

The prehistoric world was once alive with colour.

But how do we know what dinosaurs looked like?

Did they have scales, fur or feathers?

What secrets are revealed by millennia-old fossils?

And what can we learn about long-extinct animals from
the ancient humans who lived alongside them?

Find out in this colourful first book of palaeontology.

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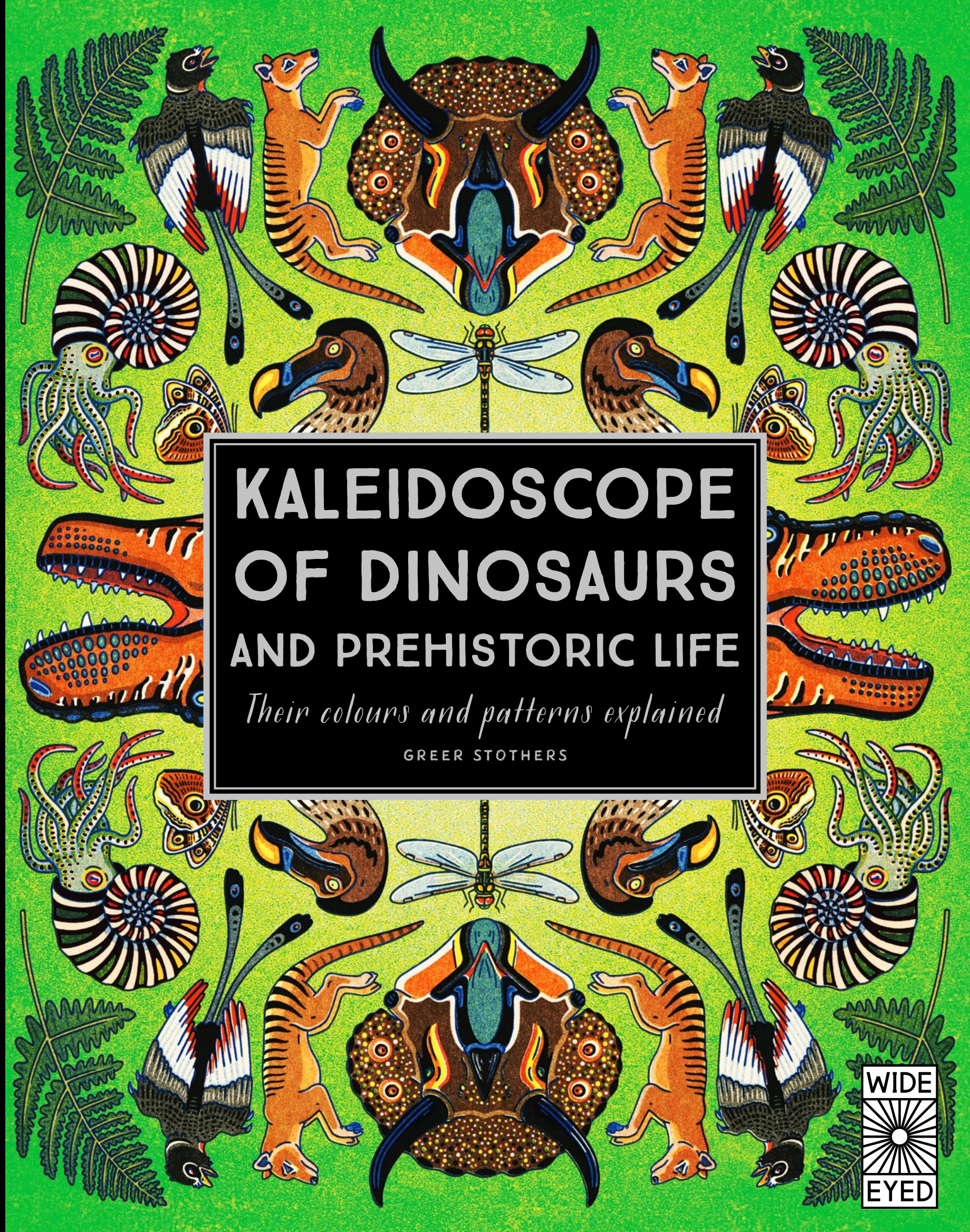


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KALEIDOSCOPE OF DINOSAURS AND PREHISTORIC LIFE

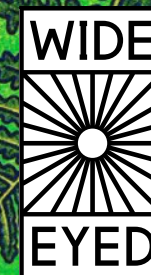
GREER STOTHERS



KALEIDOSCOPE OF DINOSAURS AND PREHISTORIC LIFE

Their colours and patterns explained

GREER STOTHERS



FOSSIL FORMATION

Fossils are key to our knowledge of ancient life. They are difficult to find but beautiful to look at. Some fossils preserve details so well that they can tell us an animal's colouration. But how are fossils made?

STAGES OF FOSSILISATION

TYPES OF FOSSIL



An animal dies and is naturally buried. Rapid burial (either by flood or wind-blown dirt or sand) preserves the body best.



Over time, the animal is swallowed by the earth. Its soft parts typically decay, leaving only the skeleton. Water flowing through the ground carries in minerals that fill in microscopic, empty spaces in the bones and tissue, gradually replacing the animal's body with stone. This process takes a minimum of 10,000 years.



Whether through erosion (wearing away) of the ground or the shifting of the earth over time, fossils 're-emerge' and come to the surface. That's when we find them!



It takes enormous skill to chisel the rock from a fossil, revealing its finer details. This is a slow process so it can be years before an animal is restored.



1. BODY FOSSILS

Body fossils occur when body parts of an animal are replaced by stone. Sometimes the preservation is so complete that we can see its microscopic cells.



2. NATURAL CASTS

Fossils that only capture the outer impression of an animal's body are called cast or mould fossils. The body has completely decayed, but the parts that were in contact with the surrounding earth have fossilised.



