**Time Travel Paradoxes - Script**

All right. Good morning everybody. I want to talk to you today about time travel. Or, to be exact, the paradoxes involved with time travel. Time travel into the future is physically possible. I’ll talk to you about that at a later date. However, time travel to the past, is inherently difficult. And, with time travel to the past, we get a number of paradoxes.

Now time travel is the same as travel, any kind of travel. I can travel through space. I can travel from here to the station. Travelling through time is the same idea. You can travel from this point in time to a different point in time. Now, travelling backwards through time, let’s say last week, one year, five years ago, causes a number of problems. These problems are called paradoxes. A paradox is something that cannot logically happen.

For example, the first paradox is called the *Grandfather Paradox*. Now, this paradox involves going back in time and killing your own grandfather. Horrible, I know. Now, let’s imagine I built myself a time machine. I get into my time machine. I program 1912. That’s the year my grandfather was born. I press go. I go back to 1912, get out of my time machine. I go and find my grandfather. When I find him, I kill him, for whatever reason. Now, because my grandfather is dead, my father is not born. And, because my father is not born, that means I am not born. And, if I am not born, I don’t exist and I cannot make a time machine. Which means I cannot go back into the past to kill my grandfather, which means my grandfather is not dead, my father is born, I am born, I do make a time machine. I go back in the past, I kill my grandfather, my father is not born, I am not born. And this loop carries on forever. So, killing your grandfather cannot logically happen. Therefore, it’s a paradox.

The second paradox is called the *Hitler Paradox*. Although, I like to call it ripples in a pond. If you imagine you have a pond in front of you and you get two different stones, one of them is very small, one of them is very large. If you throw them one at a time into the pond, the small stone is going to make small ripples, the big stone is going to make big ripples, even waves. Now, this is the same with time travel. Let’s say I’ve got my time travel … my time machine again. I get in the machine, I type in 1934, press go. I get out of my time machine in 1934. I find somebody called John Smith and I kill him. I know, lots of killing in these paradoxes. I’m sorry. I kill John Smith. When I come back to the future, the future has changed a little bit. Everybody that had a connection with that John Smith has changed. Their entire histories have changed. The present has changed. But, because John Smith was not that important, he was not that influential, he didn’t connect with that many people, the ripples are not very big. And, in the future, history hasn’t changed that much.

Now, let’s say I go back to1936 again. But, this time I go to Berlin, Germany, and I kill Adolph Hitler. Now, the ripples are going to be much much bigger. Adolph Hitler, he connected to, and influenced millions and millions of people. He still influences us today. We learn about the Second World War, we talk about the Second World War, it affects our politics and modern life. So, if I kill Adolph Hitler, I have to change all of those millions and millions and millions of people. Which means, when I come back to the future, the ripples are so big that modern society has changed so much that it’s probably impossible for me to make that time machine. Therefore, by killing Hitler, I make it impossible for myself to make the time machine, and we revert back to the Grandfather Paradox.

Now, the third paradox is called the *Watch Paradox*. There is a movie, starring Christopher Reeve, I forget the name of the movie, and in the movie, the young Christopher Reeve, he goes to a party held by an old lady. When he’s at the house of the old lady, he sees a picture of her on the wall. When she was young, she was beautiful. So, he, being a time traveler, decides to go back in time to meet her. However, before he does, at the party, the old lady, who likes him (of course, who wouldn’t like Christopher Reeve?) she gives him a watch as a gift. Christopher Reeve goes home, gets into his time machine, travels back into the past and meets the lady when she was young. He falls in love with her, and, as a gift, he gives her the watch that she gave him. He then travels back to the present. When the lady gets old, she meets Christopher Reeve, she gives him the watch. He goes back in time. He gives her the watch. They go forward and backwards, forwards and backwards. The question is, where did this watch come from? He gave it to her. She gave it to him. Where did it start? Where did it come from?

Now, this paradox breaks two laws. It breaks the first and the second laws of thermodynamics. The first law of thermodynamics states that you cannot create or destroy energy, you can only change it. So, if this watch just suddenly existed, where did it come from? Where did the energy come from? You cannot just create energy. And the second law of thermodynamics says that everything will revert to its simplest state. Entropy. So, this watch, if the old lady has had it for so long, as it goes around the cycle, will gradually get older and older and older. And, in the end, it will fall apart and break. So, how can the same watch continue through the cycle? It’s a paradox.

Anyway, time travel would be fun but it is very difficult. One solution would be parallel universes, but we don’t have enough time to talk about that, we’ll consider that next time.

