



For Luke and Daisy.
- JULES HOWARD

For Laurie and Frida,
who are always MEGA.
- GAVIN SCOTT

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Introduction

For four billion years, the planet that you and I call home would have looked rather boring if viewed from afar with a space telescope. There would be no observable life at all. Nothing but oceans and deserts and slime-covered rocks. This is because most of the animals back then were very tiny indeed, little more than a bag of swimming cells no bigger than the full-stop at the end of this sentence.

But slowly, through the wonders of evolution, life on Earth began to supersize itself. For the first time in its history, the last 200 million years saw planet Earth begin to rumble and shake and splash with the daily activities of millions of larger animals, many weighing hundreds of kilograms, some weighing tonnes.

First came giant fish, including sharks, and molluscs such as the octopus-like ammonites which could grow as big as a car. Then came the earliest reptiles, little more than walking fish at first, which evolved into mighty dinosaurs and swimming lizards called mosasaurs. Then, more recently, came the massive mammals – the sabre-toothed cats, the whales, the tigers, the elephants, the giraffes.

Scientists have spent many years trying to discover the secrets behind how and why animals like these evolve to such a large size. These same scientists have long searched for answers about how these animal giants changed the world around them, transforming the places they live in for the better and improving the lives of smaller animals through their diets, their migrations, their everyday habits – even their footprints.

Now that many of these mysteries have been solved, these scientific secrets are yours to read in the pages of this book. You and I live in an extraordinary time in Earth's history. When the massive multiplied, when life became great, when, just as it was in the age of dinosaurs, life has once again become . . .

MEGA!

What does megafauna mean?

Megafauna combines two words; mega (which means 'large' in Greek) and fauna (which means 'animal life' in Latin). The term is often used by scientists to describe animals that weigh more than 45 kilograms, about the size of a large dog or a small sheep.

What do megafauna do?

Being large, megafauna have the power to shape habitats, landscapes and ecosystems around them, mostly to the benefit of other animals – this is why scientists consider them so important to the natural world.

BIGGEST EXTINCT Elephants

The *ASIAN STRAIGHT-TUSKED ELEPHANT* is one of the largest animals to have walked the Earth since the dinosaurs. With enormous tusks and a monstrous skeleton like no elephant that lives today, it smashed its way through forests and shrubs . . .

Standing taller than a double-decker bus at the shoulders, the *ASIAN STRAIGHT-TUSKED ELEPHANT* (*Palaeoloxodon antiquus*) was a clear metre higher than any elephant species living today. In fact, weighing 20 tonnes or more, most scientists consider it the largest land mammal ever to have evolved. Its thigh bone alone was longer than most 11-year-old human children.

To carry such a heavy load, the *ASIAN STRAIGHT-TUSKED ELEPHANT* walked on thick legs that acted like pillars, supporting the huge weight of its body. Like modern-day elephants, its leg bones were partly filled with a spongy material which stopped the bones suffering from wear and tear.

A small bone in each wrist (called the 'sesamoid') was bent inwards to act as an extra toe. This helped the Asian straight-tusked elephant spread its weight more effectively, reducing the chance of one of the toe bones fracturing.

Special pads on the sole of each of the elephant's feet acted like suspension on a bike or car, so this incredible mammal could spring forward with each step it took.

As with other 'proboscideans' (the name of the mammal group to which elephants belong), the *ASIAN STRAIGHT-TUSKED ELEPHANT* had some impressive weapons – long tusks which were, in fact, specially adapted teeth.

Some tusks from this species were longer and heavier than a human! In fact, the tusks of the *ASIAN STRAIGHT-TUSKED ELEPHANT* were so heavy that it had to evolve a taller skull and bulkier neck muscles, just so that it could lift its head. In all, the head weighed more than half a tonne.

Just like the now-extinct mammoths, the *ASIAN STRAIGHT-TUSKED ELEPHANT* roamed over whole continents before disappearing forever 23,000 years ago. Fossils from the species have been found across Asia – through India and even in Japan.



Scientists who study fossils, known as 'palaeontologists', are still investigating the role humans may have played in the extinct elephant's downfall. What's certain is that with a frame larger than any living elephant, and with armour-like skin and monstrous tusks, it would have taken extraordinary agility and teamwork to successfully bring the *ASIAN STRAIGHT-TUSKED ELEPHANT* to the ground.

