Así es como podría haber sido la Antártida hace unos 90 millones de años. El Cretácico fue uno de los períodos más cálidos de los últimos 140 millones de años. En aquel entonces, el clima del planeta permitía el crecimiento de bosques tropicales templados en los polos.

Dinosaurios

El período Cretácico: ¿Cómo era la Tierra antes de que se extinguieran los dinosaurios?

Por Emily Osterloff

530

Quizás conozcas el Período Cretácico por animales grandes como *el Tyrannosaurus rex* y *el Triceratops* , o por ser el final de la era de los dinosaurios.

Pero ¿cómo era el mundo durante los millones de años que precedieron a esta extinción masiva?

Nuestra experta en dinosaurios, **la Dra. Susie Maidment,** y el experto en plantas fósiles, **el Dr. Paul Kenrick,** exploran cómo era el mundo en ese entonces y los animales y plantas que habitaban nuestro planeta.

¿Cuando fue el Periodo Cretácico?

El Cretácico es un período geológico que comenzó hace 145 millones de años y terminó hace 66 millones de años. Es el último período de la Era Mesozoica. Se ubica después del **Jurásico** y antes del Paleógeno, el primer período de la Era Cenozoica, nuestra era actual.

Duró mucho tiempo, casi 80 millones de años, lo que lo convierte en el período geológico más largo del Eón Fanerozoico, que comenzó hace unos 539 millones de años.

El Cretácico se divide en dos períodos más pequeños llamados épocas. El Cretácico Inferior duró desde hace 145 millones de años hasta hace 100,5 millones de años, y el Cretácico Tardío duró desde hace 100,5 millones de años hasta hace 66 millones de años.

El clima y los continentes del Cretácico

Los continentes de nuestro planeta estuvieron unidos en un solo supercontinente llamado Pangea. Se formó hace unos 335 millones de años, pero para finales del Jurásico, esta única masa continental comenzó a fragmentarse. Esto continuó durante el Cretácico y, para el final del período, los continentes se habían desplazado prácticamente hasta su posición actual.

En aquel entonces, la Tierra era mucho más cálida que hoy y había poco o ningún hielo en el Polo Norte o el Polo Sur. El nivel del mar fluctuaba, pero en general era alto. De hecho, en ocasiones el nivel del mar llegó a ser 170 metros más alto que hoy.

Se formaron mares poco profundos que dividieron algunos continentes. A finales del Cretácico, por ejemplo, la Vía Marítima Interior Occidental dividió América del

Norte en dos masas continentales. En su mayor extensión, este mar medía más de 3.000 kilómetros de largo, casi 1.000 kilómetros de ancho y 760 metros de profundidad.

El Platycarpus fue un mosasaurio común que vivió en la vía marítima interior occidental. Vivió hace 84-81 millones de años y se cree que cazaba peces, calamares y amonites.

Plantas en el período Cretácico

La flora del Cretácico era muy diferente a la actual. Por ejemplo, **la selva** templada crecía cerca de los polos, que en aquel entonces no tenían hielo.

'We have evidence from West Antarctica of polar forests that would have been dominated mainly by conifers, things like podocarps, araucarias, and probably gingko trees as well, with understories of ferns and cycads,' explains prehistoric plant expert Dr Paul Kenrick.

Unlike the temperate rainforests that exist today in North America's Pacific Northwest, including in Oregon and Washington, each winter the Cretaceous polar forests would have had to survive four months of the year living in the total darkness of polar night. A very long period without Sun for plants to survive!

Today, about 90% of plants are flowering plants, also known as angiosperms. While the origin of flowering plants may go back as far as **the Triassic Period**, we don't see much evidence of them in the **fossil record** at the start of the Cretaceous. However, by the end of the Cretaceous, angiosperms made up a much more prominent part of the planet's plant life.

Monteschia vidalii might be an ancient flowering plant, however, it appears to lack a proper flower. One theory is that this Early Cretaceous species lived underwater and as a result had n...