3. TRACE FOSSILS

Trace fossils are fossilised marks such as scratches on trees, burrows dug deep underground or footprints in the mud. These are valuable clues that tell us how animals acted in the past.



4. COPROLITES

This is exactly what it looks like – fossilised poo! Coprolites show what ancient animals ate. Some scientists dedicate their entire lives to studying dinosaur dung.

RAINBOW OF DISCOVERIES

Our knowledge is growing at an explosive rate. Scientists of the past mostly made do with cobbled-together bones, but modern technology allows us to explore further and faster to uncover fossilised soft tissue like skin, feathers and scales. Under the microscope, these fossils can reveal an animal's colours.



Caihong lived in the Jurassic period, 161 million years ago. That makes it one of the oldest dinosaurs with fossilised colour.

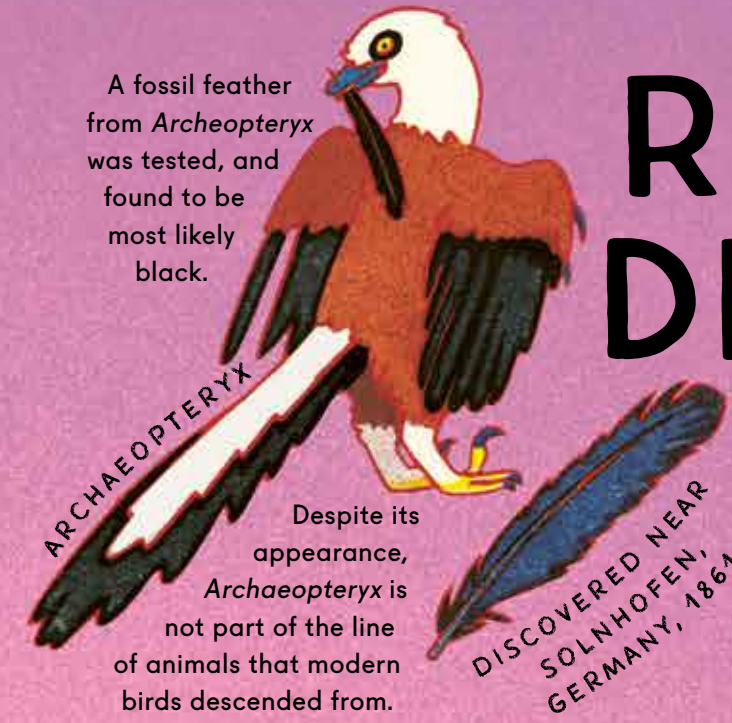
DISCOVERED IN GANGOU, CHINA, 2014



CAIHONG

Caihong's melanosomes look similar to those of trumpeters, modern South American birds. They reflect light to make beautiful iridescent feathers.

These stone feathers have shared their secrets! From looking at the shape of its melanosomes, *Cruralispennia* likely had glossy or iridescent feathers, with dark brown trousers.



ARCHAEOPTERYX

A fossil feather from *Archaeopteryx* was tested, and found to be most likely black.

Despite its appearance, *Archaeopteryx* is not part of the line of animals that modern birds descended from.

DISCOVERED NEAR SOLNHOFEN, GERMANY, 1861



Though it was not a bird, *Microraptor* could certainly fly like one.

DISCOVERED IN LAMADONG, CHINA, CIRCA 2012



MICRORAPTOR

With black and iridescent melanosomes, *Microraptor* looked like a four-winged raven.



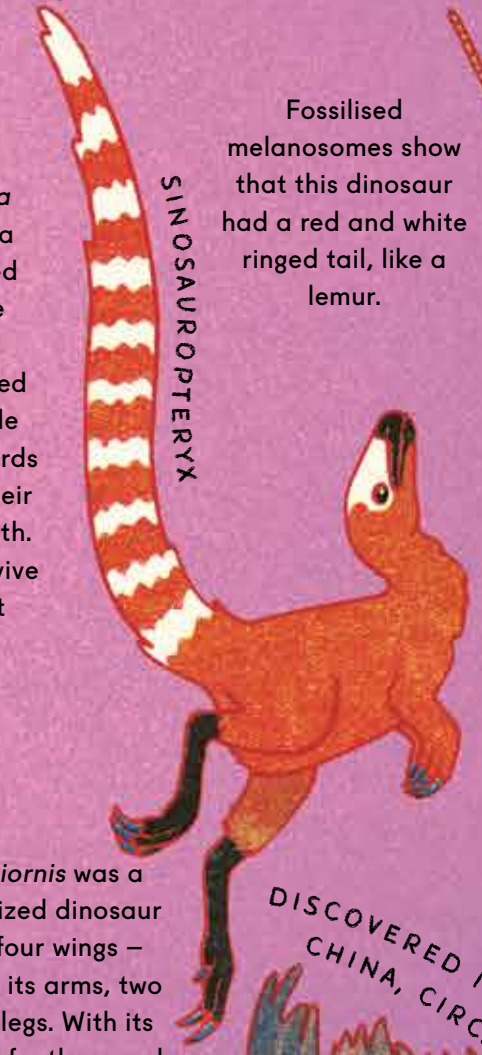
CRURALISPENNIA

Cruralispennia belonged to a family called 'opposite birds', which lived alongside modern birds but kept their claws and teeth.

Sadly, they did not survive the asteroid strike that killed most dinosaurs.



DISCOVERED IN HAUJING FORMATION, CHINA, CIRCA 2017



SINOSAUROPTERYX

Fossilised melanosomes show that this dinosaur had a red and white ringed tail, like a lemur.

Sinosauropteryx had shaggy, primitive feathers like an emu.

DISCOVERED IN LIAONING PROVINCE, CHINA, 1996



ANCHIORNIS

What a well-preserved fossil! From melanosome evidence, scientists report that *Anchiornis* was grey, black and white with a reddish-brown crest.

