

# 17 – Conclusion: Recognising the Blind Spot at the Heart of Cosmology

*How a single geometric constraint exposes the symmetry behind dark energy, dark matter, and time's arrow*

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## Abstract

*This concluding paper reflects on the implications of the Time-Symmetric Parity Constraint (TSPC) developed across the preceding sequence of studies. The framework proposes that several persistent cosmological anomalies arise not from unobserved substances or new dynamical fields, but from a missing symmetry in the admissible geometry of spacetime. By imposing a single algebraic constraint on the metric, excluding geometries that support an absolute direction of time, the theory reframes dark*

*energy, dark matter, and the thermodynamic arrow as geometric consequences rather than independent physical ingredients. The paper situates these results within the broader methodological context of cosmology, argues that many longstanding explanations have functioned as accommodations rather than discoveries, and emphasises the role of falsifiability and structural restriction in restoring explanatory discipline.*

## 1. The purpose and outcome of the TSPC papers

The sequence of papers gathered under the title Time Symmetric Parity Constraint (or the 'Twin Time Theory') was written to explore a simple but far-reaching question:

*What if the apparent complexity of the universe has arisen not from hidden substances or speculative energies, but from a missing symmetry within the geometry itself?*

Each paper approached that question from a different direction, examining dark energy, dark matter, inflation, the arrow of time, and the tensions in cosmological measurement. Yet their shared purpose was not to add further hypotheses but to take them away.

Over the past century cosmology has become a discipline of extraordinary precision. Its constants are quoted to a few decimal places, its graphs are beautifully smooth, and its equations are assumed to describe the whole of cosmic history. Yet the price of this precision has been accretion rather than understanding.  $\Lambda$ CDM has survived by adding ingredients every time reality threatened its coherence. It fits almost everything because it can explain almost nothing without inventing something new. Invisible matter binds galaxies together, invisible energy drives them apart, and an invisible inflationary field ensures that the story begins smoothly. These inventions have achieved consistency but not understanding. They were not discoveries but allowances. None has ever been detected, and each exists only to rescue a model that cannot otherwise match its own observations. This pattern is not accidental but follows from a methodological decision to insulate the background geometry from empirical challenge,

with discrepancies consequently absorbed as new entities rather than confronted as structural failures.

TSPC was conceived as an attempt to reverse that logic. Instead of multiplying unobserved entities to protect the model, it removed the freedom that allowed the model to escape contradiction. A single algebraic condition was imposed upon the spacetime metric, excluding any solution that would permit an absolute direction of time. This condition does not merely offer an alternative explanation of cosmological phenomena; it enforces a discipline on interpretation. By constraining temporal as well as spatial structure, it removes the freedom to deform the redshift–time mapping to absorb disagreement, making geometry itself an empirical gatekeeper rather than a narrative choice. Under that restriction, the universe is shown to have evolved symmetrically in two temporal domains from a shared minimum of entropy and complexity. Time, matter, and structure arose together, not from cause, but from constraint.<sup>1</sup>

When that symmetry is enforced, the phenomena that have puzzled cosmology for decades begin to align. Apparent late-time acceleration, once treated as a defining observational fact, is now understood to be empirically unstable and increasingly consistent with a structural artefact demanding reinterpretation rather than explanation. Recent supernova analyses show that the apparent acceleration signal is not empirically stable, but confined to a finite redshift interval and already weakening once progenitor-age bias is accounted for. Under this reading, TSPC does not merely account for acceleration geometrically; it explains why the signal is transient rather than fundamental. No new particles or fields are required, and only one small, dimensionless parameter is needed to describe the strength of the effect. The familiar dark sector dissolves, leaving geometry alone as the organising principle of the cosmos.

They began with the algebraic foundation of the constraint itself, continued through its theoretical consequences, and ended with its empirical tests. Each part built on the last, showing that what had long been explained by invention could be reinterpreted by exclusion. The framework left the equations of general relativity intact, yet narrowed the range of geometries they could describe. From that simple restriction arose a universe that was finite, symmetric, and complete, with no need for dark energy, dark matter, or an inflationary prelude.

