

Tomáš Tůma

Encyclopedia of the Prehistoric World for Young Readers

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Written and illustrated by
Tomáš Tůma



Beginnings of life

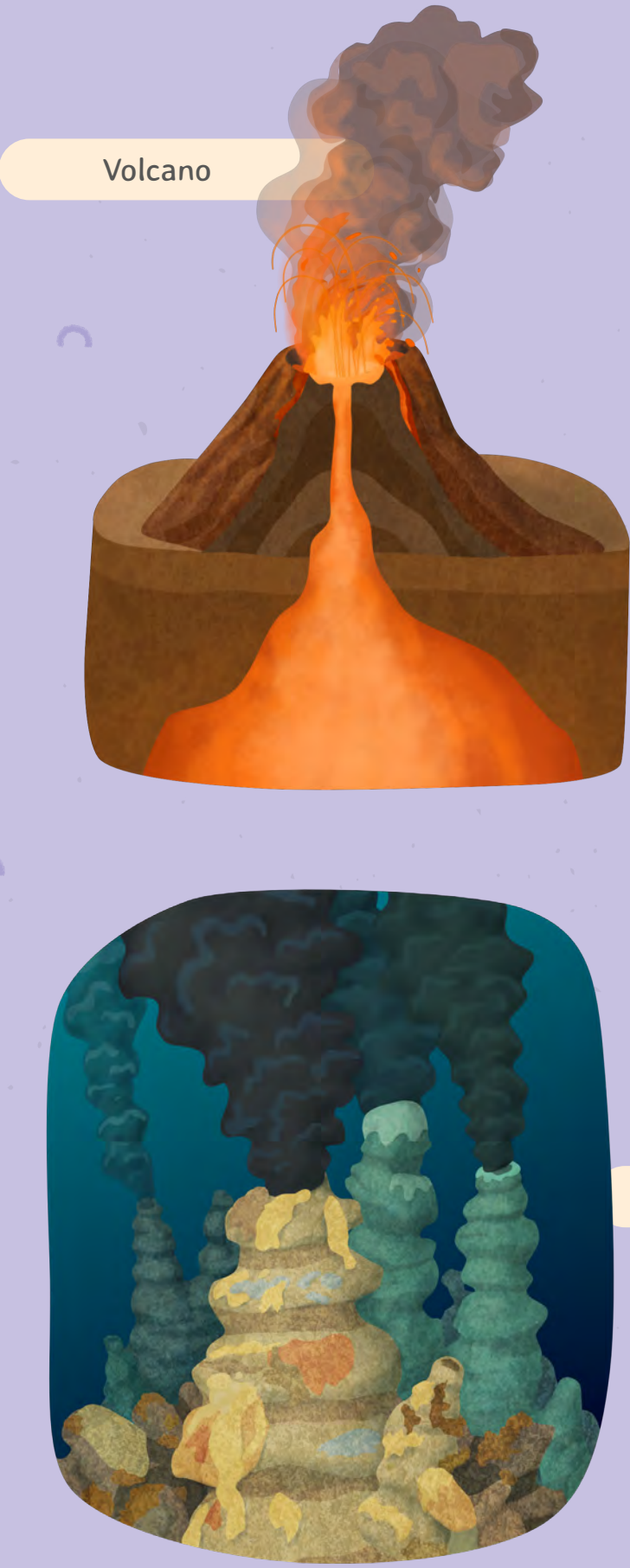
FIRST SIGNS



The first microorganisms on Earth—four billion years ago—were real superheroes. The surface of Earth's thin crust was bombarded by asteroids from above and constantly disturbed by moving magma from below. A very hot climate, lack of oxygen, and harsh conditions only allowed for simple life in water.

Volcano

Devastating, terrifying volcanic eruptions were important for the emergence of the first organisms. Volcanic gases contained water vapor, elements essential for life, and gases that made up the atmosphere.



Black smoker

A nutritious cocktail of minerals dissolved in hot water seeps to the sea floor through vents called black smokers. Surprisingly, primitive organisms like the taste.

First organisms

Archaea (primitive single-celled organisms able to survive extreme conditions) and the first bacteria evolved from a common ancestor.



Stromatolite

Sediment formations called stromatolites, created by cyanobacteria in shallow seawater, are among the oldest fossils.

Algae

One hungry cell swallowed a cyanobacterium. Instead of digesting it, it used it to generate energy from sunlight. This is not a fairy tale. It really happened.

Cyanobacteria

Bacteria adapted to use energy from sunlight evolved into cyanobacteria. Thanks to a special pigment, they can produce oxygen from water, which is essential for more complex forms of life.

From trilobites to reptiles

THE FIRST FISH

The first jawless fish or armored monsters to swim in the warm marine bays, in the Devonian period, look somewhat clumsy. But evolution continued apace, through cartilaginous sharks and bony fish to the first four-legged creatures to venture onto land. But we mustn't get ahead of ourselves.

☀ **Dunkleosteus**

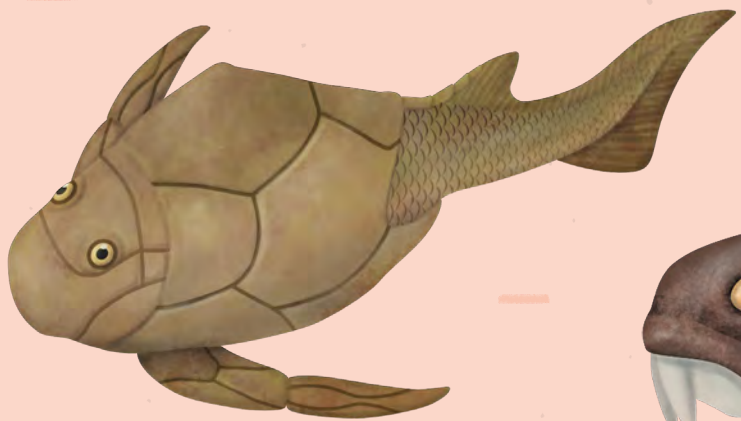
This terrifying armored fish, its head covered in bony armor, clenched its jaws with far greater force than a shark. Instead of teeth, it had bony plates as sharp as metal shears.