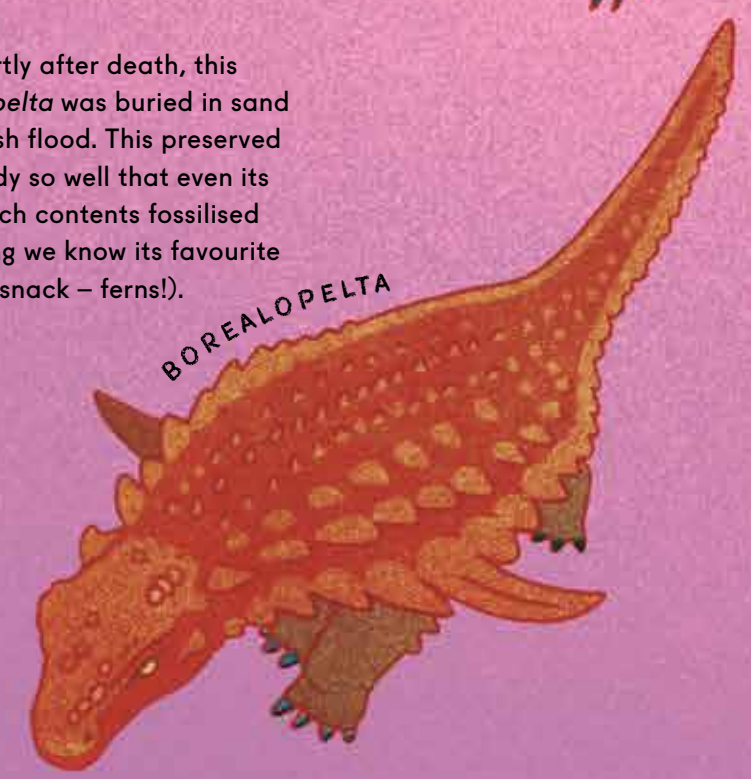
Anchiornis was a crow-sized dinosaur with four wings – two on its arms, two on its legs. With its shaggy feathers and toothy grin, it only looks like a bird at first glance.



DISCOVERED IN DAXISHAN, CHINA, CIRCA 2009



Despite the scary spikes, this reddish-brown beast was a vegetarian.

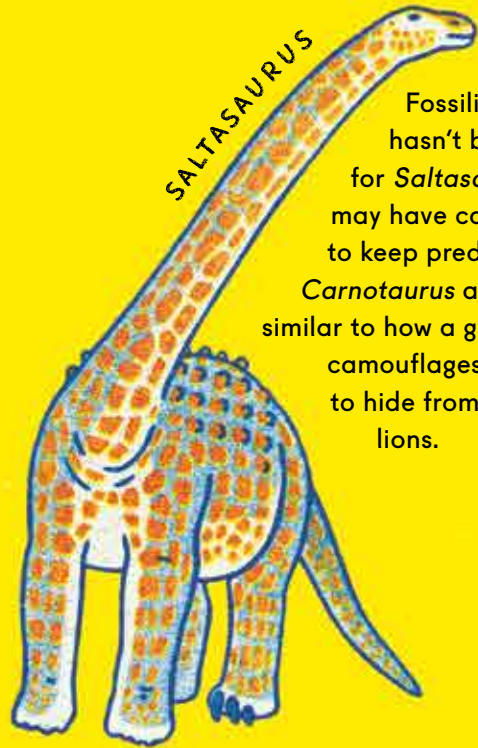


BOREALPELTA

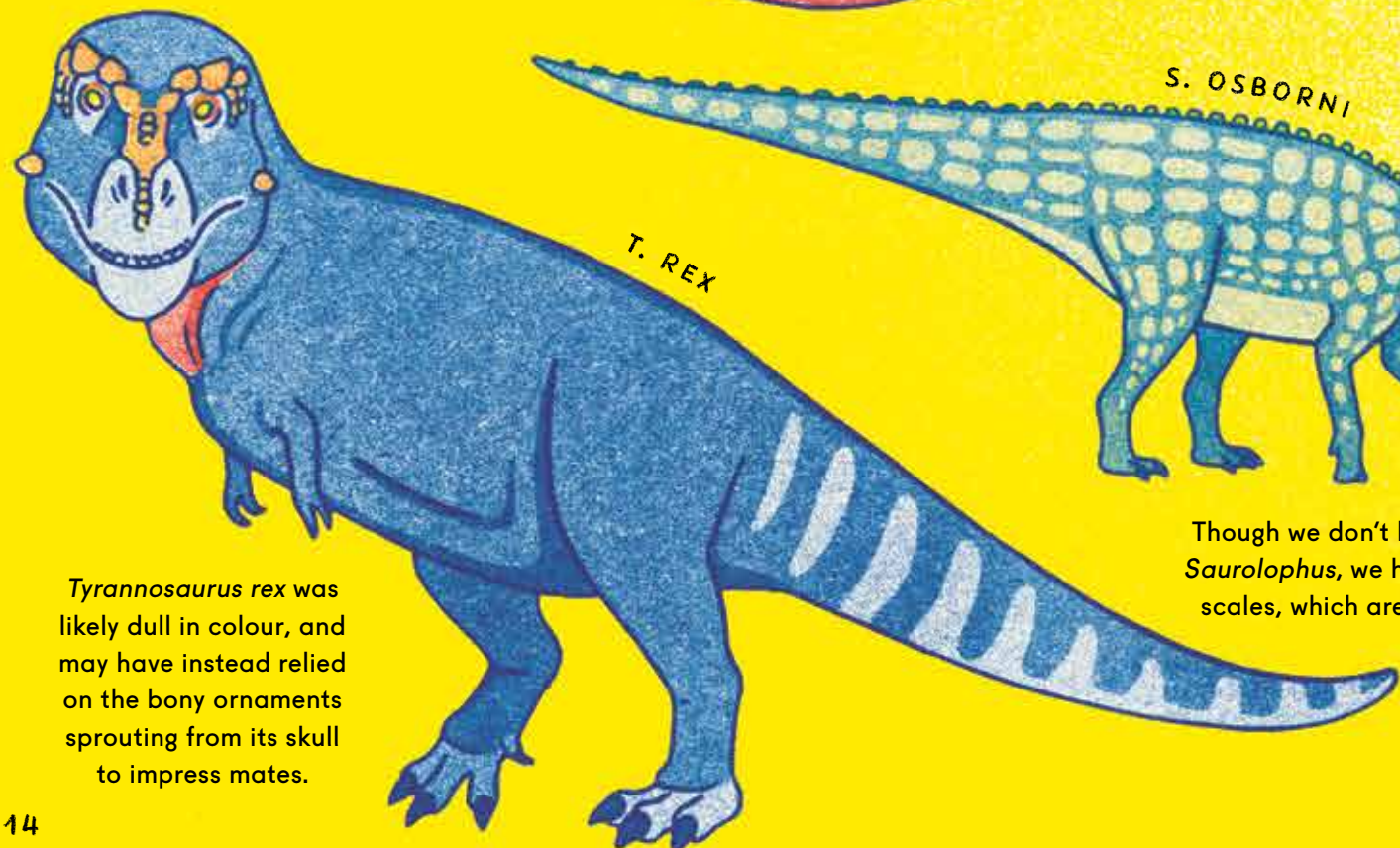
Shortly after death, this *Borealeopelta* was buried in sand by a flash flood. This preserved the body so well that even its stomach contents fossilised (meaning we know its favourite snack – ferns!).

