ATLAS *of Prehistoric* ANIMALS

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WING SPAN: 4.5 feet WEIGHT: 4.5 pounds

terosaurs are a famous type of reptile often confused with dinosaurs. Although they come from a different L branch of evolution than the dinosaurs, they met the same fate. Among them were some amazing creatures whose skeletons may have inspired the mythical dragon. Dimorphodon, a pterosaur found in Europe, is one of the oldest species known.

Pterosaurs were the earliest vertebrates on Earth, and they could fly. They lived during the same time period as dinosaurs, from the Middle Triassic (245 million years ago) to the end of the Cretaceous (66 million years ago). Their wings were leathery membranes that stretched from the body to front limbs, which had a longer fourth finger. Over 120 genera of pterosaurs have been discovered, and fossils have been found on all continents, even Antarctica. The smallest pterosaurs had a wingspan of only 10 inches, while the largest had a wingspan of over 80 feet, making them the biggest flying creatures ever to have lived on Earth. Like dinosaurs, they were probably warm-blooded, but were replaced by birds at the end of the Cretaceous period. Birds still exist today.

In December 1828, Mary Anning, a paleontologist, discovered the first fossil remains of Dimorphodon in Dorset on the southern coast of England. This area, called the Jurassic Coast, is still a renowned spot for prehistoric fossil discoveries and was the first natural monument

DIMORPHODON MACRONYX Mesozoic · Jurassic

(Jurassic)



in England to be included in the UNESCO World Heritage list. Initially, the fossil finds were placed in the genus Pterodactylus. However, in 1858, Richard Owen, a celebrated paleontologist, found additional specimens.

Owen's description led to the discovery of a new reptile genus called Dimorphodon, meaning "two-form tooth" due to the rare presence of two types of teeth. This new information changed what was previously known about this animal.

Dimorphodon had a wingspan of nearly 5 feet. It had an exceptionally long tail and skull, the front of which resembled a parrot's beak. Numerous openings over its body, especially on the skull, helped to reduce its weight. Its skull resembled a complex arched bridge, with fang-like teeth in the front of the upper jaw and smaller, flatter teeth behind them and on the lower jaw. At first, Dimorphodon was thought to be an *insectivore* (an animal that eats mainly insects), but scientists later speculated it mostly ate fish. Now, due to its movements and flying ability, it is believed that its main diet consisted of small animals with backbones.

It may surprise you to learn that Dimorphodon was probably not a great flier. It moved around trees like a squirrel, swooping down on its food in quick, sudden dives. Taking off from the ground was probably a challenge, similar to the way a pheasant does this today.



ARGENTINOSAURUS HUINCULENSIS



Argentinosaurus huinculensis (Cretaceous)



LENGTH: 100–115 feet WEIGHT: 60–75 tons

hen people think of dinosaurs, they usually imagine huge creatures. However, some dinosaur species were surprisingly small. Which was the biggest of them all? Recent research suggests it was *Argentinosaurus*, which means "Argentinian lizard." This long-necked reptile is likely the largest land animal that has ever lived on Earth.

The home of *Argentinosaurus* was Patagonia, in southern Argentina. In 1987, its fossils were discovered, and scientists learned more about it six years later. Although no complete skeleton has been found, the large vertebrae that were discovered (which were over five feet long) give us a good idea of its size. We think that *Argentinosaurus huinculensis* was nearly 120 feet long, a length surpassed in today's animal kingdom only by blue whales.

Argentinosaurus was a herbivorous (meaning planteating) dinosaur that could travel at about 5 miles per hour. Scientists think it made up to 880 pounds of poop every day! Experts don't agree on how much it weighed,

Mesozoic · Cretaceous



Brontosaurus excelsus (Jurassic) an idea from the end of the 18th century and the first half of the 20th century

Brontosaurus excelsus (Jurassic) current idea



but it was probably between 75 tons and 95 tons. That's heavier than a jet airplane! But, according to experts in biomechanics, a land animal can theoretically weigh up to 130 tons, although such an animal would be unable to move. For cetaceans, like the blue whale, the water helps them to stay afloat, so they can weigh almost 200 tons.

