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Peer Review

Review of: "Dirac’s Large Number Hypothesis: An Ongoing Quest for Correlations Between the Infinitesimal and the Infinite"

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In this review paper, the authors summarized several important physical implications related to Dirac's Large Number Hypothesis. It is an interesting topic to cover, and the writing is articulate. Although, as an academic paper, I found it generally lacking quantitative and deductive arguments, it can still be a good lead to literature for whoever is interested in the topic.

Here come some constructive comments that the authors could use or ignore in the next iteration of their manuscript.

1. The second paragraph of the introduction section, which states the most important LNH discussed throughout the paper, could use some highlights so that readers can go back to it any time.
2. “Fundamentally, the hypothesis disallows models proposing a universe that expands to a maximum size and subsequently contracts, as such models would entail a cosmological constant that remains independent of the universe's age.” I doubt if this outdated statement from Dirac is still true. In principle, I do not see an absolute contradiction between a varying cosmological constant and a positive curvature (expanding then contracting) universe, even expressed in FLRW metric notation.
3. The strongest counterargument for equation (3) would be the nice fitting to LCDM of the CMB anisotropy spectrum. The acoustic oscillation sound wave wavelength of the cosmic plasma before recombination is strongly related to the expansion history in the early universe, and any altering of LCDM's prediction will spoil the tight constraint that Planck put on \theta_a, the

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acoustic oscillation angle we found from the CMB anisotropic temperature map. The suggestion is either to mention and admit this defect of the theory or to propose an alternative ansatz that effectively resembles the LCDM case in this epoch (z>1100).

4. Evolving G has been strongly constrained by large-scale structure. There is always space for variation, but quantitatively not much, I suppose.
5. If there can be an explanatory section showing how LNH results in the implications from sections 4 to 6, that would be nice. I found it rather confusing how to start from LNH and reach those intriguing phenomenology in the current presentation.

Declarations

Potential competing interests: No potential competing interests to declare.