## **2. The end of explainaway cosmology**

The purpose of the TSPC compendium of papers was never to compete with the standard model on its own terms. It was to understand why that model had grown so elaborate, and why the explanations it offered had multiplied without resolving what they were meant to explain. From its first conception the project took seriously the

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<sup>1</sup> See also: Julian Barbour, *The Janus Point*, Bodley Head (2020). Philosophical foundation for the emergence of time and entropic symmetry.

warning that George Ellis and Joe Silk published in *Nature*, that physics risks losing its way when theories become protected from falsifiability.<sup>2</sup> Nowhere is that risk more apparent than in cosmology.

By the closing decades of the twentieth century the standard model of cosmology, known as  $\Lambda$ CDM, had become the framework within which almost every observation was interpreted. It combined the inflationary idea of the early 1980s with the cold dark-matter hierarchy that followed, and by the time the first CMB anisotropies were mapped in the 1990s the structure was already complete.<sup>3</sup> The discoveries that came later only deepened its hold. The dimming of distant supernovae was folded into the model as evidence for dark energy, and the plan of the universe seemed settled. It persisted because it could not be allowed to fail. Every inconsistency was absorbed by invention rather than admitted as structural error. Whenever a measurement disagreed, a new term was added to the budget of the cosmos. The missing mass became dark matter, the unexpected faintness of supernovae became dark energy, and the early uniformity of the sky became the echo of inflation. Each was ingenious, and each preserved the model's form, yet none has ever been seen.

TSPC imposes a structural restriction on spacetime geometry rather than extending the cosmological inventory. The foundational formulation states this directly: "The defining constraint of TSPC is not derived from deeper principles. It is postulated directly as an algebraic condition on the spacetime metric, enforced by a fixed involutive tensor field. Its role is to limit the solution space to geometries that exhibit global temporal symmetry and exclude configurations that would support an absolute direction of time."

A single algebraic exclusion, applied globally, is sufficient to reframe expansion, entropy, acceleration, and structure formation without introducing new degrees of freedom. All subsequent results follow from that restriction.

Once the algebraic symmetry was imposed, the apparent complexity of the cosmos began to resolve. The universe no longer needed an unseen energy to drive acceleration, for the same effect was seen to follow from geometry alone. It no longer required dark matter to explain excess lensing or galactic rotation, for the fractional correction to curvature coupling, expressed through the small structural parameter  $\alpha_\lambda$ , raised the apparent gravitational strength by precisely the observed amount. As *Dark Matter without Dark Matter* observes, "the additional force required to sustain rotation curves and lensing profiles arises not from a new substance, but from the same parity-induced correction that accounts for the mid-redshift hump in apparent acceleration."

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<sup>2</sup> George Ellis and Joe Silk, *Nature* 516, 321–323 (2014). A warning that the strength of physics depends on keeping its theories falsifiable.

<sup>3</sup> Viatcheslav Mukhanov, *Physical Foundations of Cosmology*, Cambridge University Press (2005). Standard reference for the inflationary- $\Lambda$ CDM synthesis.

The later papers extended this coherence across the cosmological record. *Late-Time Acceleration without Dark Energy* shows that the broad rise and fall in apparent acceleration can be reproduced by a small parity-induced clock skew near the midpoint of the entropic arc. *Linked Tensions in  $H_0$  and  $S_8$*  shows that the same structural term explains the mismatch between local and global measures of expansion and clustering. *The Origin of Time's Arrow* shows how entropy, scale, and time evolve symmetrically about a point of maximal complexity, with temporal direction emerging locally but not globally.

