
CONCEPT OF TIME TRAVEL AND THE DIFFERENT THEORIES FOR MAKING IT POSSIBLE AND THE IMPLICATIONS OF TIME TRAVELLING

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ABSTRACT

The purpose of this paper is to explain in detail the concept of time travel, also how it was popularized, and lastly, the theories presented to make it possible and what impact it will have if time travel becomes possible soon. This research uses qualitative research type, evaluating data from qualitative research is "The VOSviewer" software. Time Travel is a concept that has long been a topic of great interest to the scientific community and the common people who see it on the big screen through interesting plots and visualizations in movies and series. So, everyone's thoughts on the concept of benefits can be different, but everyone is on the same page to welcome any possibility to make it happen. Time travel is interesting and in demand, it is necessary to continue to conduct research and development, the government must invest more, and we must be careful and cooperate as one community for its development and use.

Keyword: time dilation, wormhole, black hole, multiverse, teleport.

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INTRODUCTION

In March 2003, the FBI arrested 44-year-old Andrew Carlssin. Newspapers reported that this man was so fortunate in the history of the Stock Market. He invested \$800, and within two weeks, it turned into \$350 million. The FBI suspected that he was running a scam. That he was an inside trader. When Andrew was questioned, he answered that he was a time traveler. He claimed that he was a traveler from 250 years in the future and that he knew how the stocks would perform, so he invested in them and got the extraordinary result. The FBI was convinced that he was lying, and when they investigated some more, they found that Before December 2002, there was no record of Carlssin. Even more surprising was that on 3rd April, Carlssin had to appear in court for his bail hearing, but he had disappeared, never to be found again. Was he a time traveler? Is it possible to travel through time? Or is it only fiction for novels and films? In this paper, we will understand the concept of time traveling scientifically. Time travel is a concept that has been explored since the early 1900s. In 1895, writer H.G. Wells wrote his groundbreaking novel *The Time Machine* (Nahin, 2016). It was after this that the phrase 'time machine' became popular. A machine that can take us into the future and the past. With it, we can travel through time. Although this novel was fiction, a science fiction novel, but several philosophers and physicists were inspired by it. Not only were serious research papers written on time travel, but many films were also made. If we think about it, the exact way time travel takes place can be used to classify it into different types. First, let us use sci-fi films to understand this concept better. Time travel can be of many different kinds. The first is

the one-way travel to the future. You travel to the future, and you cannot return. It is one-sided time travel. Interstellar is an example of this. In it, a time traveler travels to the future, but his family and other people keep on aging. The second way is Instantaneous Time Jumping; a person can jump from one point in time to another instantly using a time machine. It was shown in the film *Back to the Future*. And in *The Girl Who Leapt Through Time*. The third way can be when the time traveler stands still and is time moving around the traveler. This was shown in the film *Harry Potter: Prisoners of Azkaban*. When Hermione uses the time turner. The fourth is Slow Time Travel. As shown in the 2004 film *Primer*. The time traveler gets inside a box, and with every minute he spends in the box, he goes back in time by a minute. So, if he wanted to go back a day, he had to remain in the box for a day. The fifth is traveling at the speed of light to travel through time. This was shown in *Superman* (1979). In it, Superman flew faster than the speed of light and traveled back in time. The question is, among all these concepts of time travel, which way is possible today? In real life. Which way may be possible in the future? And which way is entirely unscientific and will never be possible. Some of these are possible to do, even today. There can be two types of time travel. One is to travel into the future, and the other is to go back into the past. The scientific explanations and theories of traveling to the future are derived from Albert Einstein's Theory of Special Relativity (Bub & Bub, 2021). Einstein introduced the concept of time dilation. Before Einstein, it was believed that time was constant. Whether you are on Earth, on Mars, or near a black hole. Time was thought to be something constant. One of the world's most famous mathematicians and physicists, Isaac Newton, was the one to say this. In his opinion, the flow of time would be constant regardless of the speed with respectively traveling through space, irrespective of the position. Albert Einstein was the first person to refute this. He said that Time is not constant. He claimed that time was like a river. Like water flows in a river, sometimes it slows down, sometimes the flow of the river speeds up; similarly, the flow of time, sometimes it slows down, and sometimes it picks up the pace. It depended upon speed and gravity. Einstein said that time could speed up and slow down if the speed and gravitational force could be changed. This is known as time dilation. The way that your pupils dilate, similarly, time dilates too when the speed of the object increases or if an object is subjected to an increased gravitational force. And Time dilation also, traveling into the past, can also be done with the help of immense gravitational pull. So, in this paper, we will explore all existing theories to make it possible.

