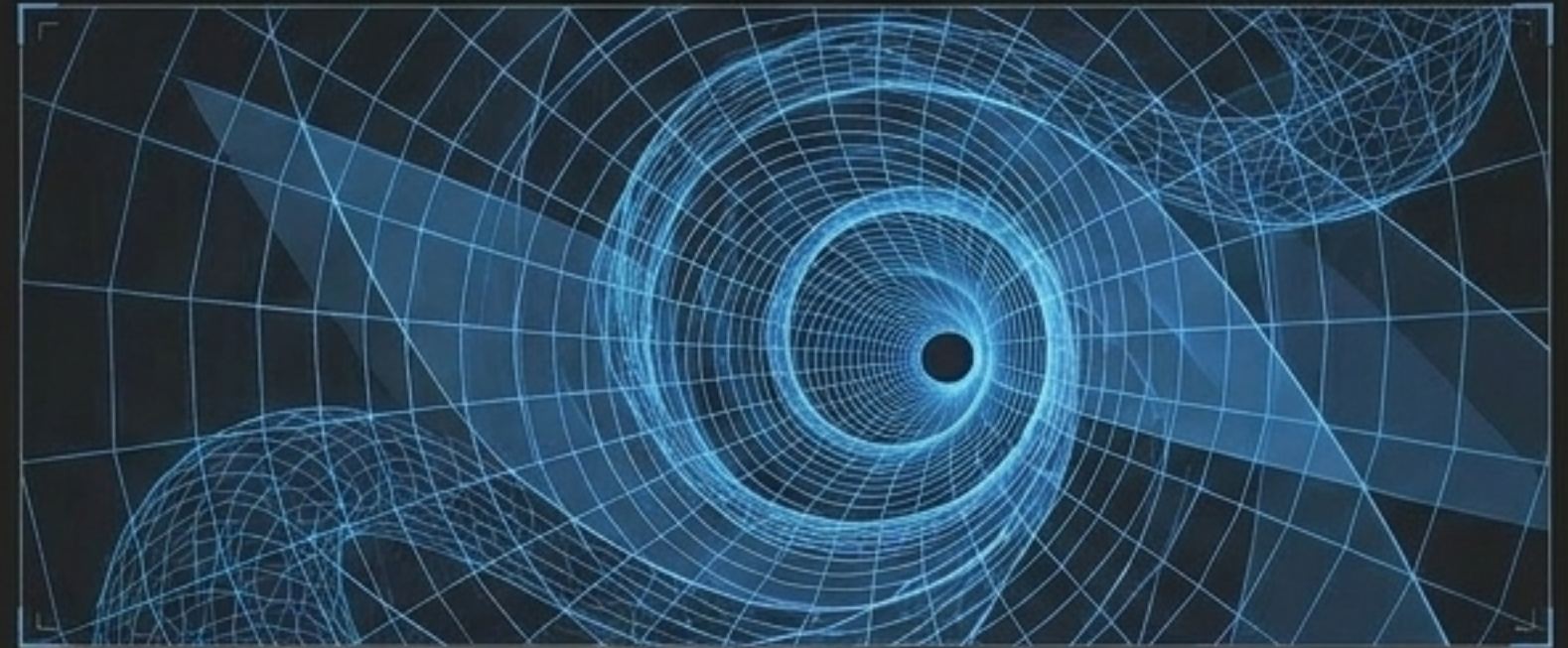
CLASS 1: INFLATON



THE UNDER-DETERMINATION PROBLEM

Hundreds of viable $V(\varphi)$ potentials fit the data.
Reheating transition mechanism remains arbitrary
and unconstrained.

CLASS 2: GEOMETRIC / QQG BENCHMARK



EMERGENT EXPANSION

Generates quasi-de Sitter expansion purely from 1-loop renormalization group (RG) running of the R^2 coupling $\xi(\mu)$.

KEY QQG CONSTRAINT

QQG predicts a structural tensor floor $r_{\text{QQG}} \gtrsim 10^{-2}$ to avoid the strong-coupling regime. This is an internal consistency condition, not an adjustable parameter.

