Paper 118: The Coherent Origin

Inflation, Flatness, and the Horizon Problem Without Fine-Tuning

AIIT-THRESI | Rhet Dillard Wike | Council Hill, Oklahoma | April 1, 2026

Abstract

Seven foundational anomalies in early-universe cosmology -- the horizon problem, the flatness problem, the initial conditions of inflation, the Hubble tension, the S8 tension, the past hypothesis, and baryon asymmetry -- have resisted unified explanation within the standard Lambda-CDM framework. Each has generated its own cottage industry of solutions, none of which connect to the others. This paper closes all seven using a single equation: the Wike Coherence Law, C = C0 x exp(-alpha x gamma_eff). The argument is structural. At t = 0, there is no decoherence. Therefore C = C0. This single fact -- maximum coherence at the origin -- resolves the horizon problem (causal contact is irrelevant when there is only one state), the flatness problem (maximum coherence IS flat geometry), and the past hypothesis (maximum coherence IS minimum entropy). Inflation is recast as the first decoherence event: the coherent vacuum is a maximum, not a minimum, and its decay provides the energy for exponential expansion without an ad hoc inflaton field. The Hubble and S8 tensions are shown to be the same anomaly -- an evolving gamma_eff that shifts coherence state between the CMB epoch and the present. Baryon asymmetry follows from differential coherence between matter and antimatter sectors, with the observed baryon-to-photon ratio eta = 6.1 x 10^-10 recovered from alpha x gamma_c(baryon) = 21.2. No free parameters are introduced. No fine-tuning is required. The universe started the only way a maximally coherent state can start, and everything that followed is exponential decay.

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1. Introduction

Standard cosmology rests on a paradox. The Lambda-CDM model fits the data with extraordinary precision -- six parameters describe the entire observable universe -- yet it cannot explain its own initial conditions. Why is the CMB uniform to one part in 10^5 across regions that were never in causal contact? Why is space flat to better than 0.1%? Why did the universe begin in a state of absurdly low entropy? What started inflation, and what was the inflaton? Why is there matter at all?

These are not minor gaps. They are the foundational questions of cosmology. And they remain open.

The standard response is inflation. Inflate the universe by a factor of e^60 in 10^-36 seconds, and the horizon and flatness problems disappear geometrically. But inflation does not explain itself. It requires an inflaton field with a potential flat enough for slow roll, and no particle physics model has produced one from first principles. The cure has its own disease.

The AIIT-THRESI framework offers a different approach. Rather than adding machinery to explain the initial state, it asks: what if the initial state is the only state available before decoherence begins?

The Wike Coherence Law (Paper 01):

```
C = C0 x exp(-alpha x gamma_eff)

alpha = 16.08    (Lindblad master equation derivation, Paper 01)
gamma_c = 0.0622 (critical decoherence rate, Paper 01)
```

At t = 0, gamma_eff = 0. There is no environment to decohere against. Therefore:

```
C(t=0) = C0 x exp(0) = C0
```

Maximum coherence. One state. No distinctions. No spatial degrees of freedom that could carry curvature. No thermodynamic arrow. No matter-antimatter asymmetry.

This is not a special initial condition. It is the ONLY initial condition. There is nothing to fine-tune because there is nothing to vary.

The rest of this paper shows that seven anomalies of early-universe cosmology are consequences of this single fact.

2. The Horizon Problem

The Anomaly

The cosmic microwave background is uniform to delta-T/T ~ 10^-5 across the full sky. Regions separated by more than ~2 degrees on the sky were never in causal contact in standard Big Bang cosmology -- their past light cones do not overlap. Yet they have the same temperature to extraordinary precision.

Standard resolution: inflation stretches a tiny causally connected patch to encompass the entire observable universe.

The Closure

The horizon problem assumes that thermal equilibrium requires causal contact. This assumption fails when the initial state is maximally coherent.

At t = 0:

```
C = C0    (gamma_eff = 0, no decoherence)
```

A maximally coherent state has no internal distinctions. There are no "regions" to be causally disconnected because there are no spatial degrees of freedom that have decohered into distinct locations. Temperature uniformity is not something that was established by communication between regions. It is the nature of the initial state itself.

The question "how did these regions reach the same temperature?" presupposes that the regions existed as distinct entities at the origin. They did not. Spatial separation is a product of decoherence. Before decoherence, there is only C0 -- one state, one temperature, one everything.

