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The True Side of TIME TRAVEL

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Abstract

TIME TRAVEL,
This word amazes many of us who are showing a keen interest in it.

"TIME TRAVEL is like an ocean of infinite depth, the more we go deeper the more we get lost."

First of all, there is absolutely no need of Time Travelling, we already are Time Travelling in the forward direction at a rate of 1 sec./sec.
In this paper, we have not only discussed TIME TRAVEL in a very detailed way but also provided some methods by which we can "actually" TIME TRAVEL to the future or the past. But Time Travelling to the past doesn't seem right to many of the scientists in this field, because even if we "assume" or "imagine" Time Travelling to the Past, we always end up with some paradoxes. Like the most common paradox that we heard of is - The Grandfather Paradox. In which, we assume that how killing my own grandfather could affect my existence, which will ultimately lead to a paradox. And in this paper, we have given our "own research" on the solution to this paradox. But that's just not that, we have even many more paradoxes, which is more and even more confusing.

We have not only talked about - Time Travel Paradoxes, but we have also given some methods to "actually" Time Travel into the future. (Not the Past yet). The most common method to Time Travel into the future, that many of us came up with is travelling near the speed of light (i.e., 299792458 m/s) which seems almost impossible "at our level" but not quantum level, but we have also discussed some more methods which seems somewhat possible "at our level" without reaching to any paradoxes. Like we could use a wormhole to travel to different spaces and at different times, that's the Time Travel. Or we could use the suspended animation technique, which will stop our bodily processes and will be restarted later at some point in the future, and hence reaching the future.
In this paper we have discussed every aspect of Time Travel, its possibilities & non-possibilities, and if so, then why.
We do believe that Time Travel is Possible, not now, not tomorrow, but someday, some point in the future.

TIME TRAVEL WOULD BE POSSIBLE!

Introduction

What is Time Travel?

Before understanding anything in this field, we need to first understand
"What TIME TRAVEL actually is?"
Let's first understand the word "TIME TRAVEL", so now, I'm going to replace the word "TIME" from TIME TRAVEL, with "ROAD", so now, it'll be "ROAD TRAVEL", which simply means *"Travelling in Road"*, So now, we can "assume" TIME to be a ROAD in which we are continuously travelling and moving in the forward direction. We always move forward in TIME without actually knowing that we all are "TIME TRAVELLING", see, we all are actually Time Travelling, and we do this our whole life, at a rate of 1 sec./sec.
We don't even know that we are, but we actually are.

Approaches to TIME TRAVELLING

What is Time Travelling?

Time Travelling refers to something that is Time Travelling, either forward or backwards.
Let's consider Time as a road that has a length of "infinity", in which we all are continuously travelling in the forward direction.
Now if I ask, How much time would it take to go 10 years forward in time, the obvious answer is, that it would take 10 years to go 10 years into the future.
So basically, we can say, we all are Time Travelling into the Future. And since the time that we took to go forward in time is equal to the distance that we cover in this time, we can say our speed of going forward in time is 1sec./sec.

That means, we are going 1 second forward in time and that is costing us 1 second. And to go 10 years into the future, would take 10 years.
So now we all can say that we are actually Time Travelling into the future all the time. So, if we are time travelling all the time then, Why are we so excited to build a Time Machine, to Time Travel?
Well, this Time Travel, that we all are doing is on a very small scale so small that everyone neglects it.
So that means if we could able to make the time duration short, then that will be an Actual Time Travel for all of us. This means if we can, somehow, cover a 1-year distance in time with just 1 second, then that will be the Real Time Travel.
But unfortunately, this is not possible "yet" and we can't tell anything about the future.
So now we know about the basics of Time Travelling, and how we are continuously Time Travelling.
So now let's see, what would it be like to "actually" Time Travel to the Future?

Time Travelling to the Future
Now let's imagine, I made a Time Machine, and with the use of that, I Time Travelled to my future to see My Future-Self.
But the problem here is, even if I do so, then I wouldn't be able to meet my Future-Self or see My Future. Wonder Why?
Because at the moment when I'm gone from the present (as I would be in the future), due to my absence from the present, My TimeLine, wouldn't continue forward to be able to create a Future for Myself. Which will eventually result in No Future for Me.
And hence, I can never meet My Future Self or even be in the Future, by Time Travelling to the Future.
But what if My Future-Self comes to visit me at my time i.e., Past for him? Will we be able to meet even then? Let See.

Time Travelling to the Past - The Never-Ending Loop
Now imagine, with that Time Machine that I had made, with the use of that I Time Travelled One week to the Past. And there, in the Past (1 week Past) I meet my past self.
So now since, I travelled back in time to meet "my past self", that means "my past self" after 1 week, will also Time Travel 1 week to the Past to meet "his past self" since, for my past self, I'm the Future that has been already decided or created.
And now here comes the Never-Ending Loop -:
Now, my past self will also Time Travel, just like me, 1 week to "his past" and there would be another past self of "my past self" and that past self will also Time Travel just like me and "my past self". So, we can see here, that this is creating a Loop which is Never-Ending.
Let's understand this with help of an example,
Now imagine a person A, he made a time machine & travelled One week in his past, there he meets "his past self", let's call him A'.
So now after 1 week, just like A, A' will also Time Travel to his past, to meet "his past self" let's call the past self of A' – A''.
Now, this whole process will continue, forever.
A'' will meet "his past self" A''' and this A''' will meet "his past self" and so on.