HUES OF THE HUGE

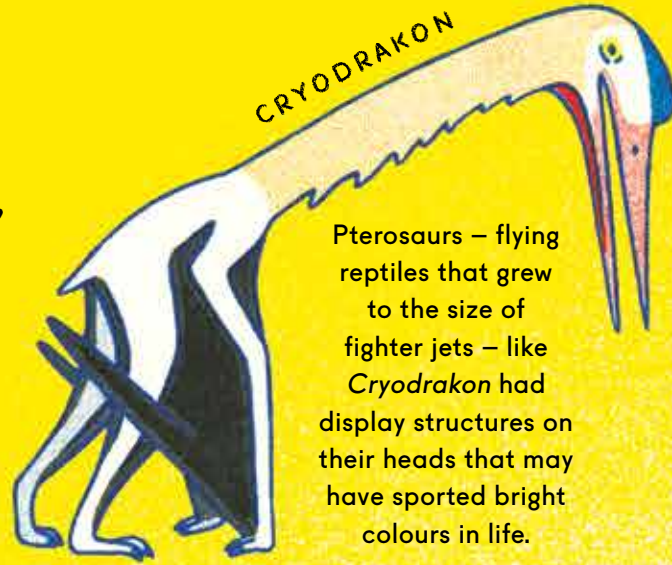
When an animal's colour fails to fossilise, scientists use other methods to figure out how it looked, such as studying living creatures. Giants are often dull, because the larger a body, the more resources it takes to create certain colours. With that in mind, can we guess the complexions of these ancient titans?



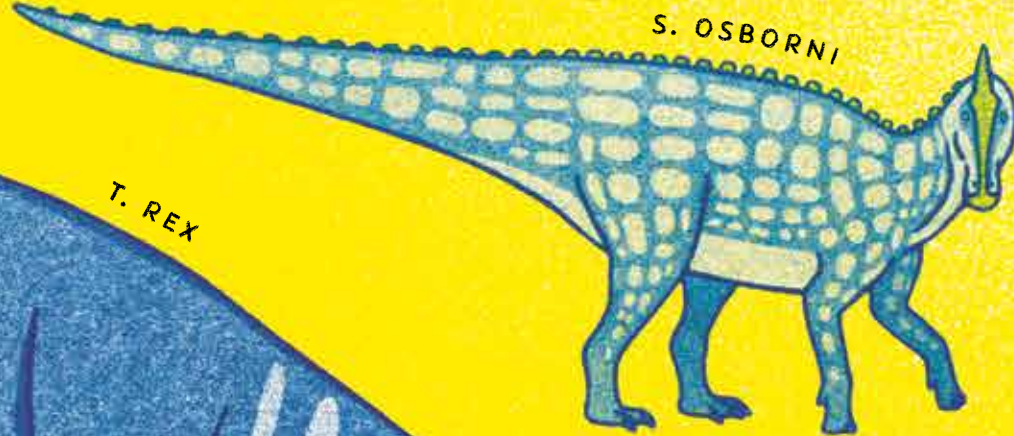
Fossilised colour hasn't been found for *Saltasaurus*, but it may have camouflaged to keep predators like *Carnotaurus* at bay – similar to how a giraffe camouflages to hide from lions.



Tyrannosaurus rex was likely dull in colour, and may have instead relied on the bony ornaments sprouting from its skull to impress mates.



Pterosaurs – flying reptiles that grew to the size of fighter jets – like *Cryodrakon* had display structures on their heads that may have sported bright colours in life.