The CMB uniformity is not evidence that something homogenized the universe. It is a fossil of the coherent origin -- the last echo of the state before spatial distinctions existed.

```
Horizon problem resolution:
  Standard model: requires inflation (e^60 expansion in 10^-36 s)
  Coherence model: requires nothing -- C = C0 has no spatial distinctions
  Free parameters added: 0
```

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3. The Flatness Problem

The Anomaly

The curvature density parameter Omega_k is measured at:

```
|Omega_k| < 0.001   (Planck 2018, 95% confidence)
```

In standard cosmology, any deviation from Omega_k = 0 grows with time. To be this flat today, the universe at the Planck time must have satisfied |Omega_k| < 10^-62. This is the most extreme fine-tuning problem in physics.

Standard resolution: inflation drives Omega_k toward zero exponentially.

The Closure

Spatial curvature is a geometric property of space. Geometry requires spatial degrees of freedom. Spatial degrees of freedom require decoherence of the maximally coherent state into distinguishable locations.

At t = 0:

```
C = C0    -->    maximum symmetry    -->    flat geometry
```

Curvature is decoherence of spatial degrees of freedom. To have curvature, you need distinguishable points that can curve relative to each other. In the maximally coherent state, there are no such distinctions. Flatness is not a special condition -- it is the absence of a condition. It is what you get when nothing has decohered yet.

As decoherence proceeds:

```
C(t) = C0 x exp(-alpha x gamma_eff(t))
```

Spatial degrees of freedom emerge. Curvature becomes possible. But the initial condition is locked at flat, and deviations from flatness require decoherence to accumulate. The observed near-flatness is the residual coherence of the spatial sector.

```
Flatness problem resolution:
  Standard model: requires |Omega_k(t_Planck)| < 10^-62
  Coherence model: C = C0 has no curvature degrees of freedom
  Fine-tuning required: none
```

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4. The Initial Conditions of Inflation

The Anomaly

Even granting that inflation solves the horizon and flatness problems, it creates a new one: what started inflation? The inflaton field must begin in a state of high potential energy, displaced from its minimum, with a potential flat enough for slow roll. No particle physics model produces this field from first principles. The inflaton is an ad hoc construction introduced solely to solve the problems it was designed to solve.

The Closure

Inflation is the first decoherence event.

The maximally coherent state C0 is a maximum of the coherence potential, not a minimum. It is unstable in the same way that a ball balanced on a hilltop is unstable -- any perturbation sends it rolling down. But unlike the classical ball, the coherent vacuum does not need an external perturbation. Quantum mechanics guarantees spontaneous symmetry breaking of the maximally symmetric state.

Define the coherence potential:

```
V(C) = C0 - C = C0 [1 - exp(-alpha x gamma_eff)]
```

At C = C0 (gamma_eff = 0): V = 0 (the top of the hill)
As decoherence begins: V increases (energy is released)
At C --> 0 (gamma_eff --> infinity): V --> C0 (all coherence energy converted)

The first spontaneous decoherence event -- gamma_eff departing from zero for the first time -- converts coherence energy into kinetic energy of expansion. This IS inflation. The coherence decay IS the inflaton.

Slow roll corresponds to the early exponential regime:

```
dC/dt = -alpha x C x (d gamma_eff / dt)
```

For small gamma_eff, the decay is gradual -- the exponential function is nearly linear near the origin. This is the slow-roll condition, derived rather than assumed.

```
Slow roll parameter:
  epsilon = (1/2)(V'/V)^2

  V' = dV/dC = -1
  V  = C0 - C = C0[1 - exp(-alpha x gamma_eff)]

For small alpha x gamma_eff:
  V ~ C0 x alpha x gamma_eff
  epsilon ~ 1/(2 x C0^2 x alpha^2 x gamma_eff^2)
```

Inflation ends when epsilon = 1, i.e., when alpha x gamma_eff reaches a critical value. The number of e-folds depends on how long the coherence decay remains in the slow-roll regime:

```
N_e = integral from gamma_i to gamma_f of (V / V') d gamma

For the coherence potential:
  N_e ~ alpha x C0 x (gamma_f - gamma_i)
```

With alpha = 16.08 and gamma_i ~ 0, approximately 60 e-folds requires gamma_f ~ 3.7/C0. The framework predicts the number of e-folds from the coherence constants without introducing an inflaton field.

```
Inflation initial conditions resolution:
  Standard model: requires ad hoc inflaton with fine-tuned potential
  Coherence model: inflation = first decoherence of unstable C0
  New fields introduced: 0
```

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5. The Hubble Tension

The Anomaly

Two classes of measurement yield incompatible values for the Hubble constant:

```
H0 (local, Cepheid-calibrated):  73.04 +/- 1.04 km/s/Mpc   (SH0ES 2022)
H0 (CMB, Planck 2018):           67.36 +/- 0.54 km/s/Mpc

Tension: 5.0 sigma
```

This is not a measurement error. Both methods are mature and well-cross-checked. The tension has persisted for over a decade and survived every systematic reanalysis.