The Problem
Now let's look at the above example again,
A, in the first place never actually met his future self, in "his past" (1 week past) so how would he be able to meet "his past self". Although this hasn't happened with A in "his actual past".
Here we arrived at a paradox very similar to The Grandfather Paradox (Discussed below).
So, the most logical explanation for this could be the following.

Explanation 1 – The Alternate TimeLine
Let's first understand, What & How many types of TimeLines do we have?

The Main TimeLine: It's the TimeLine where all the events, the events that we know, happen. And once an event occurred in the Main TimeLine, it can no longer be changed, no matter what happens. However, if events on the main TimeLine are altered then there will be a creation of an Alternate TimeLine, a copy of the Main Timeline.
The Alternate TimeLine: It is the copy of the Main TimeLine, and the creation of the Alternate TimeLine will take place when events on the Main TimeLine are altered. The events that will be on the Alternate TimeLine will not affect the events on the Main TimeLine.
Now we have all the basic knowledge of TimeLines. So, let's jump right into the Explanation.

Since, when a person went to the past by Time Travel, this didn't happen with him in his "actual past", that means that the past will be on the Main TimeLine, and the past where the person will be Time Travelling, will be an Alternate Past of his "actual past" existing in an Alternate TimeLine.
That means, no matter what happens, this event on the Alternate TimeLine will not affect the events on the Main TimeLine.
Now, what will happen with the Time Loop? Will it still exist?
Well, it'll depend on the following cases.

Case 1: The Person returns to his present with his Time Machine

Now we know, that there are two TimeLines, and the one in which the person goes, is the Alternate TimeLine.

Now, let us consider that the person returns to the present (at the Time when he previously went to the Past) in the Main TimeLine, which means the person, now will be travelling from an Alternate Past in the Alternate TimeLine, to his present in the Main TimeLine. (From Alternate TimeLine to The Main TimeLine)

And now since, the person is back in his present, in the Main TimeLine, that means he never travelled back in Time, which means the Alternate TimeLine was never created, and the person never met his past self, Hence No Time Loop will exist.

Case 2: The Person never leaves the Alternate TimeLine

Now let us consider that the person decides to stay forever, in the Alternate TimeLine. That means, now there will be an Alternate Future (Different from the Actual Future on the Main TimeLine), and this Alternate Future will depend on the "Alternate Past Self" of that Person. This means, now again we'll be having two following sub-cases.

Case2.1: Alternate Past Self Never Time Travels

If he (Alternate Past Self) never Time Travels, there will obviously be no such Time Loop. The Alternate TimeLine, in that case, will go on, as usual, depending on that Alternate Past Self of the person.

Case2.2: Alternate Past Self Time Travel to "His Past"

If his Alternate Past Self, Time Travel to "his past" then he will be Time Travelling to an Alternate Past of his "actual past", that means, now, this Alternate TimeLine for the Alternate Past self will act as a Main TimeLine, and whenever this Alternate Past Self Time Travel, there will be a creation of The Alternate TimeLine, just like we see at the beginning.

That means, in this case, there will not be a loop, but a series of Alternate TimeLines, that'll go till infinity or will depend on the above two cases.
Till here we all are considering that there exists an Alternate TimeLine, but, What if There is no such thing as an Alternate TimeLine? What if everything that had happened in the past is all because of Time Travel from the Future? What if it is ImPossible to meet or interact with our past self too by Time Travelling to the Past?
Let's jump right into the next explanation.

Explanation 2 – No Alternate TimeLine

Let's consider our example again, I Time Travelled to my past to meet my past self.
And I successfully reached my past, but it is ImPossible for me to interact or communicate with my past self. This means I cannot do things which will affect my TimeLine. This means, here I'll still be on the Main TimeLine in my "actual past".
That means, in my actual past, my future self was there with me but wasn't able to communicate or interact with me.

Till here, we have known that TIME TRAVEL is not yet possible, and if it is, then what could be the consequences for it. But today, there are various methods to "actually" TIME TRAVEL to the Future. So, let's jump right into those Ways to TIME TRAVEL.

Methods to TIME TRAVEL

Stephen Hawking, a British physicist, hosted a party for time travellers in 2009; the twist was that he sent out the invitations a year later (No guests showed up).
Time travel is most likely impossible. Even if it were possible, Hawking and others argue that you could never travel back in time before building your time machine.
But what about travelling into the future? That's another story.
Of course, we are all time travellers, as we are swept along in the current of time at a rate of one hour per hour, from past to future.
However, like a river, the current flows at different speeds in different places. Science, as we know it, allows for a variety of methods for accelerating progress into the future. Here's a summary.

1. TIME TRAVEL via Speed

Going really fast is the simplest and most practical way to time travel into the far future.
When travelling at speeds approaching the speed of light, time slows down for you relative to the outside world, according to Einstein's theory of special relativity.
This isn't just a theory or a thought experiment; it's been measured. Physicists have demonstrated that a flying clock ticks slower due to its speed using twin atomic clocks (one flown in a jet aircraft and the other stationery on Earth).
In the case of aircraft, the effect is negligible. However, if you were in a spaceship travelling at 90% of the speed of light, time would pass about 2.6 times slower than it did on Earth.
The more you get close to the speed of light, the more extreme Time Travel would be.
The protons whizzing around the Large Hadron Collider at 99.9999991 per cent of the speed of light are most likely the fastest speeds achieved by any human technology. Using special relativity, we can calculate that one second for the proton is equivalent to 27,777,778 seconds for us, or approximately 11 months.
Surprisingly, particle physicists must account for time dilation when dealing with decaying particles. Muon particles decay in the lab in 2.2 microseconds on average. Fast-moving muons, such as those produced when cosmic rays collide with the upper atmosphere, however, take ten times longer to disintegrate.