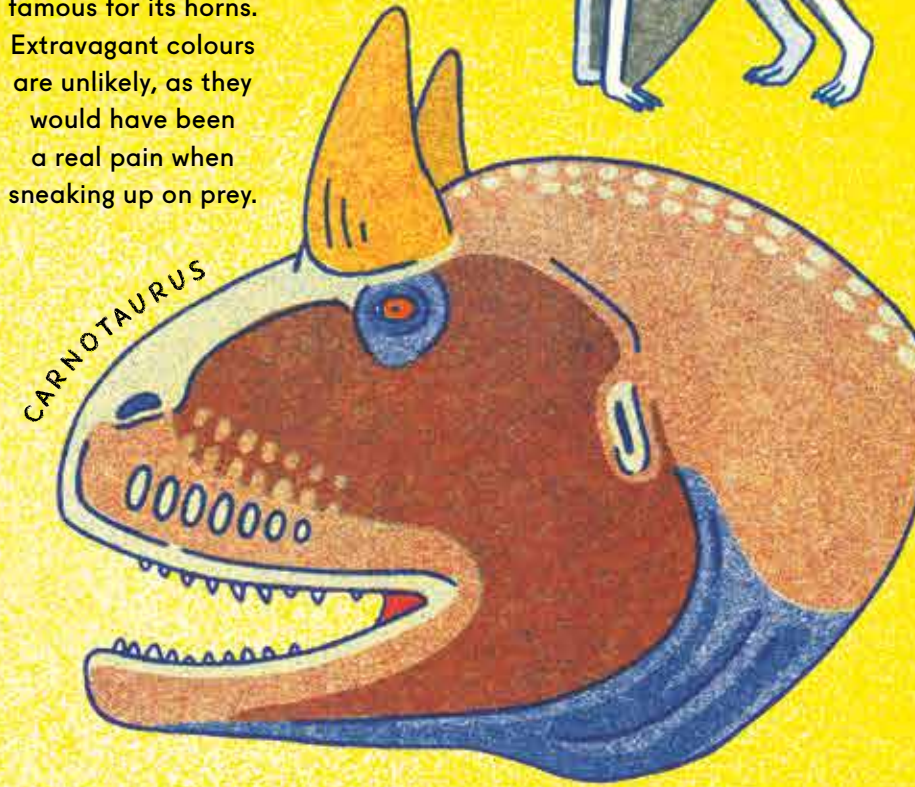


Though we don't know the colour of *Saurolophus*, we have their fossilised scales, which are arranged in a way that may suggest a splotchy pattern in life.

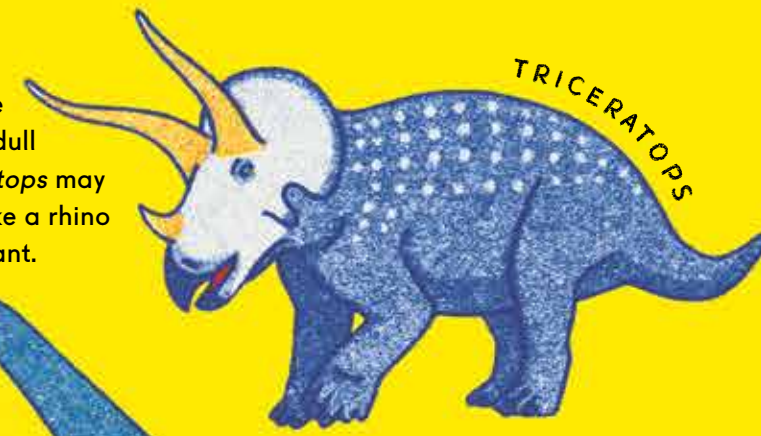
Quetzalcoatlus was the largest of the pterosaurs. The largest flying animal alive today, the wandering albatross, is primarily white – would *Quetzalcoatlus* have had a similar coat?