☀ **Coccosteus**

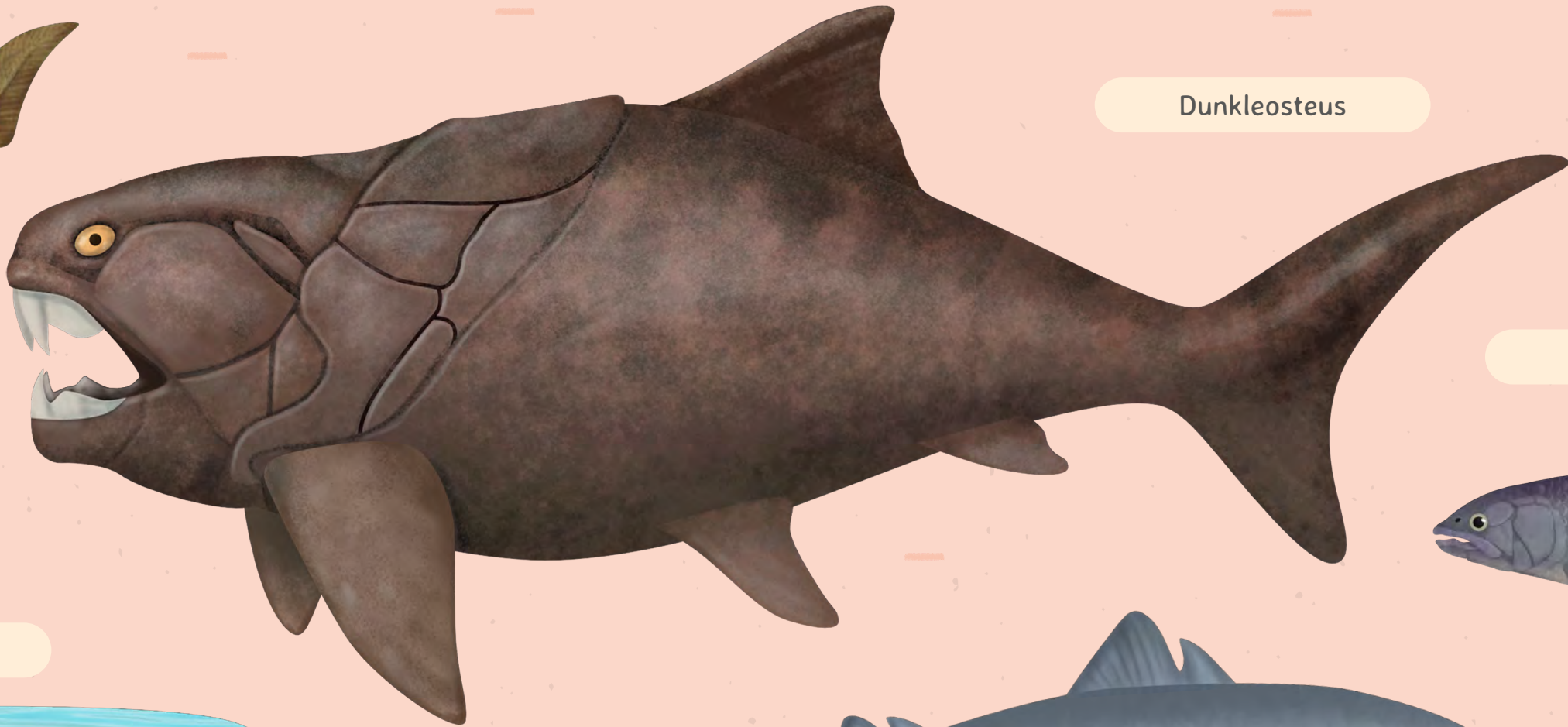
Though less of a giant than Dunkleosteus, it terrorized its freshwater prey. Owing to a joint between its skull and armored body, it could open its mouth very wide.

☀ **Cephalaspis**

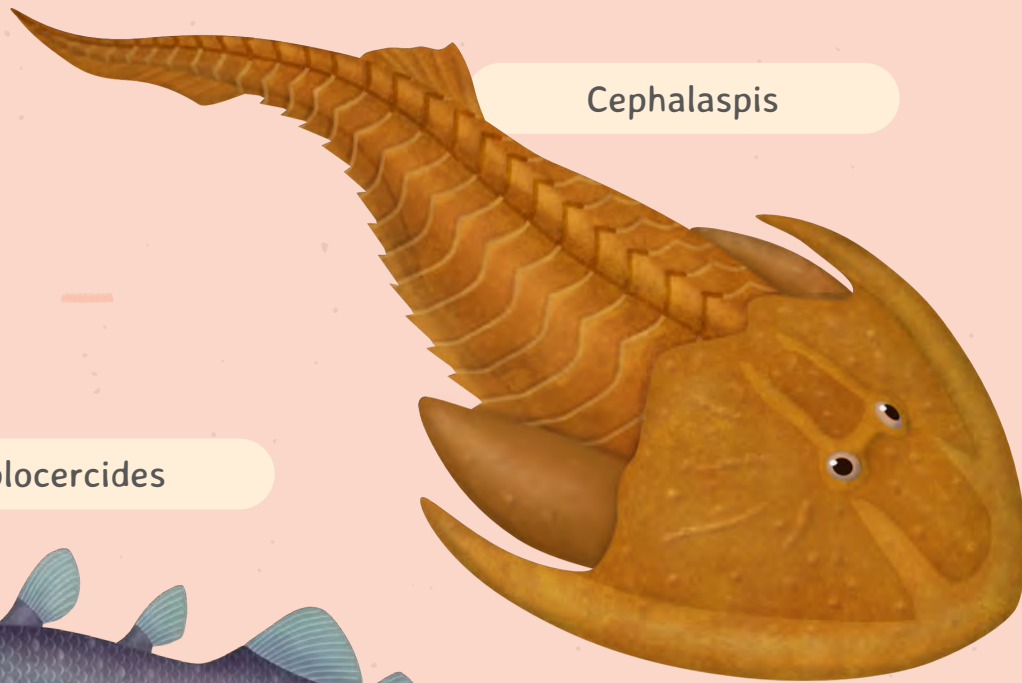
The flat head of this jawless fish, with sensitive sensory organs on the sides and a mouth on the underside, worked like a vacuum cleaner for food from the seabed.



