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Time Travel is Possible

by theoretical physicist Brian Greene

*We know a lot about time. We know that time in some sense is at rock bottom that which allows change to take place, right.*

Brian, can you explain what you mean when you claim that time *allows* change to take place? Or can you explain how time could not allow change to take place? If time cannot prevent change from taking place, then how can you claim that time is allowing it?

Brian, I think you have it backwards. Time does not allow or disallow change to take place; rather, humans use the concept of time to measure change ... *as* it takes place.

*When we say that time has elapsed we notice that because things now are different from how they were a little while ago. That’s what we mean by time elapsing. But is time some fundamental quality of reality or is it something that our brains impose on our perceptions to organize our experience into some coherent framework that allows us to survive.*

Brian, I would go with the first one. In the early universe of hydrogen, helium, and lithium, it is unlikely that any brains existed. Unless you are going to claim that time did not exist before brains, it should be clear that time is not dependent on the existence of brains.

*I mean I can well imagine that we have been under evolutionary pressure over the millennia to organize perception so that we can survive, get the next meal, plan for the future. All of that would seemingly require that we have a conception of time that we apply to what we experience out there. But that doesn’t mean time as we experience it is real.*

Brian, that all depends on what you mean by "real." Time is neither matter nor energy, so in the physical sense it is not real. However, I doubt many would claim that the passage of time is not real. In fact, you just admitted as much when you discussed the concept of "elapsed time."

So you have inadvertently agreed that the physical universe is not "all there is." There exist inherent properties of the universe that are neither matter nor energy.

Another example would be the laws of mathematics.

*It doesn’t mean that time as we experience it is how the world is actually structured. I mean there are many ideas that people put forward. The possibility for instance that, you know, we all know that matter is made of molecules and atoms.*

Brian, that is not true. An electron is matter and it is neither an atom nor a molecule. The same is true of neutrinos.

Come on Brian ... keep your guard up.

*Could it be that time is also made of some kind of ingredient? A molecule of time? An atom of time? Is that really what time is at a fundamental level?*

Brian, it sounds like you've been sniffing the Higgs Bosons at the Hadron Collider. I have no idea how you plan to get out of this one. But it should be entertaining, to watch you try.

*Time travel is absolutely possible.*

Brian, what is the difference between "possible" and "absolutely possible?" Does "absolutely possible" mean "probable?"

*And this is not some sort of weird sci-fi thing that I’m talking about here.*

Brian, that's because most science fiction makes an attempt to at least be believable. Time travel doesn't even come close.

*Albert Einstein taught us more than 100 years ago that time travel is possible if you’re focusing upon time travel to the future. And I’m not referring to the silly thing that we all age, right. We’re all going into the future.*

Brian, actually no one is going into the future because the future does not exist as anything other than a concept. Let's pick a date in the future, say December 25, 2050. Until that day arrives it does not exist. On the day it arrives it will be the present. After that date it will again exist only as a concept we call "the past."

The past is simply the present that has already happened.

The future is simply the present that has not yet happened.

Past and future are useful concepts that only exist as concepts.

In reality, there is only the present.

*Sure, I’m talking about if you wanted to leapfrog into the future, if you wanted to see what the Earth will be like a million years from now, Albert Einstein told us how to do that. In fact he told us two ways of how to do it. You can build a spaceship, go out into space near the speed of light, turn around and come back. Imagine you go out for six months and you turn around and you come back for six months. You will be one year older. But he taught us that your time is elapsing much slower than time back on Earth. So when you step out of your ship you’re one year older but Earth has gone through many, many years.*

No Brian, the Earth has not gone through many, many years. It has only gone through one year.

Let's take a photon that left the sun at the same time the spaceship left Earth. If the spaceship returns in one year, we can predict exactly where that photon will be (provided it doesn't get absorbed by an object) - it will be exactly one light year away from where it was when it started its journey at the same time the spaceship left Earth. We can also predict exactly where the Earth will be in one year - it will be in the same place in its orbit around the sun as when the spaceship left Earth.

*It can have gone through 10,000, 100,000 or a million years depending on how close to the speed of light you traveled.*

Brian, the speed of an object will affect how that object experiences time. So the space traveler will not "age" as much as those who remained on Earth and who were not traveling as fast.

But that has no effect on the passage of time in the universe. One year will have passed on Earth, on the spaceship, in the galaxy, and in the universe, regardless of how fast the traveler is going.

If a photon (which obviously does travel at the speed of light) traveled from Earth for 6 months and then was reflected back to Earth, did the Earth go a million years into the future?

(I believe that answer is ... no)

So why would the Earth go a million years into the future when a spaceship goes out and comes back near the speed of light, but not go a million years into the future when a photon does the same thing?

How does the spaceship cause the Earth to travel into the future?

*And he also taught us if you go and hang out near the edge of a black hole time again will elapse more slowly for you at the edge of the black hole than back on Earth.*

Brian, and that's the point: time will pass more slowly for an object near a gravity well. But that has no effect on the passage of time anywhere else in the universe.