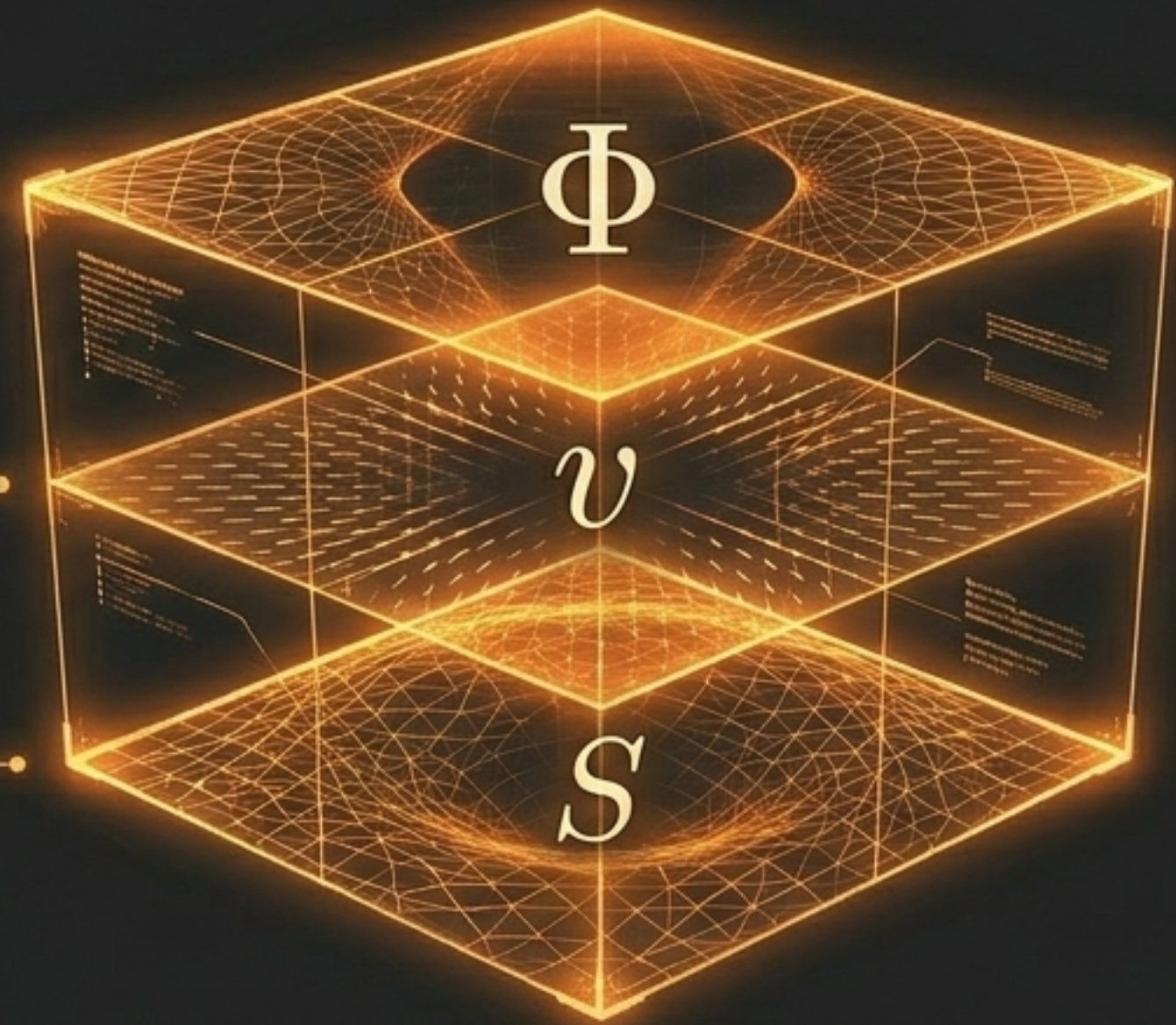
THE PARADIGM SHIFT: INTRODUCING RSVP (CLASS 3)

Cosmological homogenization without a de Sitter phase.

Plane 1: Φ
Scalar Constraint Field. Encodes local energy density and constraint-satisfaction.

Plane 2: ν
Vector Flow Field. Encodes directed entropy flux and local flow. Transverse vector perturbations do not decay by dilution.

Plane 3: S
Scalar Entropy Field. Encodes thermodynamic irreversibility and admissibility state.

