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Quantum vacuum, a cosmic chamaleon

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An universe with a Cosmological Constant has been the reigning paradigm in the last decades. However, the Cosmological Principle opens a window to the possibility of having a dynamical Vacuum Energy density, $\rho_{\rm vac}(t)$. In this talk we will summarize our results on the renormalization of the vacuum energy in the context of quantum field theory (QFT). The quantum scaling with the renormalization point turns into cosmic evolution as a series of powers of the Hubble parameter, $\rho_{\rm vac}(H)$. The resulting running is free from undesired large contributions coming from particle masses, $\sim m^4$. At low energies it also consists of an additive term plus a small dynamical component $\sim \nu H^2$, ($|\nu| \ll 1$), characteristic of the Running Vacuum Models. Higher powers may be relevant in the early universe, and could naturally drive a possible mechanism for inflation. We elucidate new features of the running vacuum energy with many interesting consequences from the phenomenological point of view, in particular their possible implications for the current σ_8 and H_0 tensions of modern cosmology.

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