Functional Analysis, Mathematical Physics, and Dynamical Systems

(FAMPDS)

American-Ukrainian Virtual Colloquium Series Jointly with Seminar of the Institute for Advanced Physical Studies, Bulgaria
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Talk 5: *Revisiting the Cosmological Constant Problem within Quantum Cosmology*

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Abstract

A new perspective on the Cosmological Constant Problem (CCP) is proposed and discussed within the multiverse approach of Quantum Cosmology. It is assumed that each member of the ensemble of universes has a characteristic scale $\mathbf{a}$ that can be used as integration variable in the partition function. An averaged characteristic scale of the ensemble is estimated by using only members that satisfy the Einstein field equations. The averaged characteristic scale is compatible with the Planck length when considering an ensemble of solutions to the Einstein field equations with an effective cosmological constant. The multiverse ensemble is split in Planck-seed universes with vacuum energy density of order one; thus, $\tilde{\Lambda}\approx 8\pi$ in Planck units and $\mathbf{a}$-derivable universes. For $\mathbf{a}$-derivable universe with a characteristic scale of the order of the observed Universe $\mathbf{a}\approx 8\times 10^{60}$, the cosmological constant $\Lambda=\tilde{\Lambda}/\mathbf{a}^2$ is in the range $10^{-121}-10^{-122}$, which is close in magnitude to the observed value 10^{-123}. We point out that the smallness of Λ can be viewed to be natural if its value is associated with the entropy of the Universe. This approach to the CCP reconciles the Planck-scale huge vacuum energy-density predicted by QFT considerations, as valid for Planck-seed universes, with the observed small value of the cosmological constant as relevant to an $\mathbf{a}$-derivable universe as observed.

Friday, April 9, 9:00-10:00 AM (PDT), 19:00-20:00 (EET)
Online via Zoom at
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