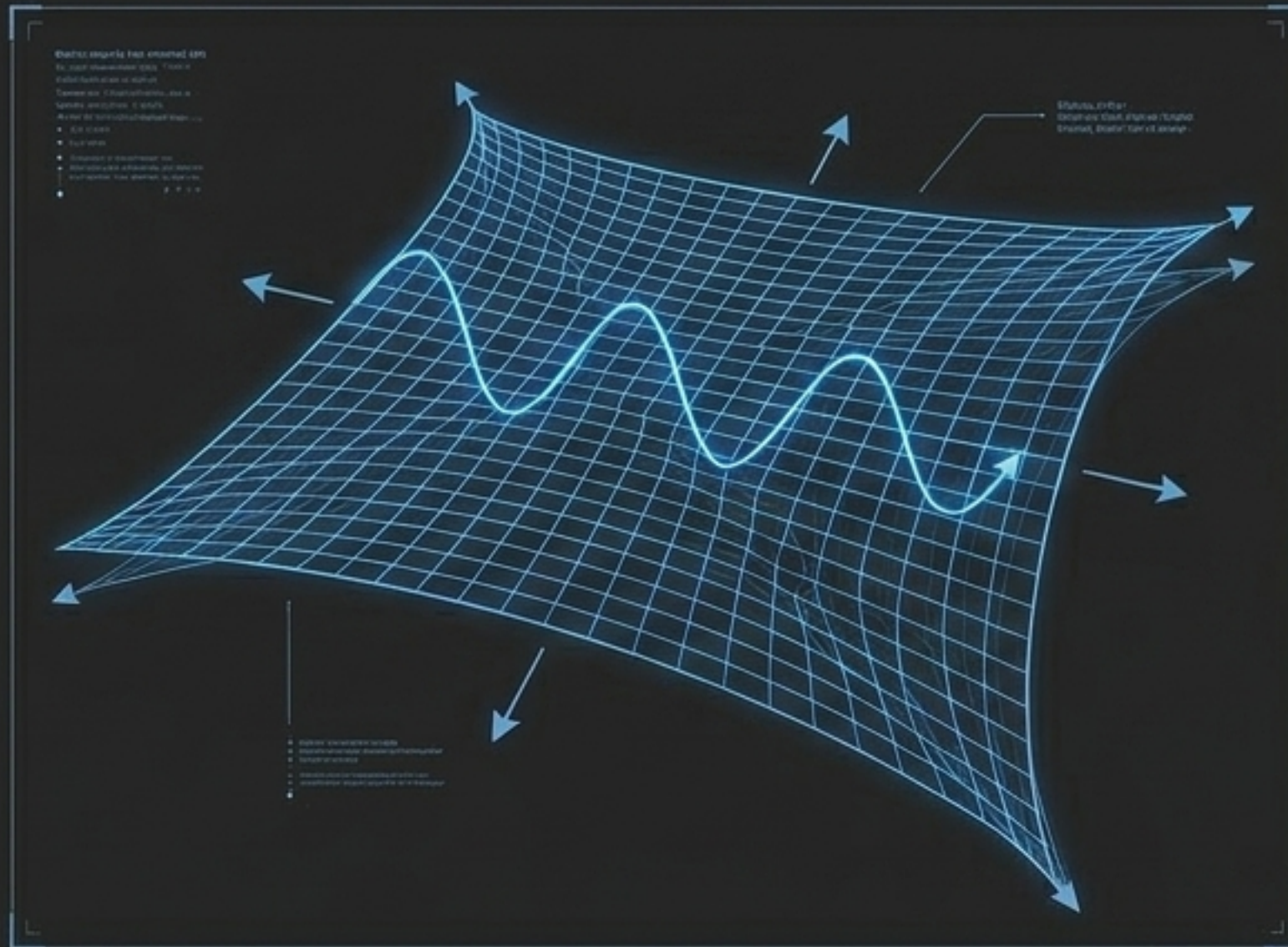


CORE THESIS: Spacetime geometry is an effective low-energy description of this underlying plenum's dynamics.

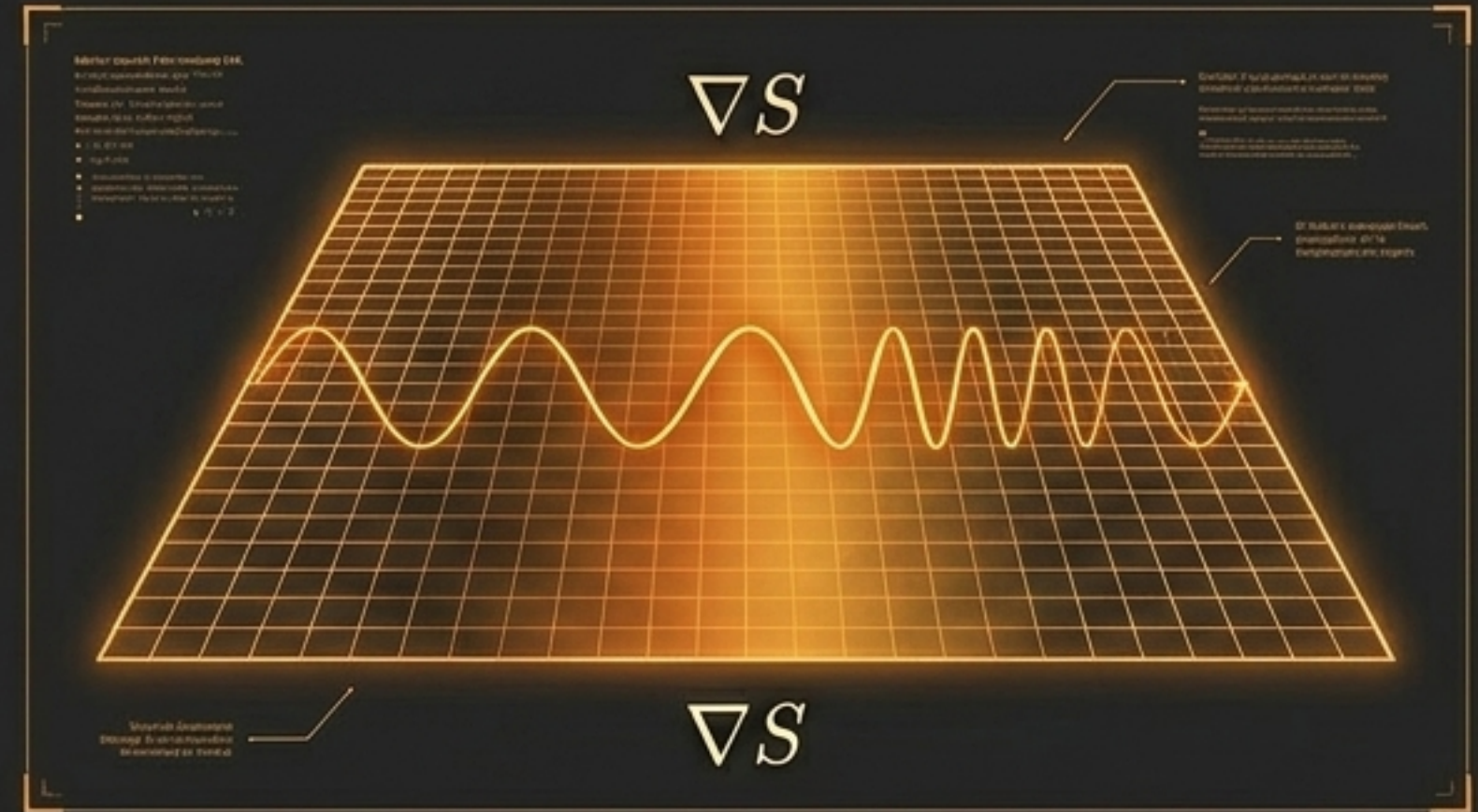
Re-engineering Cosmological Redshift

In RSVP, no global scale factor $a(t)$ is invoked. The effective Hubble law is a statement about entropy-gradient accumulation, not recession velocity.