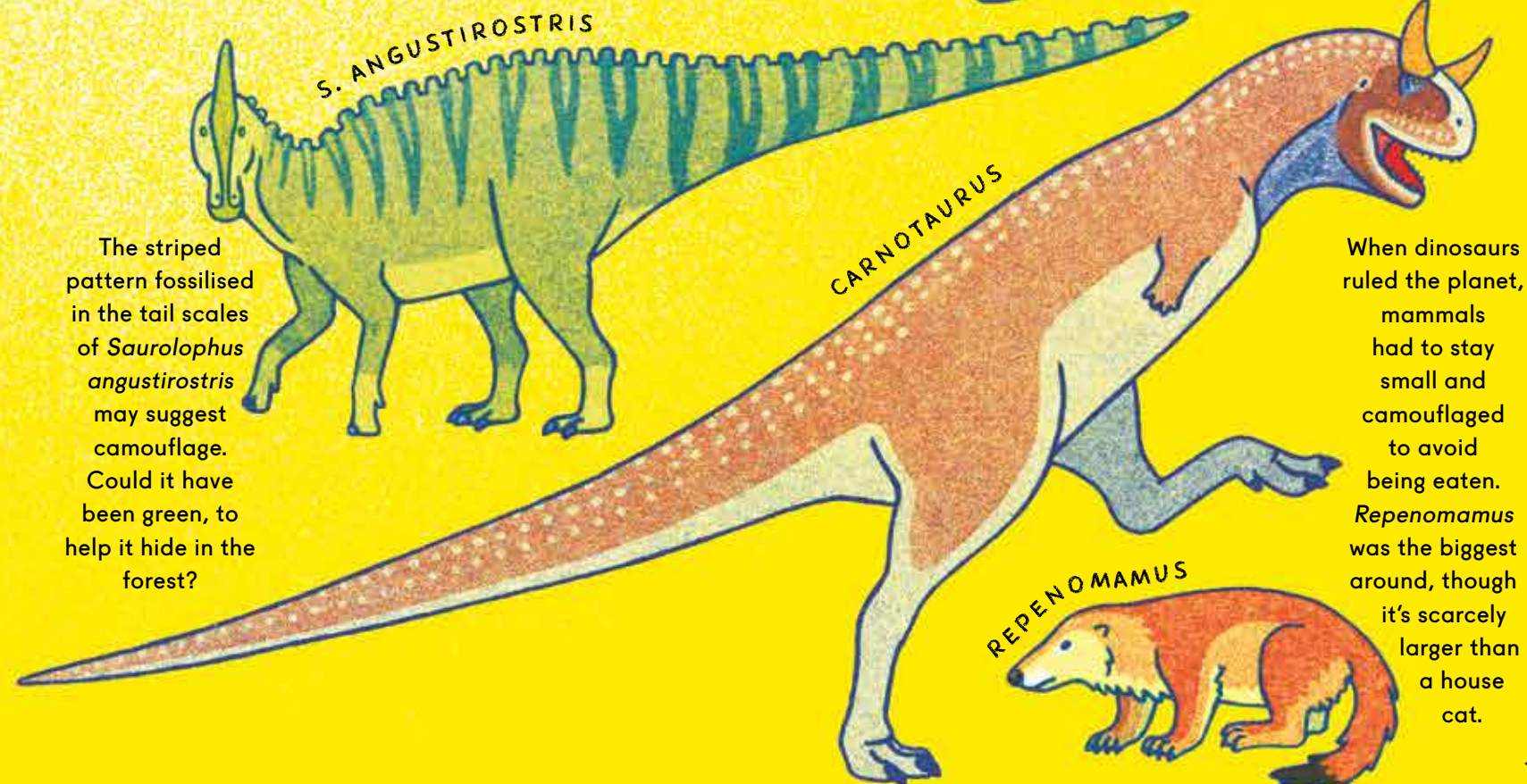
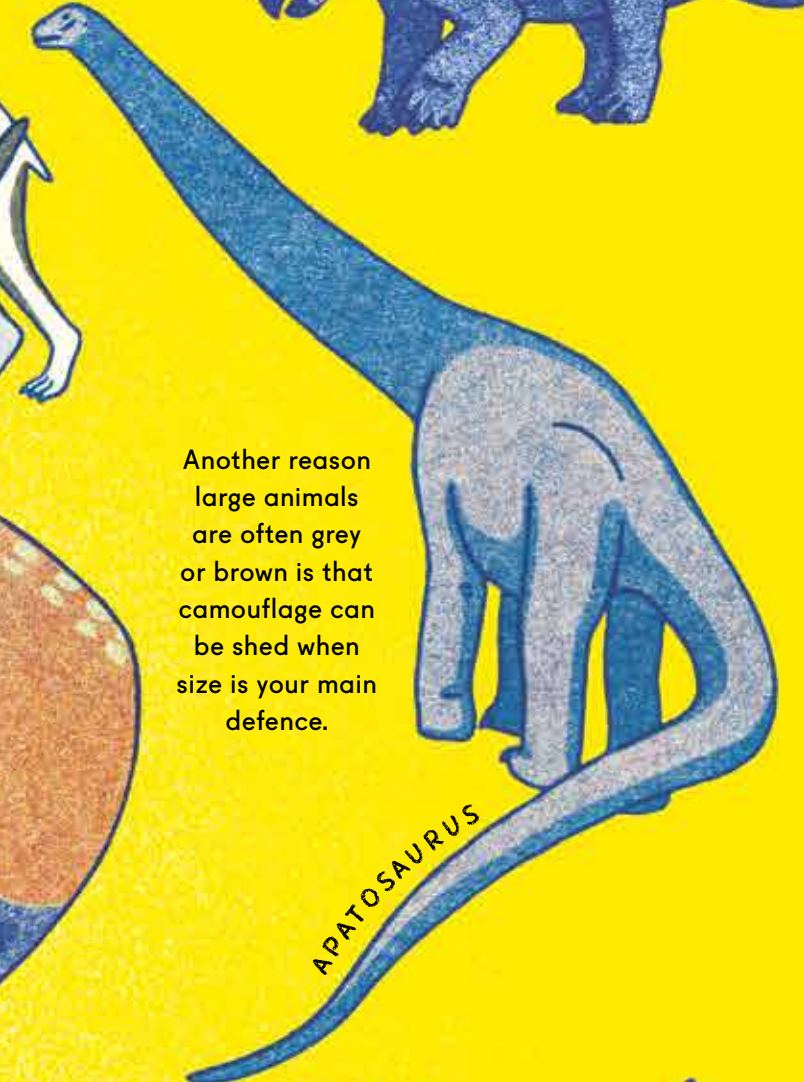
This meat-eater is famous for its horns. Extravagant colours are unlikely, as they would have been a real pain when sneaking up on prey.



Most giant plant-eaters alive today are rather dull in colour. *Triceratops* may have been grey, like a rhino or an elephant.

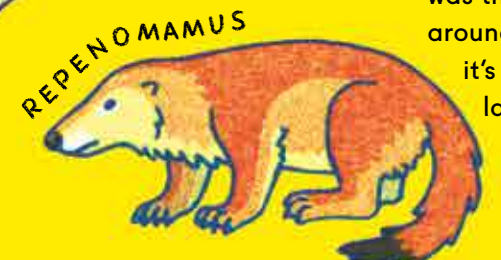


Another reason large animals are often grey or brown is that camouflage can be shed when size is your main defence.



