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Planck Scale Cosmology and Asymptotic Safety in Resummed Quantum Gravity

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In Weinberg's asymptotic safety approach to quantum gravity, one has a finite dimensional critical surface for a UV stable fixed point to generate a theory of quantum gravity with a finite number of physical parameters. The task is to demonstrate how this fixed point behavior actually arises. We argue that, in a recently formulated extension of Feynman's original formulation of the theory, which we have called resummed quantum gravity, we recover this fixed-point UV behavior from an exact re-arrangement of the respective perturbative series. We argue that the results we obtain are consistent both with the exact field space Wilsonian renormalization group results of Reuter and Bonanno and with recent Hopf-algebraic Dyson-Schwinger renormalization theory results of Kreimer. We calculate the first "first principles" predictions of the respective dimensionless gravitational and cosmological constants and argue that they support the Planck scale cosmology advocated by Bonanno and Reuter as well. Comments on the prospects for actually predicting the currently observed value of the cosmological constant are also given.

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