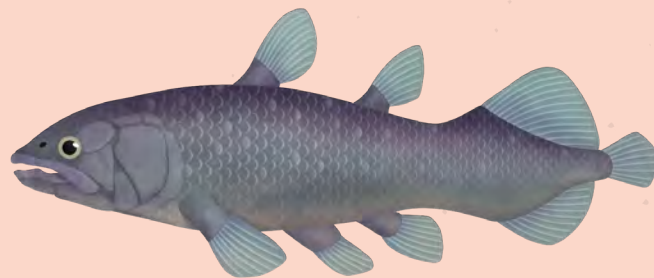
Pterichthyodes



Dunkleosteus



Cephalaspis



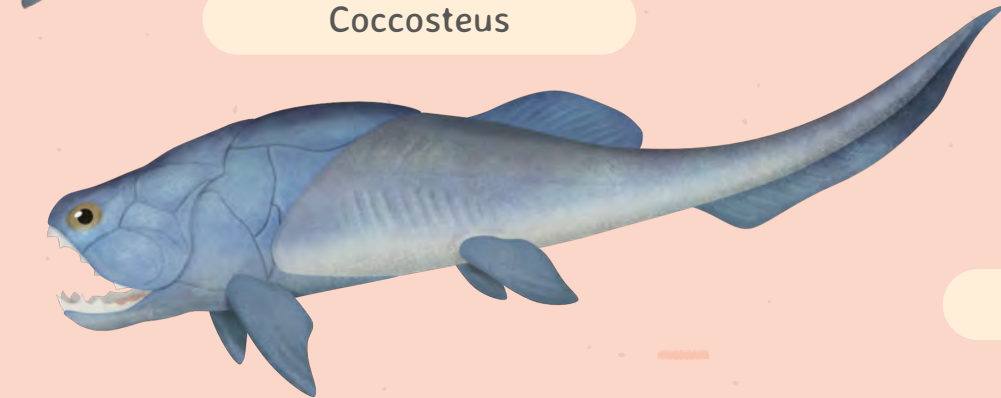
Diplocercides



Titanichthys



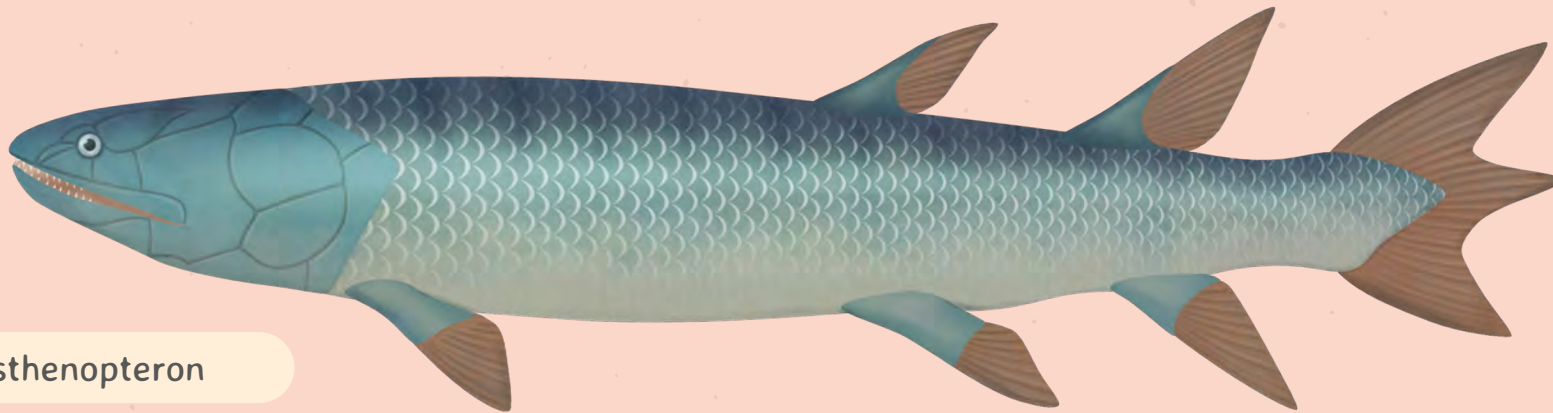
Cladoselache



Coccosteus



Scaumenacia



Eusthenopteron

☀ **Titanichthys**

Although it was a giant fish, it was easygoing. Unlike Dunkleosteus, it didn't have sharp, guillotine-like bony jaws. It hunted small animals in a similar way to today's whale shark.

☀ **Diplocercides**

With its three-lobed tail fin and lobe-like fins, it looks like the coelacanth, a ray-finned fish that survives to this day. It inhabited shallow seas during the Devonian period.

☀ **Cladoselache**

Its body and fins make it plain that it was a fast-moving hunter. You are right to be reminded of a shark: It is one of the earliest members of the shark family.

☀ **Pterichthyodes**

This heavily armored freshwater fish spent most of its time on the bottom, which is why its eyes are positioned upwards. The armor even covers its pectoral fins.

☀ **Scaumenacia**

It is a lungfish, meaning that it has lungs as well as gills. This allowed it to adapt better to life in muddy, low-oxygen water.

☀ **Eusthenopteron**

Something's brewing! Although Eusthenopteron lived only in an aquatic environment, the build of its fins and nostrils in its skull indicate that vertebrates were evolving toward life on land.

ADVANCEMENT OF THE FOREST

☀ Carboniferous forest

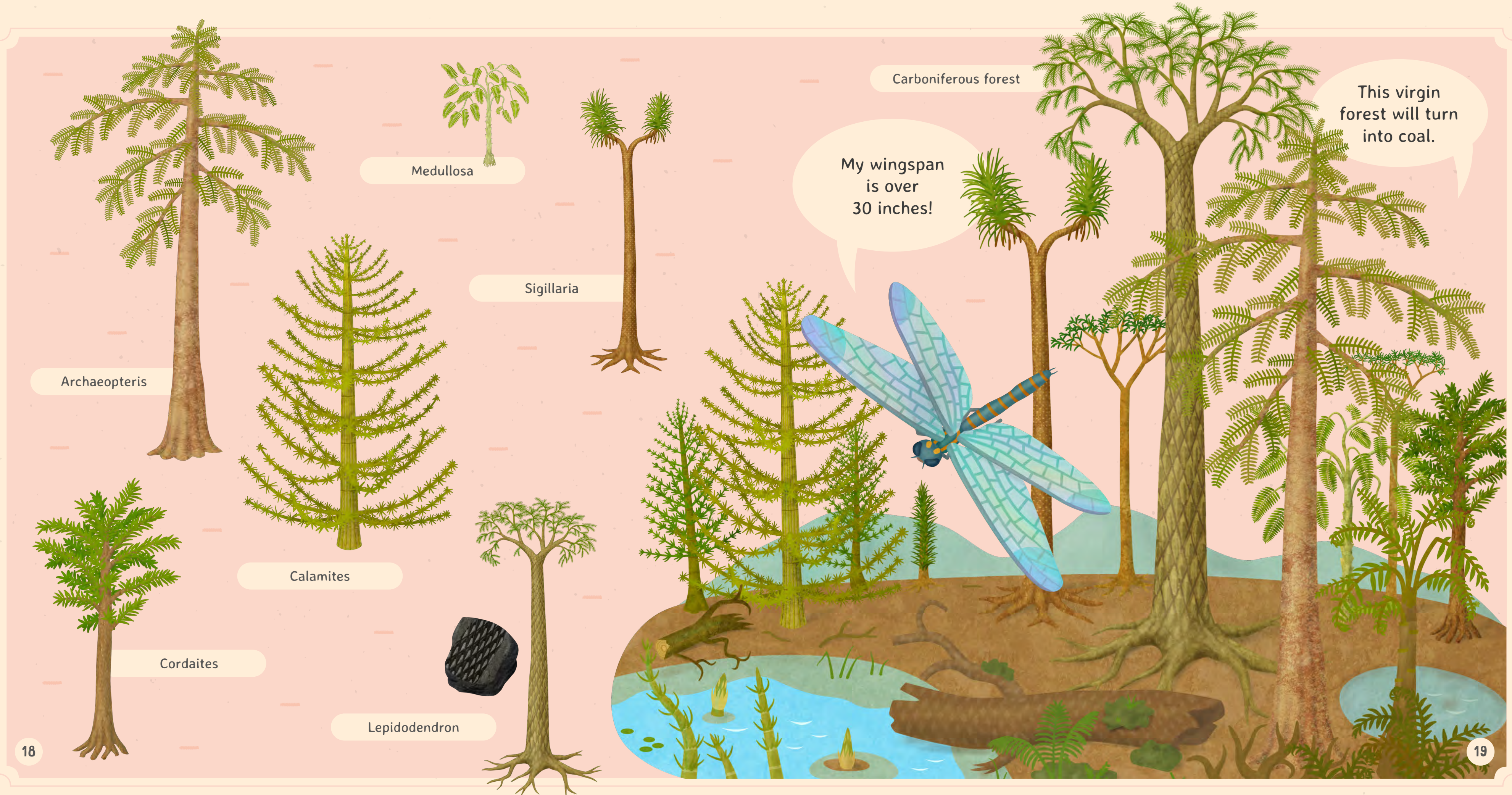
Abundant vegetation causes a rapid rise in oxygen concentration, making life possible for exceptionally large insect species, such as the dragonfly *Meganeura*.