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'In flowering plants today, something like 70% are insect pollinated,' explains Paul.

'Insect pollination happens earlier on in the Jurassic with gymnosperms [a group of seed-producing plants], but it becomes much bigger with the flowering plants.'

'So, there is this big evolutionary story going on between plants and animals.'

Cretaceous Period animals

'Everything that lived on land that was larger than a metre in size in the Cretaceous was a dinosaur,' says palaeontologist Dr Susie Maidment.

'There were small, furry mammals running around at the feet of the dinosaurs, but they were a relatively minor component of the ecosystem.'

'Birds had evolved and were in the skies, as well as **pterosaurs**. In the seas, there were mosasaurs, which are big **marine reptiles**, and there were groups of plesiosaurs and ichthyosaurs,' explains Susie.

Elasmosaurus was a North American plesiosaur that lived 80 million years ago. This marine reptile was 10 metres long, over half of this made up by its extremely long neck. **Image ©...**

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When it comes to Cretaceous dinosaurs, we often think of ***Triceratops*** and ***T. rex***, though these dinosaurs only lived at the end of the period, around 68-66 million years ago.

'The Cretaceous is 80 million years long, so there's a lot of turnover in that time,' says Susie.

'The Jurassic, which ended 145 million years ago, was the time when we have really big dinosaurs in the northern hemisphere. Things like ***Diplodocus*** and ***Stegosaurus***. Those seem to go extinct or at least decline in the Early Cretaceous and they're replaced by iguanodontians and **ceratopsids**.'

In the Early Cretaceous, **iguanodontians** were some of the first dinosaurs to evolve complex chewing mechanisms rather than just gulping down food like other reptiles.

In the Late Cretaceous, hadrosaurs - the duck-billed dinosaurs - did similar, using their hundreds of tiny teeth to grind up vast amounts of plant matter. Susie calls them 'the cows of the Cretaceous'.

The hadrosaur ***Parasaurolophus*** lived in North America 76-74 million years ago. It had a large crest on its head, which might have been used to produce a honking sound.

While the northern hemisphere's biggest dinosaurs lived during the Jurassic, it was in the Cretaceous that the southern hemisphere saw its largest reptiles. In fact, during this period, some of the **biggest land animals to have ever existed** appeared. The largest of all belong to a group of **sauropod dinosaurs** called titanosaurs.

Patagotitan, a 37.5-metre-long titanosaur from Argentina in South America, might be the largest found so far. But it's possible that one day we'll find even bigger dinosaurs.

'I think before *Patagotitan* we would have said dinosaurs were on the edge of what is physically possible, and then you find something bigger,' notes Susie.

It's not clear why some dinosaurs and pterosaurs, such as ***Quetzalcoatlus***, got so large during the Cretaceous Period. Some think it could be related to what gases were in the atmosphere, while others suggest that an evolutionary arms race between prey and predators may have been responsible.

'Big dinosaurs couldn't really run so they had to protect themselves in other ways. So, the prey animals got bigger and then the predators got bigger and so on,' explains Susie.

The titanosaur *Patagotitan* was found in Argentina and might have be the biggest dinosaur in the world. **Image © PaleoEquii via Wikimedia Commons**, licensed under **CC BY-SA 4.0**

How did giant dinosaurs affect their environment?

Sauropods might have lived and travelled in big herds. But how could the Cretaceous environment have supported so many giant herbivores?

'We have such a mammal-centric view of the world, but sauropods were so different to mammals. I suspect they had a very different metabolism and probably didn't need to eat as much food. They could also probably survive on lower-quality plant matter,' says Susie.

'They hatched out of eggs a bit smaller than a football and could grow into these 60-tonne animals. We can see that they deposited bone tissue very rapidly, so they were growing very fast, and they probably had to eat a lot to fuel their growth.'

'It's been suggested that their metabolism changed as they grew. So early on they had a really fast metabolism and as they got big their growth slowed and they actually had a much slower metabolism.'