BIGGEST TODAY Elephants

1 African bush elephant (*Loxodonta africana*) 4 metres at the shoulders

Standing almost 4 metres tall, the *AFRICAN BUSH ELEPHANT* towers over other living elephant species. It roams the open plains and grasslands of sub-Saharan Africa, where it searches for leaves, bark and grasses to eat. In spite of its enormous size, the *AFRICAN BUSH ELEPHANT* can move its trunk very gently. This incredible organ, packed with 40,000 tiny muscles, can pluck even the tiniest leaves from twigs and branches.

The *AFRICAN BUSH ELEPHANT* used to be common in Africa, but the species has become more rare because of illegal hunting.

Their tusks (which are actually enlarged incisor teeth) can be used in defence or to move branches or tree trunks while searching for food. They are highly sought after by criminals who sell them illegally to be used in traditional medicines.

2 Asian elephant (*Elephas maximus*) 2.7 metres at the shoulders

Living in a cooler climate, the *ASIAN ELEPHANT* has far smaller ears than African elephants. This elephant dwells in isolated grasslands and forests throughout Asia. Its body stands at 2.7 metres at the shoulders and its spine slopes downwards to the tail, unlike other elephant species.

The *ASIAN ELEPHANT* is often found near water. Its enormous trunk can pull in three bathtubs full of water (200 litres) each day, some of which it squirts into its mouth.

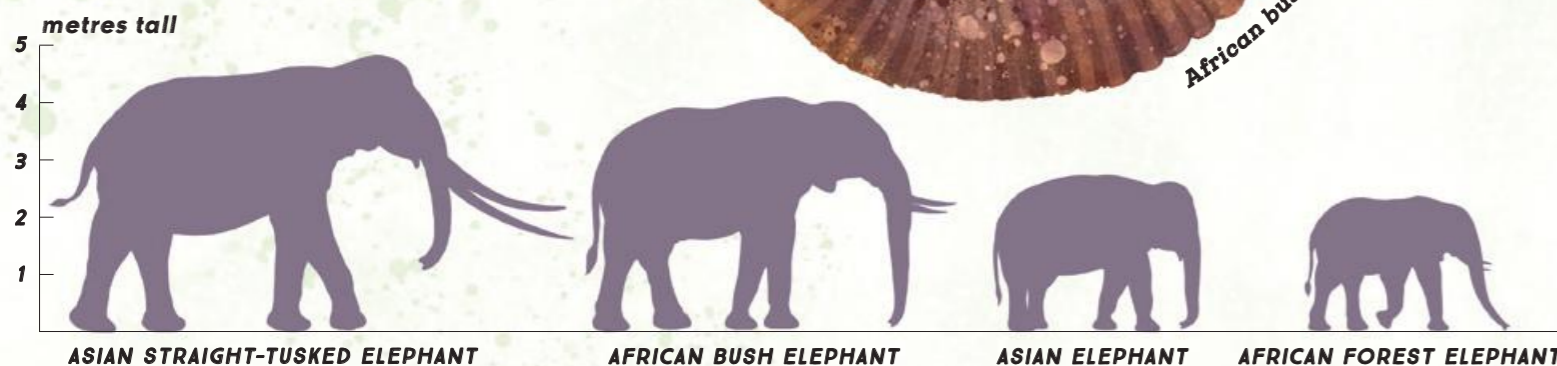
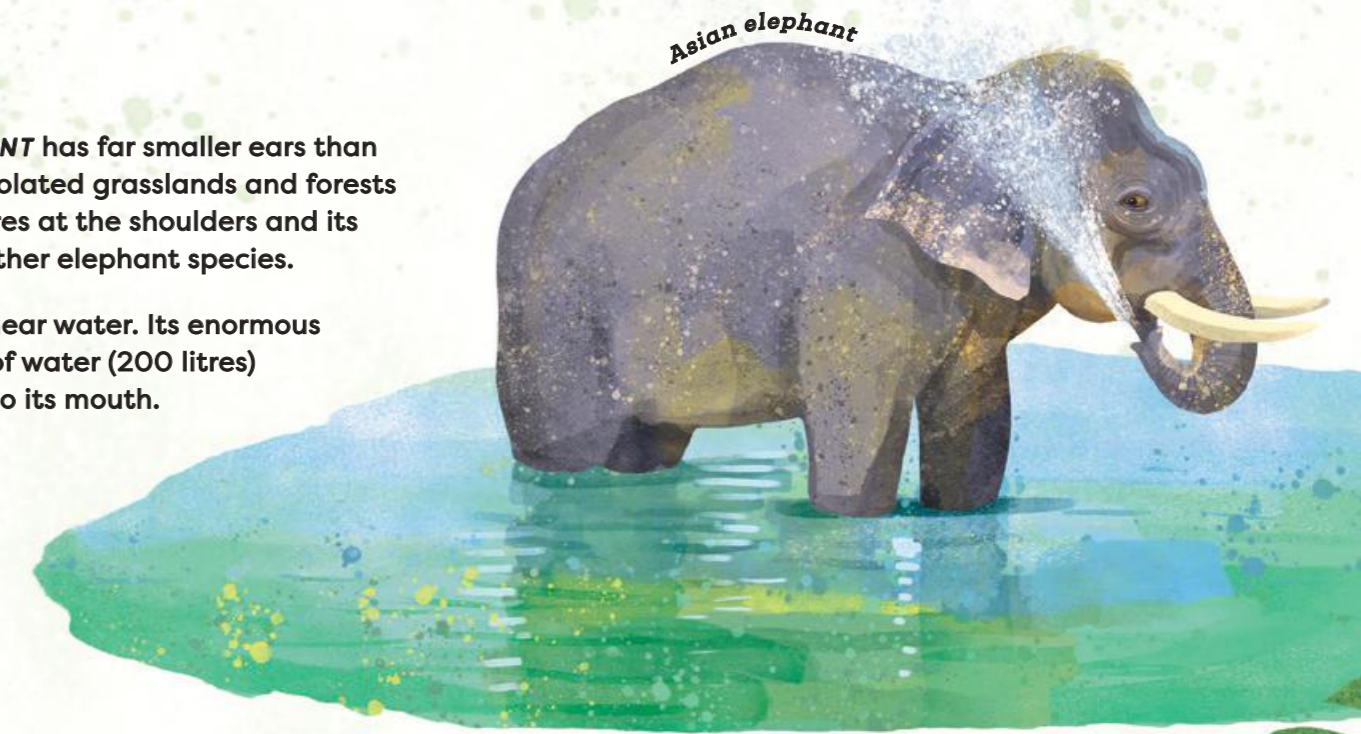
At times, the tusks are used to dig up minerals from the soil which the *ASIAN ELEPHANT* adds to its unfussy diet of grasses, bushes and palm fronds. Incredibly, it can swallow more than 150 kilograms of food in a single day – that's 100 times more than a human adult.

