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BEYOND A SOLITARY BIG BANG

A Green Paper on Cosmological Percussion, Transduction, Domain Formation and Gravitational Residue

DISCUSSION DRAFT • v0.1 • 8 AUGUST 2026

A speculative research paper. Not a claim of discovery.

The paper separates established observation, prevailing interpretation, open scientific question and conjecture.

GREEN PAPER / DISCUSSION DRAFT

Contents & paper status

STATUS	Exploratory. The hypothesis is intentionally exposed to competing explanations and falsification.

Editorial discipline: imagery may initiate the question; only mathematics and observation may carry the conclusion.

Executive Summary

Modern cosmology describes an observable universe that evolved from an extremely hot, dense early state approximately 13.8 billion years ago. The Big Bang model is highly successful, but it does not establish that the observable universe is the totality of reality, nor does it demonstrate that the hot early state was an absolute beginning from “nothing.” This green paper asks what changes if the Big Bang is treated instead as a local cosmological formation event within a larger, continuing process.

The proposed working picture is one of cosmological percussion: not a solitary bang, but an ongoing population of domain-forming or domain-transforming events embedded in a higher-order structure. A toroidal or circulation-like geometry is used initially as a heuristic rather than asserted as literal shape. In this picture, an observable universe may represent one domain within a larger recycling system, with formation, expansion, convergence and transduction occurring as phases of a continuing process.

The cosmic microwave background (CMB) is reconsidered in this framework as a possible observational shadow or residue of a transduction regime rather than the transduction regime itself. Standard cosmology explains the CMB as radiation released when the universe became transparent roughly 380,000 years after the hot early phase. The conjecture does not dispute that observation; it asks whether the surface of last scattering might preserve only the electromagnetic consequence of a deeper formation process that ordinary photons cannot directly reveal.

Gravitational information is therefore central. Gravitational waves provide a fundamentally different observational channel from electromagnetic radiation. A primordial gravitational-wave background, if detected and characterised, could probe much earlier physics than the CMB. The speculative extension considered here is whether any gravitational component could contain information not adequately attributable to processes within the conventional causal history of our domain.

JWST's “Little Red Dots” motivate the inquiry but are not treated as evidence for other universes. Current research continues to investigate them as compact high-redshift objects, including active galactic nuclei, dense star-forming systems, super-Eddington accretors and related early black-hole phenomena. Their importance to this paper is methodological: unexpected observations can expose assumptions about how rapidly structure is permitted to emerge, and remind us that interpretation is constrained by the cosmological framework through which observations are translated.

The paper therefore proposes a falsifiable research question: if our observable universe emerged through a transduction event embedded in a larger continuing cosmological process, what correlated signatures should appear in the CMB, primordial gravitational-wave spectrum, large-scale structure, redshift-distance relation, or statistical isotropy that would not naturally arise in ΛCDM or competing cyclic/topological models?

1 PURPOSE AND STATUS OF THE PAPER

A green paper is an invitation to examine a possibility, not a declaration that the possibility is correct. The purpose here is to convert an intuitive cosmological picture into propositions that can be criticised, compared with existing theory and, where possible, tested. The central discipline is that an evocative geometry must not substitute for physics.

Accordingly, four epistemic categories are used throughout: (1) established observation; (2) prevailing interpretation; (3) open scientific question; and (4) conjecture introduced by this paper. The final category is permitted to be imaginative, but it must eventually produce consequences capable of proving it wrong.

2 THE CONCEPTUAL DISPLACEMENT

Human cosmology has repeatedly undergone changes of scale. Earth ceased to occupy the privileged centre; the Solar System became one system among many; the Milky Way became one galaxy among many; and the observable universe is now understood as the causally accessible portion of a potentially much larger reality. This history does not prove that another displacement awaits us, but it makes one question legitimate: is “a universe” itself a cosmological object rather than the highest meaningful unit of organisation?

The conjecture explored here answers provisionally: perhaps. Under that interpretation, what is conventionally called the Big Bang would be our domain's formative transition, not necessarily the unique beginning of all existence.