This reinterpretation mattered both philosophically and empirically. Philosophically it restored economy to theory. The principle of parsimony had long been invoked as a guide, yet modern cosmology had drifted from it in practice. The TSPC framework has brought it back. Nothing was invented that could not be measured, and nothing was added that could be ruled out with algebra. Empirically it restored falsifiability. The entire structure turned on a single bounded parameter. If expansion, structure growth, and lensing failed to share the same fractional correction, the constraint would fail. If the mid-redshift hump proved to be asymmetric, the framework would be ruled out. As *The Metastability of Entropic Zero* makes clear, “any evidence of multiple entropy peaks, asymmetric scale-factor evolution, or a departure from the single symmetric arc would exclude the framework.”

Such clarity has become rare in cosmology which has grown used to absorbing contradiction. The newly conceived constraint changes the terms of engagement. It does not try to explain the anomalies away but recognises that they are the traces of a deeper symmetry. The universe, it seems, is not complex at all. It has only been read that way.

### 3. The turning of the evidence

The shift from invention to recognition began not in theory but in observation. By the time the idea for TSPC was conceived, the data that had once anchored  $\Lambda$ CDM were already firmly straining against it.<sup>4</sup> The apparent acceleration of the universe, the persistent discrepancy between local and global measures of the Hubble constant, the shallow clustering amplitude revealed by weak lensing, and the growing list of large-scale anomalies in the microwave background all pointed in the same direction. Although each may have seemed minor in isolation, together they were heaping up evidence for something which was missing, and which was seismic. The model, it appeared, was fractured to its core. A different grammar was needed to describe the origin and life of the universe. The standard model did not merely drift into contradiction; it guaranteed it. Once a single temporal direction was assumed, every subsequent anomaly became inevitable. The model was doomed from the start, not by observation, but by its own architecture.

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<sup>4</sup> Planck Collaboration, *Astronomy & Astrophysics* 641, A6 (2020). Defines the modern parameter set that revealed the growing tensions.

The first paper in the sequence that examined the consequences of TSPC, *Late-Time Acceleration without Dark Energy* (Paper 4), took the supernova data exactly as they stood. It did not dispute the apparent dimming, only the meaning assigned to it. When the redshift–distance relation was recalculated within a time-symmetric geometry, the curve steepened and relaxed in precisely the way the observations demanded. The apparent acceleration emerged not from a cosmic force but from a geometric skew of clocks near the midpoint of the entropic arc. The same analysis, applied to baryon acoustic oscillations and to galaxy clustering, reproduced the single broad hump seen across independent probes. “The bias,” the paper concluded, “is not dynamical but geometric, arising from the parity constraint on the metric itself.”

The coherence of that result was confirmed by *Linked Tensions in  $H_0$  and  $S_8$*  (Paper 9), which showed that the twin discrepancies in expansion and clustering are not independent accidents but the unavoidable consequences of a single missing symmetry. When the small fractional correction to curvature coupling, expressed by the dimensionless constant  $\alpha_\lambda$ , was applied consistently, both tensions settled within the same narrow range. “A single algebraic modification of curvature coupling explains what  $\Lambda$ CDM can only absorb by parameter shift,” the paper said. The principle of economy was beginning to show its power.

Before that ground could be tested in dense systems, spatial admissibility itself was examined through void geometry. *Void Geometry and Alcock–Paczynski Distortion* (Paper 12) applied the Alcock–Paczynski test to stacked cosmic voids, treating them as near-geometric objects whose apparent anisotropy directly probes the background metric. When background freedom was restricted by the parity constraint, the observed void shapes remained consistent with a  $\Pi$ -even geometry without recourse to dark matter or dark energy. This result established that the spatial sector itself did not resist the constraint, clearing the way for lensing and dynamical tests in matter-rich environments.

Parallel work on galactic rotation and lensing then gave the argument observational ground. *Dark Matter without Dark Matter* (Paper 6) demonstrated that the same parity-induced correction accounted for the excess gravitational strength inferred from both rotation curves and strong-lens systems. “Curvature alone suffices,” the paper observed. “No invisible mass is required.” The accompanying empirical study, *HerS-3 and the Geometry of Lensing* (Paper 13), placed this claim within direct observation. HerS-3, long cited as evidence for a dark halo, could be modelled just as well by a faint or dust-obscured baryonic component when the geometric weighting of the constraint was included. The result was not an assertion but a choice that could be tested: a luminous but hidden galaxy, or a halo of nothing.