Metric Expansion (Classes 1 & 2)



Entropy Gradient Traversal (Class 3)

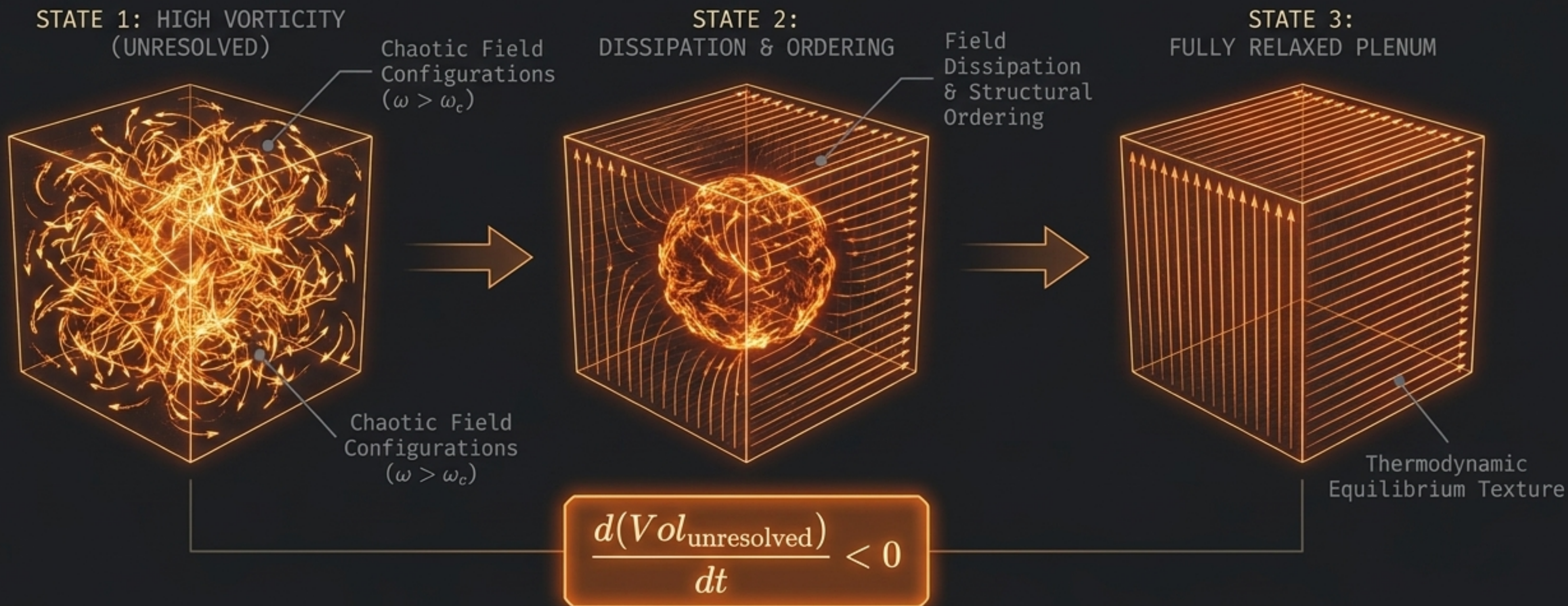


$$1 + z_{\text{RSVP}} = \exp \left(\int_{\text{path}} \kappa |\nabla S| dl \right)$$

(Where κ is the coupling constant between the photon propagator and the entropy field)

THE MECHANICS OF LAMPHRODYNE RELAXATION

Process Definition: Relaxation is driven by the dissipation of unresolved field configurations (e.g., local vorticity exceeding threshold ω_c).



Insight: The apparent homogeneity of the CMB is not the result of causal contact from an expansion phase, but the final thermodynamic equilibrium texture of a fully relaxed plenum.

A Built-In Thermodynamic Arrow of Time

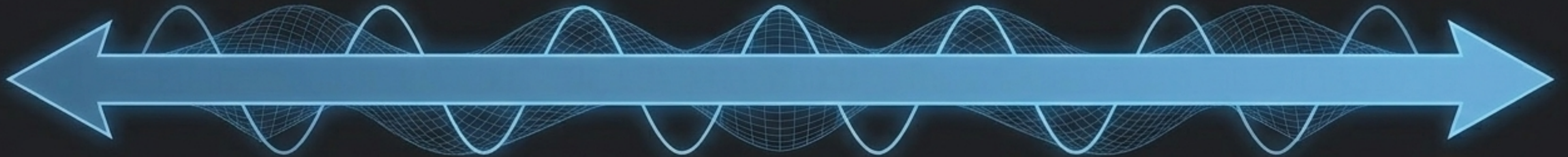
Inflation / QQG

The Contrast: Inflationary expansion is mathematically time-reversible at the level of the field equations; an arrow of time must be imposed externally.

RSVP Lamphrodyne Epoch

The RSVP Irreversibility Condition: Lamphrodyne relaxation is fundamentally directional. The Spherepop formalization ensures asymmetric resolution of unresolved configurations.

Time Reversible (Symmetric Field Equations)



Chaotic State
(Unresolved)

Ordered State
(Thermodynamic Equilibrium)

Time Irreversible (Thermodynamic Admissibility Loss)

Result: Relaxation is admissibility loss, and admissibility loss is by definition irreversible.

THE MATHEMATICS OF THE DESCENT

Inflation

ϵ_{infl} : Measures steepness of the potential $V(\phi)$ descent.