2. TIME TRAVEL via Gravity

Einstein also inspired the next method of time travel. According to his general relativity theory, the more gravity you feel, the slower time moves.
The strength of gravity, for example, increases as you get closer to the centre of the Earth. Your feet move at a slower pace than your head.
This effect has once again been quantified. In 2010, physicists at the US National Institute of Standards and Technology (NIST) measured the difference in ticking rates of two atomic clocks placed 33 centimetres apart on shelves. The lower one ticked slower because it is subjected to slightly greater gravity.
All we need to travel to the far future is a region of extremely strong gravity, such as a black hole. The closer you get to the event horizon, the slower time moves – but it's a dangerous game; cross the boundary and you'll never be able to escape.
In any case, the effect isn't particularly strong, so it's probably not worth the trip.
Assuming you had the technology to travel the vast distances required to reach a black hole (the nearest is approximately 3,000 light-years away), the time dilation caused by travel would be far greater than any time dilation caused by orbiting the black hole itself.
(According to Kip Thorne, the film's scientific advisor, the situation described in the movie Interstellar, in which one hour on a planet near a black hole is the equivalent of seven years on Earth, is so extreme that it is impossible in our Universe.)
The most astounding aspect is that GPS systems must account for time dilation effects (due to both the speed of the satellites and the gravity they experience) in order to function. Without these corrections, your phone's GPS would be unable to pinpoint your exact location on Earth to within a few kilometres.

3. TIME TRAVEL via Suspended Animation

Another method of time travel is to slow your perception of time by slowing or stopping your bodily processes and then restarting them later.

Bacterial spores can live in suspended animation for millions of years until the right conditions of temperature, moisture, and food restart their metabolisms. Some mammals, such as bears and squirrels, can slow their metabolism during hibernation, reducing their cells' need for food and oxygen dramatically.

Could humans ever achieve the same feat?

Though completely stopping your metabolism is likely beyond our current technology, some scientists are working on inducing a short-term hibernation state that lasts at least a few hours. This may be just enough time for a person to survive a medical emergency, such as a cardiac arrest, before being able to reach the hospital.

American researchers demonstrated a method to slow the metabolism of mice (which do not hibernate) in 2005 by exposing them to minute doses of hydrogen sulphide, which binds to the same cell receptors as oxygen. The mice's core body temperature dropped to 13 °C, and their metabolism was reduced tenfold. The mice could be reanimated without harm after six hours.

Similar experiments on sheep and pigs were unsuccessful, implying that the method may not work for larger animals.

Another method, which induces hypothermic hibernation by replacing the blood with a cold saline solution, has been tested on pigs and is now being tested on humans in Pittsburgh.

4. TIME TRAVEL via Wormholes

General relativity also allows for the possibility of wormholes, which may be able to bridge distances of a billion light-years or more or different points in time.

Many physicists, including Stephen Hawking, believe wormholes appear and disappear at the quantum scale, which is much smaller than that of atoms. The trick would be to capture one and inflate it to human scales – a feat that would require a tremendous amount of energy but could theoretically be accomplished.

Attempts to prove this in either direction have failed, owing to the incompatibility of general relativity and quantum mechanics.

5. TIME TRAVEL Using Light

Another time travel concept proposed by American physicist Ron Mallet is to twist spacetime with a rotating cylinder of light. Anything dropped inside the swirling cylinder could theoretically be dragged around in space and time in the same way that a bubble on top of your coffee runs around after you swirl it with a spoon.

According to Mallet, the right geometry could allow time travel into the past or future.

Mallet has been trying to raise funds for a proof of concept experiment, which involves dropping neutrons through a circular arrangement of spinning lasers since he published his theory in 2000.

His ideas have not been well received by the rest of the physics community, with some claiming that one of his basic model's assumptions is plagued by a singularity, which is physics speak for "it's impossible."

6. TIME TRAVEL – Do Nothing

It is, probably, the easiest way to TIME TRAVEL, Do Nothing, there is absolutely no need to do anything for TIME TRAVEL, we always are TIME TRAVELLING in the forward direction.

So now we can say, TIME TRAVEL seems possible “theoretically” but it is not “yet” practically possible, but whenever we assume it is possible, we tend to reach some paradoxes. In physics, there are many paradoxes, majorly or only because of TIME TRAVEL.

What is a “Paradox”?

> **Paradox:** Any statement or sentence that seems to have two or more parts that contradict each other, i.e., they don’t seem right or correct together, is called a Paradox.

Example of a Paradox -:

> *Many countries in the world produce food in larger quantity “but” there are still few countries in which people are unable to get proper nutrition.*

Let’s jump right into those “many” paradoxes in the field of TIME TRAVEL.

TIME TRAVEL Paradoxes & Their Explanations

Paradox 1. The Grandfather Paradox

Figure 1

Figure 2

It is the most common paradox, that arises whenever we talk about TIME TRAVEL.

In this paradox, we "assume" TIME TRAVEL to be possible, which means we can TIME TRAVEL to the past.

Let us assume I travelled back in TIME to meet my Biological Grandfather in my so-called TIME MACHINE, and assume that I killed him before the meeting of him and my grandmother.

So now, if my grandfather is no more, and my grandfather has never met my grandmother, that means they both didn't get married, which means, my father was never born so do I.

Now I don't exist anymore, so who was the person who travelled back in time and killed his grandfather?