Alamosaurus was a titanosaur that lived in North America in the Late Cretaceous. It was among the last groups of dinosaurs, **apart from birds**. © Herschel Hoffmeyer/ Shutterstock.com

Giant sauropods would have stripped cellulose-rich leaves off conifers and these may have taken a long time to process in their digestive systems. They might have also eaten the cones from these trees.

'The cones contain the seeds. They're different to the leaves because they contain starches rather than just cellulose, so you get more for your bucks by eating them,'

says Paul.

Herbivorous - plant-eating - dinosaurs might also have been ecosystem engineers, meaning they changed the places where they lived through their behaviour. When these dinosaurs ate plant seeds, they may have passed through their guts and out in their poo, which helped to spread the seeds across the animal's habitat as they moved around.

'If you think about the analogies in the modern world, such as elephants, then seed dispersal may have been an important function of big dinosaurs,' notes Paul.

But was there any way Cretaceous plants could prevent themselves from becoming a dinosaur's dinner? Paul points out a few groups of plants that might have done just that!

Of the around 370 species of cycads alive today, almost all of them are toxic to most mammals, with only a few primates able to stomach them. If cycads were this toxic during the Jurassic and Cretaceous, it's possible this could have been enough to put dinosaurs off eating them.

Cycads and Bennettitales were at their most diverse during the Mesozoic Era. This fossil trunk of a Bennettitales shrub is more than 50 centimetres in length and is from the Early Cretaceous. It's

144-149 million-years-old.

Bennettitales are an extinct group of plants that looked a lot like cycads.

'Cycads have cones that are produced at the top of the plant, whereas in many Bennettitales, cone-like structures were embedded in the trunk,' Paul explains.

'It might be that these plants were protecting their reproductive parts by encasing them in an armour-like trunk rather than allowing them to be exposed and being easy to predate by dinosaurs.'

Some plants might have survived by being robust. The monkey puzzle tree, *Araucaria araucana*, for example, looks almost armour plated, covered in thick, scale-like leaves with sharp edges. The group this plant belongs to was at its most diverse during the Jurassic and Cretaceous.

The monkey puzzle tree is native to Chile and Argentina. It is now commonly grown in UK gardens. It's a hardy conifer species with relatives that lived during the Cretaceous Period....