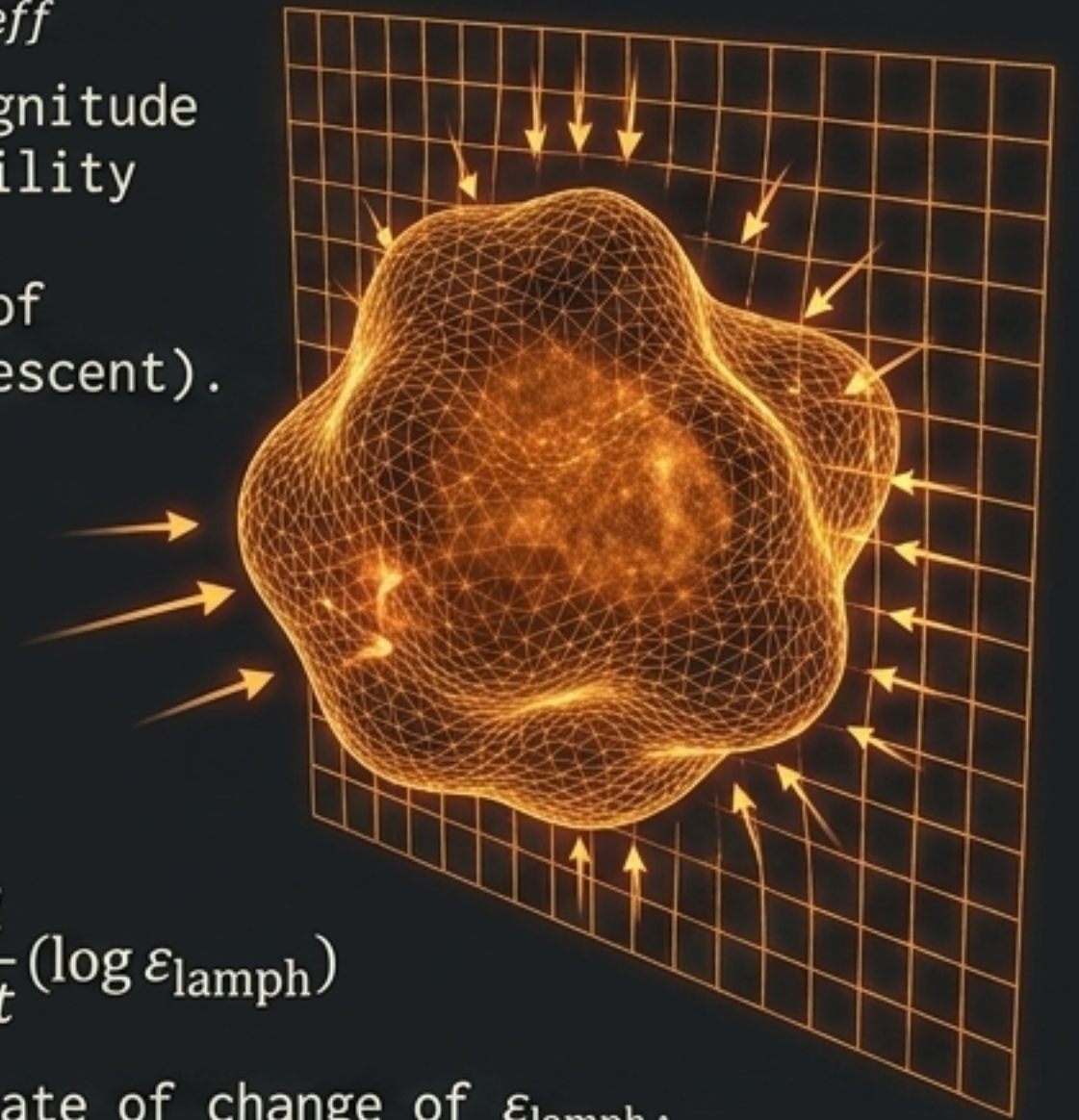
η_{infl} : Measures the curvature (rate of change of descent).



Lamphrodyne Relaxation

$$\epsilon_{\text{lamp}} = \frac{\|\nabla_F \log \text{Vol}(A)\|}{H_{\text{eff}}}$$

Measures the magnitude of the admissibility gradient. (The steepness of admissibility descent).



