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What goes up must come down? Right?

Wrong, not if it goes up fast enough.

The threshold speed needed for an object to escape the gravitational pull of a body is called the escape velocity. If you throw something up with a speed less than the escape velocity then it will fall back.

The force of gravity pulling an object (like you) towards a body (like the Earth) depends on both of the masses involved and the distance between them. The escape velocity does not depend on the mass of the object — the escape velocity for a 1 kg satellite is the same as for a 1 ton satellite or even a 1000 ton space station.



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Escape Veloci	ty
The escape velocity at the surface of a body M	
depends on the ratio of the mass to the radius R	
Some escape velocities:	
Velocity to escape the Moon = 2 km/s (= 5,000 mph)	
Velocity to escape the Earth = 11 km/s (= 25,000 mph)	
Velocity to escape the Sun = 600 km/s (> 1,000,000 mph)	
600 km/s may sound like a lot, but it is only 0.2% of the speed of light	
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Detecting Gravitational Waves

eLISA = Evolved Laser Interferometer Space Antenna

LIGO is sensitive to waves with periods of less than a second. This means that it can detect waves created by the merger of two black holes, but this does not happen very often.



By comparison, eLISA will be sensitive to waves with much longer periods, from seconds to hours. This should mean that eLISA can detect signals from BH within our galaxy and SMBH in other galaxies.



It is also hoped that eLISA will be able to detect the gravitational waves created by the biggest singularity of them all – the Big Bang.*

* See "The Beginning of Everything"



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Maybe quantum mechanics will prevent a singularity from forming, thus avoiding the horrible properties like infinite density and infinitely warped space.

For instance, String Theory describes a ten-dimensional universe in which the fundamental building blocks are 'strings' rather than the more familiar 'particles'.

If String Theory is right, black holes are 'fuzzballs' without a singularity at their core. They are just 'balls of string'.

But, is the universe described by String Theory the one in which we live?



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The Future