METHOD

Due to the analyzed data being in a textual format, this research employed the methodology of "qualitative research." We utilized the in-direct citation method for the literature review since we didn't use the definition's phrase precisely as it is written; instead, we took the definition and rewrote it in our terms. Finally, one of the suitable tools for evaluating the data from qualitative research is "The VOSviewer" software, which we utilized to assess the research data. To that end, we were given research article data on the subject, and after running the process to extract the central theme from it, we dug deeper to uncover the topics discussed in the result and discussion part.

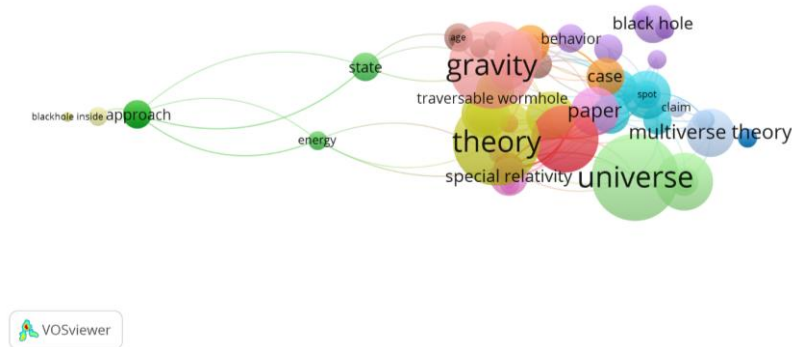


Figure 1. Blackhole Inside Approach

RESULTS AND DISCUSSION

Time travel has always been a fascinating concept since it was popularized in 1895 through H.G well's novel; since then, people from the Scientist community have started researching it and tried to find the possibilities to make it a reality. And some theories have been created that prove that Time Travel is possible, but still, it is theoretical. So here in this section, we will try to explain those concepts.

Travelling in Future

The first way to make the concept of time travel possible is to travel in the future, which means we will be going forward in time, and there are different theories presented to make it possible. It is still considered a concept that has not been experimented on or tested yet. But theoretically, it is considered possible. A few of the theories are mentioned below;

1. Attaining Speed of Light

The First Technique is with speed. If you are sitting in an object that is going very fast. Like an airplane or a spacecraft. The faster something goes; the more would time slows down for it. Relative to a person who is not going as fast. To explain it with a practical example, suppose we have two clocks; one person keeps one clock and puts it on the ground. And we send the second clock with another person, who is in an airplane, and that airplane goes around the earth once and lands back. If we compare the two clocks, though, the clocks have the same time at the start. But now, the clock that the Second person took with him on the airplane, the time it shows would be some nanoseconds behind the First person's Clock time. The two clocks would not show the same time. Because one clock was traveling at a higher speed. It is subjected to Kinematic Time Dilation. To prove it, there was an experiment done in 1971. On which atomic clocks were used to measure time precisely. And it was seen that the clock that was in the airplane, its time was behind the other clock. This was known as the Hafele Keating Experiment. This proved Einstein's theory of time dilation. It does not mean that time is slowing down for the clock on the airplane. Instead, it means that time is relative. Theoretically, if we could build a rocket that travels at the speed of light, you get in that rocket. You remain in that rocket for ten years traveling at that speed. And then you return to Earth, and the time you see on earth would be 9,000 years later. Simply speaking, if we want to travel into the future, we can already do it now; it is scientifically possible to do so today. The only problem is that there is not an aircraft that travels at this speed.