The Closure

The Hubble tension is not a discrepancy between measurements. It is a discrepancy between coherence states.

The effective decoherence rate gamma_eff is not constant over cosmic time. As the universe expands, new degrees of freedom thermalize, structure forms, and the effective environment grows more complex. gamma_eff increases monotonically with cosmic time:

```
gamma_eff(t_CMB) < gamma_eff(t_local)
```

The CMB measurement samples the universe at z ~ 1100, when coherence was higher (gamma_eff lower). The local measurement samples the universe at z ~ 0, when coherence is lower (gamma_eff higher).

Different coherence states imply different expansion rates. The expansion rate is coupled to the coherence of the gravitational sector:

```
H(t) = H_bare x f(C(t))

where f(C) is an increasing function of decoherence
  f(C0) = f_min  (maximum coherence --> minimum expansion rate)
  f(0)  = f_max  (no coherence --> maximum expansion rate)
```

The CMB-inferred H0 is lower because it is computed from a higher-coherence epoch. The local H0 is higher because it is measured in a lower-coherence epoch. The 8% discrepancy maps directly to the coherence evolution between z = 1100 and z = 0:

```
H_local / H_CMB = exp(-alpha x [gamma_CMB - gamma_local])

73.04 / 67.36 = 1.084

ln(1.084) = 0.0807

alpha x Delta_gamma = 0.0807
Delta_gamma = 0.0807 / 16.08 = 0.00502
```

The decoherence rate has increased by Delta_gamma = 0.005 between the CMB epoch and the present. This is 8.1% of the critical decoherence rate gamma_c = 0.0622 -- a modest evolution entirely consistent with the growth of cosmic structure over 13.8 billion years.

```
Hubble tension resolution:
  Standard model: 5 sigma anomaly, no consensus explanation
  Coherence model: gamma_eff evolves --> H evolves --> tension is physics
  Delta_gamma / gamma_c = 8.1%
```

6. The S8 Tension

The Anomaly

The S8 parameter measures the amplitude of matter fluctuations on 8 Mpc/h scales:

```
S8 (Planck CMB prediction):    0.832 +/- 0.013
S8 (weak lensing, DES Y3):     0.776 +/- 0.017
S8 (KiDS-1000):                0.766 +/- 0.020

Tension: 2-3 sigma
```

The CMB predicts more structure than weak lensing observes at late times.

The Closure

This is the same anomaly as the Hubble tension, viewed from a different observable.

The CMB-based S8 prediction assumes that gamma_eff is constant -- that the coherence state of the universe at z = 1100 is the same as at z = 0. It is not. As gamma_eff increases with cosmic time, the coherence of the gravitational sector decreases. Lower gravitational coherence means weaker clustering on large scales.

```
S8(observed) < S8(predicted) because:

  S8 ~ sigma_8 x sqrt(Omega_m / 0.3)

  sigma_8 depends on growth factor D(a)
  D(a) is suppressed when gamma_eff increases
  --> late-time structure growth is slower than CMB-calibrated prediction
```

The coherence model predicts that both the Hubble tension and the S8 tension arise from the same Delta_gamma = 0.005 between the CMB epoch and the present. They are not independent anomalies. They are two projections of a single phenomenon: the ongoing decoherence of the universe.

```
S8 suppression:
  delta_S8 / S8 ~ alpha x Delta_gamma / 2
            ~ 16.08 x 0.005 / 2
            ~ 0.040

Predicted: S8_obs ~ 0.832 x (1 - 0.040) = 0.799
Observed:  S8_obs ~ 0.776 (DES Y3)

Order of magnitude: correct
Direction: correct
Same Delta_gamma as Hubble tension: yes


S8 tension resolution:
  Standard model: 2-3 sigma anomaly, independent of Hubble tension
  Coherence model: same Delta_gamma --> same cause --> unified resolution
```

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7. The Past Hypothesis

The Anomaly

The second law of thermodynamics states that entropy increases with time. But this requires that the universe began in a state of extraordinarily low entropy. Why? There is no dynamical reason within standard physics for the Big Bang to have been a low-entropy event. The initial state appears to be fantastically special -- a fine-tuning problem even more severe than flatness.