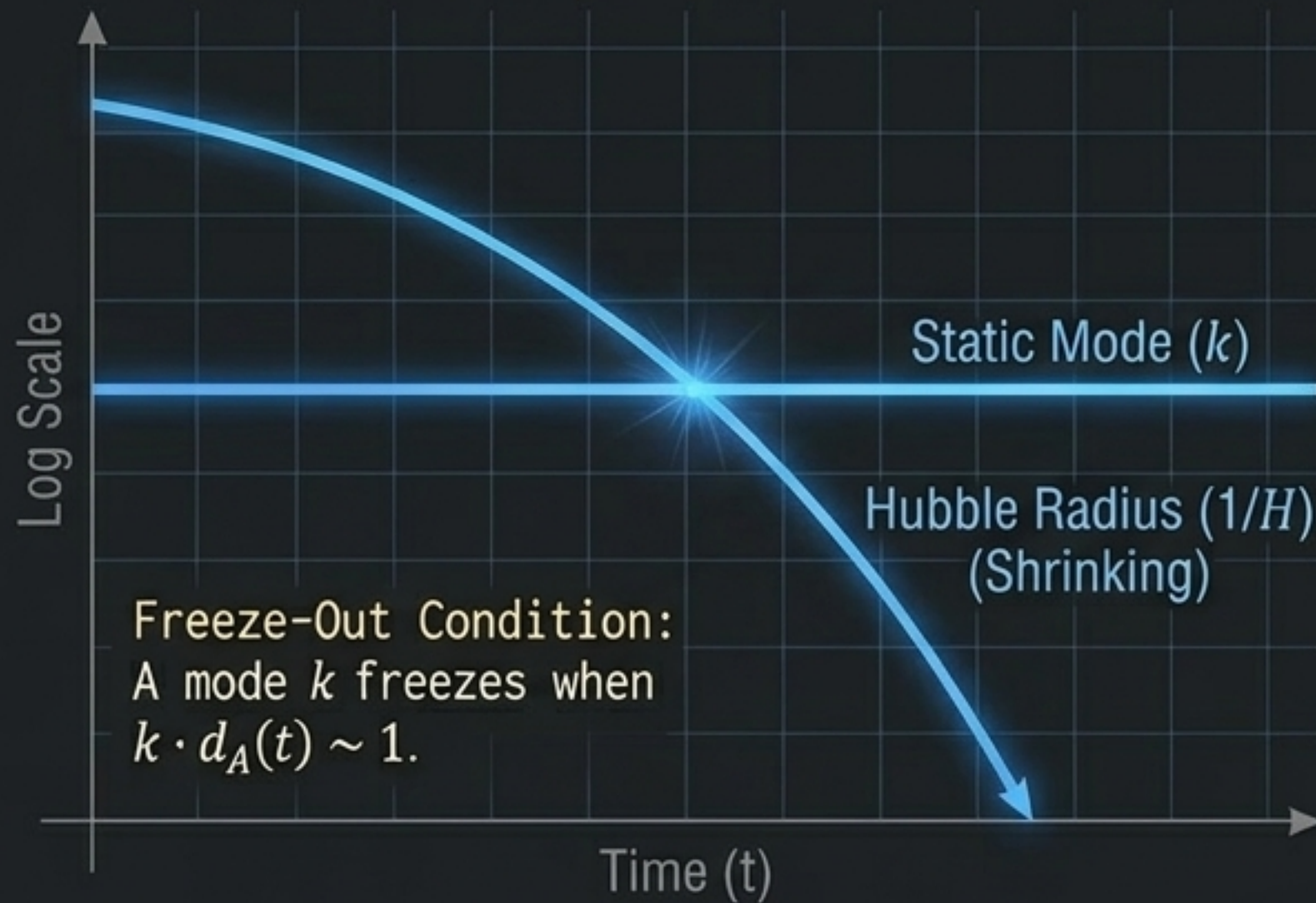
$$\eta_{\text{lamp}} = -\frac{1}{H_{\text{eff}}} \frac{d}{dt} (\log \epsilon_{\text{lamp}})$$

The fractional rate of change of ϵ_{lamp} . "Slow relaxation" requires $|\eta_{\text{lamp}}| \ll 1$.

THE HORIZON ALTERNATE: ADMISSIBILITY CROSSING

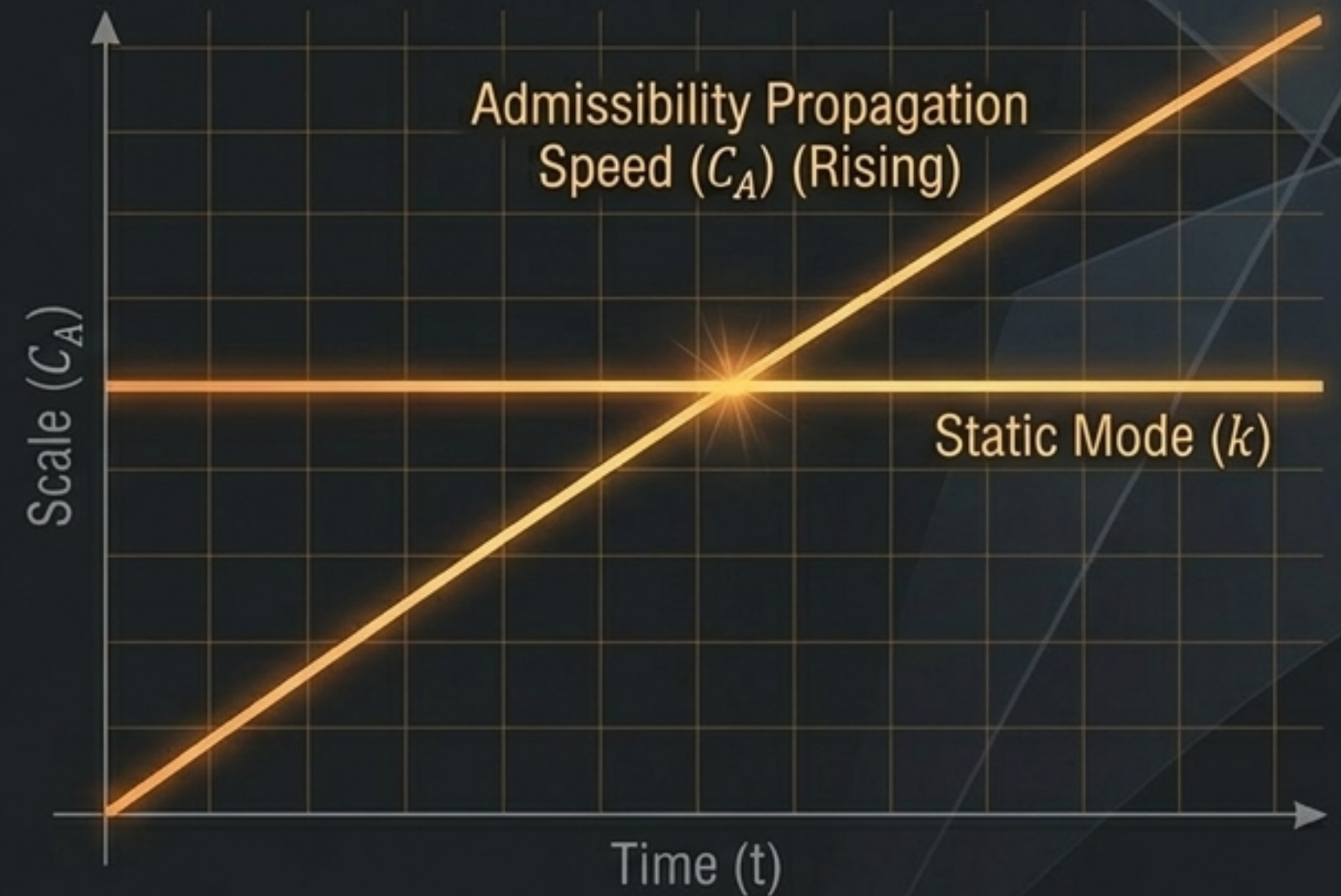
Graph 1: Standard Inflation (Blue Paradigm)