3 COSMOLOGICAL PERCUSSION

The phrase cosmological percussion denotes an ongoing population of universe-scale formation or transduction events. “Bang” is retained only as historical shorthand. The underlying process need not resemble an explosion and may instead involve budding, pinching, phase transition, collapse, rebound, emergence or some mechanism not represented by familiar macroscopic analogies.

WORKING SEQUENCE

larger process → domain formation/transduction → expansion/evolution → convergence or return → recycling/transduction → further domain formation.

The central departure from a solitary-Big-Bang intuition is therefore temporal and ontological. Creation is replaced by continuing transformation. There need not be one privileged event, and there need not be a privileged scale at which reality finally becomes container rather than contained.

4 TOROIDAL GEOMETRY AS HEURISTIC

A torus is useful here because it provides an intuitive image of circulation without requiring a terminal edge: outward movement in one region can coexist with return elsewhere. However, a drawn doughnut is not a spacetime metric. A physically meaningful model would have to specify dimensionality, topology, causal structure, stress-energy content and the metric governing observers inside the domain.

Non-trivial cosmic topology, including toroidal possibilities, is already a legitimate subject of cosmological research. Searches for repeated or matched patterns in the CMB have constrained compact topologies smaller than or comparable with the observable last-scattering region. Those constraints do not establish the larger recycling geometry proposed here, and a structure lying beyond the observable domain would become progressively harder to test.

5 EXPANSION AND APPARENT ACCELERATION

The conjecture proposes that accelerated expansion might be a local observational consequence of position or phase within a larger circulation rather than evidence for a simple outward trajectory from a unique beginning. This is presently an intuition, not a derivation.

To become physical, the proposal must reproduce the measured expansion history and explain why observers infer positive cosmic acceleration. A toroidal sketch alone does not imply acceleration. A viable theory would need a metric and dynamics from which an effective scale factor a(t) and its acceleration emerge, while also satisfying supernova, baryon acoustic oscillation, CMB and structure-growth constraints at least as well as ΛCDM.

6 THE CMB AS AN OBSERVATIONAL SHADOW

In standard cosmology, the early universe was opaque to electromagnetic radiation. The CMB is the relic radiation observed from the epoch when photons could propagate freely, approximately 380,000 years after the hot early phase. It is therefore already an observational boundary in an important sense: electromagnetic astronomy cannot simply look through it to photograph the earliest moments.

This green paper introduces a more speculative interpretation. The CMB may be investigated as the electromagnetic shadow, residue or projection of a deeper cosmological transduction regime. The claim is not that established recombination physics is wrong. Rather, the observed last-scattering surface may encode the consequences of a process whose full geometry is inaccessible to photons and perhaps inaccessible to the coordinates used by observers within the resulting domain.

This also avoids requiring a literal spatial centre somewhere on our sky. A higher-order “centre” could be central to the embedding geometry without being a location in the three spatial coordinates available to an internal observer. In such a case, every direction could trace backward toward a common formative regime without pointing toward a conventional centre within the observable universe.

7 GRAVITATIONAL RESIDUE: A SECOND INFORMATION CHANNEL

Gravitational waves open a different observational window. Direct detections have established gravitational radiation from compact-object mergers, while pulsar timing arrays have found evidence for a nanohertz gravitational-wave background whose spectrum is broadly compatible with populations of supermassive black-hole binaries, while cosmological alternatives remain subjects of analysis.

The key distinction for this paper is between ordinary astrophysical gravitational radiation, primordial gravitational radiation associated with the early history of our domain, and a hypothetical third category: gravitational information originating in, or transformed by, the larger process that produced the domain itself.

Category	Interpretation	Status
G_local	Black holes, neutron stars and other sources within our cosmic history	Observed
G_primordial	Gravitational background from very early physics of our domain	Sought / constrained
G_external	Residue or transmission from a larger domain-forming process	Conjectural

The decisive question is whether any statistically robust gravitational component could resist attribution to astrophysical populations and conventional early-universe mechanisms while displaying structure predicted independently by a transduction model. Merely finding an unexplained background would not establish cosmological percussion.

