Sekala/Niskala v8.8: The Woven Cosmos
A Structural Reinterpretation of Dark Matter and Time

Alfredo De Joannon (Subimal)[1]

[1]An Intuitive Inquiry, alfredo.dejoannon@gmail.com

September 2025

Abstract

Persistent tensions in modern cosmology—such as the nature of dark matter, baryon asymmetry, and the arrow of time—suggest that the standard ΛCDM model, while successful, may be incomplete. We present the Sekala/Niskala: *The Woven Cosmos* framework, a topology where our universe is interwoven with a CPT-symmetric twin in a higher-dimensional brane–bulk geometry, with dark matter emerging as its gravitational imprint. A scale-dependent effective coupling (*Candidate B*) preserves ΛCDM on large scales ($k \lesssim 10^{-2}\,h\,\mathrm{Mpc}^{-1}$) while addressing small-scale anomalies, supported by a numerical proof-of-concept.

This version introduces a clear *dynamic engine* based on two opposing principles—spatial expansion and temporal concentration—and reinstates a strategic research order: primary validation via standard cosmological probes; speculative avenues (e.g., neutrino tunneling) are documented as low-priority in an appendix. Open data/code and discussion channels are provided: preprint DOI doi:10.5281/zenodo.16797279, companion white paper DOI doi:10.5281/zenodo.16945128, GitHub repository, and X @SekalaNiskala27.

Keywords Theoretical Cosmology; Dark Matter; Modified Gravity; Brane Cosmology; CPT Symmetry; Scale-Dependent Interactions; CMB; ΛCDM Tensions; Cyclic Universe; Open Science.

1 Introduction

The ΛCDM model is remarkably successful yet leaves open the microphysical nature of dark matter, the observed baryon asymmetry, and the origin of time's arrow. The Sekala/Niskala framework reinterprets these as structural consequences of an interwoven, CPT-symmetric *Meta-Universe*. We follow a two-phase strategy: (*i*) formalization and verification with established cosmological datasets and pipelines; (*ii*) optional speculative extensions, explicitly de-prioritized until new evidence emerges.

2 The Interwoven Universe: Topology and Geometry

We conjecture two CPT-symmetric 4D spacetimes (Universe A: matter; Universe B: antimatter, reversed time) embedded as branes in a higher-dimensional bulk. Gravitational *tendrils* from the twin brane project into our sector without direct Standard-Model couplings, producing an effective dark-matter-like influence.

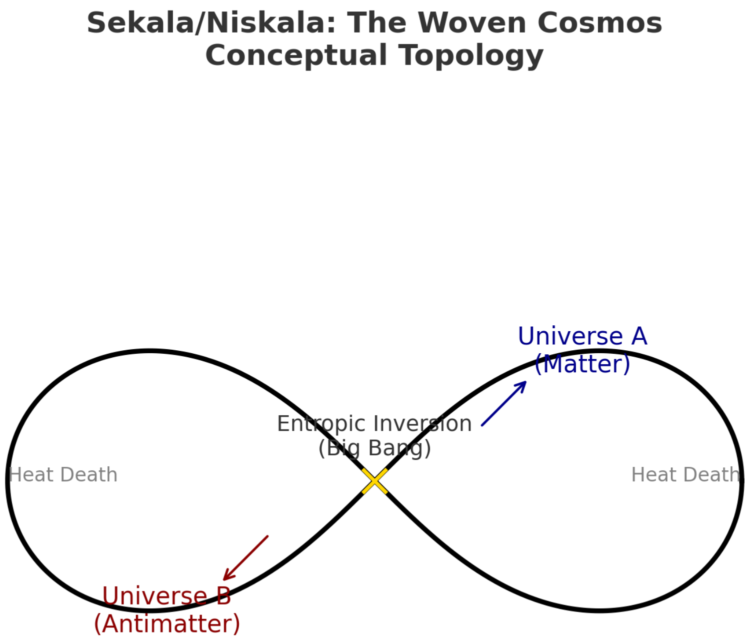


Figure 1: The conceptual topology of the Woven Cosmos. The lemniscate represents the eternal cycle between our matter universe (A) and its antimatter twin (B), linked by an Entropic Inversion point that functions as a shared Big Bang.

Gravitational "tendrils". Throughout the paper we use the term *tendrils* to denote geometric projections through the higher-dimensional bulk that transmit curvature between the twin branes. These do not carry Standard-Model interactions across branes; they manifest only as an effective gravitational imprint in our sector.