We can get to the speed of light. But with technological improvements, we can build more aircraft and spaceships that can fly faster. It would slowly become possible. For now, Gennady Padalka, a Russian astronaut, is credited with the most time travel into the future. It is because he remained in space the longest. 879 days. And he was traveling at 28,000 km/hr in space. Accordingly, he has traveled 0.02 seconds into the future. In comparison to the people on Earth.

2. Through Strong Gravity

The second way to do it is by using gravitational force. Like time dilation with speed, gravitational force leads to time dilation too. The more the gravity, the more time dilation would be. To visualize it, Einstein asked us to imagine a fabric of space-time (Asmus & Parfenov, 2021). Imagine a mesh and put balls on it. Then we can think of these balls as planetary objects. The more mass in the ball, in the planetary object, the more would be its gravitational force. Earth's gravitational force is less than Jupiter's. Sun's gravitational force is more than Jupiter's. The closer we get to an object with a high gravitational pull, the more would we feel time slow down for us. This means that if we want to travel through time in the future, then spend some time near Jupiter or Sun or an object with even more gravitational force, like a black hole. If you spend some time near a black hole, time will pass slowly for us. This is the same concept shown in the film *Interstellar*, the central character lands on a planet near a black hole, and each hour he spends there, it is seven years for the people not on the planet. It is a scientifically accurate depiction. But whether someone can survive that close to a black hole is unknown.

3. Through Hibernation or Cryosleep

The third way of time traveling in the future is Cryosleep or Hibernation. NASA is trying to develop a Stasis Chamber; in it, astronauts would be kept in a state of mild hypothermia in a cold environment, and they would be able to sleep continuously for two weeks, a sort of hibernation (Stratmann & Stratmann, 2016). The concept behind it is that when a body is kept cool, the chemical reactions in the body will slow down to quite an extent; this would lead to energy conservation in the body and would slow down aging. Cryosleep may be developed in the future by NASA or some other space agency (Caballero, 2020). It has been shown in many films too. There was a recent film *Passenger*; in it, People were traveling on a spacecraft, and they were in Cryosleep.

4. Through Time Machine

The Forth way to do this is Instantaneous Time Jumping Through Time Machine. A person can jump from one point in time to another instantly using a time machine (Suddendorf et al., 2011). So, the Time machine will be a device invented by scientists based on scientific theories. Through this machine, we can select the time and date of our choice of Future, and then this machine will transport us to the future on the date of our choice like it was shown in the film *Back to the Future Part II*. But it is still very unlikely that it is possible to invent the machine like this or not.

Travelling in Past

As of now, no such proven theory exists that tells us that we can travel into the past. Scientists are still trying to figure out to derive a concept that can make Travel into the past possible in the future but still no success on it, and, so many problems exist in this concept which we discuss later.

Still, now there are some concepts that exist regarding giving hope of traveling into the past, which are as follows.

1. Teleport to Another Universe

The first way is to get a glimpse of the past by Teleporting from one place of the universe to another distant place in the universe with instant travel and then; through any strong Telescope and then look back on the Earth through it then, we can able to see how many lights year before our earth looks like, how much in the past we can see is dependent on our distance from Earth the far we are the far we can see in the Past (Rabounski & Borissova, 2022). Because it takes a significant time for light to travel from one place to another, even with how fast light travels, if we talk about distance in light-years, it takes years for light to travel to some places. So, if we could get somewhere before the light reaches there and then look back at the approaching light, the light would be from the past. That is how we can see the past. Like Light of the Sun takes approximately 8 minutes to reach the Earth, so the Sun's Light we see is Eight Minutes Old, and if Sun suddenly get disappears, then we will know after Eight minutes that Sun is no longer exist; this is an example of how we can see in the Past. Right now, what the James Webb telescope is doing is also the same as it is capturing the images of distant Stars and galaxies, which appeared 13.5 billion years ago (Herzog, 2013).

2. Through Time Machine

Instantaneous Time Jumping Through a Time Machine is the alternate method. Where a time machine allows a person to go from one moment in time to another immediately. As a result, the Time machine will be a tool that scientists will create based on scientific beliefs (Hovanec, 2015). We will be able to choose the time and date of the Past with this device, and it will then take us there on the selected day like it was shown in the Back to the Future Part I movie. However, whether it is possible to create the machine in this manner is still extremely unlikely.

