**Extinction of the Dinosaurs Script**

Hi. Good morning. I want to talk to you about the extinction of the dinosaurs today. Dinosaurs lived a long time ago. They died out about sixty-five million years (65,000,000) before humans, before we, arrived on the scene. Dinosaurs were actually here for a very long time. From the very beginning of the dinosaurs to their extinction is about a hundred and eighty million years (180,000,000). So, there is more distance between the more recent dinosaurs and the very early dinosaurs than there is between the last dinosaurs and humans. People don’t usually think about that.

Anyway, the dinosaurs were around for about a hundred and eighty million years (180,000,000) and then, suddenly, they disappeared. I mean, not overnight, but pretty quickly. Now, this extinction is called the K-2 extinction. K-2 stands for cretaceous-tertiary. The cretaceous period was the very last period of the dinosaurs. Now, no one actually knows why this happened. We have some ideas, and there are three theories, which I’m going to try and explain to you now.

The first theory is volcanoes. Right now, on Earth, we have numerous supervolcanoes all over the place. In fact, Yellowstone National Park in America is a supervolcano. Were that to erupt, it would cause mayhem and havoc. If you’ve seen the movie two thousand and twelve (2012), that features quite strongly in that movie. Anyway, back when the dinosaurs were around, we had things, well, even now, we have things called Deccan traps. Now, these Deccan traps are giant areas of volcanic lava and magma. They are enormous. They are bigger than even supervolcanoes. Now, these giant traps release gasses into the atmosphere. They release volcanic gasses, they release Sulphur dioxide. And what that does is basically it creates climate change. In fact, when the dinosaurs were around the climate dropped … the temperature dropped by about 2 degrees centigrade (2℃). If you are a lizard, if you are a dinosaur, if you rely on warm temperatures to survive, a drop of temperature like that can be fatal. And that did kill a lot of dinosaurs, however, it wasn’t the main reason for the extinction.

The second theory is sea level drop. Around about the time the dinosaurs disappeared, world sea levels suddenly fell. You can see this if you look at cliff faces, if you cut into a mountain or if you look at a cliff, you can very clearly see where the seabed used to be. And it’s much much higher than it is now. What caused that? Probably, the mid-ocean ridges, the mountains in the middle of the ocean, collapsed. That would have caused earthquakes and tsunamis, but it would also have meant that the sea level dropped. Now, that did kill dinosaurs, but it probably only killed dinosaurs that lived in coastal areas; dinosaurs that relied on the sea for their life. Because the sea level drops it doesn’t disappear and dinosaurs can go to the new sea shore, the new coast. So, again, it kills off a lot of dinosaurs, but it doesn’t kill all of them.

The third theory, and probably the most likely, is a meteor. A meteor is a piece of rock, well a piece of … pieces of metal and rock and sand and dust and ice. That have survived since the beginning of the … since the creation of the solar system. They are what’s left over from when the planets were formed. And these meteors, they fly all around the solar system and occasionally, they fly into the planets. Earth has been hit by numerous meteors over the … over the course of its history. Now, the one meteor that people suspect was the cause of the dinosaur extinction landed in Mexico. How do we know this? How do the experts know this? If you cut into the earth again, around the world there is a layer of iridium. Iridium is a type of metal that you do not find on Earth, but you do find in meteors. How did that layer of iridium become spread evenly around the Earth? Well, the only possible solution is because a meteor hit the Earth, evaporated, became dust and the dust settled all over the planet. Now, why is a meteor a candidate for the extinction of the dinosaurs? Well, because, if you look at the iridium layer, if you look at the K-T boundary, underneath it there are dinosaur fossils, above it there are no fossils.

So, why would a meteor cause the extinction of the dinosaurs? Well, if you got a stone and threw it into some sand, or threw it into some water, what happens? The sand and the water splash up. Now, if you take that to a much larger scale, if you throw a giant rock at a planet, what happens? Well, the surface of the planet liquefies, becomes dust, and that dust sprays up into the atmosphere and forms a cover all over the planet. And, what that does is, it shuts out the sunlight. It causes a … well, a nuclear winter. In the beginning there is heat, there’s radiation, but, once that dies away, the sunlight is gone. And back then the sunlight was gone for a year. Maybe even longer. And with no sunlight temperatures drop. The global temperature dropped by 7℃. Plants die. Animals that rely on heat die. It’s extremely hard to live. Plus, sulphuric acid is released into the atmosphere, which turns the rain to acid rain, which turns the water to acid water. Dinosaurs could not survive this. Mammals. Mammals could survive. Why? Mammals can live underground. Mammals can eat insects and plants. Mammals can eat dead things. Mammals can regulate their own body temperature. They can stay warm when it drops … when it gets cold. They are very good at surviving.