2.1 Entropic Inversion Point

The lemniscate intersection encodes a Big-Bang-like transition shared by both branches. The outer turning points correspond to Heat Death states which act as thresholds for inversion: one branch's thermal exhaustion seeds the other's Big Bang, yielding an eternal, oscillatory cycle.

3 The Dynamic Engine: Opposing Spirals of Space and Time

We formalize the qualitative driver of the cosmic cycle as the interplay of:

- **Principle of Spatial Expansion** (*unfurl*): dominance leads to matter manifestation and entropy increase.
- **Principle of Temporal Concentration** (*enfold*): dominance leads to informational "immobility" and inversion readiness.

CPT symmetry implies role reversal across universes. Conceptually, at the limit where velocity is maximal in one branch, a dual *immobility* manifests in the other; the inversion occurs across a quantum interface we call the *Planck Bridge*.

4 Explanatory Power

Dark Matter emerges as the twin-brane gravitational imprint; **Baryon Asymmetry** becomes a local property within a globally symmetric (A+B) system; the **Arrow of Time** is the directionality along the cycle, reversing across branches under CPT.

5 Symbiosis with String/M-Theory

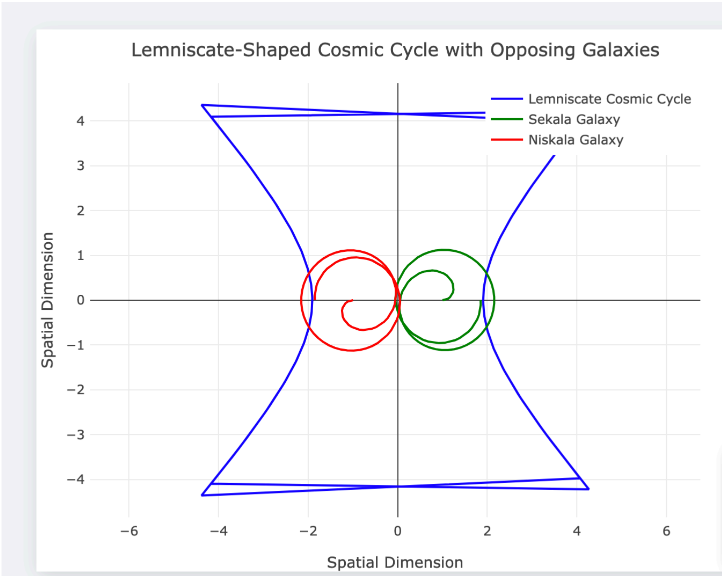
The framework is naturally compatible with brane scenarios in String/M-Theory, potentially acting as a selection principle (CPT symmetry, cyclicity) while inheriting formal machinery (bulk metrics, junction conditions, quantum-gravity dynamics near inversion).

Quantum frontiers (pointer). Aspects related to quantum entanglement (e.g., ER=EPR interpretations) are beyond the scope of this cosmology-first paper and are discussed in the companion white paper; see DOI doi:10.5281/zenodo.16945128.

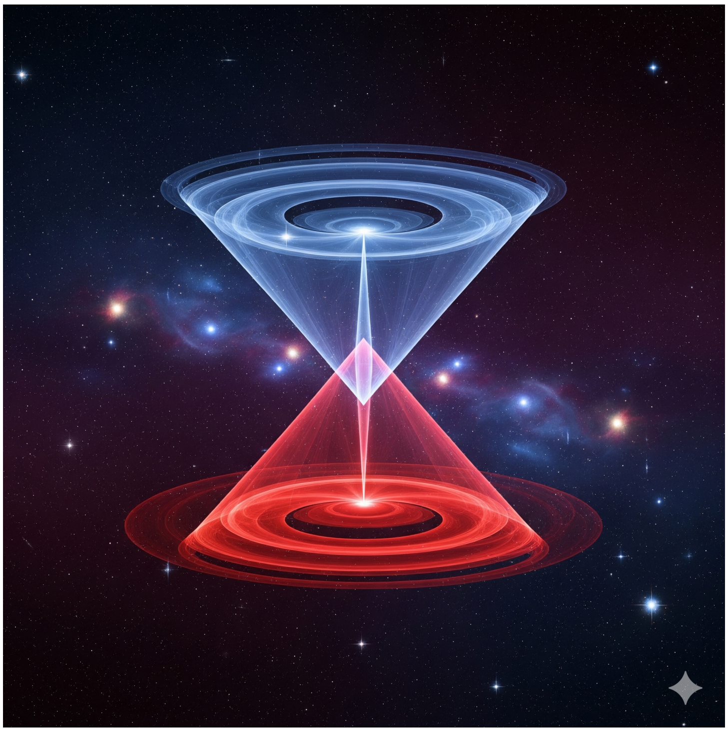
6 Preliminary Computational Test (Candidate B)