☀ Archaeopteris

Mighty trunks with fern-like leaves often grew in flooded areas or around rivers, creating the first forests.

☀ Lepidodendron

These tree-like lycopods grew to be around 130 feet tall. The beautiful latticing on their trunks and branches was scarring caused by falling leaves.



By the Carboniferous period, some land is covered by lush swamp forest consisting of lycopods, tree-like horsetails, and the first seed plants. Three hundred million years on, these dense forests will have been swallowed by swamps and replaced by coal.

☀ Sigillaria

This relative of *Lepidodendron* had a long, straight trunk with leaves resembling a tall clump of grass. At its top, the trunk often forked into two.

☀ Cordaites

The first conifers also grew in drier areas. They no longer spread across the landscape by means of spores, like lycopods, but by a wonderful new feature—actual seeds!

☀ Calamites

Dense, fast-growing stands of these horsetails are a common feature of carbon-forming primeval forests. They grew to be over 100 feet high.

☀ Medullosa

Medullosa leaves resemble ferns, but this plant is not a fern. It had much in common with cycads, including large seeds.

From trilobites to reptiles

PREDECESSORS OF MAMMALS

On the great supercontinent known as Pangea, swampy areas with dense growths of horsetails and club mosses gave way to drier areas and more resistant conifers and cycads. In the Permian period, the rapid evolution of reptiles included separation of teeth into canines and incisors.

☀ **Captorhinus**

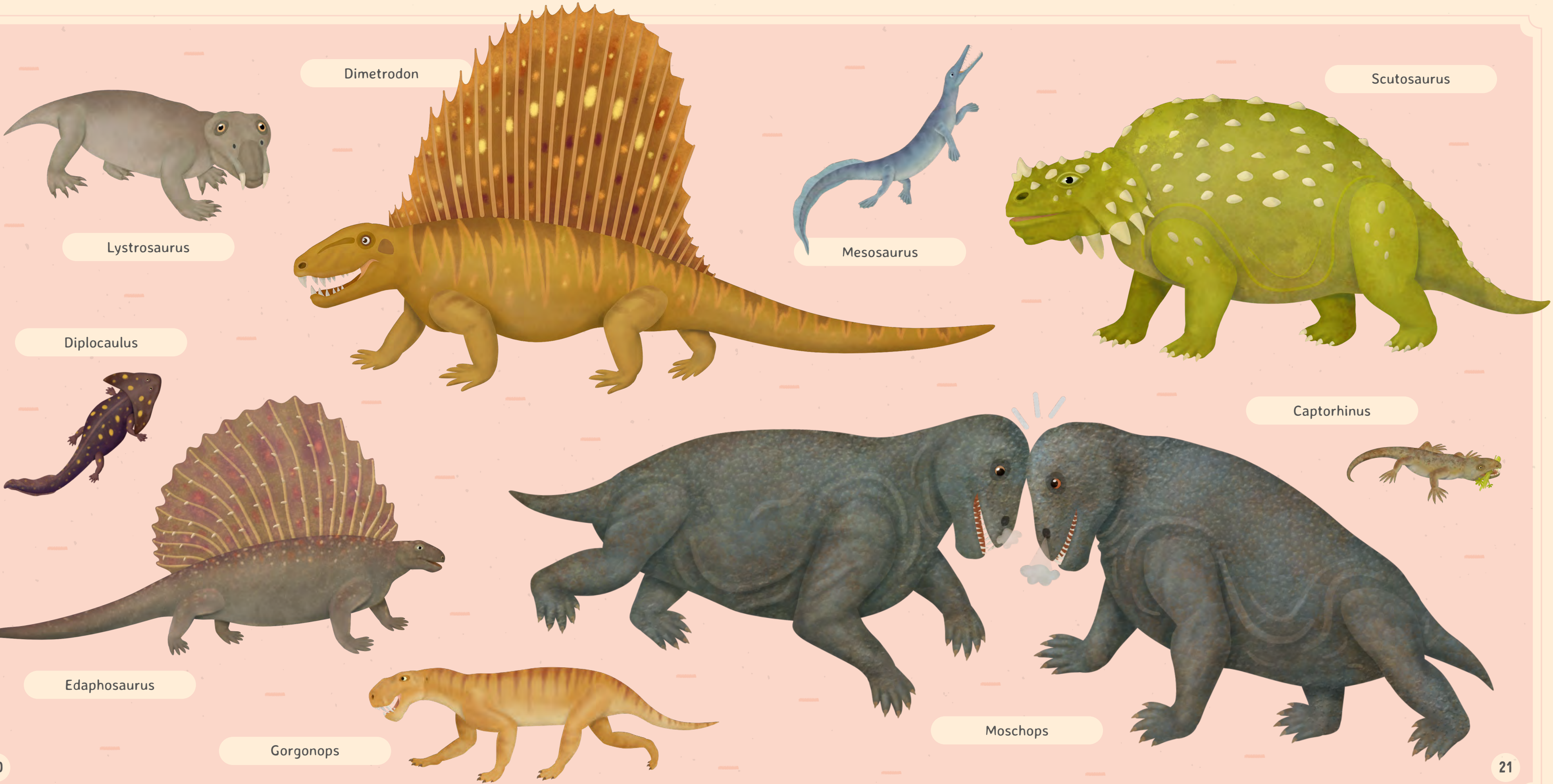
This early, successful reptile wasn't large, even when full-grown, but its solid skull and powerful teeth allowed it to feed on more than just plants.

☀ **Scutosaurus**

Laid-back herbivorous reptile that weighed over a ton. The small bony plates on its body made it look like an armored car, a splendid defensive strategy.

☀ **Mesosaurus**

While others were conquering dry land, this reptile kept its cool and adapted for life in the sea. It seems that it was viviparous, and that its young were born in the water.



☀ **Diplocaulus**

The purpose of the amphibious Diplocaulus's boomerang-shaped head remains unclear. Its upward-facing eyes indicate that it preferred life on the bottom.

☀ **Dimetrodon**

Although this carnivorous predator, with its strange sail, resembles a dinosaur, it is no relative. In evolutionary terms, it is closer to mammals.