Now, the site in Mexico where the meteor hit, they think … the scientists think that the meteor was probably fifteen kilometers (15km) across. A fifteen-kilometer (15km) meteor hit the Earth and caused this much damage and caused the extinction of a major species. Could that happen again? Of course it could. Meteors have hit Earth all through Earth’s history. However, Earth is very fortunate in its position. Two things protect Earth from being hit by more meteors. The first thing, if it’s night and you look into the sky you can see this, the first thing is the moon. The moon actually protects us, it shield us ... it shields us. It receives a large amount of the meteors that would otherwise hit Earth. And the second thing, you can also sometimes see in the night sky, is Jupiter. Jupiter is a gas giant. The most massive planet in the solar system. And Jupiter’s gravity is so strong that most of the meteors in the solar system are attracted towards Jupiter. And hit Jupiter. So, thanks to Jupiter and thanks to the moon, hopefully, we won’t be hit by a meteor for a while. But, one day, it will happen. And what will happen to mankind? Will we go extinct, too? I’ve no idea. I hope not. Anyway, thanks for listening. Goodbye.

**Extinction of the Dinosaurs Questions**

1. How long were the dinosaurs here before their extinction?

A: 18,000,000 years

B: 65,000,000 years

C: 118,000,000 years

D: 180,000,000 years

2. How did Deccan traps cause climate change?

A: They were supervolcanoes that erupted

B: They released gasses into the atmosphere

C: They caused mayhem and havoc

D: They were giant areas of volcanic lava and magma

3. What could have caused a drop in sea levels?

A: You can see the levels if you look at cliff faces

B: The sea level was much higher than it is right now

C: There were many earthquakes and tsunamis

D: They mid-ocean ridge collapsed

4. Why can’t falling sea levels be the sole cause for the extinction?

A: Because the earthquakes and tsunamis would have killed many dinosaurs

B: Because the dinosaurs could move to the new sea shore

C: Because the dinosaurs relied on the sea for their life

D: Because all of the dinosaurs in coastal areas died

5. Where do meteors originate from?

A: They are pieces of metal and rock and sand and dust and ice

B: They were left over pieces when the planets were created

C: They have hit Earth before

D: They created the solar system

6. How can it be argued that a meteor was the cause of the extinction?

A: There is a layer of iridium all around the world

B: Because the dust settled all over the planet after it evaporated

C: Because there are no fossils above the layer of iridium

D: Because you do not find iridium anywhere on Earth

7. Which of these would **not** be true about a nuclear winter?

A: The mammals cannot stay warm

B: The global temperature drops

C: The water becomes acidic

D: Plants and animals that rely on heat die

8. Why does Jupiter help protect us from meteors?

A: It’s massive gravity pulls them all in

B: It is a gas giant

C: The meteors hit the far side of the moon

D: They pass straight through its gaseous body

9. In the first part of his talk, Steven says, “So, there is more distance between the more recent dinosaurs and the very early dinosaurs than there is between the last dinosaurs and humans. People don’t usually think about that.” Why do you think that is?

10. If we discovered a meteor was going to hit Earth in one month, what would our options as a species be?

11. How would life on Earth be different if the dinosaurs had not gone extinct?

12. Do you think humans should attempt to colonize other planets in case another meteor hits Earth?

13. If an extinction level meteor was going to hit Earth and we could send a small group of people with an archive of Earth, what would you send?

**Extinction of the Dinosaurs Questions**

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

9. In the first part of his talk, Steven says, “So, there is more distance between the more recent dinosaurs and the very early dinosaurs than there is between the last dinosaurs and humans. People don’t usually think about that.” Why do you think that is?

