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Challenging the Cosmological Constant

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We outline a dynamical dark energy scenario whose signatures may be simultaneously tested by astronomical observations and laboratory experiments. The dark energy is a field with slightly sub-gravitational couplings to matter, a logarithmic self-interaction potential with a scale tuned to $\sim 10^{-3}$ eV, as is usual in quintessence models, and an effective mass m_ϕ influenced by the environmental energy density. Its forces may be suppressed just below the current bounds by the chameleon-like mimicry, whereby only outer layers of mass distributions, of thickness $1/m_\phi$, give off appreciable long range forces. We discuss its cosmological evolution and consequences. Among the signatures of this scenario may be dark energy equation of state $w \neq -1$, stronger gravity in dilute mediums, that may influence BBN and appear as an excess of dark matter, and sub-millimeter corrections to Newton's law, close to the present laboratory limits.

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