3 African forest elephant (*Loxodonta cyclotis*) 2.4 metres at the shoulders

With a shoulder height of 2.4 metres, the *AFRICAN FOREST ELEPHANT* is the smallest and most secretive elephant species alive today. Its slight body allows it to move through West Africa's humid rainforests without getting stuck in the undergrowth.

Compared to the *AFRICAN BUSH ELEPHANT*, the tusks of the *AFRICAN FOREST ELEPHANT* are noticeably pink and far tougher. They regularly use them in defence when they feel threatened, either by other elephants or human poachers. Because of illegal hunting, their numbers have plummeted in the last hundred years and just 30,000 remain today.

Like the *AFRICAN BUSH ELEPHANT*, the *AFRICAN FOREST ELEPHANT* has enormous ears. They can be used like giant radiators to pump heat away from its brain, preventing the elephant from overheating.



MEGAFUNA AT WORK

Elephant engineers

When elephants move from place to place, knocking trees over and feeding and bathing as they go, they often change local habitats for the other animals that live there. For this reason, scientists refer to elephants as 'habitat engineers'.

Here are some of the ways that these incredible architects regularly change our world for the better.

Stepping up for nature

When elephants move through muddy landscapes, they leave behind footprints that fill up with water when it rains. Many animals move into these temporary pools, especially insects, and even frogs and toads.

A single footprint can be home to more than 30 types of insect. The most common visitors to these water-filled footprints are flies and beetles, which use the new puddles as a nursery ground for their babies. When the babies emerge as adults and fly away, they provide food for hundreds of hungry birds in the area.

Finding the spotlight

Elephants often knock over and crush branches and other foliage when they march through undergrowth. This opens up the forest floor to the sun's light, making woodlands that were once dark become bright and sunny. This is especially helpful for reptiles such as snakes and lizards that rely on the sun's energy to keep warm.

Because elephants bring sunshine to the forest, reptiles are given places to bask – which keeps them healthy and active.

Sowing the seeds of success

Many of the seeds that elephants eat are so tough that they pass through the elephant's digestive system totally unharmed. When the elephant produces its droppings, the seeds are pumped out too, ready and waiting to grow in a new part of the forest.

In one scientific study, elephants carried seeds in their digestive system for an incredible 57 kilometres before getting rid of them in their droppings. Some forest plant species actually need elephants to provide this handy gardening service for them, and without it, they might eventually face extinction.