We tend to think that the dinosaurs are one species living in one compressed period of time. We tend to just think of “dinosaurs”, but saying that is like using “animals” to refer to every single animal that has ever or will ever exist. In reality there were tens of thousands (possibly even hundreds of thousand) of different species that were born, evolved and disappeared over 180 million years. A good example of our misunderstanding this is when we group dinosaurs together that would have been millions of years apart. The Tyrannosaurus Rex and the Stegosaurus would be a good example. They are quite often picture together yet the Stegosaurus roamed 150 million years ago and the T-Rex only came around about 67 million. Seeing the dinosaurs died out 65 million years before humans existed, that means we are closer to the T-Rex than the Stegosaurus was. Maybe it stems from out (relatively) short history. Maybe only being here for about 10,000 years limits our ability to understand such huge frames of time.

10. If we discovered a meteor was going to hit Earth in one month, what would our options as a species be?

In one month? Very little. Pray. Well, first we would attempt to destroy it. There is a plan where you could fire a probe at the meteor. The probe would hit the meteor at such speed that it would alter its trajectory and move it away from a collision with Earth path. If that didn’t work we could fire our nukes, but they don’t travel that far so we would have to wait until it was incredibly close. If they missed or failed to break it up enough we would have no other options. Both of these options would probably take years of planning. The nukes could be fire from space but putting the infrastructure up there would be incredibly hard. There is also a law banning the use of nuclear weapons in space. Could that law be sidestepped?

A month wouldn’t be enough time to do anything. However, certain satellites are tasked with tracking meteors that could possibly come close to Earth. If there was the chance of an impact, we might have a lot longer than one month. We could potentially have decades to plan and prepare. And, humans are an adaptive species. I think, if given enough time, we would survive.

11. How would life on Earth be different if the dinosaurs had not gone extinct?

While understanding how it is not a good answer, I am going to have to say it would either be wildly different, or it wouldn’t be different at all. Let me try to explain.

If the dinosaurs hadn’t gone extinct then mammals wouldn’t have had the freedom and safety to evolve that they were granted when the top of the food chain was removed. The mammals would have continued to be small because small mammals can escape easily, which would have meant they probably wouldn’t have evolved into us, and I would probably not be sitting here typing this. Things would be vastly different because we wouldn’t be here.

However, let’s suppose that mammals got the chance to evolve despite the challenges of there being angry dinosaurs all over the place. Let’s suppose mammals started to use tools. Then that is the end of the dinosaurs, as it was for the wooly mammoth and the auroch. Once humans started to use tools, there were no longer any other species that could compete with them. Once this happened, if the dinosaurs were not yet extinct, they would have most likely been forced into extinction by this point.

Although, it is a pleasant idea to consider that some might have survived, similar to the crocodile. A T-Rex hiding out in the forest for example.

12. Do you think humans should attempt to colonize other planets in case another meteor hits Earth?

I do, but not for that reason. And I don’t like the word “colonize”. I think we should explore other planets and, as far as possible, set up bases there, for the furtherment of our knowledge. To colonize implies to subjugate, and it is a word with so many negative connotations. If a meteor big enough to destroy the Earth were discovered, it would be nice to know that the human race could continue in a distant part of the galaxy, but outposts like these could be used for further exploration, and scientific observation.

However, if we do begin to “colonize” the galaxy, there are two main problems. If we look back throughout history, we can see that whenever two civilizations have met, the most technologically advanced civilization, almost without exception, brings about the destruction of the least advanced. If we go sailing through the heavens with this motive we must be careful that we are not the most advanced civilization, for that would destroy too much, and also that we are not the least, for that would lead to our own destruction.

13. If an extinction level meteor was going to hit Earth and we could send a small group of people with an archive of Earth, what would you send?

I expect the usual answer is art, books, music, our history, artifacts and so on and so on. I wouldn’t do that. I don’t know how big the space for this archive is but it must be fairly large. I would convert it and send more people. I would send children. Our archive is not as important as we are. In fact, you can say that we are our archive. Is it better to save the Mona Lisa than to save ten children? If it is then what is the point of art? Or has some art become such a part of the consciousness that it exceeds our own life? The children, the people, could land somewhere and start afresh. And, someday, generations later, they may look back and think, “I wish we had some things from our old world.” And I, despite having been killed by a meteor, would answer, “Yes, but you are alive. You can create again. You are your own civilization.”