Probing quantum gravity at all scales

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What is the fundamental quantum structure of spacetime? This question constitutes a persistent challenge in physics and several candidate theories of quantum gravity have been developed in response to this challenge. However, experimental tests of these theories are extremely rare, because the typical scale of quantum gravity, the Planck scale, is much smaller than distance scales that can be probed experimentally.

To confront quantum theories of gravity with observations, we therefore require ``lever arms'' which translate predictions of quantum gravity at the Planck scale into testable predictions at much larger scales.

In this talk, I will introduce asymptotically safe quantum gravity as an example for which such a lever arm exists, which is the Renormalization Group flow of couplings - a ``microscope'' for quantum field theories, which enables us to translate Planck-scale predictions to testable predictions, for instance for properties of elementary particles in the Standard Model and beyond, for example for dark matter.