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Research Article

A RESHAPE OF THE LIGHT-PERCEPTION HYPOTHESIS AND THE SPEED OF LIGHT: A MATHEMATICAL REFORMULATION OF THE UNIVERSE LIGHT-PERCEPTION HYPOTHESIS AND THE COSMO CONSTANT

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Abstract

Recent measurements of cosmic distances and the Hubble constant reveal a persistent discrepancy between conventional distance-ladder estimates and newer observations from the James Webb Space Telescope (JWST). In other words, the inferred value of the Hubble constant, and thus our understanding of the cosmic distance scale, may differ from previously accepted values, suggesting that aspects of our cosmological knowledge require revision. So, this research aims to interpret these tensions as a conceptual bridge that connects the estimation of the constant with the scale of the cosmological mechanism. In-addition, this paper aims to analyse this tension and propose an interpretation that reconciles these results within a coherent cosmological framework. We consider a phenomenological model in which the inferred cosmological scale depends on the state of the constant scale under the measurement.

Keywords: Hubble tension, Cosmic distance scale, Observable universe, Speed of light, Wave–particle duality, Light-perception hypothesis, Measurement dependence, State-dependent light propagation, Cosmological expansion, Cosmic diameter, Layered universe model, Observational cosmology, Effective wavelength, Dark energy, Phenomenological cosmological model.

INTRODUCTION

Preliminaries

Let $\mathcal{U}$ denote the observable universe. We distinguish two empirical scales associated with cosmological observation:

$$D_1 \approx 13.8 \times 10^9$$

Here D_1 is the scale commonly associated with the age-based inference from the Big Bang model, while D_2 is the larger scale inferred from more recent astronomical observations. The ratio is

$$\frac{D_2}{D_1} \approx \frac{93.4}{13.8} \approx 6.77.$$

Thus, the two observational scales differ by a factor of approximately 6.77, which indicates a nontrivial discrepancy between distinct measurement regimes.

Therefore, we set 6.77/2 as the new constant of the Cosmo Expansion Constant. (In assuming the cone shape model and putting into the sphere of Cosmo [r] as the new constant diff. hypothesis).

Cosmo New Constant Hypothesis

So, our new observational hypothesis is Constant U Expansion = 6.77/2

Our paper hypothesizes and interprets this expansion constant as possibly arising from variability in "light behavior" stemming from the proton's duality.

Let L denote light, and let M denote a measurement apparatus. We postulate that the observational outcome depends not only on the intrinsic properties of L, but also on the interaction between L and M. In particular, we introduce two effective states:

$$L \in \{L_{\text{wave}}, L_{\text{particle}}\}.$$

Ournew hypothesis is that the act of measurement induces a state transition:

$$L_{\text{wave}} \longrightarrow L_{\text{particle}} \text{or } L_{\text{particle}} \longrightarrow L_{\text{wave}},$$

depending on whether the light "detects" the measurement configuration. Although this notion is not part of standard formulation in classical optics or quantum mechanics, it serves here as a phenomenological assumption for explaining the observed discrepancy (Appendix 1).

We therefore define an effective diameter function

$$D = D(\sigma, M),$$

where σ denotes the state of light. If $\sigma = L_{\text{particle}}$, then the inferred scale is D_1; if $\sigma = L_{\text{wave}}$, then the inferred scale is D_2.

Particle–Wave Distinction Hypothesis

Let λ be the effective wavelength of light. Under the proposed model, the apparent cosmological scale is positively correlated with λ. More precisely, if

$$\lambda_{\text{wave}} > \lambda_{\text{particle}},$$

then

$$D(\lambda_{\text{wave}}) > D(\lambda_{\text{particle}}).$$

Hence, the larger observed diameter D_2 may be interpreted as arising from a wave-dominated regime, whereas the smaller diameter D_1 may correspond to a particle-dominated regime. In this sense, the observed universe is not assigned a unique geometric scale independent of measurement context; rather, its inferred size depends on the state in which light is registered. (Appendix 1).

Measurement Dependence

Let $x \in \mathcal{U}$ denote a point in the observable universe, and let $T(x)$ denote the light travel time from x to the observer on Earth. Since distance is inferred through time-of-flight measurements, one may write

$$d(x) = cT(x),$$

where c is the speed of light in vacuum. Under the standard interpretation, c is constant. However, the present hypothesis suggests that the effective propagation of light may depend on the observational layer of the universe.

