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Free-falling in Quantum Spacetime

Wednesday 6 December 2023 11:15 (45 minutes)

Gravity is usually regarded classically, obeying Newton's law or Einstein's equations. Here I will show that, when the gravitational field is treated quantum-mechanically, the classical trajectories of freely falling objects are subject to random fluctuations, or "noise". Intuitively, the fluctuations can be viewed as arising due to the bombardment of the falling object by gravitons. This fundamental noise might even be observable at gravitational wave detectors and, if detected, would provide experimental evidence for the quantization of gravity. I will also show that, when these results are extended to congruences of geodesics, the quantum fluctuations of spacetime give rise to an additional term in the Raychaudhuri equation.

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