"I killed my grandfather, before his marriage"

This statement has two different parts, which are highly contradictory -:

1. I killed my grandfather
2. My Grandfather is no more so I can't exist anymore

"If my grandfather is no more than, how can I exist and kill him?"

Here we reached a Paradox.

This is called the Grandfather Paradox.

So, The Grandfather Paradox, actually shows us, *"TIME TRAVEL to the Past is ImPossible",*

So, does that apply to "TIME TRAVEL to the Future" as well?

Now Imagine, This time, I went to the future with my so-called Time Machine, and there I killed My-Self, so does this event anyhow affect my existence or my time, at the present? The Answer is NO. Because that's the "Future" that hasn't happened yet, so it wouldn't affect me anyhow, that means, even if I kill myself, by Time Travelling to the future that will not affect me, because that's the Future. (But we already discussed that Time Travel to the Future may not be possible)

So Now We Can Say –
"Time Travelling to the Future doesn't affect the Present, But Time Travelling to the Past does."

Explanations of The Grandpa Paradox

Many people came up with many theories to try to explain this Paradox but till today this is still known as "The Grandfather Paradox". But there are still some solutions that seem to be possible, but as we all know, in this *"TIME TRAVEL"* field nothing can be proven practically (except a few) so the solution for this Paradox is Theoretical, i.e., ImPossible Practically "yet".

Explanation No.1: Disappearance of the Time Traveler

So, I was existing till I didn't kill my grandfather (in the past), so at the moment when my grandfather is killed, so right after it, I'll stop existing. It will be something like this – I Time Travelled to my past, killed my grandfather, and right after killing him, I will disappear, i.e., no longer exist.

The Problem -:

This is the most basic solution that many people first came up with, but there is a huge problem with this, which is – I killed my grandfather, and due to this my father was never born, which means I, as well, was never born, and hence never went back in time.

That means I have no existence to be able to live or make a Time Machine or even go to the past to kill my grandfather.

So, saying, that, I would disappear right after killing my grandfather is not Right. So that is why we have "Explanation(s)".

Explanation No.2: Stuck in a Time Loop?

A possible solution is that since I exist to kill my grandfather when I kill my grandfather, my grandmother remarries and I effectively get a new grandfather. My grandfather only contributes 1/4 (actually a little less) of his DNA.

I'm then locked in a time loop where I go back to kill the new grandfather only to be born again decades later with a different grandfather.

So first of all, there is a huge problem with this,

The Problem -:

So, after killing my grandfather, my grandmother marries someone else, since my grandfather is no more. So, after all this process, the "me" that will be born will be not "actual me" in fact he will be just a kind of a copy of "actual me".

Moreover, this "me" will not do Time Travel, because that was supposed to be done by the "actual me" which now is not existing.

So, therefore, these two explanations are unable to explain the Grandfather Paradox, and that is why we have our more explanations. Which are as follows –:

Explanation No.3: Time Stop

We don't know how a Time Machine would work or what it would look like?

The only thing we can do is to Imagine a Time Machine, so let us imagine that a Time Machine would be something that let us Stop Time.

This means, with the help of that Time Machine, I can stop the whole time, "except for My Time", and can Time Travel wherever I want.

Now consider, With the help of that Time Machine, I first Time Travelled to my past, in my grandfather's time when he was unmarried, and after reaching there I stopped time due to which My Grandfather's time will not flow forward, and I killed him, and now since his Time is yet stopped that means the effect of killing my grandfather wouldn't take place (until I start the time again). So now My grandfather is no more, and I'm still existing because my grandfather's time is yet stopped which is not affecting me in any way.

And after this, I returned to My time, at that point where I had previously gone back in Time and after reaching the present I started the Time again, and then continue living naturally. So, for me, it'll be like this – I made that Time Machine, went into the past, stopped Time, kill my grandfather, return back to the present, at the point where I previously Time Travelled to the past, and started living naturally without Time Travelling. And hence, I never went back in Time, and never killed my grandfather, and therefore, I'm still existing.

And Hence, No Paradox.

The Problem -:

There's also a problem with stopping Time, and actually, there are many.

Life would be nothing like we'd expect if we had a technology that could freeze time for everyone but me. I wouldn't sleep late, rob a bank while no one is looking, or cheat on an exam.

I will be blind, deaf, and unable to move a single muscle instead. But how time freezing can go such wrong?

Let us first know How to stop time?

As we all know, Speed equals distance divided by time, and time equals distance divided by speed, according to physics.

That means I'd have to move eternally fast to make time equal zero. And that won't be possible without breaching the laws of physics since we won't be able to exceed the speed of light yet.

But let us imagine that I can stop Time somehow. What would "actually" happen then?

Absolutely nothing will happen then. People would come to a halt. Water would cease to flow. Our globe would come to a halt. Every molecule would simply stop moving.

Because our neurons wouldn't be moving either, we wouldn't even notice that time had stopped.

But now let us add some modifications to it. What would happen if the Time stops except for me, would it mean that I will still be able to move?

I wouldn't see anything at first. Stopping time would stop photons, which are light particles that ordinarily travel at the speed of light.

I wouldn't be able to hear anything because soundwaves wouldn't be able to travel through the air to my eardrums. I'd be stuck between the frozen molecules that surrounded me, unable to move.

It would get worse when I will realize I couldn't force oxygen molecules into my lungs. Blind, deaf, and suffocated at the same time.

We'll make another change to get around this hasty and pointless conclusion. This time, I'd be encased in a bubble within which time would continue to pass. I'd also be able to manipulate the space around me in time. That would allow me to move around and breathe.