Accordingly, we introduce a family of effective speeds

$$c_1, c_2, \dots, c_n,$$

where each c_i is constant within a corresponding spatial level or observational domain. This gives the formal possibility that a single universe may contain multiple effective regimes, each with its own invariant light speed.

Multi-Level Universe Model

Let the universe be decomposed into layers

$$\mathcal{U} = \bigcup_{i=1}^{n} \mathcal{U}_i, \mathcal{U}_i \cap \mathcal{U}_j = \emptyset \ (i \neq j).$$

On each layer $\mathcal{U}_i$, light propagates with constant speed c_i. Then the observed diameter may be expressed as

$$D_i = c_i T_i,$$

for some observational time scale T_i. The empirical fact that $D_1 \neq D_2$ implies that at least one of the following holds:

1. $T_1 \neq T_2$,
2. $c_1 \neq c_2$,
3. The measurement process itself changes the effective state of light.

The present article adopts the third interpretation, while allowing the first two as compatible structural consequences. Therefore, the discrepancy in observed cosmic diameter is taken as evidence for layered structure in the universe and for state-dependent propagation of light.

Reinterpretation of the Age–Diameter Relation

The quantity 13.8 billion light-years is often interpreted as the cosmological age of the universe converted into a distance scale via the finite speed of light. In the present framework, this is reformulated as follows.

Let t_0 be the age of the universe. Then the characteristic light-travel scale is:

$$D_1 = ct_{\mathrm{i}0}$$

Thus, the age of the universe and its observable radius become mathematically linked through the same propagation law. Consequently, the value 13.8 billion light-years may be interpreted not merely as a temporal estimate, but also as an effective spatial scale derived from light propagation.
So,

$$D_2 = cL * t_{\mathrm{i}0}$$

cL refers to c, the constant speed of light in layer form
ti refers to the time of the imaginary number

Main Proposition

We now state the core proposition in formal terms.

Proposition

The observed difference between $D_1 \approx 13.8 \times 10^9$ ly and $D_2 \approx 93.4 \times 10^9$ ly can be modeled by a state-dependent light process in which the effective wavelength and propagation regime of light depend on the measurement configuration. Equivalently,

$$D = F(\text{state of light, measurement setup,universal layer}),$$

for some function F, and the observed diameter is not a fixed scalar independent of observation.

Interpretation

Under this hypothesis, the universe appears smaller when light is treated in a particle-like regime and larger when it is treated in a wave-like regime. The enlargement is not necessarily caused by physical expansion of space itself; rather, it may arise from the change in the effective wavelength of light under different observational conditions. In this sense, the measured geometry may descried as a observer-dependent, additionally, the difference between the two inferred universal scales is not interpreted here as a contradiction, but as a consequence of distinct measurement regimes. If light transitions between wave-like and particle-like states depending on the observational context, then the measured diameter of the universe becomes a function of that context. Therefore, the universe may not admit a single invariant observational scale; instead, its apparent size may vary across layers and measurement configurations.

Hence, the discrepancy between the two diameters is taken to support two conjectures:

- $\mathcal{U}$ has multiple observational levels,
- L possesses a sensing mechanism that affects its measured state.

These conjectures provide a unified explanation and the expansion Cosmo constant diff.[U] for the two empirical values of cosmic diameter.

So, our new cosmos-model formula hypothesis is:

$$\frac{4}{3}\pi\rho\left(\frac{c}{U}\right)^3$$

$\boldsymbol{c}$ refers to the constant c of the speed of lights
$\boldsymbol{U}$refers to the new cosmos diff-constant due to D2/D1
$\boldsymbol{\rho}$ refers tothe momentum of the cosmos (dark energy)

Conclusion

Although, we know that, in standard cosmology, 13.8 billion years refers approximately to the age of the universe, whereas about 93 billion light-years refers to the present-day comoving diameter of the observable universe. These quantities represent distinct aspects of the Cosmo system.

In summary, our new mathematical framework proposed here written compactly as

$$D = F(\sigma, M, \mathcal{U}_i),$$

where D is the observed cosmic diameter, σ is the state of light, M is the measurement apparatus, and $\mathcal{U}_i$ denotes the spatial layer of the universe. This formulation captures the mechanism behind the sense of the Cosmo dimension.