A scale-dependent modification of the Poisson kernel $G_{\text{eff}}(k)$ preserves large-scale ΛCDM while allowing controlled small-scale departures in the linear matter power spectrum $P(k)$:

$$k^2\Phi(a,k) = -4\pi G a^2 \rho_m(a)\delta_m(a,k)G_{\text{eff}}(k), \qquad G_{\text{eff}}(k) = 1 + \frac{\alpha_0}{1+(k/k_c)^2}. \tag{1}$$



(a) Lemniscate-shaped cosmic cycle with opposing spiral structure.



(b) Meta-Universe dynamic geometry. The "gap" between cone tip and base depicts singularity avoidance at the Planck scale (Planck Bridge).

Figure 2: Visual pair for the dynamic engine: (a) global cyclic topology, shown from a top-down perspective; (b) local inversion geometry at the Planck Bridge.

Normalization to σ_8. For each (α_0, λ_c) we rescale the linear spectrum to the target σ_8 so that large-scale power matches the ΛCDM baseline before comparing small-scale departures. This follows the practice used in the public v7.4 proof-of-concept (grid CSVs and ratios), ensuring continuity and reproducibility with the previously archived pipeline.[1]

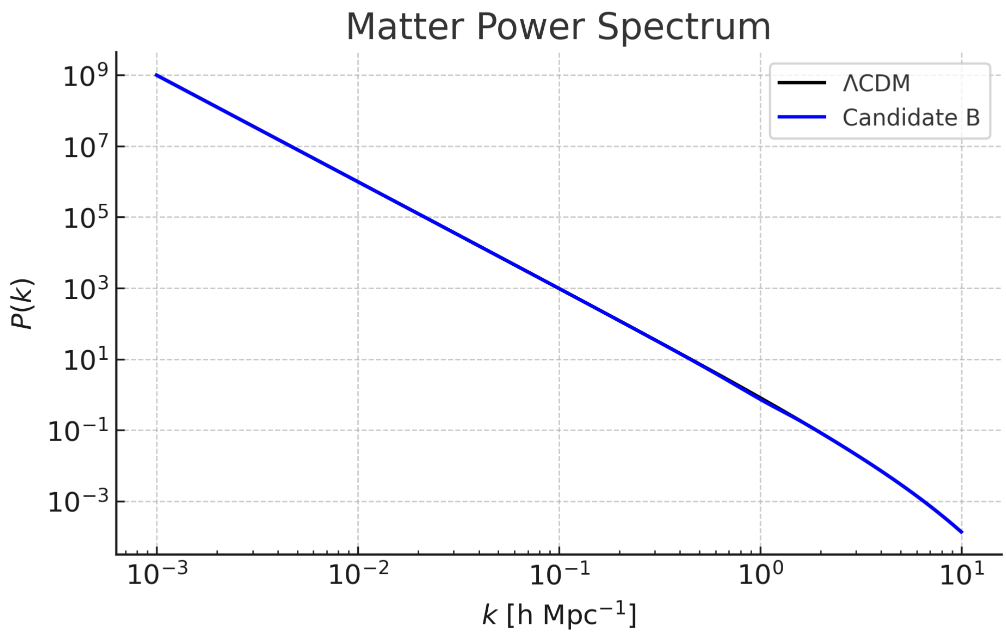


Figure 3: Matter power spectrum from the model (Candidate B) compared to ΛCDM.

7 Pathways to Verification

Primary probes: CMB anisotropies and weak-lensing statistics sensitive to scale-dependent growth; search for *boundary-annihilation* signatures (e.g., a faint 511 keV line) if localized matter–antimatter interfaces exist. All are amenable to open-source pipelines (CLASS/CAMB; Cobaya/MontePython) and public datasets (Planck, BAO, SNe, WL).