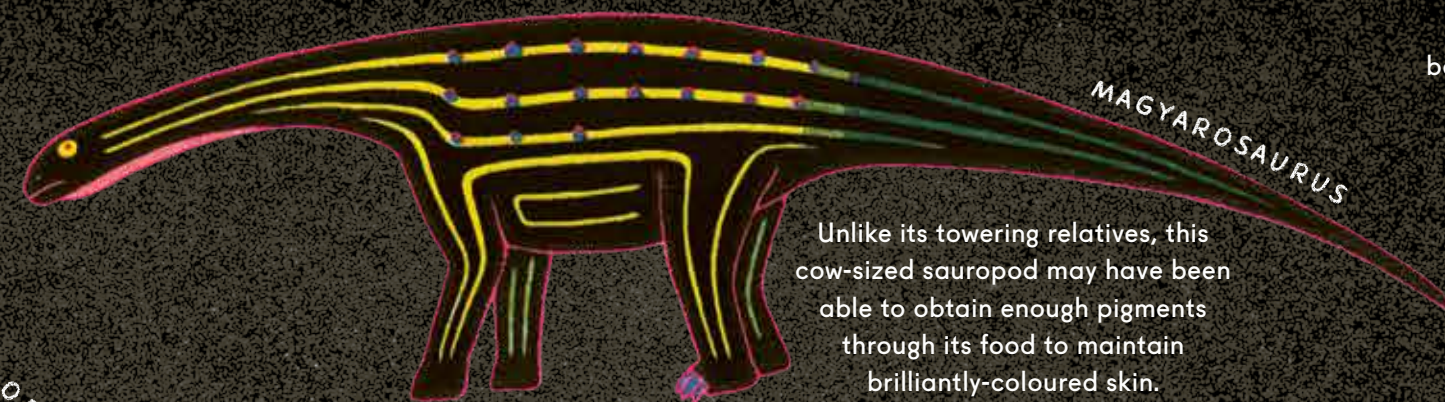
The striped pattern fossilised in the tail scales of *Saurolophus angustirostris* may suggest camouflage. Could it have been green, to help it hide in the forest?

When dinosaurs ruled the planet, mammals had to stay small and camouflaged to avoid being eaten. *Repenomamus* was the biggest around, though it's scarcely larger than a house cat.





Flying dinosaurs had less need for camouflage. If a predator swung by, they could take to the sky! *Eoconfuciusornis* fossilised with a reddish neck and ribbon-like feathers, so it obviously felt comfortable showing off.



Unlike its towering relatives, this cow-sized sauropod may have been able to obtain enough pigments through its food to maintain brilliantly-coloured skin.



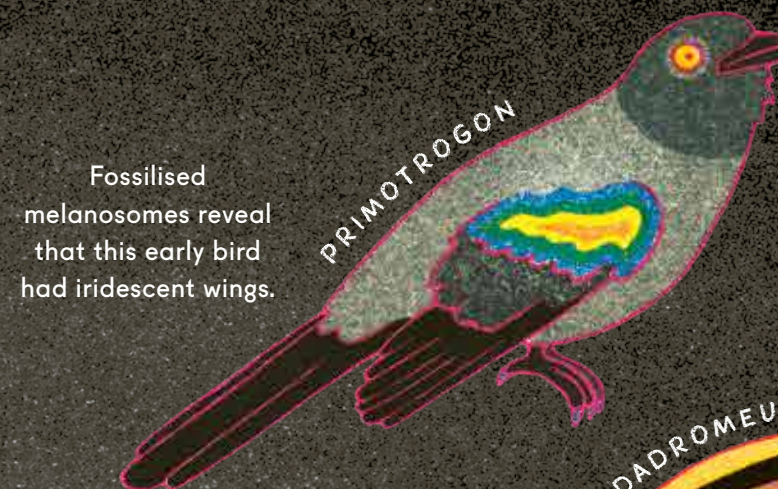
At 48 million years old, beautiful *Eocoracias* would have rivalled any parrot. Under the microscope, its body feathers were a structural colour that is likely deep blue.



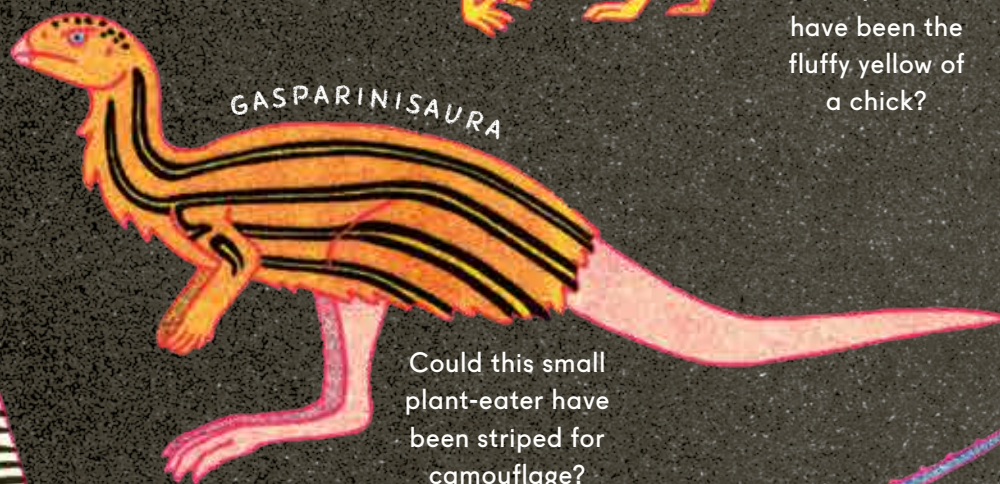
Though flightless, this small dinosaur sported lovely wings. Fossilised melanosomes show a striped light-and-dark pattern on its tail feathers, contrasting with black body plumage.