The Problem: Without metric expansion, standard Hubble horizon crossing cannot occur.



Graph 2: RSVP Solution (Orange Paradigm)

The RSVP Solution: Causal coherence is established by an admissibility propagation cone C_A .



Key Insight: If sound speeds of the plenum (c_s, c_v) are superluminal relative to the emergent metric, the admissibility horizon outpaces the effective particle horizon, establishing large-scale coherence prior to the existence of standard spacetime.

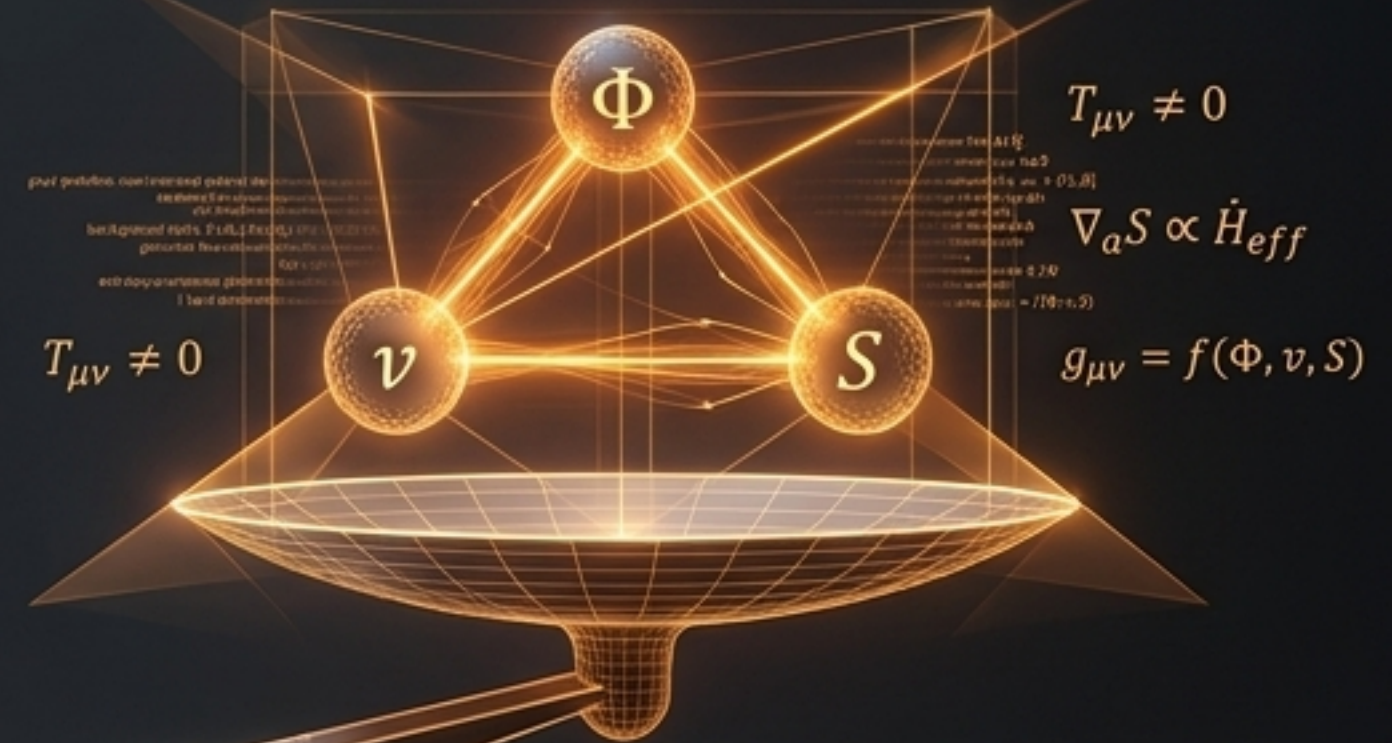
ONTOLOGICAL ECONOMY AND THE LARGE-N QUESTION

QQG: $N \sim 10^5$ to 10^6 Matter Fields

QQG's Burden: Requires up to a million spectator matter fields just to modify the RG flow. These fields sit in vacua, are dynamically inert, and exist purely to ensure the beta functions produce a viable slow-roll trajectory.