Outside of the bubble, I won't be able to hear anything. What about taking a look?
I could walk around and capture light from every angle. However, my brain is unlikely to be able to decode any of that data. It would all be wiped away.
So now, if we now come to Our Explanation of Stopping time and killing my grandfather, then first of all I wouldn't be able to kill my grandfather, because I can't see, as photons stop moving too so they can't reach my eye, i.e. I would be blind.
So now we reach a conclusion that Stopping Time is also not a proper explanation for the Paradox.
So, we have to think of something else.

Explanation No.4: The Alternate TimeLine
Before getting to the explanation let us first recall the Types of TimeLines.
We have discussed Two types of TimeLines – The Main TimeLine & The Alternate TimeLine.
Main TimeLine: It is the TimeLine in which all the events occur. The event once occurred in this TimeLine can no longer be changed, i.e. *"It is impossible to change what has happened in the Main TimeLine."* And if events on the Main TimeLine are altered then there will be a creation of an Alternate TimeLine, which means that "change or altered" will be on the Alternate TimeLine "Not on the Main TimeLine."
Alternate TimeLine: It is the exact copy of the Main TimeLine, which occurs when there is a violation in the Main TimeLine, i.e., the events that shouldn't be supposed to happen in the Main TimeLine. And it is temporary, that means, once the Main TimeLine starts flowing again then the existence of this Alternate TimeLine will be gone.
Also, *"The Events on the Alternate TimeLine doesn't affect the Events on the Main TimeLine."*
Now we know these two types of TimeLines. So, let's jump right into our Explanation.
So, I travelled back in time to kill my grandfather, but now we know that, since this shouldn't be supposed to happen, as I'm still alive, i.e., my grandfather was existing before his marriage. So, the past in which I would Time Travel will be an Alternate Past in The Alternate TimeLine.
Consider, for example, that I went in 1937 to kill my grandfather, so I would Time Travel in an *"Alternate 1937"* and in that Alternate Past I kill my grandfather due to the effect of this will be on the Alternat TimeLine not on the Main TimeLine.
And, right after killing my grandfather, the effects will be on this Alternate TimeLine, and that means there is no existence of "me" in that Alternate TimeLine.
And even after killing my grandfather, I'm existing because I'm from the Main TimeLine not from the Alternate TimeLine.
And Hence, Now, there will be no such Paradox thing.
Moreover, if I return to the Present in the Main TimeLine, at that point from where I previously Time Travelled, and continue living naturally, then for me this Time Travel would be like a dream that I now forget.
Till now we have discussed Four Explanations for the Grandfather Paradox. However, there still could be many more. And among those "many" explanations one is Multiverse.

Explanation No.5: The Multiverse
As we all know, we live on a planet, Earth, which exists in a Solar System, this solar system is part of a Galaxy called The Milky Way Galaxy, and this galaxy and many more galaxies made up The Universe.
But a theory suggests that there could be an infinite number of Universes present. The Multiverse.

What is a Multiverse?
The idea of a Multiverse did not come from imaginative science fiction writers; it arose from other premises, like string theory and quantum mechanics. Even astronomers' current knowledge of our Universe, the idea of cosmic inflation, implies the existence of a multiverse.
A Multiverse could be brimming with words that are nearly identical to ours, or it could be teeming with universes that are diametrically opposed to our own. In any event, parallel universe regions offer a wealth of fascinating (and mind-boggling) possibilities.
Throughout the years, many writers have postulated that if there are infinite other worlds, at least some of them contain doppelgängers of oneself. However, because physics principles aren't always the same in every universe, these other possibilities exist.

The Four types of parallel Multiverse -:

According to MIT mathematician and cosmologist Max Tegmark, there are four types of parallel worlds.

- Nothing in a parallel universe could possibly be qualitatively different from our own.
- A parallel world could have completely different physical laws.
- A parallel universe could have the same fundamental physics as our own. Even so, it may have begun under different conditions.
- A parallel universe might have the same fundamental physical laws as ours, but its effective bylaws are different.

Many scientists have dismissed the multiverse notion throughout the years because of one simple fact: you can't prove that other worlds exist if you can't leave your own. However, not everyone agrees with this viewpoint.

So, the explanation using this Multiverse theory can go this way -:

Every event that happens with us "may" occupies a space in a different Universe, and moreover, every possibility that an Event can possess simultaneously exists in a separate different Universe.

For example,

If I throw a ball above me then it can have multiple possibilities at the same time.

Like it can come back and hit me, or it doesn't hit me, or maybe it reaches somewhere else, and many more like this. And for each such possibility there exist a separate Universe.

So now, if we apply the same concept in our Grandfather Paradox, that means the killing of grandfather has infinite numbers of outcomes, and so for these different outcomes there exists a different Universe, so like, in one Universe I killed my grandfather, and he doesn't exist anymore, so do I. And in some other universe, I killed him but he still exists, and so do I.

In simple words,

The time traveller's actions caused the universe to split into two universes: one in which he was born and one in which he murdered his grandfather and was not born.

And hence, it "might" lead to No Paradox.

A similar paradox arises when information is transferred from the future to the past. Let's say someone from the future tries to warn me that a grand piano is about to fall on my head in the street, or that I have a type of cancer that is curable if caught early enough. I could take precautions as a result of this warning, but there is no reason to send back the information from the future that save my life. Another Paradox!

Paradox 2. The Bootstrap Paradox

It is a situation in which a previous event is both the cause and the result of a subsequent event.

A simpler example would be a time traveller giving a copy of Shakespeare's complete works to a young William Shakespeare so that he can copy them. If this occurs, who is the noteworthy genius of Macbeth?