☀ **Edaphosaurus**

Nor is the function of the sail on the back of the herbivorous Edaphosaurus entirely clear. Perhaps it served to cool its body.

☀ **Moschops**

This sturdy herbivore had an exceptionally strong skull. The rounded upper part was 10 cm thick, making it perfect for jostling and fighting.

☀ **Gorgonops**

A well-built, agile body and two sharp canines protruding from the mouth: there can be no doubt that this is a dangerous beast. He who runs, wins!

☀ **Lystrosaurus**

This pudgy, nondescript creature did something remarkable: It survived the mass extinction of the end of the Permian. Unlike others, it lived in a burrow, had large lungs, and took frequent rests.

Era of the dinosaurs

LAIID-BACK HERBIVORES

A warm, stable climate delivered an abundance of food for all herbivores. Giant-sized, they were able to reach the treetops. Although they, too, had a varied diet, smaller dinosaurs had to defend themselves against stronger predators with bone armor, horns, or by gathering in herds.

Patagotitan mayorum

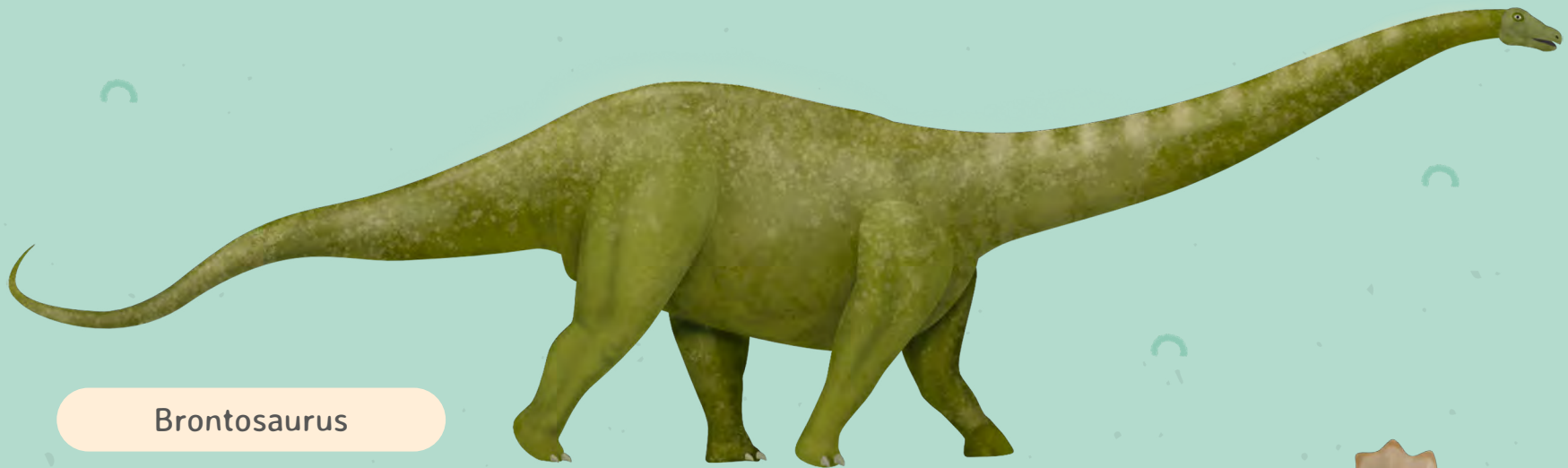
At 120 feet long, it is in the big league of largest known dinosaurs and land animals. It weighed more than ten African elephants.

Brachiosaurus

The greater length of its front legs over its hind legs extends the reach of its long neck into tall treetops. A sixty-ton galloper controlled by a brain weighing 7 ounces.

Stegosaurus

Stegosaurus, too, was short on intelligence and speed. But it protected itself against stronger predators with a powerful tail armed with bony spikes.



Brontosaurus



Parasaurolophus



Pachycephalosaurus



Protoceratops



Triceratops



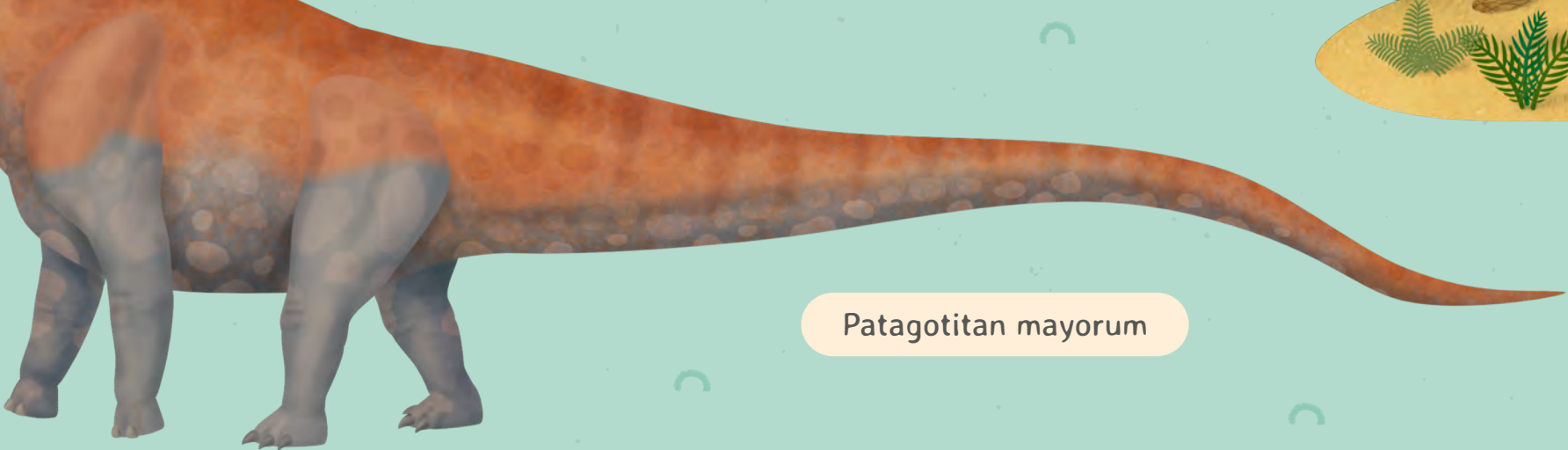
Brachiosaurus



Stegosaurus



Iguanodon



Patagotitan mayorum

Triceratops

Its horns and bony frill might have saved its life, even in confrontation with the dreaded T. rex. Many of its fossils bear traces of fierce battle.

Parasaurolophus

Many dinosaur species had sociable lives in which communication was important. To make itself audible to all, Parasaurolophus wore a large amplifier on its head.

Iguanodon

Iguanodon could walk on four or two limbs. The little toe on the front limbs may have been for gripping, while the spike-shaped big toe was probably for defense.

Pachycephalosaurus

One of the last dinosaurs of the Late Cretaceous period had an exceptionally thick skull. A head-on collision with it would have hurt the wearer of a proper helmet.

Protoceratops

Many finds of remains have shown interesting things about the lives of dinosaurs. Nests with eggs indicate that Protoceratops cared for its offspring.