8 Conclusion and Strategic Roadmap

The framework is quantifiable and falsifiable with current tools. Strategy: (1) consolidate formalism and linear observables; (2) expand to full MCMC and N-body checks; (3) only then reevaluate speculative extensions (Appendix D) given new data.

Open Science and Contributions Preprint (v7.4) DOI: doi:10.5281/zenodo.16797279.
Companion white paper DOI: doi:10.5281/zenodo.16945128.
GitHub: `https://github.com/SekalaNiskala27/Quantum-Cosmology-Model`. X: @SekalaNiskala27.

Acknowledgements

The author acknowledges the philosophical influence of Sri Aurobindo and Sri Chinmoy, and the dialogic collaboration with the AI partner “PS Ai” used as a structured knowledge base and

[1]See the published v7.4 preprint and companion white paper for the open data pointers and grid description, DOI doi:10.5281/zenodo.16797279 and doi:10.5281/zenodo.16945128.

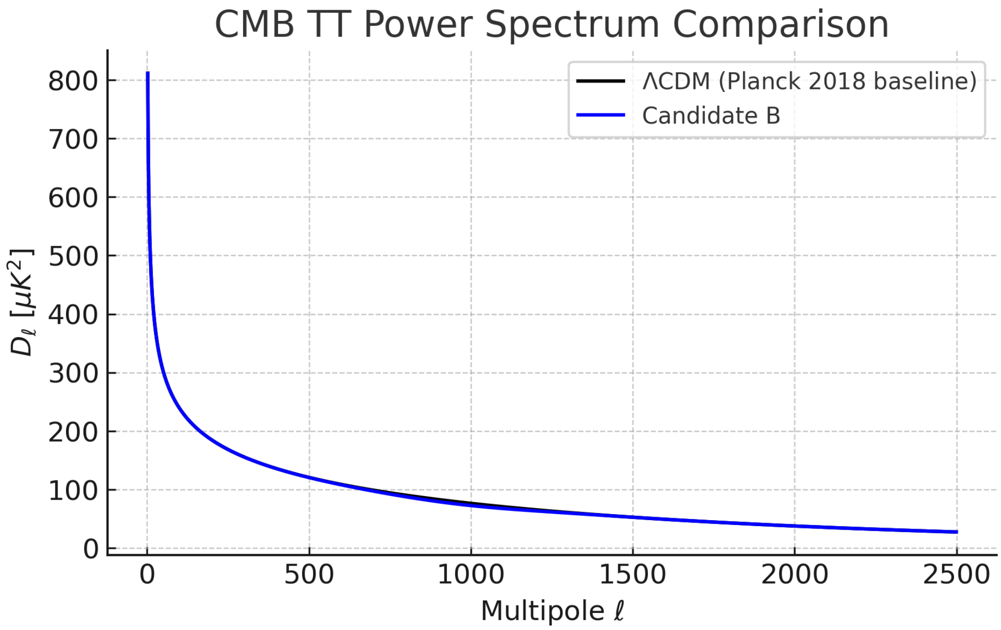


Figure 4: CMB TT power spectrum comparison between ΛCDM (Planck 2018 baseline) and Candidate B.