RSVP: 3 Coupled Fields



RSVP: 3 Coupled Fields

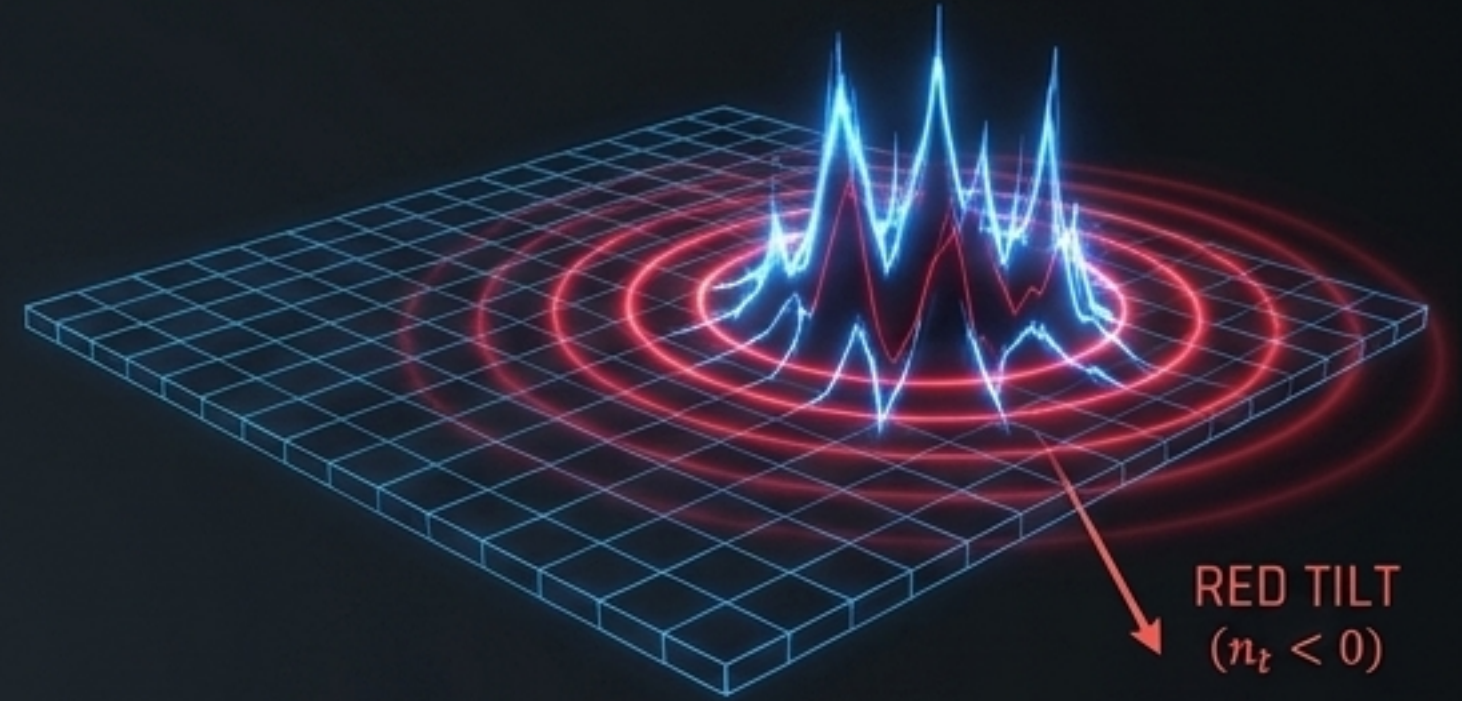
RSVP's Economy: Introduces only 3 fields, but all 3 are dynamically active. They define the background state, source perturbations, generate the stress tensor, and carry the entropy gradient producing redshift.

THE TENSOR MODE SHOWDOWN

Expansion (Classes 1 & 2)

Tensor modes arise from vacuum fluctuations of the metric during the de Sitter phase.

Signature: Inherently red spectral tilt ($n_t \approx -r/8$).



Relaxation (Class 3 RSVP)

Tensor modes arise from the effective anisotropic stress tensor (T_{ij}^{eff}) of the relaxing plenum itself.

The Structural Signature: Because they are sourced by plenum dynamics rather than vacuum fluctuations, RSVP generically predicts a near-zero or distinctly blue tensor tilt ($n_t > 0$) at scales $k \gtrsim H_{eff}$.



THE EMPIRICAL FORK

	QQG	RSVP
Observation: $r > 0.01$	 Survives natively; bounds the λ_{tH} coupling.	 Must explain large tensor residue from plenum stress.
Observation: $r < 0.01$	 Falsified. Violates internal perturbativity bounds.	 Survives natively (plenum correlators suppressed).
Observation: Blue Tilt $n_t > 0$	 Falsified. Requires complete model overhaul.	 Natural consequence of sourced plenum correlators.

THE IMMINENT COLLAPSE OF COSMOLOGICAL TAXONOMY

SYNTHESIS:

The significance of QG and RSVP is not merely that they remove the inflaton. They prove that cosmological smoothing can emerge from intrinsic, fundamental dynamics—either quantum geometry or thermodynamic relaxation.



Quantum Geometry
(Blue)

Thermodynamic
Relaxation
(Orange/Gold)

Next-Gen CMB
Observations

Unified Paradigm

FINAL TAKEAWAY:

Cosmological taxonomy is currently in a state of theoretical superposition. Driven by the hunt for primordial B-modes and spectral tilts, this superposition is about to collapse into a single, empirically verified paradigm.