Brontosaurus

One of the best-known dinosaurs. Like its relative Diplodocus, it was extraordinarily long and could swing its tail nimbly.

DINOSAUR FOOD

Williamsonia

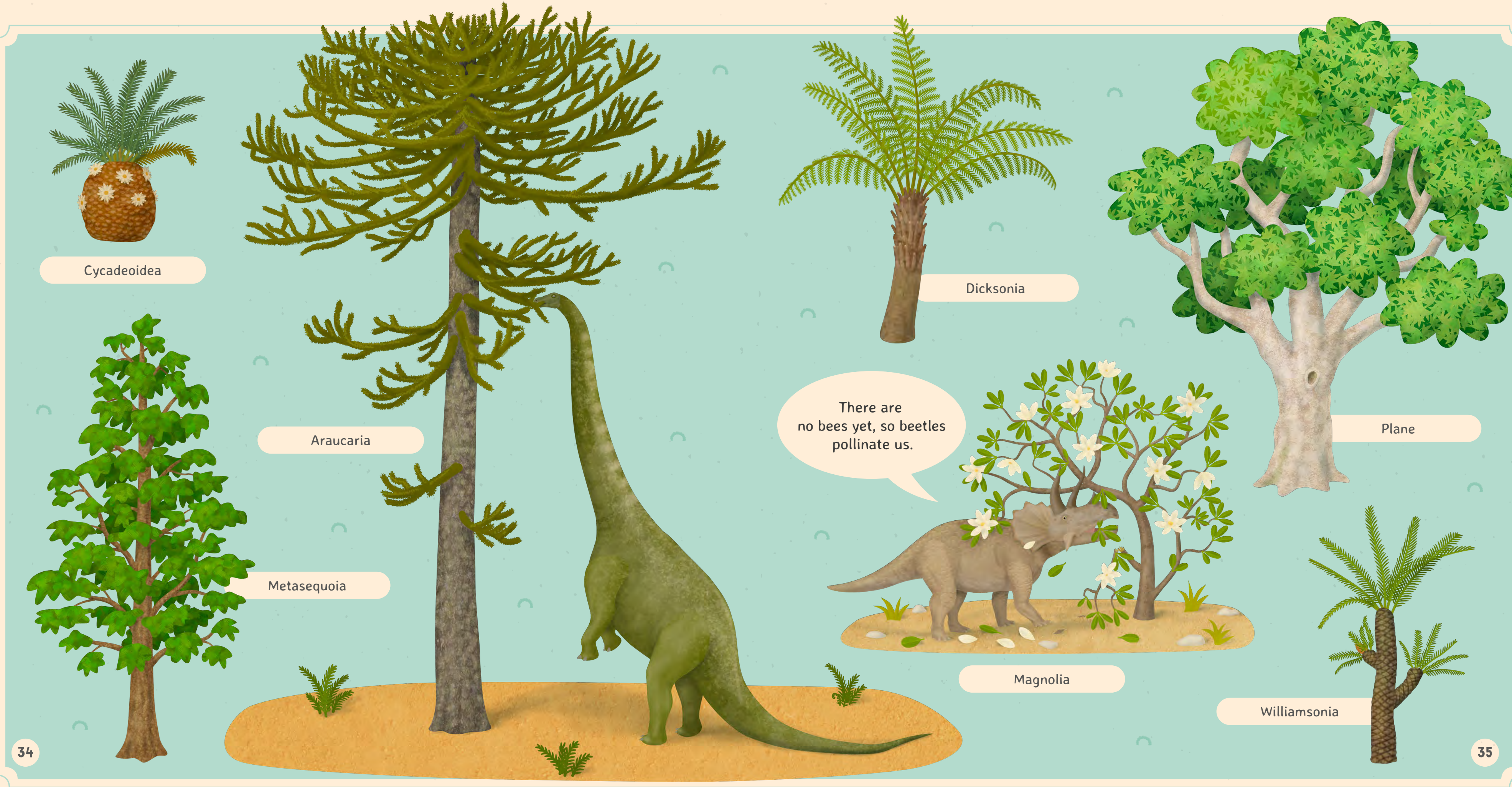
The leaves and cones of Williamsonia were an important part of the diet of many dinosaurs. Seeds formed inside the flower-shaped cones.

Cycadeoidea

Unlike its relative Williamsonia, it had a short, unbranched stem. Though flower-like in appearance, its reproductive structures weren't true flowers.

Magnolia

Beautiful magnolia flowers are a common adornment of today's parks and gardens. Dinosaurs knew them too. Parasaurolophus or Triceratops may have had them in their diet.



The landscape of the Mesozoic wasn't composed of the flowering grasslands we know today. Dinosaurs nibbled on tough leaves, such as cycads, ferns, and horsetails. Larger, stronger-toothed species fed on tough branches of tall conifers. Only at the end of the dinosaur era, the time of the dreaded T. rex, were there more flowering plants.

Araucaria

Some species of this ancient conifer genus are still with us. The tallest trees can grow to 260 feet.

Plane

The plane is one of the oldest, most widespread deciduous trees. Fossils of its leaves prove its presence in warmer, temperate regions as early as the Lower Cretaceous.

Dicksonia

Although they are tree ferns, their trunk is not wooden, being made up of intertwining roots and remains of dead leaves around the rootstock.

Metasequoia

Scientists believed this deciduous conifer to be long extinct before they discovered a dawn redwood growing in 20th-century China.