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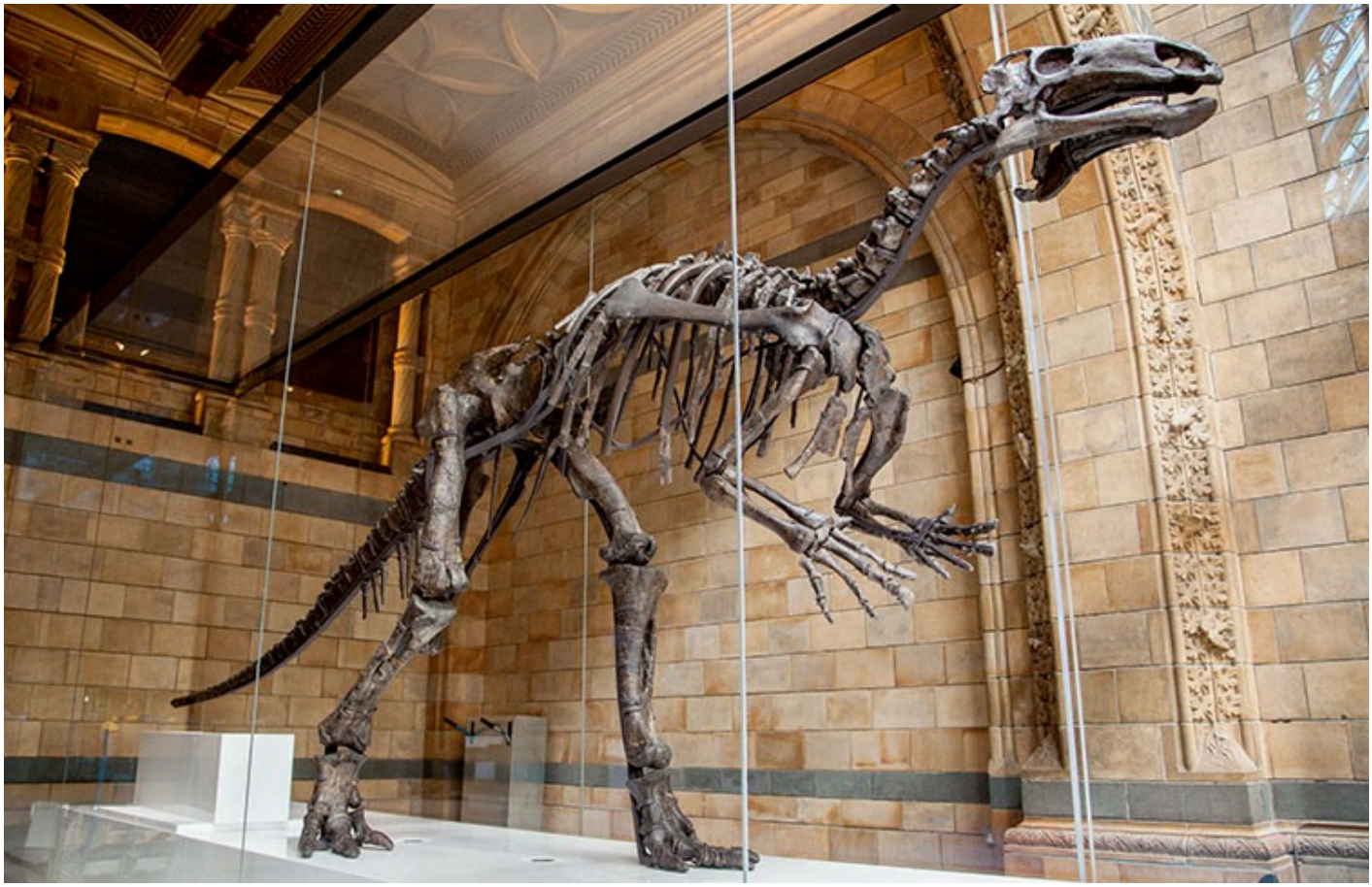
Cretaceous Britain

The name Cretaceous comes from the Latin 'creta' which means chalk. It's named for the large quantities of chalk rock laid down at this time in Western Europe. The UK's famous White Cliffs of Dover are just one of many Late Cretaceous chalk deposits.

Chalk is laid down in marine environments, and the fossils within it can tell us about the creatures that lived in the ocean. But it also means scientists have less of an understanding of the plants and land animals that lived in Britain at the end of the Cretaceous Period.

We have a much better idea of what lived on land here in the Early Cretaceous, particularly thanks to rocks near Bournemouth in southern England known as the Wealden Group. This area is well known for the **discovery of *Iguanodon***. In fact, the UK is particularly well known for iguanodontians, with 12 genera having been found here from the Early Cretaceous.



Mantellisaurus is an iguanodontian dinosaur that lived 130-120 million years ago. The **holotype** - the specimen to which all others are compared to - was found on the Isle of Wight in 1914.

We know from the fossil record that rather than dense deciduous woodlands, back in the Cretaceous Britain's landscapes would have featured conifers with an understory of ferns and cycad-like plants.

These landscapes would have been relatively open. Today, big areas dominated by grasses and with sparse tree cover are known as savannahs and prairies. In the Cretaceous, open landscapes like these would have been dominated by ferns rather than grass.

'We think of ferns as being these little delicate things that like wet places, but back then you had ferns that were quite robust and lived in semi-arid environments,' says Paul.

Baryonyx lived in southeast England during the Early Cretaceous. This carnivorous dinosaur is closely related to *Spinosaurus*, which some think **may have hunted prey underwater**.

How did the Cretaceous Period end?