8 JWST LITTLE RED DOTS: PROVOCATION, NOT PROOF

JWST has revealed a population of compact, red, high-redshift sources commonly called Little Red Dots. Their physical identity remains an active research subject. Recent work continues to test black-hole, active-galactic-nucleus, dense stellar and super-Eddington interpretations, and time-domain observations have added further constraints. These objects should therefore not be presented as other universes on current evidence.

Their relevance is epistemological. An object is not observed together with its ontology; photons arrive and are translated through models. Redshift, spectral shape, morphology, lensing, variability and other measurements constrain interpretation, but the interpretation remains embedded within a cosmological framework. The Little Red Dots are useful reminders that observations at the frontier can force revisions to assumptions about early structure formation without necessarily overturning the larger cosmological model.

The stronger speculative question is consequently not “are the red dots other universes?” but: if another cosmological domain or transduction event could communicate information into ours at all, what would that information look like after crossing the relevant boundary?

9 TRANSDUCTION

Transduction is used here to mean a change in representational or physical regime through which information, energy or structure survives in altered form. The concept is intentionally broader than ordinary signal conversion. A cosmological transduction boundary would be a regime in which the precursor state and the resulting observable spacetime are not simply the same system viewed at different times.

TRANSDUCTION SCHEMA

$$S_A \rightarrow T \rightarrow S_B$$

An observer confined to state S_B may reconstruct the past using only observables available in S_B. If the transformation T destroys, compresses or remaps information, the observer could mistake the earliest reconstructable state for an absolute beginning. The proposal therefore asks what an observer inside one cosmological recycling product would mistake for evidence of creation ex nihilo.

10 CANDIDATE OBSERVATIONAL SIGNATURES

A useful conjecture must expose itself to failure. Depending on the eventual mathematical form of the model, candidate signatures could include correlations between primordial gravitational structure and CMB anisotropies; statistically significant directional structure incompatible with expected isotropy; repeated or topological correlations

not explained by foregrounds; departures from the standard redshift-distance relation; distinctive gravitational-wave spectral features; or objects whose measured properties cannot be consistently embedded in the available cosmic timeline.

None of these signatures would uniquely establish the proposed model. Each has conventional and competing exotic explanations. The task would be to derive a combination of signatures before looking for them, thereby reducing the risk of retrofitting the conjecture to whatever anomaly happens to appear.

11 WHAT WOULD FALSIFY THE PROPOSAL?

- A mathematically specified circulation/transduction model cannot reproduce the observed near-isotropy and homogeneity of the universe.
- It cannot recover the observed expansion history without arbitrary parameters or conflicts with established distance measurements.
- It predicts CMB correlations, topology or anisotropies that are absent at the required sensitivity.
- It predicts a primordial or external gravitational-wave spectrum inconsistent with increasingly precise observations.
- Its proposed cross-domain information transfer violates causal or conservation requirements without a coherent replacement framework.
- Every claimed distinctive signature is shown to be either impossible under the model or indistinguishable in principle from ΛCDM and competing models, leaving the proposal without empirical content.

12 COMPETING EXPLANATIONS MUST REMAIN STRONG

The conjecture should be compared not with a caricature of standard cosmology but with its strongest form. ΛCDM successfully explains a wide range of observations, including the CMB acoustic structure, primordial element abundances, large-scale structure and the expansion history. Inflationary, bouncing, cyclic, conformal, emergent and non-trivial-topology cosmologies already explore different aspects of beginnings, recurrence and global geometry.

A new model earns attention only if it explains something these frameworks do not, makes a discriminating prediction, reduces unexplained assumptions, or unifies observations that otherwise remain disconnected. Philosophical appeal, recurrence of toroidal forms in nature and dissatisfaction with an absolute beginning are not sufficient evidence.

