

Your Shortcut to... The End of the Dinosaurs

They ruled the Earth for more than 160 million years... a thin layer of rock helped scientists work out why most of them disappeared... and those that survived are still all around us today. This is your Squiz Kids Shortcut to the End of the Dinosaurs... the podcast where we explore the who, what, where, when, why and how of the wonderful world around us. I'm Christie Kijurina.

And I'm Bryce Corbett.

[Sound Effects] Bryce... why does the studio look like the gardening section of Bunnings exploded?

I've been doing a little decorating, Christie

A little? There are ferns on my chair, a cycad beside the microphone and that enormous leaf just poked me in the ear.

I wanted to make our guests feel at home.

Guests?

Dinosaurs

Bryce, there are currently no dinosaurs expected in the studio.

Not yet...

...What does that mean?

Well, while I was doing all this gardening, I also built something.

You built something? When? Between trips to Bunnings?

Behold!

SFX: FERN FRONDS RUSTLING / METALLIC REVEAL

Bryce... is that a time machine?

It certainly is. And I've already programmed our first destination. Sixty-six million years ago.

Oh

Dinosaurs

Right. Suddenly the ferns make a lot more sense.

I thought instead of just talking about what the world was like back then... we could go and have a look.

Which is either the greatest idea you've ever had... or ... I actually don't want to think about the 'or'...

Only one way to find out, Christie. Today, we're travelling back to find out WHEN dinosaurs still ruled the Earth... discovering HOW scientists worked out what happened when most of them suddenly disappeared... and learning WHO managed to survive, including one very familiar branch of the dinosaur family tree. So grab your binoculars and push aside the ferns ...

And listen carefully. There's a S'Quiz at the end... And hold onnnn....

WHEN

We have arrived. Christie, this is incredible. let's get this door open... [Bryce exerting himself]. Phew ...Ahhh...It's warm, it's lush, there are ferns and flowering plants everywhere... and, yep, I can confirm, that is definitely a dinosaur.

Several dinosaurs, actually. We're right near the end of a period of Earth's history called the Cretaceous. Dinosaurs have already been around for more than 160 million years by this point, and they come in all sorts of shapes and sizes. There are enormous plant-eaters, meat-eaters with very impressive teeth, little feathered dinosaurs... and there are birds here too.

Hang on. Birds already exist?

They do. Birds evolved from one branch of feathered dinosaurs millions of years before this. So when we say we've come back to the age of dinosaurs, we shouldn't imagine a world without birds. Some of the dinosaurs here are already flying over our heads. And dinosaurs aren't the only animals around. There are crocodilians and turtles, insects, fish and plenty of mammals too.

But the mammals are mostly small compared with the giant dinosaurs dominating the landscape. And Earth itself looks a little different. The continents aren't quite where they are today, sea levels are much higher, and the climate is generally warmer. There's also something pretty dramatic happening over in what will one day become India.

The Deccan Traps.

Exactly. Huge volcanic eruptions have been pouring out enormous quantities of lava. Not one volcano blowing its top on a Tuesday afternoon, but repeated eruptions over a very long period, covering vast areas in layer after layer of volcanic rock. So even before anything else happens, this is already a planet going through some big environmental changes.

But dinosaurs are still here. Ecosystems are still functioning. Tyrannosaurs are hunting. Plant-eaters are munching. Birds are flapping. Mammals are scurrying around underfoot. Which makes what happens next so extraordinary.

Because if we jumped forward through time from here...

...things would look very different.

How far are we jumping?

Far enough that I think we should skip the next bit entirely.

Why? What happens in the next bit?

Bryce... that very bright light in the sky!!!

Umm. Christie?

BRYCE...TIME MACHINE. NOW.

SFX: ALARM / TIME MACHINE WHOOSH

And... we're back.

Well. Sort of. Because we've jumped forward, and this is still Earth... but something has changed. The giant non-bird dinosaurs we were just looking at are gone. No Tyrannosaurus rex. No Triceratops. No enormous herds wandering across the landscape. In geological terms, they disappear incredibly suddenly.

Which is where things get really interesting. Because scientists can actually see this change in the rocks. All around the world, geologists have found a boundary dating to about 66 million years ago. It's called the K-Pg boundary... K stands for Cretaceous (yes, even though it starts with a 'C'). And Pg stands for Paleogene... (the period that came directly after, when birds and mammals dominated the landscape) Below that boundary (that dark line in the rock) you can find fossils from the Cretaceous world we just visited. Above it, many of those species are suddenly missing. And right between them is often a very thin layer of clay.

A layer that turned out to contain something very strange: much more of an element called iridium than scientists would normally expect to find in Earth's crust. Iridium is rare near the surface of Earth, but it's much more common in some asteroids and meteorites. So suddenly scientists had a clue. A world full of dinosaurs below the line. A very different world above it. And sitting right between the two... a layer containing material that might have come from space.

Which means the big question is no longer just WHEN did most of the dinosaurs disappear... It's HOW did one event change an entire planet?

HOW

So Bryce, scientists had found this strange layer in rocks all around the world, dating to about 66 million years ago... and it contained unusually high levels of iridium. That was a big clue. But one clue isn't enough to solve a mystery this enormous. So scientists kept looking. And they found other things in that same layer. Tiny glassy beads formed from rock that had been melted and blasted into the air... and crystals of quartz that had been squeezed so violently they showed microscopic damage called shocked quartz. All of it pointed towards something huge. Something arriving with an unbelievable amount of energy.