It's hard to figure out how big *Argentinosaurus* was because we only have about 10% of its skeleton. We do know that one of its thigh bones was 8 feet long and its heart weighed over 440 pounds. We don't know why *Argentinosaurus* and its relatives got so huge, but it could have been a mix of things like having lots of available food, a warm climate, and the fact that the great weight of the skeleton of large dinosaurs was relieved by air pockets in the body, as is the case with birds.

As if all this were not enough, some people believe that even bigger dinosaurs may have lived in the same area as *Argentinosaurus*. Some of these theories are pretty wild. For example, is this a giant bone? Or a petrified tree trunk?



ELASMOSAURUS PLATYURUS



LENGTH: 33 feet WEIGHT: 2 tons

You've probably heard of the Loch Ness Monster, an enormous reptile said to live in Scotland's Loch Ness lake. Its long neck reminds us of the prehistoric rulers of the oceans, plesiosaurs. Plesiosaurs lived during the Mesozoic era, during the same time as the dinosaurs, but they weren't dinosaurs and the two orders weren't related. Plesiosaurs first appeared 203 million years ago and lived until the end of the era of the great reptiles, 66 million years ago.

Enormous predators at the top of the food chain, they had four flippers and a long neck. They were excellent swimmers, inhabiting all parts of the world's oceans. Some of them grew to be 66 feet long, although most were much smaller. The first fossil of the species Plesiosaurus dolichodeirus was found in 1821 by Mary Anning, an amateur paleontologist who had earlier discovered the Ichthyosaurus. Elasmosaurus, a representative of the plesiosaurs, is characterized by its long neck. It inhabited the seas around the territory of North America. Although it was scientifically described as early as 1868, the reconstruction of the creature's skeleton made by this describer was wrong; indeed, he placed Elasmosaurus's

Mesozoic · Cretaceous



skull at the end of its tail. It was up to 46 feet long, most of which was accounted for by its extremely long neck. We are now able to distinguish eight *Elasmosaurus* species. A predator, it fed mainly on fish and ammonites. It made good use of its long, supple neck when pouncing on its prey.

Recent discoveries have revealed that not all plesiosaurs were predators. In Antarctica, a new species of plesiosaur was found and named *Morturneria*. This species was part of the youngest branch of evolution, and its remarkable teeth were long, narrow, delicate, and pointed outward, resembling the trap of a carnivorous plant. Morturneria likely fed on small aquatic crustaceans, like cetaceans do today, showing evidence of convergent evolution, which is when different animals evolve similar things separately.

Although long extinct, plesiosaurs still fascinate us. In 2009, a team of American scientists created an underwater robot that moves like plesiosaurs did, using its tail like most aquatic creatures, but also its flippers, which act as paddles. This robot was modeled after the extinct species *Quetzalcoatlus northropi*, which lived during the Mesozoic and Cretaceous Periods.

Elasmosaurus platyurus (Cretaceous)



UINTATHERIUM ANCEPS Cenozoic · Eocene



HEIGHT: 5.6 feet WEIGHT: over 2 tons

This animal was possibly the largest mammal of its time and probably the first to weigh over a ton. **L** Its skull had a unique, downright bizarre shape, so it's no wonder Uintatherium is such a beloved prehistoric creature. Its fossil history is fascinating too.

At first glance, Uintatherium may remind you of today's rhinoceros, due to its large size. We think it was around 13 feet long, over 5 feet tall, and over 2 tons in weight. Its most notable feature is its huge skull, which was about 3 feet long and had bone outgrowths (ossicones) that looked like the horns on a giraffe's skull. Scientists are still debating what the purpose of these "horns" were; since they are bigger on males, they probably were used in fights between males and females.