The Cretaceous-Palaeogene extinction 66 million years ago is possibly the most famous **mass extinction** event. It was caused by **a large asteroid crash-landing** off the coast of Mexico, which changed the climate of the planet dramatically.

'It vapourised carbonate and sulphate rocks, which caused acid rain, and threw lots of ash, dust and dirt into the atmosphere, blocking out the Sun. This caused a global collapse of the food chain,' explains Susie.

'There also would have been a thermal heat pulse that caused wildfires - that's evidenced by charcoal in the rock record - and huge tsunamis washed across the ocean basins.'

Adding to the chaos was the formation of the Deccan Traps, one of the planet's largest **volcanic features**. The vast quantities of sulphur released would have cooled the atmosphere.

The Cretaceous extinction wiped out about 65% of all species.

The Cretaceous extinction event wiped out many animals, including **ammonites, a group of shelled cephalopods**. © Esteban De Armas/ Shutterstock.com

Plants were affected, though not in quite the same way as animals.

'With animals, whole groups disappeared. Whereas with plants, you see a lot of extinction, but you don't tend to see whole groups of plants disappear,' explains Paul.

'In many respects, plants are more robust than animals, more resilient to physical disturbance.'

Paul likens this to cutting the grass. Even after cutting a plant in half with a lawnmower, it can regenerate, something that is impossible for animals to do. In catastrophic circumstances, plants can regrow from rooting systems, buds and other parts.

Plants also have the advantage of creating vast quantities of seeds that, in some types of plants, can survive in the soil for decades until conditions are right for them to begin to grow.

Ecological variation within groups also helps in the face of catastrophe.

'You see plants that produce big trees and small shrub-like things. You might have families that have annuals and long-lived perennials. You might have groups that are adapted to hot and cold climates in the same family.'

'The family level of plants may be more diverse than animals, so that's why you don't get the massive losses of these big groups, because some element of them finds a way to survive extinction.'

Quick quiz

How many mass extinctions has Earth experienced?

Five

Three

Ginkgo biloba is the only remaining member of their group Ginkgoales, the diversity of which began declining in the Late Cretaceous. Image from of Max Pixel, licensed under CC0

What came after the Cretaceous Period?

When the Cretaceous Period and Mesozoic Era ended 66 million years ago, the Palaeogene Period and the Cenozoic Era began.

En el Paleógeno, los continentes se desplazaron aún más cerca de sus posiciones actuales, y durante el siguiente Período Neógeno el mundo era más frío y los efectos de la estacionalidad se sintieron más ampliamente.

En este período evolucionaron muchas plantas modernas y los pastos comenzaron a extenderse.

En lugar de los pterosaurios, las aves se convirtieron en los animales dominantes en los cielos y **la extinción de los dinosaurios no aviares** permitió que los mamíferos se diversificaran y crecieran rápidamente.

Aunque todavía pasarían muchos millones de años antes de que aparecieran **parientes humanos antiguos , la evidencia de algunos de los primeros mamíferos**

similares a los primates proviene del Paleógeno.

Descubre los dinosaurios

Descubra lo que los científicos del Museo están revelando sobre cómo se veían, vivían y se comportaban los dinosaurios.

Desenterrar datos sobre los dinosaurios

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Hace sesenta y seis millones de años los dinosaurios tuvieron el peor día.

Dinosaurios

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Al final del Jurásico, los dinosaurios dominaban nuestro planeta. Pero cómo llegaron a ser un grupo tan diverso sigue siendo un misterio.

Dinosaurios

¿Cuál fue el dinosaurio más grande?

Conozca algunos de los dinosaurios más grandes que jamás hayan caminado sobre el planeta.

Dinosaurios

¿Por qué eran tan grandes los dinosaurios? Los secretos del gran tamaño de los titanosaurios.

Los dinosaurios son los animales terrestres más grandes que jamás hayan existido. Los titanosaurios fueron los

más grandes de todos. Descubre cómo alcanzaron ese tamaño.

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