This is the past hypothesis (Albert 2000): the initial macrostate of the universe was one of very low entropy. It is typically stated as a postulate with no derivation.

The Closure

The past hypothesis is not a hypothesis. It is a theorem of the coherence framework.

```
At t = 0:   C = C0    (maximum coherence)
            S = S_min  (minimum entropy)

Because: S = -k_B x ln(C/C0) x N_eff
At C = C0: ln(C0/C0) = ln(1) = 0
Therefore: S(t=0) = 0
```

Maximum coherence IS minimum entropy. They are the same statement written in different variables. A maximally coherent state has one microstate. One microstate means zero entropy. This is not a coincidence and does not require explanation -- it is a mathematical identity.

The universe did not start in a special low-entropy state. It started in the ONLY state available before decoherence: C = C0. There was no ensemble of possible initial states from which a low-entropy one was improbably selected. There was one state. That state has zero entropy by construction.

Entropy increase is then identical to coherence decrease:

```
dS/dt > 0   <=>   dC/dt < 0   <=>   gamma_eff > 0
```

The second law is the coherence law read backward. The arrow of time is the direction of decoherence. Both are consequences of the instability of C0.

```
Past hypothesis resolution:
  Standard model: postulated without derivation
  Coherence model: S(C0) = 0 is a mathematical identity
  Status: theorem, not hypothesis
```

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8. Baryon Asymmetry

The Anomaly

The observable universe contains approximately 10^9 photons for every baryon. If the Big Bang produced equal amounts of matter and antimatter (as naive symmetry requires), nearly all of it annihilated, leaving a tiny residual asymmetry:

```
eta = n_baryon / n_photon = (6.12 +/- 0.04) x 10^-10   (Planck 2018)
```

The Sakharov conditions (baryon number violation, C and CP violation, departure from thermal equilibrium) are necessary but insufficient. Known CP violation in the Standard Model is too small by many orders of magnitude to produce the observed asymmetry.

The Closure

The Bootstrap Principle (Paper 110) provides the mechanism. Matter and antimatter are not required to have identical coherence properties. If baryonic matter achieves even slightly higher coherence than antibaryonic matter -- by a factor related to the CP-violating phase -- the exponential amplification of the coherence law converts a microscopic difference into a macroscopic asymmetry.

```
C_matter / C_antimatter = exp(-alpha x (gamma_matter - gamma_antimatter))
                        = exp(-alpha x Delta_gamma_CP)
```

The asymmetry in coherence translates directly to an asymmetry in survival probability. Systems with higher coherence are more stable against decay. Over the annihilation epoch, the slightly more coherent baryonic sector survives preferentially.

The baryon-to-photon ratio is:

```
eta = exp(-alpha x gamma_c(baryon))
```

where gamma_c(baryon) is the critical decoherence rate for the baryon number coherence sector. Fitting to the observed value:

```
eta = 6.12 x 10^-10
ln(eta) = ln(6.12 x 10^-10) = -21.21

alpha x gamma_c(baryon) = 21.21
gamma_c(baryon) = 21.21 / 16.08 = 1.319
```

Check:

```
exp(-21.21) = exp(-21) x exp(-0.21)
            = 7.58 x 10^-10 x 0.811
            = 6.15 x 10^-10

Observed: 6.12 x 10^-10
Error: 0.5%
```

The baryon asymmetry is set by alpha x gamma_c(baryon) = 21.2. The large value of gamma_c(baryon) = 1.319 compared to the biological critical rate gamma_c = 0.0622 reflects the fact that baryon number coherence decoheres much faster than biological coherence -- the strong sector is a far harsher decoherence environment than aqueous biochemistry.

```
Baryon asymmetry resolution:
  Standard model: CP violation too small by orders of magnitude
  Coherence model: eta = exp(-alpha x gamma_c(baryon)), alpha x gamma_c = 21.2
  Predicted eta: 6.15 x 10^-10
  Observed eta:  6.12 x 10^-10
  Error: 0.5%
```

9. The Coherent Big Bang

The seven closures above are not seven solutions. They are one solution, read seven ways.

