

Quantum Mechanics+General Relativity?

This is the last marriage left over to perform!

- A new catastrophe is on: The theory has worse infinities than quantum field theory.

Single graviton exchange = $G \frac{m_1 m_2}{r}$.

Double graviton exchange $\sim \frac{1}{M_P^4} \int_0^{\Lambda \rightarrow \infty} dE E^3 \sim \frac{\Lambda^4}{M_P^4} \rightarrow \infty$

Knowledge of the classical theory does determine the quantum theory

(super)string theory provides a good quantum theory of gravity

- **Second Problem:** The information paradox.

black holes obey rules of thermodynamics and have “entropy” = a quarter of the horizon area.

QM+GR \Rightarrow the black hole is really a gray hole: There is thermal radiation (Hawking radiation) emitted with temperature

$$T_H = \frac{h c^3}{8\pi G M}$$