So, our new cosmos model formula hypothesis is

$$\frac{4}{3}\pi\rho\left(\frac{c}{U}\right)^3$$

The difference between the two inferred universal scales is not interpreted here as a contradiction, but as a consequence of distinct measurement regimes. Therefore, the universe may not admit a single invariant observational scale; instead, its apparent size may vary across layers and measurement configurations. In addition, Recent measurements of cosmic distances and the Hubble constant (H_0) reveal a persistent tension between conventional distance-ladder estimates and newer James Webb Space Telescope (JWST) observations, implying that the inferred value of $H_0$and hence our calibration of the cosmic distance scale, may differ from previously accepted values. This discrepancy signals that elements of current cosmological framework require revision.

Accordingly, this study interprets the U constant tension, is not merely as an observational anomaly but as a conceptual bridge linking the estimation of the constant to the underlying scale of cosmological dynamics. We analyse the origins of this tension across distance indicators and early- versus late-universe probes, and we propose an interpretation that reconciles these results within a coherent cosmological framework. Specifically, we consider a phenomenological model in which the inferred cosmological scale depends on the state of the expansion constant scale under measurement, thereby offering a pathway to align local and global determinations of $new\ H_0\ which\ is\ U$. Hope my research paper can contribute to the world and society.

References

1. Brout, D., Scolnic, D., Popovic, B., Riess, A. G., Zuntz, J., Kessler, R., Hinton, S. R. (2022). The Pantheon+ analysis: Cosmological constraints. *The Astrophysical Journal, 938*(2), Article 110. https://doi.org/10.3847/1538-4357/ac8e04
2. Einstein, A. (1905). Übereinen die Erzeugung und Verwandlung des Lichtesbetreffendenheuristischen Gesichtspunkt [On a heuristic point of view concerning the production and transformation of light]. *Annalen der Physik, 17*(6), 132–148. https://doi.org/10.1002/andp. 19051770607
3. Einstein, A. (1916). Die Grundlage der allgemeinen Relativitätstheorie [The foundation of the general theory of relativity]. *Annalen der Physik, 49*(7), 769–822. https://doi.org/10.1002/andp.19163540702
4. Freedman, W. L. (2021). Measurements of the Hubble constant: Tensions in perspective. *The Astrophysical Journal, 919*(1), Article 16. https://doi.org/10.3847/1538-4357/ac0e95
5. Hubble, E. (1929). A relation between distance and radial velocity among extra-galactic nebulae. *Proceedings of the National Academy of Sciences, 15*(3), 168–173. https://doi.org/10.1073/pnas.15.3.168
6. Planck Collaboration. (2020). Planck 2018 results. VI. Cosmological parameters. *Astronomy & Astrophysics, 641*, Article A6. https://doi.org/10.1051/0004-6361/201833910
7. Riess, A. G., Casertano, S., Yuan, W., Macri, L. M., Scolnic, D., Brout, D., Jones, D. O., Murakami, Y., Anand, G. S., Breuval, L., Breuval, L., Campanelli, M., Freedman, W. L., Hoffmann, S., Jha, S. W., Kenworthy, W. D., Riess, A. G., & other collaborators. (2022). A comprehensive measurement of the local value of the Hubble constant with 1 km s^{-1} Mpc^{-1} uncertainty from the Hubble Space Telescope and the SH0ES team. *The Astrophysical Journal Letters, 934*(1), Article L7. https://doi.org/10.3847/2041-8213/ac5c5b
8. Perlmutter, S., Aldering, G., Goldhaber, G., Knop, R. A., Nugent, P., Castro, P. G., Deustua, S., Fabbro, S., Goobar, A., Groom, D. E., Hook, I. M., Kim, A. G., Kim, M. Y., Lee, J. C., Nunes, N. J., Pain, R., Pennypacker, C. R., Quimby, R., Lidman, C., … Project, T. S. C. (1999). Measurements of Ω and Λ from 42 high-redshift supernovae. *The Astrophysical Journal, 517*(2), 565–586. https://doi.org/10.1086/307221
9. Bohr, N. (1928). The quantum postulate and the recent development of atomic theory. *Nature, 121*, 580–590. https://doi.org/10.1038/121580a0
10. Aspect, A., Grangier, P., & Roger, G. (1982). Experimental realization of Einstein–Podolsky–Rosen–Bohm Gedankenexperiment: A new violation of Bell's inequalities. *Physical Review Letters, 49*(2), 91–94. https://doi.org/10.1103/PhysRevLett.49.91

Appendix 1:

Let D denote the observed diameter of the universe, c the speed of light in vacuum, and λ the effective wavelength associated with the observational regime. We postulate that the interaction between light and measurement apparatus induces a state transition between wave-like and particle-like descriptions, and that such a transition modifies the inferred scale of the universe. We formalize this idea using definitions, lemmas, and propositions.

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