3. Through Worm Holes

The Final way to Travel in the past is to use the wormhole. So, a wormhole is like a tunnel between two distant points of the universe, and each distant point exists in a different time and space; with a wormhole, we can find a shortcut to travel millions of years in distance within hours or minutes. To understand how it was created, let us go back to Einstein's theory that in the mesh of space-time, if a gravitational force is put on it is so heavy that the object falls through the mesh, it would create a wormhole (Lu et al., 2023). We need an extremely powerful gravitational field close to the black hole to do this. Perhaps a spinning black hole can generate so much gravitational field that it bends the curvature of the space-time back on itself. Nobel Prize-winning physicist Kip Thorne believes that small Wormholes get created and disappear in space all the time, but they are small, like atoms. And if we want to travel through them, we need to open them up. It would take much energy to expand them. Not only the usual energy, but we would need negative energy also. Negative energy is a kind of anti-gravitational energy that would repel the fabric of space-time. Like the same poles of magnets repel one another. Negative energy would work in the same way to repel it. This would make it possible to keep the wormhole open for a long time so we can travel through it. This is purely theoretical for now. With this, we may think it might be theoretically possible to travel to the past.

Impacts of Time Travels

Every action has a reaction; every cause has its effect; this rule also applies to the concept of time traveling. So many problems also exist on it, creating the problem whose answer we still do not know. Which is as follows;

1. Grandfather Paradox

The First problem that exists, which is related to Travelling in the Past, is the Grandfather Paradox (Mason et al., 2007). The paradox goes like this. Suppose we go to the past with time traveling and kill our great-grandfather. So, if he dies, then how would we be born? If our great-grandfather had already died before getting married and having children, then we should not be alive, and if we were never born, we would have never existed. Then how could we have gone to the past and killed him? This is a paradox. Whether we are alive or not. This goes against the logic.

2. Predestination

Related to this, another problem that exists is the Predestination Paradox. It means that when we go into the past and do anything, then everything we will do will not be shaping our present timeline. This paradox claims that things are destined to turn out a certain way. Things will play out as written in destiny (King Jr, 2020). No matter how much we try to change the past, whatever we try to change, then in the end and the result of that change will be our present. Like, Suppose Our friend meets with an accident, and he dies. If you have a time machine, then you can go into the past and try to prevent that accident from happening. But what happens? Going into the past and doing something to stop it will be causing that accident. And then we find out that it was us because we went into the past and tried to prevent that accident; that becomes the reason for the accident. This concept was shown in many films like Time crimes (2007), The Time Traveler's Wife (2009), Predestination (2014), etc.

3. Multiverse Theory

The Third problem that exists in Time Travel is the Theory of Multiverse. This theory claims that what happened once was in one universe. But if when we travel back in time and change something, that change would create a new universe and makes a multiverse (Matsubara, 2018). So, there will be multiple universes will exist with different things happening, which means every possible change will create an alternate timeline and create a new universe. In that way, one person will exist parallelly in different universes simultaneously with different timelines (Deutsch & Lockwood, 2016). This concept was also shown in many films like Doctor Strange in the Multiverse of Madness, Loki, etc.,

4. Only Forward Time Travel through Time Machine

Finally, one of the problems related to the Time Machine is that you can use it only for Time travel forward in time from that time, and also you can go back in time till the time when the Time machine was invented (Gardner, 2020). So, it means that to travel by road, the road should exist. Similarly, when the Time Machine is invented, then from that exact time, you can travel into the future. If you want to go into the past, then you can only go into the past till the time when the time machine was invented because before it, the time machine was not invented, so you will not be able to go and come back from a time where the time machine does not exist (Buonomano, 2017).

CONCLUSION

Time Travel is an intriguing concept that has captured the interest of both the scientific community and the general public. Research and development should continue, and the government should invest more in making time travel a reality. However, we must be cautious of the potential negative implications and ensure that the technology benefits all of humanity rather than just a select few. As a global community, we should work together towards the development and responsible use of time travel technology for the betterment of humankind.

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