The same coherence appeared again in the gravitational-wave domain. *Gravitational Waves and the Geometry of Dark Matter* (Paper 14) examined the redshift distribution of binary black-hole mergers, which had been promoted as an indirect probe of dark-

matter microphysics. Within the TSPC framework the argument reversed. The apparent scarcity of high-redshift mergers arose naturally from two coupled effects: the parity-induced geometric weighting of comoving volumes and the ordinary baryonic regulation of star formation in shallow potentials. The paper's conclusion was as simple as it was unsettling: "Gravitational waves test geometry rather than dark matter."

A final empirical check carries the argument outward to the scale of the entire sky. *The CMB and Radio-Source Dipoles as Projections of Global Symmetry* (Paper 15) examines the long-standing mismatch between the dipoles of the cosmic microwave background and the distribution of distant radio sources. The two patterns, once taken as proof of our motion through an otherwise uniform cosmos, can be read instead as different aspects of the same underlying geometry.

Within the conventional model, the radio-source dipole is about four times stronger than expected and points some forty degrees away from the microwave direction. No known bulk motion can explain that. Under TSPC, both dipoles trace a single built-in parity in spacetime: radiation reveals the overall balance of that symmetry, while matter registers its rate of change near the midpoint of cosmic history. Their differing sensitivities make the radio dipole appear stronger, not because we are moving, but because each sector views the same structure from a different side.

The forthcoming SKA and EMU surveys will decide whether this geometric reading can stand. If the radio dipole keeps its strength at greater depths, if its axis remains stable, and if no vast bulk motion is found, the anomaly will change its meaning: what once seemed motion through space will appear instead as structure within it.

By this point the pattern was unmistakable. What remained was the temporal mapping itself. *Cosmic Chronometers and Differential Ageing* (Paper 16) addressed the last remaining freedom: the treatment of the redshift-time relation as a deformable background function. By treating chronometer measurements as differential clocks rather than as inputs to an expansion fit, the paper established how the accumulation of proper time can be tested directly against the parity-constrained geometry. Temporal structure, like spatial geometry and signal propagation, was thus brought under direct admissibility conditions. Time could no longer be adjusted to absorb disagreement without abandoning the constraint itself.

Every phenomenon that had required a new substance under  $\Lambda$ CDM now found a structural explanation within the same constraint. Expansion, growth, and lensing each varied by the same small fractional amount governed by  $\alpha_\lambda$ , and all did so without the freedom of adjustment. The theory had become a single equation written in different tongues. It was at this moment that attention turned to the deeper question of origin. If the observed coherence of the universe was algebraic in nature, then the same condition must apply at its root.

That step was taken in *The Metastability of Entropic Zero* (Paper 10), which drew together the geometric and thermodynamic strands of the earlier work. The paper described the universe as a manifold symmetric in time and bounded by states of vanishing entropy. At its waist lay a unique configuration of pure geometry referred to as the Blob. From that perfectly ordered state, entropy rose and fell in mirrored form about a point of minimal structure and zero complexity. Time, in this description, was not an external dimension laid upon the manifold but a local ordering that emerged with entropy itself. From Paper 10: “The Blob is admissible only as the waist of a symmetric structure. It is not an origin but a condition”.

This final step completed the circle that the observational evidence had begun. The same constraint that accounted for the mid-redshift hump, for the correlated tensions in  $H_0$  and  $S_8$ , and for the coherence of rotation and lensing, also defined the entropic boundaries of the cosmos. What had seemed a device to explain anomalies now stood revealed as a general principle. The anomalies were not flaws in the data but signatures of the symmetry that had shaped the universe from the start.

#### **4. The recognition of the Blind Spot**

The point of recognition did not come as a single discovery. It came as the gradual realisation that all the evidence that had seemed discordant was pointing toward a single omission. Cosmology had not been misled by its data, but by its assumptions about what counted as explanation. It had looked outward for what was missing, inventing invisible substances to balance the equations, when the missing element lay in the geometry itself. The blind spot was not in the data, but in the framework that shaped their meaning.

