

## Testing Einstein's General Theory of Relativity

*The General Theory of Relativity accounts for influences of objects having mass.*

There have been many tests of Einstein's theory, in which objects with mass are viewed as causing spacetime to bend, and then nearby objects or light beams follow paths consistent with this bending. Consider the following.

**The precession of Mercury's orbit.** Describe this issue.

Does Newton's Theory of Universal Gravitation predict such a precession?

Does General Relativity? Does it differ from the Newtonian prediction? Which fits the observations?

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**Bending light.** One prediction of Einstein's theory was that light can be deflected by the presence of massive objects. When was this prediction first put to the test? What was the result?

Describe a gravitational lens.

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**Clocks ticking at different rates.** We have talked about time dilation, an effect from Special Relativity that accounts for differences between clocks in relative motion. However, moving through curved spacetime (associated with General Relativity) also affects the rate at which a clock ticks. This effect was measured by Gravity Probe A. Describe that experiment.

**Pound and Rebka** also tested this idea. Describe their experiment and what they found.

**Gravitational waves.** Who first postulated the existence of gravitational waves?

Describe an experiment designed to detect gravitational waves.

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For what did **Taylor and Hulse** win the Nobel Prize? What does this have to do with General Relativity?

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**Black holes.** Do they exist? What do we know about them?

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