Here, as we can know, is a creation of a Time Loop, in which the Shakespeare's Complete work is trapped in a loop which will be continuously be forwarded to a young Shakespeare & hence, will lead to the question, who is noteworthy of the complete Shakespeare's work?

Consider it this way, I build a TIME MACHINE somehow "on my own", & I then travelled back in time to give the idea of how to build the TIME MACHINE, to my past self. Then how am I even got the idea to create a TIME MACHINE?

It'll be like that, I'll keep on making the time machine just to let my past self know how to do it.

And hence creating an Infinite Loop.

And there are more & even more confusing paradoxes.

Next paradox we have,

Paradox 3. The Fermi Paradox

Enrico Fermi famously asked over lunch in 1950, "If there is intelligent extraterrestrial life in the Universe – where are they?" indicating that we have never encountered aliens or discovered evidence of their existence, such as radio signals, which would be evidence of a technological society That same question could be asked of time travellers: "If time travel is possible, where are all the time travellers?"

The question, known as the Fermi Paradox, is significant. After all, if we could travel through time, wouldn't we have run into a slew of future observers at critical junctures in history? It's unlikely that they all managed to perfectly disguise themselves, with no mistakes in the design of their clothes, accents, vocabulary, and so on. Another option is that time

travel is possible, but it must be used with extreme caution and under strict supervision due to all of the dangers discussed here.

On June 28, 2009, physicist Stephen Hawking conducted a scientific experiment that was intended to provide an answer to this question once and for all. He brought snacks, balloons, and champagne and hosted a secret party for only time travellers – but sent out the invitations only for the next day. He contended that if no one showed up, it would prove that time travel to the past is impossible. The invitees did not show up. "I sat and waited for a while, but no one came," he said at the 2012 Seattle Science Festival.

Is this enough to prove that TIME TRAVEL to the past is ImPossible? Let's see an explanation.

One possible explanation for this could be – Maybe TIME TRAVEL is Possible in the future, but future people don't come up here because they don't want to change the future, they don't want to do things that could affect "their" time. Maybe they have some kind of "Law" then doesn't allow them to TIME TRAVEL beyond a "certain limit". MAYBE.

Or maybe "they" actually did TIME TRAVEL here, but they can't do things which could impact the TimeLine or maybe there is some kind of barrier that doesn't let us see or interact with "them".

Or since they are beings of the future, we can assume that they have very high-tech gadgets by the use of which they are always successful in hiding themselves from us.

MAYBE.

Paradox 4. One Way TIME TRAVEL

When it comes to travel, it is always continuous – from point A to point B, passing through all the points in between. Travelling through time should supposedly be the same: travellers get into their machine, press a button, and travel from time A to time B, passing through all the times in between. But there's a catch: if we're only travelling through time, the time machine appears to the casual observer to exist in the same space between the points in time. As a result, our journey will be one-way, and time travellers will be stuck in the future or the past because the machine will block the time path back. And that's before we even consider how to construct this thing in the first place if it already exists in the location where we want to construct it.

If that's the case, there's no choice but to suppose there's a mechanism to leap from one time or place to another and arrive at the desired location. How will our machine "know" to jump to an empty space and avoid colliding with a wall or a living thing that happens to be nearby?

To avoid regrettable events at the point of entry, passengers will surely require effective navigation and surveillance equipment.

Paradox 5. Know TIME TRAVEL in a more detailed way

Time travellers may confront – or have previously experienced – various hurdles from physics, including classical physics, in addition to the problems that time travel provides for anyone trying to keep the concept of cause and effect in order.

The topic of arriving at the stated time location and what would happen to us there is one that you must address during time travel, and which science fiction writers normally prefer to disregard for convenience's sake.

It is commonly accepted, without evidence, that if someone travels through time, they will arrive in the same location but at a different time - past or future. But here's the catch: the Earth revolves at 110,000 kilometres per hour around the sun, whereas the Solar System moves at 750,000 kilometres per hour around the galaxy. We will most likely find ourselves drifting in outer space if we time-travel for even a few seconds and stay in the same coordinates of space. We may even manage a quick glimpse around before we perish. Our time machine will have to account for the movement of the celestial bodies in order to deposit us at the correct location in space.

Explanation – The Wormholes -:

Wormhole: It basically, acts as a path that connects two different points in time or space together.

This may be resolved on its own because time travel occurs between two points in the four-dimensional space-time continuum in any scenario. Space and time are one physical phenomenon, known as space-time, according to general relativity,

the theoretical foundation for time travel. This entity can be deformed and bent; in reality, gravity is an exterior manifestation of space-time distortion.

If we could establish a closed space-time loop, or if we could travel from one location to another via a "wormhole," time travel would be possible. In any event, this would entail not only going from one point in time to another but also moving through space. As a result, the adventure begins not only in time but also in space, which we must, of course, pre-program on our machine.

In practice, things are more tricky - particularly if we want to travel to the distant past or future. Over time, the speed of celestial bodies, as well as the shape and structure of the continents, seas, and mountains on the Earth's surface, change. And, because even a minor error in our knowledge of the past can deposit us in the Earth's core, outer space, or somewhere else where life expectancy is quickly reduced to zero, time travel becomes a game of Russian roulette.

Paradox 6. TIME TRAVELLING Safely

Assume we solved the problems and arrived at the precise location in space-time where life can be sustained. We're not quite there yet; we still have to contend with momentum.

