

My Peter Bullock Award is going to be on what Space-time is and what it can do.

Space time can be used to visualise how both space and time works, hence its name.

It can be understood using a large rubber sheet.

The rubber sheet isn't actually a real thing, It is only here to help you understand what it may look like.

In reality it is complicated as it is in 4 dimensions, our brains are wired to work in only three so we struggle to visualise it

The rubber sheet represents empty space time.

However space isn't empty as is filled with stuff. For example Planets, suns and people.

We can represent these things as objects on our imaginary rubber sheet.

If we put an object with a small mass on the sheet, like a marble, it creates a small indentation or for simplicity a well.

If a larger object is placed on the sheet, like a bowling ball it will create a far bigger well

Now that we have explained the idea behind our space time sheet we can actually use it to describe something useful... gravity

Gravity is now easier to understand.

The wells that we talked about before can be used to visualize it.

If the small marble that we talked about before came too close to the bowling ball, the marble would start to roll down the bowling ball's well until it collided with the bowling ball.

This is exactly like gravity .

the marble is like the earth and the bowling ball is like the sun, the sun is attracting the earth.

If a marble comes across another marble, they will not start to roll towards each other because they would both create a small distortion on the sheet

These two marbles could be you and me, gravity does not make us stick together.

We now have a way of visualising gravity....

The second part, is the part that I find the most interesting, it is time.

Most people think time is a constant tick that goes throughout all of the universe, however Time is not constant, it can be warped and changed.

If we go back to our rubber sheet, we need to remember that it doesn't only represent space, it also represents time.

When an object is near another large object, its relative time is effected by the dent in the space time sheet.

The amount that your time is slowed down, depends on the mass of the other object that is affecting you, the bigger object, the bigger it's well and the slower time is.

Most of the time this effect is very small, we need a lot of mass before it has a noticeable effect.

even on the planet earth, which you may think as a large object, it barely has any effect on time.

Only when we go to an object with an extremely high mass, for example a black hole, would the change be noticeable.

However A massive nearby object isn't the only thing which is able to affect or warp time

it can also be affected by the object's speed....

we need to imagine two people who have synchronised their clocks.

They both separate and travel with different velocities,

They would both still experience the same length of a day.

They would get up for breakfast, eat their lunch and go to sleep at night.

If they were to meet up again later you'd expect their clocks to still be synchronised.

If they had both been traveling at normal speeds, this would be the case and their clock times would still look the same.

However if one of them had been traveling really fast... near the speed of light... this would no longer be the case

their clock times would look different.

even though their times on their watches are different , both their times would still be correct.

How?

The faster the object is moving the slower time moves to an outside observer.

The term used to describe time being affected is called Time dilation.

Imagining space time in this way can help you understand what relativity is really about.