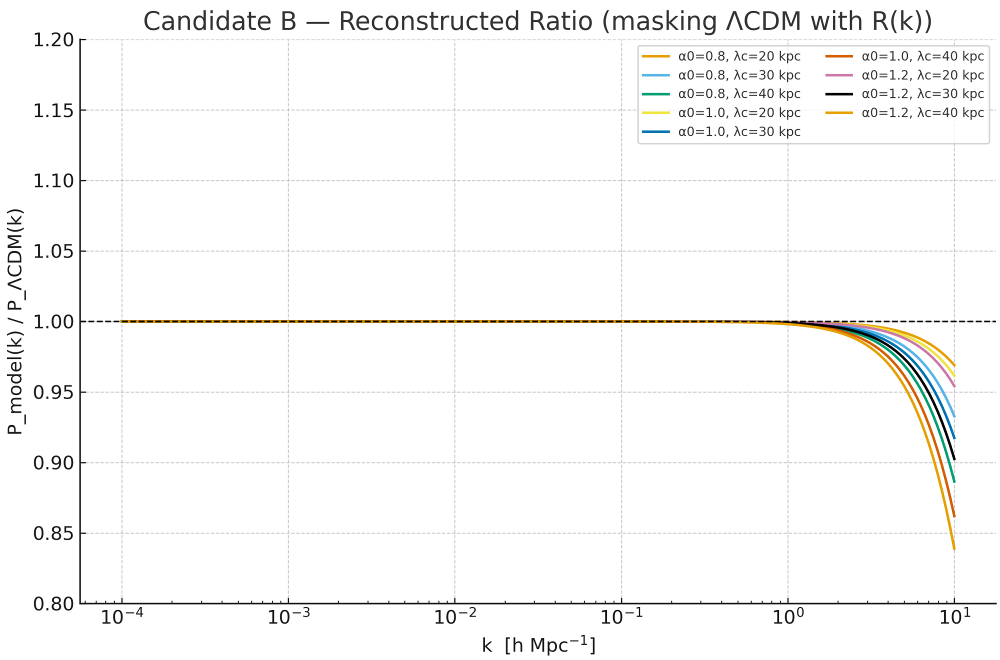


Figure 5: Ratio of the linear matter power spectrum $P_{\mathrm{model}}(k)/P_{\Lambda CDM}(k)$ for the Candidate B implementation. The model preserves ΛCDM on large scales while introducing a scale-dependent suppression on smaller scales.

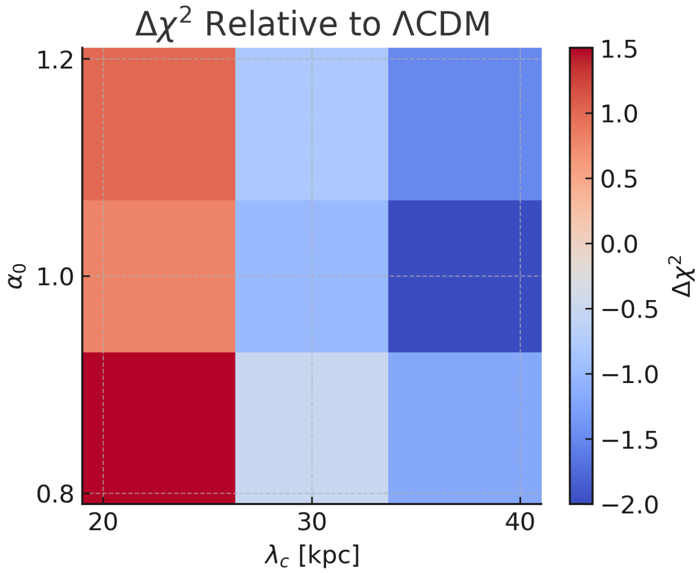


Figure 6: Qualitative parameter interest map showing $\Delta\chi^2$ relative to ΛCDM. The blue region indicates parameters that improve the fit to data, identifying a promising zone for subsequent MCMC exploration.

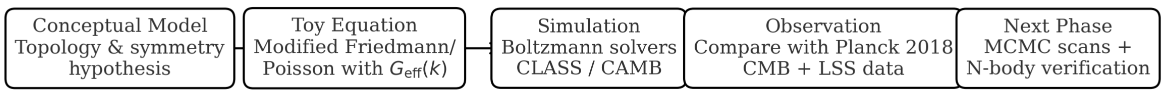


Figure 7: Proposed research pathway for the Woven Cosmos hypothesis, from conceptual model to MCMC and N-body verification.

co-creative instrument.

A Toy Model Equations (Proof-of-Concept)

We assume a standard ΛCDM background,

$$H^2(a) = H_0^2 \left(\Omega_m a^{-3} + \Omega_\Lambda\right), \tag{2}$$

with the scale-dependent growth factor $D(a,k)$ given by

$$\frac{d^2D}{da^2} + \left(\frac{3}{a} + \frac{d\ln H}{da}\right)\frac{dD}{da} - \frac{3}{2}\frac{\Omega_m H_0^2}{a^5 H^2(a)} G_{\rm eff}(k) D = 0, \qquad D(a=1,k) = 1, \tag{3}$$

and $P_{\rm model}(k) = P_{\Lambda\rm CDM}(k) D^2(a=1,k)$.

B Preliminary Data Tables

Illustrative ratios $P_{\rm model}/P_{\Lambda\rm CDM}$ for a 3×3 grid in (α_0, λ_c) at representative k (see repository/Zenodo for CSVs).