*So you hang out there for a while, you come back and again you get out of your ship and it will be any number of years into the future, whatever you want all depending on how close you got to the edge of the black hole and how long you hung out there.*

Brian, during the time you "hung out" near the Black Hole, time was passing in the universe at the same rate it always has. While you may have been experiencing time passing more slowly than other objects in the universe, your experience does not change the passage of time for other objects. If you spent one year there and then returned immediately to Earth, one year will have passed on Earth, and on Jupiter, and in the Andromeda Galaxy, and everywhere else in the Universe.

*That is time travel to the future. Now of course what people really want to know about is getting back. Can you travel back to the past? I don’t think so. We don’t know for sure. No one has given a definitive proof that you can’t travel to the past.*

Brian, if you wanted to travel to the past, say to 1889 to prevent Hitler's birth, you would have to restore the entire universe to the way it was in 1889 ... otherwise you wouldn't be in the same time, would you?

How do you propose to do that? How do you propose to move every photon from every star back to the location it was in ...

in 1889?

Until you can explain how that is possible, I think that we can call that a "definitive" proof.

*In fact, some very reputable scientists have suggested ways that you might travel to the past.*

Brian, nice Appeal to Authority. But until they can answer the question I just posed above, I think their credentials might be somewhat tarnished if they are supporting the nonsensical concept of time travel.

Hey, that's exactly what you are doing, aren't you Brian?

*But every time we look at the proposals and detail it seems kind of clear that they’re right at the edge of the known laws of physics.*

Brian, I think it would be more accurate to say that the proposals and detail are right at the edge of fantasy and delusion.

*And most of us feel that when physics progresses to a point that we understand things even better, these proposals just will be ruled out, they won’t work.*

Brian, the proposals have already been ruled out. Time travel is not only impossible - it is nonsensical; and those who believe in the concept demonstrate a huge misunderstanding about the nature of time.

*But I guess I would say there’s a long shot possibility based on what we know today that time travel to the past might be possible. But most of us wouldn’t bet our life on it.*

Brian, but in this video you have just bet your career and credibility on it. That's unfortunate.

However, all is not lost. All you have to do is answer my question about how you plan to return every photon in the universe to the exact location it was in, at the time you want to travel to.

And as for traveling into the future, all you have to explain is, how you plan to get all the photons in the universe to move (faster than the speed of light) to the location that you will need them to be in, when you arrive in "The Future."

Let us know how that goes, Brian.

<https://www.youtube.com/watch?v=Bmk1VZQpuzk>

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THE SCIENCE SEGMENT

No proof that radiation from X rays and CT scans cause cancer

The widespread belief that radiation from X rays, CT scans, and other medical imaging can cause cancer is based on an unproven, decades-old theoretical model.

The model, known as linear no-threshold, is used to estimate cancer risks from low-dose radiation such as medical imaging. But risk estimates based on this model are only theoretical, and as yet, have never been conclusively demonstrated by empirical evidence. Use of the linear no-threshold model drives unfounded fears and excessive expenditures on putative but unneeded and wasteful safety measures.

Researchers reexamined the original studies, dating back more than 70 years, which led to adoption of the linear no-threshold model. This reappraisal found that the data reported in those studies do not actually support the linear no-threshold model.

In the linear no-threshold model, the well-established cancer-causing effects of high doses of radiation are extended downward in a straight line to very low doses. The linear no-threshold model assumes there is no safe dose of radiation, no matter how small. However, the human body has evolved the ability to repair damage from low-dose radiation that naturally occurs in the environment.

The linear no-threshold model dates to studies, conducted in the 1940s, of fruit flies exposed to various doses of radiation. The scientists who conducted those studies concluded there is no safe level of radiation, thus giving rise to the linear no-threshold model that is used to this day. But their conclusion was unwarranted because their experiments had not been done at truly low doses. A study exposing fruit flies to low-dose radiation wasn't conducted until 2009, and this study did not support the linear no-threshold model.

Studies of atomic bomb survivors and other epidemiological studies of human populations have never conclusively demonstrated that low-dose radiation exposure can cause cancer.

Any claim that low-dose radiation from medical imaging procedures is known to cause cancer should be vigorously challenged, because it serves to alarm and perhaps harm, rather than educate. The researchers conclude that the linear no-threshold model should finally and decisively be abandoned.

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FAMOUS QUOTES

George Harrison (1943–2001) 58 years

He was an English guitarist, singer, songwriter, and music and film producer who achieved international fame as the lead guitarist of the Beatles. Often referred to as "the quiet Beatle" Harrison embraced Indian mysticism and helped broaden the horizons of his fellow Beatles as well as their Western audience by incorporating Indian instrumentation into their music.

Rolling Stone magazine ranked him number 11 in their list of the "100 Greatest Guitarists of All Time". He is a two-time Rock and Roll Hall of Fame inductee – as a member of the Beatles in 1988, and (posthumously) for his solo career in 2004. He left an estate worth almost 140 million dollars.

“It's being here now that's important.

There's no past and there's no future.

Time is a very misleading thing.

All there is ever, is the now.

We can gain experience from the past,

but we can't relive it;

and we can hope for the future,

but we don't know if there is one.”

(Brian Green - how embarrassing is that?

A musician even had it figured out.

You should turn in your physics badge)