Age of mammals and flowers

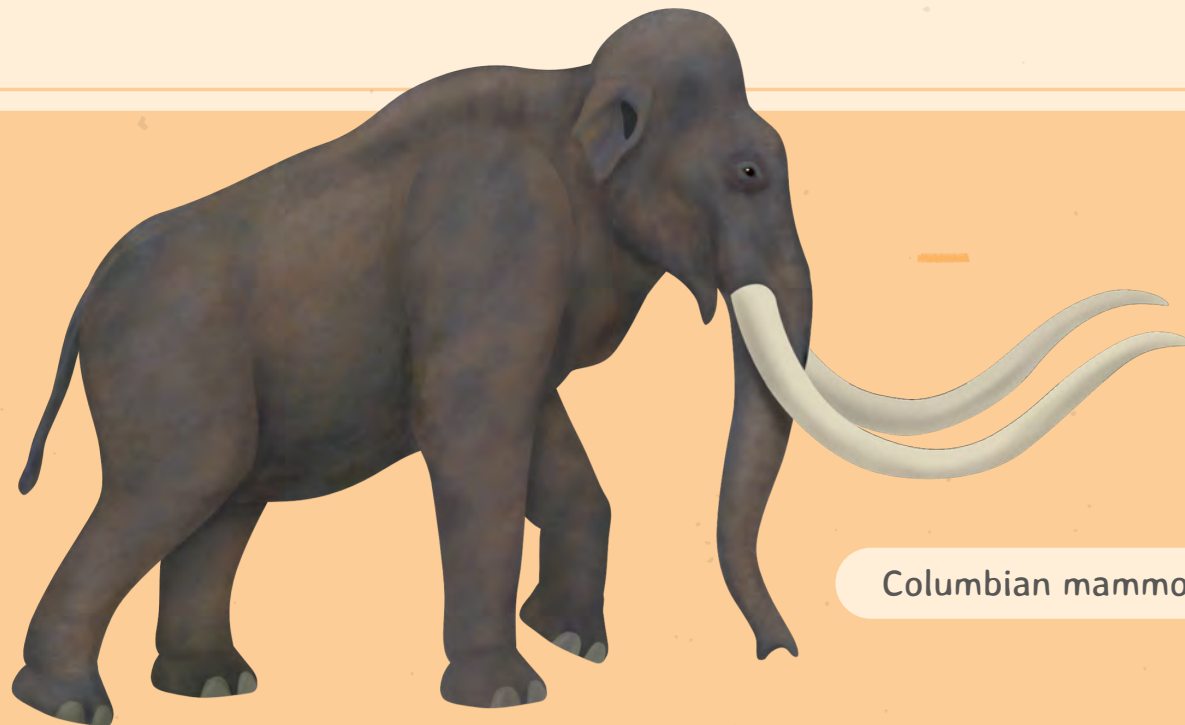
PROBOSCIDEA

This universal tool for grasping, sniffing, and touching has been around for several million years. Nature has tried out several variations on the theme of trunk and tusks. The most famous extinct proboscidean is surely the mammoth.

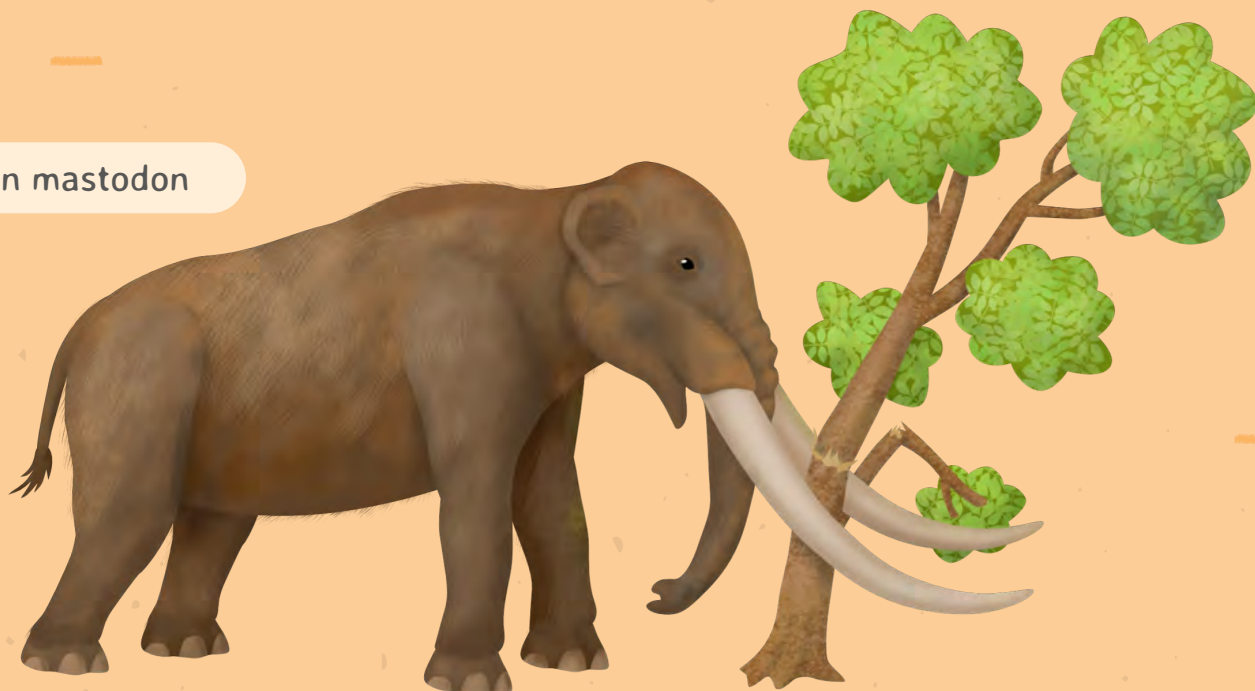
Moeritherium
Although in size and shape it is more like a tapir than an elephant, it is a proboscidean. The high-set ears and eyes atop the head indicate that it spent a lot of time in water.

Platybelodon
Imagine a cross between a digger and a duck and you get Platybelodon! Its wide, shovel-shaped lower tusks were great for scything and scooping up aquatic plants.

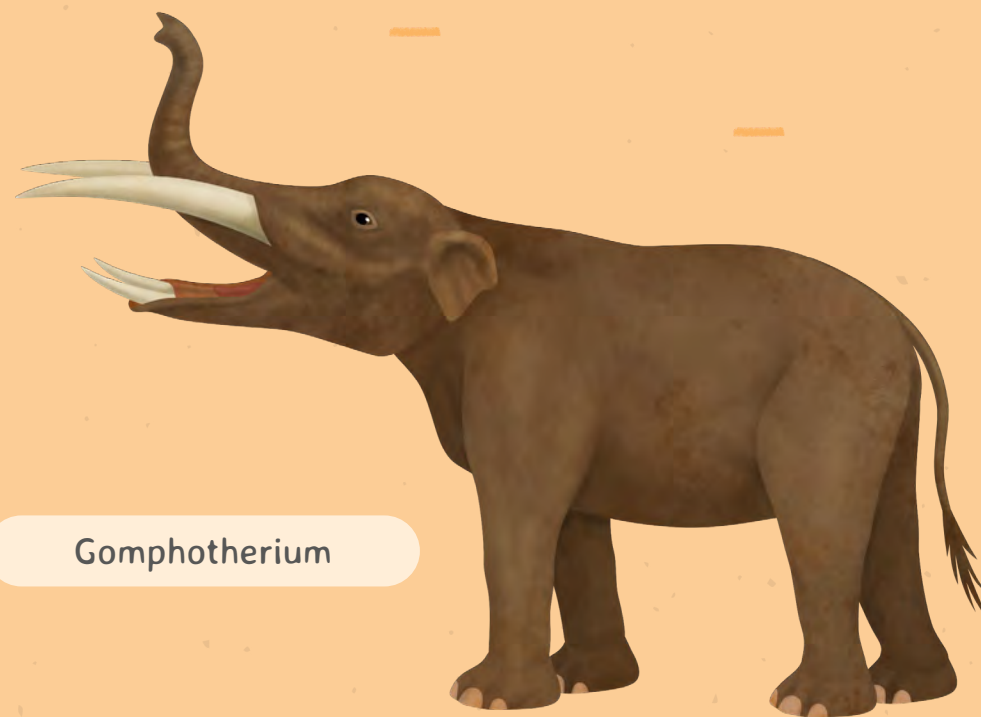
American mastodon
The mastodon was part of North American megafauna. Its strong tusks worked like a bulldozer to break branches and uproot trees. Its strong teeth could work through tough conifers.



