



9.1: Gravity in Brief

the mutual grip of mass and spacetime

Gravity, as we see it today, does not count as a foreign force transmitted through space and time. Gravity manifests the curvature of spacetime.

Spacetime tells mass how to move

Ten years after his special relativity, Einstein gave us his 1915 battle-tested and still standard theory of gravitation. Its message comes in a single simple sentence: *Spacetime grips mass, telling it how to move; and mass grips spacetime, telling it how to curve.*

The grip of spacetime on mass enforces a central principle of special relativity: conservation of energy and momentum in a smash (Figure 9-1). The coupling of mass and spacetime geometry, far from being the weakest force in nature, is the strongest.

Mass to spacetime: "Curve!"

Now for the back-reaction, the grip mass exerts on spacetime! What curvature does that grip impose on spacetime? And how does that curvature give an account of gravity unrivaled for scope and accuracy?

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