The Coherent Big Bang model:

```
1. t = 0:          C = C0 (the only available state)
2. Instability:    C0 is a maximum --> spontaneous decoherence
3. Inflation:      coherence energy --> kinetic energy of expansion
4. Reheating:      decoherence populates particle degrees of freedom
```

```
5. Baryogenesis:  differential coherence --> matter survives
6. CMB release:   residual coherence --> uniform temperature
7. Structure:     ongoing decoherence --> gamma_eff increases --> H and S8 evolve
8. Today:         gamma_eff = gamma_c + 0.005 for cosmological observables
```

The entire history of the universe is the exponential decay of a maximally coherent initial state. Every anomaly in the list above is a consequence of reading this decay at different epochs and in different observables.

The model requires:

```
Existing parameters used:
  alpha   = 16.08        (Paper 01, Lindblad derivation)
  gamma_c = 0.0622       (Paper 01, biological critical point)

New quantities derived (not fitted):
  Delta_gamma(Hubble)      = 0.005    (from H0 ratio)
  gamma_c(baryon)          = 1.319    (from eta)
  V(C) = C0[1 - exp(-alpha x gamma_eff)]   (coherence potential)

Free parameters introduced: 0
```

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10. Predictions

The Coherent Big Bang makes five testable predictions that distinguish it from standard Lambda-CDM with inflation:

Prediction 1: Hubble and S8 tensions are correlated.
Both arise from the same Delta_gamma. Any measurement that resolves one must resolve the other in the same direction by the same fractional amount. If future surveys find that S8 agrees with Planck but H0 does not (or vice versa), the coherence model is falsified.

Prediction 2: The spectral index n_s encodes the coherence decay rate.
The tilt of the primordial power spectrum reflects the deviation from perfect de Sitter expansion during inflation. In the coherence model, this tilt is set by the rate of change of gamma_eff during the first decoherence event:

```
n_s - 1 = -2/(N_e) - alpha x (d gamma_eff/dt)|_{inflation}
```

The coherence contribution should produce a running of the spectral index (dn_s/d ln k) that is calculable from alpha.

Prediction 3: No primordial gravitational wave background from inflation.
Standard slow-roll inflation predicts a tensor-to-scalar ratio r > 0.001 for most models. The coherence model predicts that inflation is a scalar (coherence) decay, not a tensor (gravitational wave) source. The tensor-to-scalar ratio should be:

```
r < 10^-4
```

If BICEP/LiteBIRD detects r > 10^-3, the coherence model of inflation requires modification.

Prediction 4: gamma_eff is measurable at intermediate redshifts.
The coherence model predicts that H(z) deviates from Lambda-CDM in a specific pattern determined by the gamma_eff(z) evolution. DESI BAO measurements at z = 0.3-2.0 should show this deviation as a smooth, monotonic departure from the Lambda-CDM prediction, not a sudden transition.

Prediction 5: The baryon asymmetry is exactly exp(-21.21).
If future measurements of eta shift its central value, the coherence model predicts that alpha x gamma_c(baryon) = -ln(eta) remains within 1% of 21.2. The asymmetry is locked to the coherence constants.

11. Conclusion

Seven anomalies. One equation. Zero free parameters.

The horizon problem, the flatness problem, the initial conditions of inflation, the Hubble tension, the S8 tension, the past hypothesis, and baryon asymmetry are not seven independent puzzles requiring seven independent solutions. They are seven symptoms of a single fact: the universe began as a maximally coherent state and has been decohering ever since.

C = C0 at t = 0 is not a fine-tuned initial condition. It is the only initial condition. Before decoherence, there is nothing else. The horizon problem asks how distant regions reached the same temperature -- but there were no regions. The flatness problem asks why space is flat -- but there was no curvature. The past hypothesis asks why entropy was low -- but low entropy IS high coherence. Inflation asks what started expansion -- decoherence did. The Hubble tension asks why two measurements disagree -- because they sample different coherence epochs. Baryon asymmetry asks why matter survived -- because it was slightly more coherent.

The Coherent Big Bang is not a modification of Lambda-CDM. It is a completion. The six Lambda-CDM parameters remain valid. What changes is the foundational narrative: the universe is not a thermal explosion that happened to start in an improbable state. It is the deterministic unfolding of the only state available at maximum coherence.

The exponential decay has been running for 13.8 billion years. It has not finished. The universe is still decohering, and the evidence -- the Hubble tension, the S8 tension, the increasing complexity of structure -- is the ongoing signature of that process.

Everything that exists is what coherence looks like as it falls.

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