Columbian mammoth



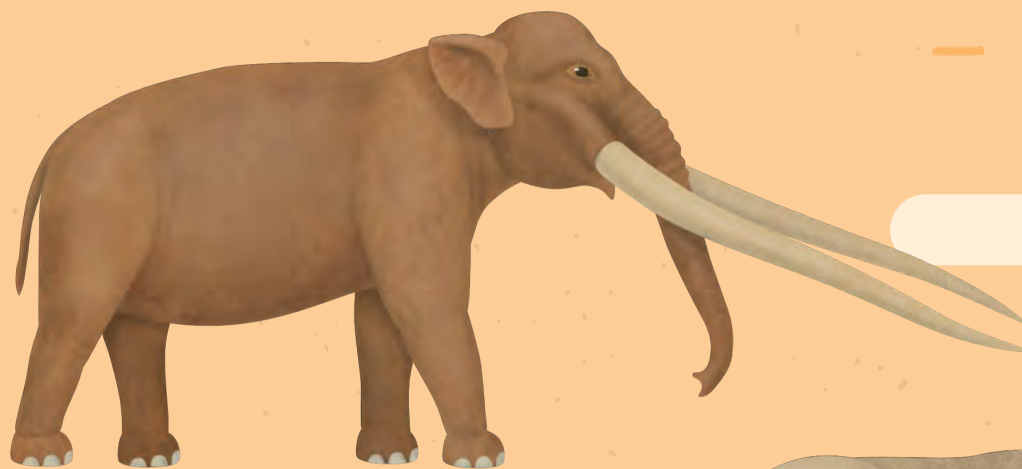
American mastodon



Gomphotherium



Platybelodon



Anancus



Moeritherium



Woolly mammoth



Mammuthus creticus



Deinotherium

Deinotherium
The name of this impressive proboscidean means “terrible beast.” It is easily recognized by its tusks, which grow on the lower jaw and extend backward.

Gomphotherium
Four forward-facing tusks helped with picking and tearing forest vegetation, as well as with digging in the muddy soil around lakes.

Anancus
It was comparable in size to the modern elephant. Its almost thirteen-foot-long tusks are unusually straight. Like other proboscideans, its extinction was due to climate change.

Woolly mammoth
This well-known symbol of the Ice Age survived the harsh winters of the grassy steppe-tundra thanks to its long, thick fur and reserves of fat.

Columbian mammoth
Because it lived in warmer regions of North America, the fur of this massive, huge-tusked mammoth was less dense. It ate almost 440 pounds’ worth of plants in a day.

Mammuthus creticus
This dwarf mammoth, which lived in Crete, was the size of a small pony. Its reduced size was caused by limited food resources on the island.

Age of mammals and flowers

HUMANITY



Study of skeletal remains opens a window into the first stages of human evolution. Scientists can determine the way archaic humans lived from the shape of their teeth, while the shape of their pelvis may indicate upright walking. As for the genus Homo, there is evidence of higher intelligence in the shape of the skull, and also in its invention of the first tools.

Homo erectus

The era of discovery and improvement of tools and use of fire began two million years ago. People learned to cooperate, and they discovered new territories. Beginning in Africa, they would reach Asia and Europe.

Australopithecus

These hominids, which inhabited Africa approximately 3 million years ago, had a relatively small brain but were already able to walk upright on two legs.

Homo sapiens

Homo sapiens, meaning "wise man," has accomplished a great deal in 200,000 years of evolution. We have computers and fly into space, yet we belong to the same species as the mammoth hunters.

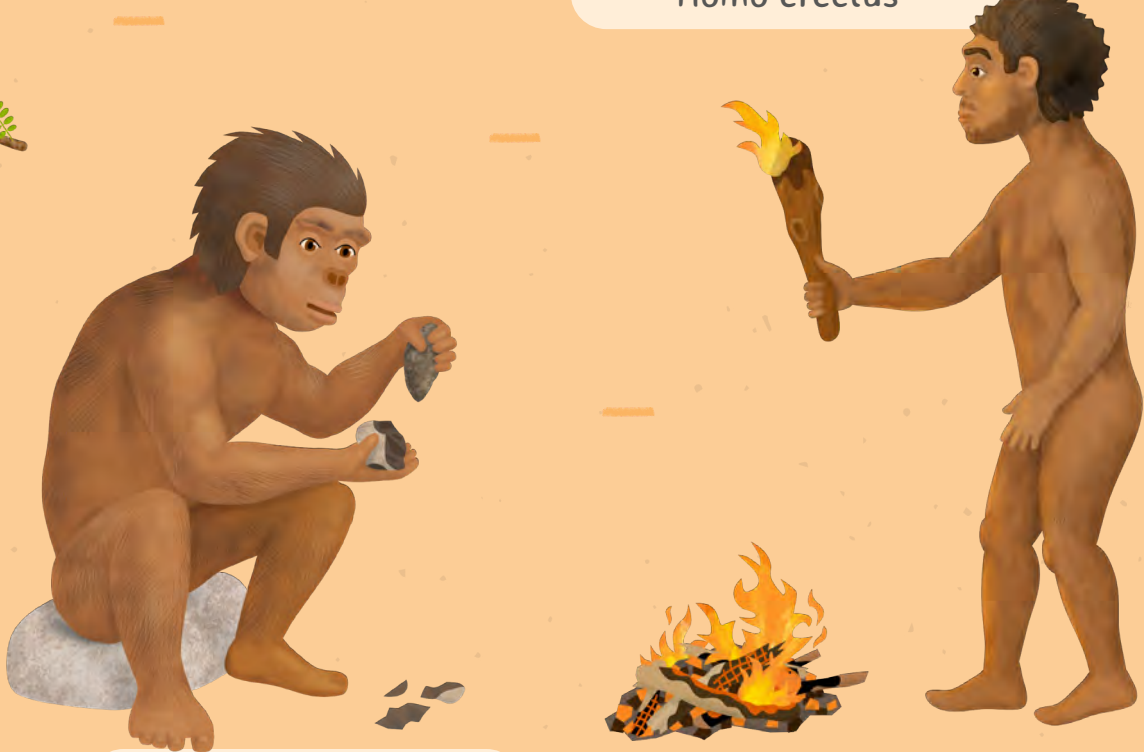
Homo habilis

Homo habilis, meaning "handy man," had an opposable thumb, enabling him to handle tools, which he also made.

Australopithecus



Homo erectus



Homo habilis

Homo floresiensis



Denisovan

Neanderthal



Homo floresiensis

Unraveling human history can be detective work. The skeleton of a three-foot-tall adult archaic human was discovered on the island of Flores.

Denisovan

Scientists are sometimes able to read genetic information from remains. This is how we know that the now-extinct Denisovans interbred with Homo sapiens.

Neanderthal

There is evidence that Neanderthals, too, lived alongside Homo sapiens. Though skilled hunters and tool makers with above-average intelligence, they didn't survive.