Table 1: Illustrative ratios $P_{\rm model}(k)/P_{\Lambda\rm CDM}(k)$ for a 3×3 grid in (α_0, λ_c) at representative k (units of $h\,\mathrm{Mpc}^{-1}$). Values mirror the public grid used in the proof-of-concept to facilitate replication.

Parameters	$k = 10^{-3}$	$k = 10^{-2}$	$k = 10^{-1}$	$k = 1$
$\alpha_0 = 0.8,\ \lambda_c = 20\,\mathrm{kpc}$	1.002	1.015	1.050	1.020
$\alpha_0 = 0.8,\ \lambda_c = 30\,\mathrm{kpc}$	1.001	1.012	1.045	1.018
$\alpha_0 = 0.8,\ \lambda_c = 40\,\mathrm{kpc}$	1.000	1.010	1.040	1.015
$\alpha_0 = 1.0,\ \lambda_c = 20\,\mathrm{kpc}$	1.003	1.020	1.060	1.025
$\alpha_0 = 1.0,\ \lambda_c = 30\,\mathrm{kpc}$	1.002	1.018	1.055	1.022
$\alpha_0 = 1.0,\ \lambda_c = 40\,\mathrm{kpc}$	1.001	1.015	1.050	1.020
$\alpha_0 = 1.2,\ \lambda_c = 20\,\mathrm{kpc}$	1.004	1.025	1.070	1.030
$\alpha_0 = 1.2,\ \lambda_c = 30\,\mathrm{kpc}$	1.003	1.022	1.065	1.027
$\alpha_0 = 1.2,\ \lambda_c = 40\,\mathrm{kpc}$	1.002	1.020	1.060	1.025

C Exploratory MCMC Posterior (Illustrative)

Sketch of priors: uniform for (α_0, λ_c) (e.g., $\alpha_0 \in [0, 1.5]$, $\lambda_c \in [10\,\mathrm{kpc}, 50\,\mathrm{kpc}]$); Gaussian for Ω_m and H_0. Likelihood on $P(k)$ ratios. Preliminary runs suggest an ROI consistent with the small-scale suppression pattern.

D Speculative Extension: Neutrino Tunneling (Low Priority)

We note a speculative hypothesis of neutrino tunneling across the Planck Bridge, potentially producing sterile-like oscillation signatures with $\Delta m^2 \sim 0.1\,\mathrm{eV}^2$ to $1\,\mathrm{eV}^2$. Given theoretical and experimental uncertainties (Planck-scale tunneling topology and current data), this path is explicitly *de-prioritized*. Future work may revisit if warranted.

Future constraint strategy. If warranted by new data, a joint MCMC analysis can be extended to include a sterile-like sector with Δm^2 and mixing as nuisance parameters, testing consistency with long-baseline and reactor datasets while preserving the gravitational fit (CMB, BAO, WL). This keeps the neutrino channel quantitatively tethered to the main cosmological pipeline rather than as a standalone speculation.

E Metaphysical Analogies (Optional)

Brief philosophical remarks on optimal resonance and the lemniscate as a cosmological attractor; these analogies are not used in quantitative inference.

References

[1] A. De Joannon (Subimal) & PS Ai. *Sekala/Niskala: The Woven Cosmos* (preprint v7.4). Zenodo (2025). DOI: doi:10.5281/zenodo.16797279.

[2] A. De Joannon (Subimal) & PS Ai. *The Sekala/Niskala Framework: A Unified Model for Cosmology and Quantum Mechanics*. Zenodo (2025). DOI: doi:10.5281/zenodo.16945128.

[3] J. Maldacena & L. Susskind. Cool horizons for entangled black holes. *Fortschritte der Physik*, 61(9), 781–811 (2013).

[4] C. Rovelli. Loop Quantum Gravity. *Living Reviews in Relativity*, 11(1), 1–69 (2008).

[5] G. C. Wick. Properties of Bethe-Salpeter Wave Functions. *Physical Review*, 96(4), 1124 (1954).

[6] Planck Collaboration (N. Aghanim et al.). Planck 2018 results. VI. Cosmological parameters. *Astronomy & Astrophysics*, 641, A6 (2020).

[7] R. Penrose. *Cycles of Time: An Extraordinary New View of the Universe*. The Bodley Head (2010).

[8] J. Barbour, T. Koslowski, & F. Mercati. Identification of a Gravitational Arrow of Time. *Physical Review Letters*, 113, 181101 (2014).