The upper jaw of Uintatherium had huge, 8-inch-long teeth that resembled those of the saber-toothed tiger. But these teeth weren't dangerous; Uintatherium probably used them to pluck aquatic plants from the marshes to eat. Initially, only one species of Uintatherium living in North



America was known and described, called Uintatherium anceps. In the early 1980s, a Uintatherium skull was discovered in China, which was very surprising. This led to the description of Uintatherium insperatus, which was a bit younger than *U. anceps* in terms of evolution.

In 1870, the first fossils were discovered in Wyoming, sparking the so-called "Bone Wars" between two paleontologists, Othniel Charles Marsh and Edward Drinker Cope. The two competed fiercely for who could discover and describe more extinct species, even going so far as to slander and scheme against each other. Looking back, their work resulted in a huge increase in interest in paleontology and the description of over 100 dinosaur species.

But how did Uintatherium come by its strange name? The answer is simple: it comes from the place it was found, the Uinta Mountains, with its name meaning "beast of the Uinta Mountains."





WINGSPAN: 16-20 feet WEIGHT: over 155 pounds

rgentina in South America is an amazing place for paleontologists. It was home to the largest land L Linosaurs and the largest known bird in history flew above its plains and mountains. Using the modern scientific view that birds are essentially dinosaurs, due to their having descended from them, Argentina can lay claim to the biggest flying dinosaur: Argentavis.

The "magnificent Argentinian bird" (Argentavis magnificiens) was scientifically described in 1980, following discoveries made in central and northwest Argentina. Although it was not the largest bird by wingspan, it was certainly the heaviest and most powerful bird capable of powered flight. It could weigh over 155 pounds, and its wingspan was estimated to be between 16 and 19 feet. It was so tall that when standing on the ground, it would have been at eye level with an adult human. We know of a larger wingspan (up to 24 feet) in certain marine birds of the genus Pelargonis from the Early Tertiary Period, but these giant birds weighed about 85 pounds - about half as much as Argentavis.

Argentavis belonged to the Teratornithidae family of large birds that inhabited the Americas 10,000 years ago. We believe that its legs were strong enough to allow movement on land, giving it a similar appearance and way

ARGENTAVIS MAGNIFICENS

Cenozoic · Miocene



of life to the condor we know today. However, Argentavis had a hooked beak tip, which begs the question of whether it was an active hunter or just a scavenger.

Scientists believe that the Argentavis laid a maximum of two eggs every two years. Each egg weighed around two pounds. Remarkably, it took a long time for the Argentavis to grow up, not reaching full maturity until it was 12 years old.

It's no easy feat for a big, heavy animal to take off and fly. North American scientists used computer simulations that were originally designed for helicopters to figure out how Argentavis could stay in the air with the power of its chest muscles alone. Like modern-day condors, it likely rode on warm air currents. It took off by going downhill into a headwind, the same way people do today on hang-gliders.

When sailing through the sky, it could soar up to 37 miles per hour, gliding through the air for dozens of miles. Some researchers believe that the air was thicker in the past, which could explain why birds of flight were so much larger back then. There are still many mysteries about this creature - and many other ancient birds - that have yet to be solved.



GIGANTOPITHECUS BLACKI Cenozoic · Pliocene – Pleistocene



HEIGHT: 10 feet WEIGHT: 1,200 pounds

ou have probably heard of the mysterious yeti, also known as the Abominable Snowman. This mythological caveman-like creature is said to be over 8 feet tall and is said to live in the Himalayas. Although experts doubt its existence, some believe it could be Gigantopithecus, the largest great ape the world has ever seen. The problem with this speculation is that we humans evolved around 150,000 years after Gigantopithecus went extinct.