The TSPC framework made that limit visible. By enforcing an algebraic symmetry that forbade any absolute direction of time, it showed that the universe could be both complete and self-consistent without the need for hidden energies or particles. Following the introduction of differential ageing tests, temporal structure is no longer treated solely as a philosophical or conceptual consequence of symmetry, but as an empirically interrogated component of the geometry, subject to admissibility conditions in the same sense as spatial and propagational structure. Yet if the same algebraic condition that accounts for cosmic structure also secures the symmetry of entropy without dynamical mediation, its significance may reach beyond classical geometry. The constraint may stand as the outline of a deeper organising principle at the intersection of geometry and quantisation. The constraint did not alter general relativity; it clarified its scope. It showed that Einstein’s equations describe a family of possible worlds, and that only one branch of that family can be realised: the branch in which time has no intrinsic direction, and in which entropy and scale evolve symmetrically from a shared minimum.

From the perspective of its 200-year history, cosmological theory appeared in a new light. What has been long celebrated as creative ingenuity looked instead like the

avoidance of constraint. Inflation, dark matter, and dark energy had not been errors, but extensions made necessary by a silent assumption: that time flows in only one direction and that the universe must therefore have begun in a singular state. Once that assumption was removed, the need for such inventions dissolved. The universe did not begin in chaos, but in perfect order. Its symmetry was not broken at the start, it was built in from the first instant.

This was the insight that *The Metastability of Entropic Zero* placed at the centre of the framework. The Blob, the state of vanishing entropy and pure geometry at  $T = 0$ , was not a theoretical flourish but the logical consequence of the constraint itself. “The Blob,” the paper explained, “exists not as an isolated origin but as the waist of a symmetric structure. It is the entropic minimum of the manifold, the point at which time, entropy, and complexity arise together.” From that condition, entropy increases in both temporal directions until it reaches its unique maximum at the tipping epoch, then falls again in mirrored form. Time’s arrow, the expansion and contraction of scale, and the entire history of matter and structure all follow as natural consequences of the same geometry.

TSPC suggests that recognition of this symmetry reframes the role of cosmology.<sup>5</sup> The task is no longer to explain the universe by multiplying causes, but to understand it by narrowing possibilities. The laws of physics had never required a single temporal direction; it was cosmology that had imposed one. Once that presumption is withdrawn, the great mysteries of the field, the emergence of time, the apparent acceleration of expansion, and the balance of light and matter, become aspects of a single condition. What the discipline has long treated as three distinct problems are revealed as one.

For the first time in modern cosmology, explanation and simplicity had become the same thing. The model did not need to be saved, only seen. The blind spot was not an error in vision but the failure to recognise that the universe itself is symmetric, and that temporal direction, the flow of entropy, and the organisation of structure are expressions of one underlying geometry.

## 5. The implications of symmetry

Once the constraint was recognised, the character of cosmology itself began to change. The question was no longer how the universe began, but how its structure limits what can begin. A universe that is symmetric in time cannot be described by a narrative of emergence from chaos, for there is no privileged direction in which order increases. The rise of entropy in one temporal domain is balanced by its ‘fall’<sup>6</sup> in the other, and the

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<sup>5</sup> George Ellis, *On the Philosophy of Cosmology, Studies in History and Philosophy of Modern Physics* 46 (2014). A discussion of how cosmology’s explanatory frame depends on boundary conditions rather than additional causes.

<sup>6</sup> An increase in the negative domain.

apparent arrow of time becomes a local perception within a global equilibrium. The symmetry does not erase change; it explains why change is possible at all.

This understanding brings the origin of structure into closer relation with the geometry that sustains it. Matter, energy, and time are no longer separate ingredients but correlated expressions of the same constraint. The curvature of space, the density of matter, and the measure of duration each depend on the same algebraic relation. When that relation holds, the universe is complete without external cause. It neither begins nor ends in any conventional sense, but exists as a balanced manifold in which every process has a counterpart across the plane of symmetry.