Momentum is a conserved quantity that essentially signifies a body's ability to continue travelling at the same speed and direction as it is now. If we were to jump out of a moving car (heaven forbid!), conservation of momentum would cause us to roll on the ground, most likely injuring ourselves (in the best-case scenario).

So, if we travel back in time a month and arrive at the same location on Earth, we will discover, much to our dismay, that the ground beneath us is now moving swiftly at one angle or another towards us, even if we started immobile in regard to the ground. As a result, even if we're lucky enough not to crash on collision, we're bound to run into something. We would swiftly burn up in the atmosphere or gasp for air in space if we were to survive by some miracle because we have well exceeded the escape velocity from Earth.

A possible solution to this difficulty is to plan our landing spot ahead of time so that our ground speed is identical in magnitude and direction to our exit speed, however, this imposes other limits on our voyage. We could always leap into space, where there are few moving objects to collide with, and then return to Earth to reach our target.

After all of that, the problem occurs mostly when we suppose that time hopping is instantaneous — that we vanish from one point in time and reappearance in another without losing mass, energy, or velocity. A "realistic" journey through time, on the other hand, is no different from other types of journeys since it is not instantaneous and instead includes travelling through space-time. As a result, we can hope that, like a spaceship slowing down before landing on a planet, we will be able to modify our speed to the correct value and direction prior to landing.

It's also worth remembering that, happily, we'll have access to a powerful technology that will allow us to deal with such issues: time-travel technology. For instance, we could send thousands of tiny probes ahead of us, each at a slightly different position in space-time. For one of the reasons already indicated, some, if not all, of them will be destroyed. Others will calmly wait until the present, after which they will feed their programmed locations into the time machine. As a result, the destination entered will be safe for us, with the exception of the irritating probing shower that will hit the travellers. The entire process will be instantaneous for the travellers.

Paradox 7. TIME TRAVELLING Grammar

Finally, we must address the matter of how to talk about time travel. The three tenses – past, present, and future – are insufficient to discuss a future event that occurred in the past with someone who is in the present, who is someone else's past, and who is someone else's future. What grammatical tense should we use while discussing an alternate future that would have been produced if we hadn't slain our grandfather? Or, when we become locked in a time cycle where what will happen leads to what has already happened, and so on, how can we describe the future-past tense (or past-future, or past-future-past?)? And, of course, the most pressing topic that Hebrew editors and translators have grappled with for years: is present continuous truly a thing?

It's Complicated.

Till now, we have discussed many Paradoxes, and all are based on TIME TRAVE to the “Past”. But about the Future? Wouldn’t there be any paradoxes then? Let’s see.

TIME TRAVEL to the Future – Paradox?

We already talked about Time Travelling to the Future, that when we do that, we wouldn't be able to meet or see our future. Because, at the moment, we wouldn't be in the present and hence my future never be created.

But if we ignore this, and believe that I can go to my future and can meet my future self, that wouldn't be supposed to create any paradox, like if I kill my future self, or I kill my grandson then there wouldn't be any such "Grandson Paradox". Because all of those events will happen in the future, that will not affect the present anyhow. That means I will still be existing even if I kill my grandson or myself in the future.

TIME TRAVEL – A complete solution without any Paradoxes

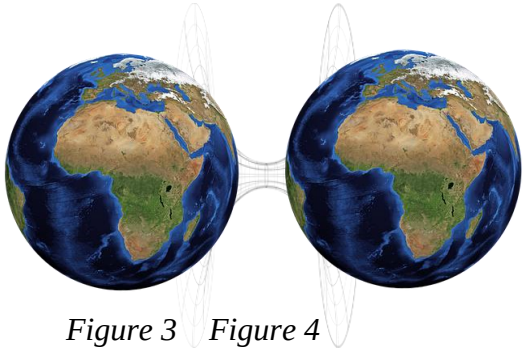

Figure 3 *Figure 4*

We can assume that "maybe" time runs at a different pace in different Universes, and to Time Travel to a particular point in time, we just have to travel to a particular Universe and for that, we need a medium through which we can travel to different Universes, which could be a Wormhole. And in that case, there will be no such paradoxical thing because each universe will be going to have a different future. It's like, time is running at a different pace, just like a river, at different Universes, like in one Universe, Time is running slow, so as for the other Universes, this Universe would be the past. And similarly, there could be another Universe in which Time is running comparatively very fast, so for the other Universe, it would be Future. That means that the time is different for each of those Universes. (Considering the same or similar world in each Universe)

So, assuming Time Travelling this way could be effective, as in this, Time Travel seems much possible, without reaching any paradoxes. That means, TIME TRAVEL would be like travelling from one Universe to another in Space, through a medium called Wormhole.

But for that, we need a Wormhole.

A wormhole may theoretically be used as a time machine. Moving clocks must run slowly due to special relativity. To put it another way, someone travelling at nearly the speed of light would not advance as swiftly into the future as someone standing still.

If scientists were to build a wormhole, the two ends would be time-synchronized at first. However, if one end is accelerated to nearly the speed of light, it will begin to lag behind the other. According to MIT physicist Andrew Friedman, the two entrances might then be brought together, but one would be in the past of the other.

You'd simply step through one end to travel back in time. You'd be in your own history when you emerged from the wormhole.

And this would allow us to travel at any point in time and space without reaching a paradox,

Hence no paradox would be there if we assume TIME TRAVEL to be this way.

But this is just an "Assumption".

No one knows What & How TIME TRAVEL would be in the future.

