Einstein and the Relativity of Time

Time: it sets the seasons, tells us when to go to work and is inescapable. However, Einstein saw time differently.

PRACTICAL SCIENCE WITH PHIL FREDA

Your alarm starts to ring.

Get up its time for work! Jump in the shower, scarf down a meal and run to the door. Don't forget to kiss your loved ones goodbye. OK, hurry, get to the car!

Sound familiar? You can thank time for your busy, hurried life. In our everyday lives, time is a cruel slave master.

As each second ticks by and each moment passes, the closer you are to your next point on your agenda. If you are like me, I'm sure there are times where you wish you can slow time down or perhaps even speed it up.

Wouldn't it be nice to somehow speed up the clock at work or slow it down on a lazy Sunday.

Well, I have some good news.

Time, according to Einstein and almost a hundred years of research, is relative. Time is variable, it can and actually does, speed up and slow down.

Einstein's Brilliant Theory

Albert Einstein is most well known for his equation $E=mc^2$ which relates matter and energy, but this is only part of his Theory of Relativity.

Einstein figured that the speed at which light travels, 186,000 miles per second, is a universal constant. This means that light **always** travels at this speed in a vacuum (space), no matter what.

After watching an interesting video on YouTube, I can explain how this works.

Let's say, you just bought a shiny, new spaceship that came standard with some very powerful headlights.

Just as you leave the Earth's atmosphere, you notice the same model ship come and park right next to you. Who's that? It's that friend of yours who always seems to have to “one up” you all the time. Your friend decided to go out and buy the same model ship but, in fire engine red. Figures!

Your friend decides to show off and speed off at half the speed of light, which is pretty fast. You decide to flash your headlights in frustration.

Now, what do you think your friend will see as the light passes his ship?

- Will it go by him like a car speeding down the highway going double the speed ...
- Or will it pass him at the speed of light, so fast that it will appear as a flash?

Well, to my surprise, the light will pass at the speed of light, even at the speed your friends was going.

If you got it wrong, don't feel bad, so did I.

So, this means, the speed of light is constant, no matter what speed you are traveling.

Something has to vary - and that something is time.

Journey into the 4th Dimension

I'm sure you have heard that we live in a three dimensional world of height, width, and length, but we actually live in 4 dimensions.

Time is the fourth dimension.

Here's an example:

Say you have a job interview coming up. The address is provided to you along with the floor and room number.

As you drive towards your destination, you are traveling in the dimensions of width and length. When you arrive at your destination, you traverse the dimension of height climbing the stairs.

We missed something: the time of your interview.

Time is the fourth dimension that we humans experience, but not every clock in the universe ticks at the same rate.

Two variables can affect time: speed and mass.

Time's Relativity

This may sound crazy, but the faster you move, the slower time moves to your observer.

You decide to jump back into your new spaceship to open 'er up!

You put the pedal to the metal and hit almost the speed of light, lets say about 95% of it.

To you, time is ticking like usual. The clock on your dashboard changes every minute and you feel totally normal.

You decide to take an hour drive round trip and return back to Earth. You may be surprised at what you see. You were only gone for an hour but hundreds of years have passed on Earth!

Congratulations, you have just time traveled.

Light particles called photons, travel at the speed of light. Since they travel so fast, they actually do not experience time at all. The closer you get to the speed of light, the slower time moves to your observers.

Let's say during your trip, you zoomed past another spaceship with a clock sitting on top of it. Aside it from being odd, you notice that the clock is moving extremely fast, but to him, your clock would be barely moving.

Even though you are both experiencing time exactly the same to your own vehicles, in reality, time is moving at a different rate for each of you.

We actually deal with this on a daily basis, as satellites travel at a high rate of speed around the Earth. Because of this, they have to constantly synchronize their clocks with the ones on Earth. The difference may be a fraction of a second, but it adds up after a while.

According to Wikipedia, Russian Cosmonaut Sergei Avdeyev has spent over 747 days in space aboard the Mir Space Station. During this time, he orbited the Earth 11,968 times and actually traveled 17,000 miles per hour.

This was enough to bring him 0.02 seconds into the future.

This phenomenon is called time dilation.

Time can also be affected by mass and gravity.

The closer you are to a massive body, the slower time moves to your observer.

If you were in your ship and looked at a clock on a ship close to the Sun, the clock would seem to move slowly. Conversely, the clock on your ship would appear to move faster to his/her perspective.

Time is not universal and isn't really the oppressive tyrant we think it is. It can be manipulated and shaped to our advantage. One day, we may be able to evade the grasp of time. Think about it.

If interested in the subject of time travel, I recommend the sites of Dr. Robert Mallett and Dr. Michio Kaku. Have you thought about it yet? Tell us in the comments.