

EXCAVATION KIT

**1 DIGIT!
DINOS**

**GLOW-IN-THE-DARK
PTEROSAUR**

THAMES & KOSMOS

Contents

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- › **1. Excavation block with skeleton parts hidden inside**
- › **2. Hammer**
- › **3. Chisel**
- › **4. Sponge**
- › **5. Black display stand**

You will also need newspaper, water, a small bowl, and paper towels.

If any parts are missing or defective, please contact Thames & Kosmos customer service:
US: techsupport@thamesandkosmos.com
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Dear Parents!

Please provide your child with assistance and support when excavating the pterosaur skeleton. Before starting the experiments, read through the manual together and be sure to follow it. That way, nothing will stand in the way of a successful dig. Please be careful not to let any parts of the kit get into the hands of small children, especially the plaster pieces that are left over after excavating. These can be disposed of in the household trash.

Safety Notes

WARNING. Not suitable for children under 7 years. For use under adult supervision. Read the instructions before use, follow them and keep them for reference.

This kit contains functional sharp edges or points. Do not injure yourself!

WARNING. Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

Follow the instruction manual when performing the excavation. Keep small children and animals away from the experiment area. Do not eat or drink at the experiment area. Process the plaster block slowly and moisten it to prevent the formation of chips and dust. Do not place the plaster material in mouth or eyes. Clean all equipment and the work area after use. Wash your hands after the experiment.

Keep the packaging and instructions as they contain important information.

Calling All Dinosaur Researchers!

This kit will teach you what it's like to be a prehistoric animal researcher. A scientist who does this is also known as a paleontologist (pronounced "pay-lee-un-TAH-luh-just"). You will be using the tools included in the kit to excavate and assemble the skeleton of a pterosaur. Pterosaurs were winged creatures that belonged to a group of their own closely related to the dinosaurs.

Nobody has ever seen a living pterosaur since they died out long before any humans existed. Everything we know about them is based on bones that paleontologists have dug up.

Have fun learning about this flying giant!