We know very little about the extinct giant primate Gigantopithecus. The first description of this species came in 1935, when German-Dutch paleontologist Ralph von Koenigswald found an unusually large molar in a Chinese pharmacy in Hong Kong. It was being sold as a dragon's tooth, a traditional Chinese medicine. Von Koenigswald named the species Gigantopithecus blacki, in honor of Canadian paleontologist Davidson Black. Later, smaller and older specimens were found in other Asian locations and were named Gigantopithecus giganthea. The size of the tooth suggests that *Gigantopithecus* was almost 10 feet tall and weighed around 1,200 pounds,

Gigantopithecus blacki lower jaw



making it a whopping three times bigger than today's gorillas. Because of its size, it probably lived and moved around on the ground on all fours, instead of swinging from tree to tree. In 2019, an analysis of protein taken from its tooth enamel showed its closest living relative to be the orangutan, leading us to believe it may have had a reddish-brown coat. This protein was studied using proteomics, a method that is likely to make more such amazing discoveries in the field of paleontology in the near future.

The thickness of the tooth enamel shows that this creature was an herbivore (plant-eater) who liked crunchy foods like bamboo and tree branches. It's possible that it didn't evolve with the changing climate fast enough and died out. Another idea is that competition from the giant panda edged it out of existence. Ancestors of modernday humans were competitors of *Gigantopithecus* too; they shared a living space with it for a million years. While it is unlikely that these proto-humans hunted *Gigantopithecus*, they occupied its territory and used its bamboo.



COELODONTA ANTIQUITATIS Cenozoic · Pleistocene – Holocene



Elasmotherium sibiricum (Pleistocene)

Stephanorhinus (dicerorhinus) etruscus (Pleistocene)

LENGTH: 13 feet WEIGHT: 5 tons

You wouldn't want to stumble across a rhinoceros in the wild – although considering that humans have tragically brought the present-day rhino to the brink of extinction, the chance of that happening is low. However, an encounter between a human and a rhino – a woolly rhino, that is – would have been fairly common 10,000 years ago. And because that was during the Ice Age, it makes sense that the woolly rhino had a thick fur coat.

The woolly rhinoceros was one of the most recognizable animals of the Pleistocene Epoch. It was known to early humans, as evidenced by cave paintings. In fact, these paintings show a fairly accurate depiction of the rhino, which had a large, 4-foot-long body, short stubby legs, external ears, and two horns, with the front horn growing up to a foot in length. It is believed that the largest woolly rhinos weighed around 5 tons. They ate plants they dug from the snow-covered steppe with their horns and were well-protected from the harsh weather of their habitat by their thick, waterproof fur.

For a long time, scientists thought the woolly rhino evolved during the last Ice Age, which is when most of



cave painting of a woolly rhinoceros, Rouffignac cave, Dordogne, France





our fossils of it are from. But recent research has found that the woolly rhino lived three million years ago on the Tibetan Plateau, where it had the opportunity to get used to the cold. It then spread out to other areas when much of central Europe was covered in snow and ice.

During the Middle Ages – way back in 1335, to be precise – a piece of a woolly rhinoceros skull was discovered in Central Europe. And it has been kept in the Austrian city of Klagenfurt ever since. Originally thought to be part of a "dragon's head," this fossil is the oldest known paleontological find. Humans may have played a part in the extinction of the woolly rhinoceros, as well as the woolly mammoth, but recent studies suggest that climate change and the melting of ice dealt this species a far heavier blow.

Although the woolly rhinoceros was quite big, it was nowhere near as big as some of its relatives. For example, Elasmotherium, which lived in the same area and time, had a 7-foot-long horn on its head and weighed up to 7 tons. And that's nothing compared to the hornless rhino Paraceratherium, which you can learn more about in this book. Life on Earth, which we take for granted, started to develop over 3.7 billion years ago – a time so far away that it's hard to even imagine. The first organisms visible to the naked eye appeared about 60 million years ago, but almost nothing has survived of them. Another 60 million years had to pass before the first organisms with hard shells and skeletons arrived, and these have reached up through the ages as mementos of how life on our planet was formed. It is these first, oldest animals that are the focus of this installment of Radek Malý's meticulous and captivating narrative encyclopedia series, which takes young readers on a journey through prehistory featuring the best-known animals of each era, as well as some new, unexpected ones. To bring the text to life, the story of each species is accompanied by the evocative narrative illustrations of Czech artist Petr Modlitba, incorporating the most recent discoveries in paleontology.



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