Something from space. The leading idea became that a giant asteroid, probably around 10 kilometres wide... roughly the size of Mt Everest... had slammed into Earth. But there was still one rather important problem. Where was the crater? Then scientists started piecing together evidence from Mexico's Yucatán Peninsula. Buried beneath rock and partly beneath the sea was an enormous circular structure about 180 kilometres across. The Chicxulub crater [cheek-shoo-LOOB]. And when they dated it... it lined up with the extinction.

So now we can reconstruct some of the bit we very sensibly skipped in our time machine. Around 66 million years ago, that asteroid came screaming into Earth's atmosphere and struck near what is now Mexico. The impact released an almost unimaginable amount of energy. Rock was instantly melted and vaporised. Enormous earthquakes shook the planet. Tsunamis raced across oceans. Huge amounts of debris were hurled high into the atmosphere and even out into space before raining back down. And this is where scientists are still working out exactly what happened next.

Some research suggests all that material falling back through the atmosphere may have created an intense pulse of heat, perhaps helping ignite fires across huge areas. But there was another effect that almost certainly lasted much longer. The impact blasted dust, soot and sulfur-rich gases high into the atmosphere. Those gases formed tiny particles that reflected sunlight back into space, while dust and soot helped darken the skies. Less sunlight reached Earth's surface. Temperatures dropped. Plants struggled to photosynthesise to make energy. And once plants and tiny ocean organisms began dying, the effects travelled straight through food chains.

First the animals that depended on plants lost their food. Then the animals that depended on those animals lost theirs. So the asteroid didn't necessarily need to directly hit every dinosaur on Earth. It changed the conditions that life depended on. And that helps explain how an impact in one part of the world could trigger extinctions right across the planet.

But remember those enormous volcanic eruptions we saw happening in India before we skipped forward? Scientists have spent decades asking whether the Deccan Traps also played a role. Those eruptions were releasing gases that could change the climate too,

and Earth may already have been under some environmental stress before the asteroid arrived.

But the strongest evidence today points to the Chicxulub impact as the main cause of the mass extinction. The volcanoes may have affected the climate before and after it, but the asteroid appears to have been the event that pushed ecosystems over the edge. And by the time the dust began to settle, about three-quarters of the species on Earth had disappeared.

Which makes the next question pretty remarkable. If the world had been shaken, burned, darkened and cooled... and entire food chains had collapsed...Who on Earth survived?

WHO

So Bryce, we've jumped forward through one of the worst days, and years, in the history of life on Earth. Around three-quarters of all species have disappeared. But look around. Earth isn't empty. There are fish in the water. Insects are buzzing about. Turtles and crocodilians have survived. Amphibians made it through. Small mammals are still scurrying around. And there's something flying overhead.

"A bird.

Which means... Christie, is that technically a dinosaur?"

It is. And this is the bit that sometimes gets lost when we say the dinosaurs went extinct. Most dinosaurs did. The big non-bird dinosaurs, like Tyrannosaurus rex and Triceratops, disappeared completely. But one branch of the dinosaur family tree survived. The avian dinosaurs...Birds....So every chicken, kookaburra, magpie, cockatoo and pigeon you see today belongs to the only dinosaur group that made it through the K-Pg extinction. Which raises another mystery. Why them?

Christie, scientists can't point to one magical dinosaur survival trick, but the animals that made it through seem to have had a few useful things going for them. Being small probably helped, because smaller animals need less food. Being able to shelter underground or in water could protect you from some of the immediate destruction. And being flexible about what you ate became incredibly important when normal food chains collapsed. That may help explain why some birds survived too.

After the impact, forests around the world were badly damaged. That would have been terrible news for species that depended on living in trees. But some early birds seem to have lived mainly on the ground. And some could eat things like seeds. Seeds are little survival packages. Even if the plants around them have been killed or burned, seeds can remain on or under the ground for quite a while. So in a dark world where fresh leaves

and fruit were suddenly hard to find, being a small ground-dwelling animal able to peck up seeds may have been a very handy way to make a living.

And mammals had some useful qualities too. Remember, mammals weren't new arrivals. They had already been living alongside dinosaurs for more than 100 million years. Many were small. Some could burrow. And many seem to have eaten a fairly broad diet, including insects, seeds and whatever else they could find. Those survivors suddenly found themselves in a world with something very unusual. Space.

Because for more than 160 million years, dinosaurs had filled enormous numbers of jobs in Earth's ecosystems. There were giant plant-eaters, enormous predators and dinosaurs filling all sorts of niches in between. Then suddenly, most of those animals were gone. Over the millions of years that followed, the survivors began evolving into those empty spaces. Birds diversified into thousands of different forms. And mammals did too. Some eventually became enormous land animals. Some took to the air and became bats. Another returned to the ocean and eventually became whales. And one branch would eventually produce the primates.

Including us. So that asteroid didn't just end one chapter in the history of life. It changed who got to write the next one. And perhaps the strangest part of our whole trip is that the dinosaurs never completely disappeared. Sixty-six million years later, their descendants are still everywhere. Swooping us in spring. Stealing chips at the beach. Waking us up at dawn. So I think it's fair to say that the dinosaur most likely to attack me today, is a magpie!

THE S'QUIZ

"This is the part of the podcast where you get to test how well you've been listening...

1. True or False: Birds only appeared after most of the dinosaurs went extinct.[False]"
2. What is the name of the dark line in rocks around the world, marking the sudden end of the Cretaceous period? [K-Pg boundary]
- 3 What fraction of life on Earth survived through this mass extinction? [One quarter]

That's all we have time for today. Thanks for joining us as we explored the who, what, how, where, when, and why of the End of the Dinosaurs

Now get out there...and have a most excellent day!

Over and out.