Anyway, thanks for listening. Don’t forget to subscribe. See you later. Bye.

**Time Travel Paradoxes - Questions**

1. What is a paradox?

A: A way of travelling into the past.

B: A loop in time, that you travel on forever.

C: Something that cannot logically happen.

D: An idea that is very difficult to understand.

1. What happened in 1912?

A: Steven’s grandfather was born.

B: Steven travelled back into the past.

C: Steven killed John Smith.

D: Steven built a time machine.

1. Why doesn’t killing John Smith change the future much?

A: Because he never really existed.

B: Because he didn’t have that many connections.

C: Because the changes flow out like ripples.

D: Because Steven couldn’t have killed him.

1. What happens if I kill Adolph Hitler?

A: Nothing will happen.

B: Millions of people have to change.

C: It will be difficult to find him.

D: We will still study about the Second World War.

1. Where does the Watch Paradox idea come from?

A: It’s an idea Steven had

B: A movie

C: An old conversation

D: A lecture by Christopher Reeve

1. In the movie, why does Christopher Reeve’s character decide to go back in time?

A: To test a paradox

B: To see if he can find the watch

C: To understand the laws of thermodynamics

D: To meet the old lady when she was young

1. Where did the old lady get the watch?

A: Christopher Reeve’s character gave it to her.

B: She found it.

C: She had always had it.

D: It was a family heirloom.

1. What is the first law of thermodynamics?

A: All things return to their simplest state.

B: You can make something from nothing.

C: A watch will always lose time.

D: You cannot create or destroy energy.

1. Explain the *Grandfather Paradox*.
2. Explain why the *Watch Paradox* breaks the laws of thermodynamic.
3. Explain why Steven calls the *Hitler Paradox* ripples in a pond.
4. Explain why Adolph Hitler still influences us.
5. If time travel were possible, where would you go and what would you do?

**Time Travel Paradoxes - Answers**

1. C 2. A 3. B 4. B 5. B 6. D 7. A 8. D

9. Explain the *Grandfather Paradox*.

 The basic idea is that it is impossible to travel back into the past and kill your own grandfather because that would mean you were never born and couldn’t go back into the past. It creates a loop that you can never escape from. To simplify it:



10. Explain why the *Watch Paradox* breaks the laws of thermodynamic.

 The first law of thermodynamics states that you cannot create energy. You can change energy from one form to another, but you can never create or destroy it. If the watch was given to the woman by the man and then to the man by the woman, it has no starting point. It becomes from nothing, and that violates the first law.

 The second law of thermodynamics states that all things revert to their simplest state. That means things decay or age. The watch in the example always remains in the same state. It is identical when it is given to the woman as it is when she gives it back to him. Time must pass between the two events, and the watch must age, and this is repeated so, it must age until it breaks down to nothing. But this does not happen. It is always the same watch. Therefore, it breaks the second law of thermodynamics.

11. Explain why Steven calls the *Hitler Paradox* ripples in a pond.

 There are two reasons. Firstly, the idea behind this paradox is that changing a small event in history or a big event in history has a knock-on effect. All of the things that would have happened now no longer happen. And all of the things that would have happened because of those things now no longer happen, and so on. The changes move out like ripples in a pond, where the first point you changed is the stone you threw into the water.

 Secondly, it is much easier to understand the paradox if it is called the ripple effect rather than if it were called the Hitler Paradox.

12. Explain why Adolph Hitler still influences us.

 Hitler as a person influences us because of everything he did. We learn about the Second World War at school, it still affects international relationships and our modern society has been constructed on the back of the war.

13. If time travel were possible, where would you go and what would you do? Write 100 words.

 There are so many times I would like to visit that it is almost impossible to choose. I’m going to pick two. I’m going to go 4,000 years into the past (2017BC) and 4,000 years into the future (6,017).

 I would go back to the past because history fascinates me. I would love to walk among the people. I wouldn’t be able to communicate with them because, in their time, the English that I speak won’t be invented for another 3,400 years, but I would love to just be with them. I’d head to Egypt and see the newly built pyramids (the would shine white) and the Sphinx.

 Then I would go into the future, just to satisfy myself that the human race still exists and check that we haven’t destroyed ourselves, as we seem about to do.

 And, if I still have a trip left, I would go back to when my mother was still alive, and I would hug her and hold her and tell her I love her and tell her I’m sorry. And I would take the granddaughter she never saw and we’d just play in a park. But, that would cause too many paradoxes.