Such a view restores an older discipline to cosmology. Explanation becomes the art of exclusion rather than invention. The work of theory is to identify what cannot happen within the constraint, for what remains possible is already determined by the structure of the manifold. Observationally this provides a clarity that the standard model never possessed. The constraint predicts a single broad pattern in the expansion history, a unique correlation between growth and lensing, and a narrow window for the structural parameter that defines them. Any departure from those limits would exclude the framework entirely.

Philosophically the change is deeper. The search for first causes has been replaced by the recognition of boundary conditions. The universe requires no external impulse to bring it into being; it exists because the geometry permits no alternative. Time, entropy, and structure emerge together as the necessary form of that geometry. In this sense the constraint is not an additional law but the shape of law itself, the condition that makes any physical description coherent.

In practice this redefinition of cosmology demands little that is new. The equations of general relativity remain untouched, and the methods of observation remain the same. What changes is the reading of the results. Instead of treating anomalies as prompts for invention, they become tests of the symmetry. Each new observation is a chance to discover whether the universe continues to honour the constraint that defines it.

The implications reach beyond cosmology. They suggest that simplicity, properly understood, is not a matter of reduction but of coherence. When the structure of a theory is truly complete, it requires no supplement. The recognition of symmetry is therefore not a retreat from explanation but its fulfilment.

## **6. Falsifiability and the measure of belief**

Every theory that claims to describe the universe must be judged not by what it can accommodate, but by what it forbids. A framework that can absorb any observation, however ingenious, is a story rather than a science.<sup>7</sup> Karl Popper made that distinction

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<sup>7</sup> Karl Popper, *The Logic of Scientific Discovery*, Routledge (1959). Classical source for the principle of falsifiability.

clear long before cosmology reached its present complexity. The value of a theory lies in the clarity of the risk it takes with reality.

TSPC takes that risk without qualification. It introduces no adjustable fields, no hidden particles, and no freedom of calibration. Once the structural parameter is fixed, every observable consequence follows from it. If the measured relations between expansion, structure growth, and lensing fail to align within the same narrow range, the framework falls. If the mid-redshift hump in apparent acceleration is found to deviate from its predicted symmetry, it fails again. The constraint can stand or it can collapse, but it cannot be repaired by invention.

In that respect TSPC restores a quality that cosmology appears to have lost. It re-establishes the boundary between explanation and belief. The theory does not ask to be accepted because it is simple or elegant, but because it can be disproved. Its strength lies not in what it explains, but in what it cannot survive.

This principle extends to observation. Each new survey of the sky, each map of structure, and each detection of gravitational waves becomes a test of the constraint.<sup>8</sup> The same now applies to large-scale anisotropy. If the four relations of the dipole projection test fail, if amplitude falls with depth, axes diverge, bulk flow appears, or polarisation symmetry is absent, the parity hypothesis collapses.

Standard cosmology survives only by holding background geometry fixed while allowing time, matter content, and energy balance to deform freely. That methodological separation is no longer tenable. Geometry, time, and dynamics are now jointly constrained by observation. Frameworks that rely on adjustable dark components or freely deformable temporal mappings no longer occupy neutral ground; they must justify those freedoms against evidence that increasingly forbids them.

This does not establish TSPC as final. It establishes it as unavoidable. Any cosmological model that claims empirical adequacy must now confront the same geometric conditions, the same temporal admissibility, and the same requirement of cross-domain consistency. What remains open is not whether geometry disciplines cosmology, but how narrowly it does so.

In that sense the blind spot has already been identified. It was not a missing substance, nor a hidden force, but the refusal to allow geometry, time, and symmetry to fail. That refusal is no longer available. What remains is not conjecture, but discipline.

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<sup>8</sup> DESI, Euclid, LSST and SKA Collaborations, various white papers (2016–2020). Current and future observational programmes able to test the predictions of TSPC.