13 MINIMAL MATHEMATICAL PROGRAMME

The next serious step is not to elaborate the imagery but to strip it down. A minimal model would specify: a higher-order manifold or effective background; a rule for formation of observable domains; a metric experienced by internal observers; a transduction map connecting precursor and domain states; and predicted electromagnetic and gravitational observables.

The first target should be modest: determine whether any simple circulation-like geometry can produce an internal expansion history that an observer would infer as early deceleration followed by late acceleration, without inserting dark-energy behaviour by hand. If it cannot, that version of the idea should be abandoned.

14 RESEARCH QUESTIONS

1. Can a domain embedded in a larger circulation possess no internal spatial centre while still having a meaningful centre in the embedding geometry?
2. Can such a geometry reproduce the observed Hubble expansion and late-time acceleration?
3. Would a transduction boundary naturally generate a nearly thermal CMB and its observed anisotropy spectrum, or does standard recombination physics leave no room for the proposed deeper interpretation?

4. What gravitational information can survive a domain-forming transition, and what spectrum or correlations would it produce?
5. Could any cross-domain signal reach an observer without violating the causal structure of the effective spacetime?
6. What observational feature would uniquely distinguish cosmological percussion from inflation, cyclic/bounce cosmology, non-trivial topology or ordinary astrophysical backgrounds?
7. Does the hypothesis reduce explanatory assumptions, or merely relocate the unknown from the Big Bang to a larger unseen mechanism?

15 WORKING PROPOSITION

WORKING PROPOSITION

Our observable universe may be one domain produced within a larger continuing cosmological process. What is conventionally reconstructed as the Big Bang may represent a transduction event rather than an absolute beginning. The CMB may be the electromagnetic residue or observational shadow of that regime, while primordial gravitational structure may preserve a different class of information about it. If the larger process is recurrent, a population of such events could constitute a cosmological percussion whose existence must ultimately be tested through signatures distinguishable from those predicted by established cosmology.

16 CLOSING PERSPECTIVE

The proposal begins with a historical caution. Human beings repeatedly mistake the boundary of observation for the boundary of reality. Yet the opposite error is equally dangerous: imagining an unseen larger structure simply because observation has a boundary. The appropriate response is neither dismissal nor belief, but translation from intuition into constraint.

The productive question is therefore not whether a toroidal recycling cosmos feels plausible. It is whether a universe formed within such a process would leave evidence that could not have been produced by the universe we already know how to model. Cosmological percussion becomes scientifically interesting only at the point where reality is allowed to say no.

A NOTES ON EVIDENCE AND TERMINOLOGY

- “Big Bang” in contemporary cosmology describes the hot, dense early evolution of the observable universe; it need not be interpreted as an explosion from a spatial point into pre-existing emptiness.
- “Toroidal” is used initially as a heuristic for circulation. A 3-torus in mathematical cosmology is not equivalent to a fluid vortex or a doughnut embedded in ordinary three-dimensional space.
- “Little Red Dots” are an observational class, not evidence of separate universes.
- The nanohertz gravitational-wave background is evidence for a stochastic gravitational-wave signal; its spectrum is broadly compatible with supermassive black-hole binaries, while alternative origins remain under study.
- “Transduction” and “cosmological percussion” are working terms of this paper, not established cosmological terminology.

B SELECTED STARTING REFERENCES

NANOGrav Collaboration (2023), 15-year data set and evidence for a nanohertz gravitational-wave background.

Vaudrevange, Starkman, Cornish & Spergel (2012), constraints on non-trivial cosmic topology using matched circles in the CMB.

Vaida & Farber (2025/2026), review of Little Red Dots and early supermassive black-hole assembly in the JWST era.

Liu et al. (2026), TWINKLE time-domain study reporting a lack of expected variability in a sample of Little Red Dots.

Standard CMB/recombination literature: the surface of last scattering occurs roughly 380,000 years after the hot early phase.

END OF GREEN PAPER • Working Version 0.1 • August 2026