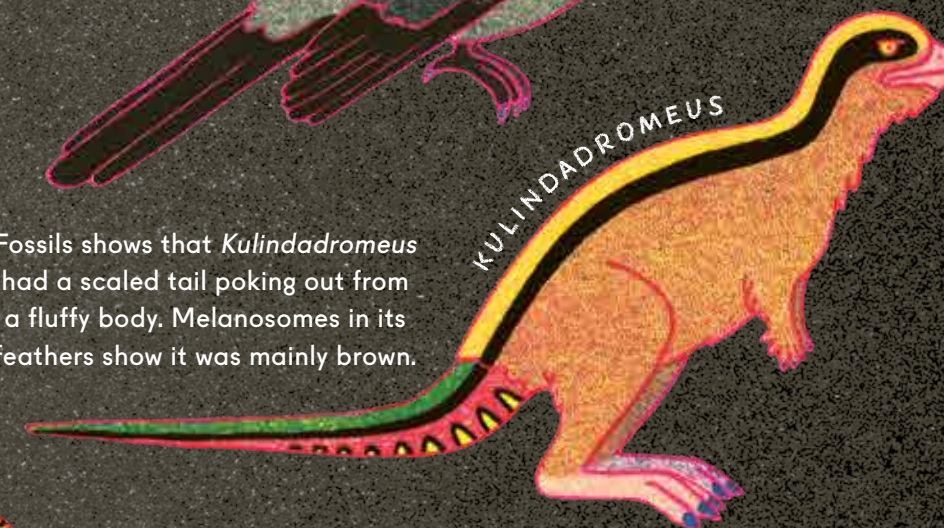
With its 25 cm wingspan, scientists are unsure whether this teeny pterosaur fossil was a baby or a sparrow-sized adult. If the former, could it have been the fluffy yellow of a chick?



Fossilised melanosomes reveal that this early bird had iridescent wings.



Could this small plant-eater have been striped for camouflage?



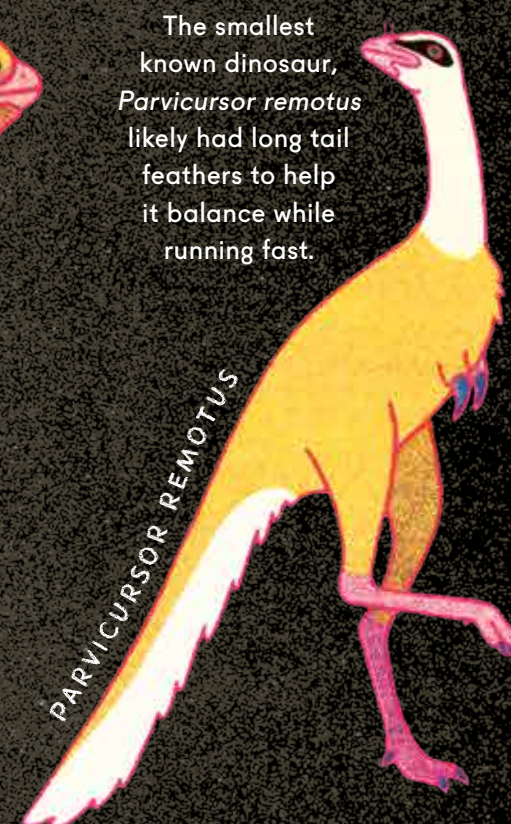
Fossils show that *Kulindadromeus* had a scaled tail poking out from a fluffy body. Melanosomes in its feathers show it was mainly brown.



This small dinosaur was named after its 'scutes', the bony plates running down its back.



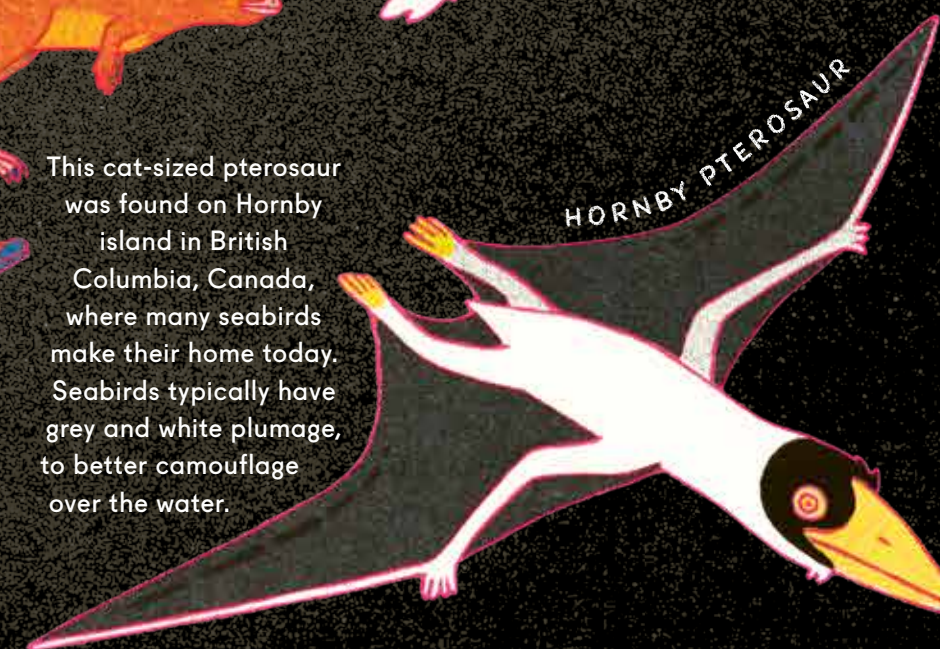
This rabbit-sized dinosaur fossilised with strange bristles protruding from its back. Bristles on modern animals like hedgehogs come in a variety of colours, from salt-and-pepper to neon yellow – could that be the case for *Tianyulong*?



The smallest known dinosaur, *Parvicursor remotus* likely had long tail feathers to help it balance while running fast.



Relatives of *Compsognathus* fossilised with scaled tails! Scales can hold more complex colours than primitive feathers, so this tail may have been the key to its beauty.



This cat-sized pterosaur was found on Hornby island in British Columbia, Canada, where many seabirds make their home today. Seabirds typically have grey and white plumage, to better camouflage over the water.

TINY TINTS

Small animals require less resources to invest in colourful feathers and scales. But being bite-sized also makes them an easy snack, so it might be smarter to dress drably and hide away. How did ancient life deal with this dilemma?