Seeing The Past and The Future

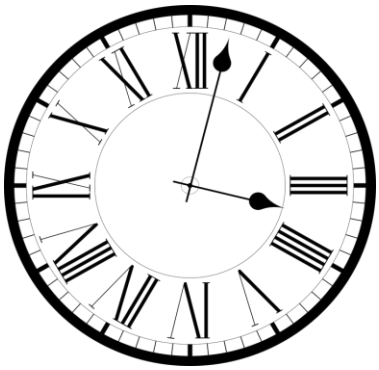

Figure 5

Till now, we have discussed various ways to go to the past and the future, but what about seeing the past or the future? Will it have any paradox? Or, is it really possible to see the future or the past? Let's see.

Seeing The Past

It is as easy as scrolling through photos that we had taken from our phones.

Photos or Videos that are taken from our phones are the Past because they had been recorded at that moment in the past. But that doesn't what we have to discuss.

Looking at a starry night is very joyful for many of us. But what if I tell you, that the stars that we see are not existing in real time, we see them as how they "were" existing. Let me explain.
You have a firm grasp of the observable universe. This is the cosmos we view, in which everything outside of our planet has some sort of temporal lag. Our Sun appears to us as it did eight minutes ago. We can see Jupiter as it was, roughly 30 minutes ago. We may view the stars as they were hundreds of years or thousands of years ago. The Andromeda galaxy as it was 2.5 million years ago is visible to us. We push further back into time as we look further out into the universe and push our technology to its limits, collecting the light that has travelled longer and longer distances to reach us.
Everything in this Universe is very far from each other, so to measure such a long distance, we can't use an ordinary metric system, as it is not enough to measure a distance greater than billions or trillions of kilometres. So, to measure such long distances, we use Light Years.

(Acc. to google)
Light Year: A unit of astronomical distance equivalent to the distance that light travels in one year, which is 9.4607×10^{12} km (nearly 6 million million miles or 9 trillion kilometres).

What is a Light Year?
It's a unit of distance rather than time, more precisely it represents the distance travelled by light in a vacuum over a 365 days (1 Year) period. And that is equal to 9.5 trillion kilometres.
For example, Light takes around 8 minutes from the sun to reach Earth, which means if the sun suddenly disappears, then we still be able to see it for 8 minutes, as the light coming to us is 8 minutes old, that means we see our sun as 8 minutes old, i.e., we are seeing it's Past.

So now, the stars that we see, are many many Light years away from us, and even, some of them are nearly Billions of Light years away. So, what we see is their Past. Like if a star would die, even then we'll still be able to see it for almost billions of years on Earth because the death of the star would be in the future (after billions of years), what we are seeing is the Past of that star.

Theoretically Speaking
If somehow, we watch the moon from 53 Light Years away (at an instant), through a Very Powerful Telescope then it is somewhat possible to see the actual Moon Landing in real time.
But obviously, to reach at that distance instantaneously is not possible. For that, we need to travel faster than the speed of light and that's a story for another time.
We have discussed that seeing the past seems somewhat possible, what about seeing the future? Can We See the future, just like we can see the Past? Let's see.

Seeing The Future
Since The Future is something that hasn't been created, it is not possible to see it. Even if we travelled faster than the speed of light, we could only see the past then not the Future.
Understand it this way,
light is coming to us with some data which it captured some time ago, so the data that we receive is only the past, not the future. Because whenever light captures data, we are also moving forward in time, so for us, it would always be the past, not the future.
But what if we stop time (except for ours), even then it's not possible as that light would also stop moving (As we have discussed). Hence, Seeing the future doesn't seem to be possible.

Now we can say -:
Seeing the past seems possible, but travelling to the past seems impossible, and on the other hand, seeing the future seems impossible, but travelling to the future does seem possible.
(As we all are continuously time travelling to the future)

Conclusion

Why TIME TRAVEL is Possible?

Till today, we humans have achieved so many things in this field, we have literally touched the sun and captured so many galaxies, and we literally recently pictured two Black holes by just sitting here on Earth. There was a time when all of these things seem ImPossibel just like TIME TRAVEL, but they became possible. So, TIME TRAVEL would be possible someday at some point in future. Maybe many many decades or centuries later but TIME TRAVEL would be possible. ONE DAY

Why TIME TRAVEL is ImPossible?

Just like a coin has two sides, TIME TRAVEL also has two sides. But we humans always talk about the positive side, which is, "TIME TRAVEL would be possible someday". But what if TIME TRAVEL is never possible, this is also a possibility, the other side of TIME TRAVEL that we humans don't want to see or believe yet. And that is the reason we have no future visitors yet and that is why we have paradoxes.

Moreover, as we know, for TIME TRAVEL, we need a machine, which we called a TIME MACHINE, so if we think we reach too many questions, like what could be the basic requirement for a Time Machine & what would it look like?

And even if we are considering it to be a Car that would allow us to Travel at a speed approaching near the speed of light, then for even that we would need a car that doesn't get affected with that much of speed while travelling. When a meteor comes into Earth's atmosphere, then it attains a speed of nearly 60-70km/s but here we are talking about a speed which is close to $3x10^5$ km/s, so with that speed, any material can get easily burnt, so we need a material that could prevent it.

Or the wormhole could be a better way to TIME TRAVEL as we think, but wormhole yet exists in theories only. which means there is not any physical evidence for it yet. So, we can't rely on that.

Hence, the very first step to TIME TRAVEL, to find or create a TIME MACHINE is enough for us to challenge. And we yet haven't created or found anything like a Time Machine. Hence by observing current scenarios and future scenarios it'll be right to say:

"TIME TRAVEL is not possible because it's ImPossible." YET.

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