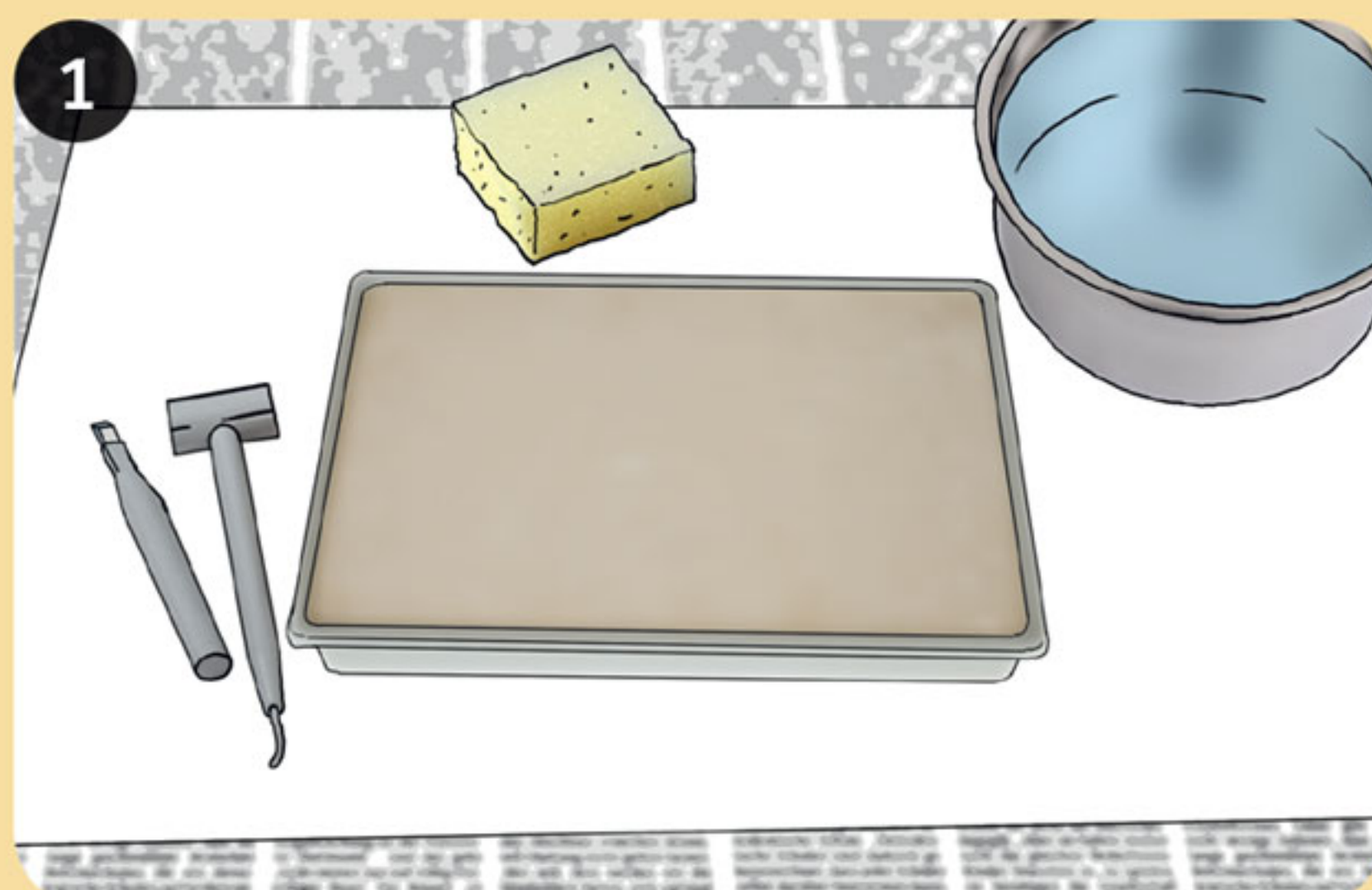
How to Excavate the Fossil

STEP 1

Start by looking for a suitable work place, someplace where it won't matter if a few bits of plaster fall here and there, and that won't be harmed by a little dust and water. If the weather is nice, you can also work outside.

The ideal work surface is a level, sturdy table covered with a few layers of newspaper.

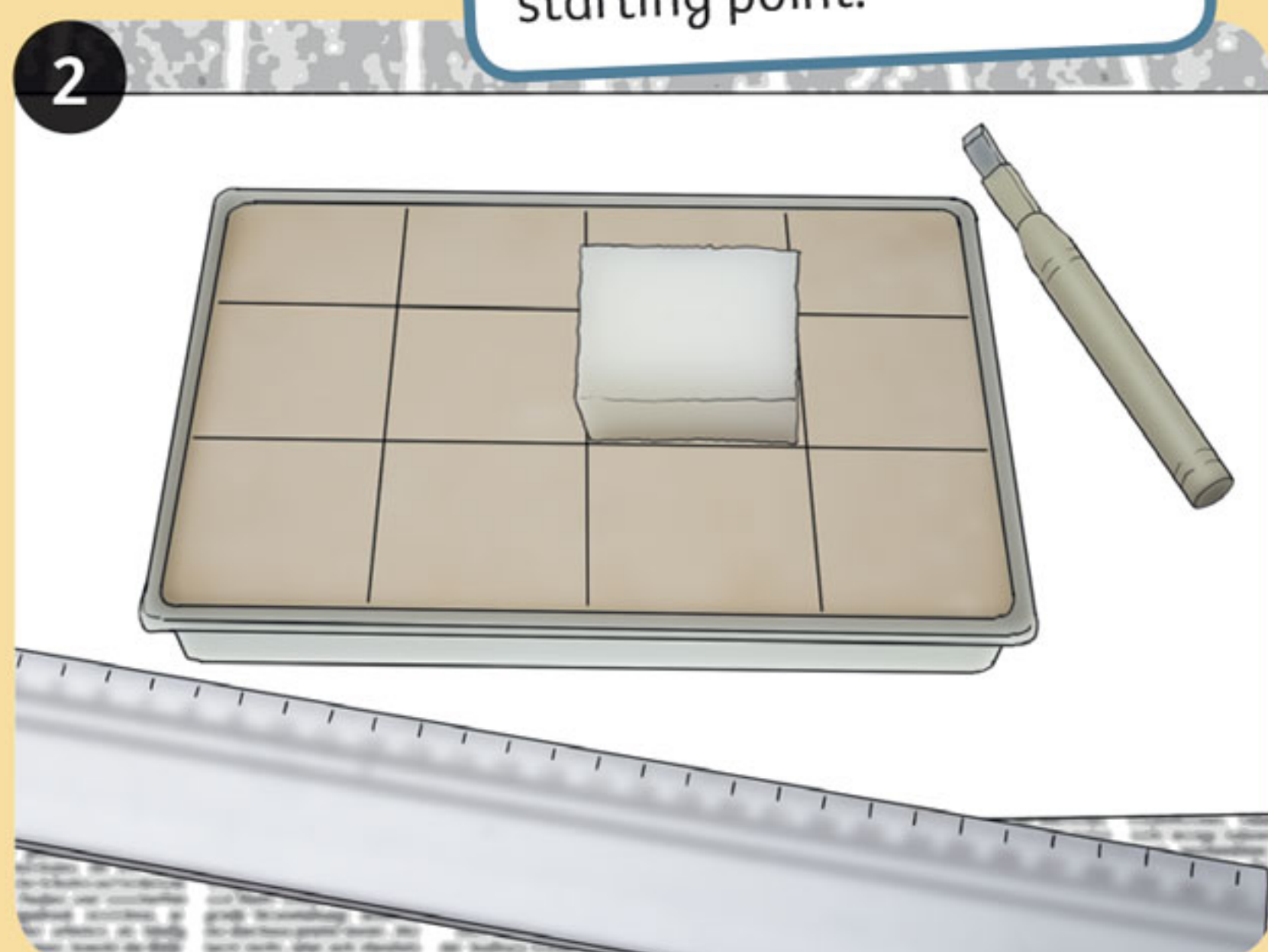
Get the excavation block and tools ready, along with a small bowl of water.



TIP! Don't just dig straight down. Also dig out sideways from your starting point.

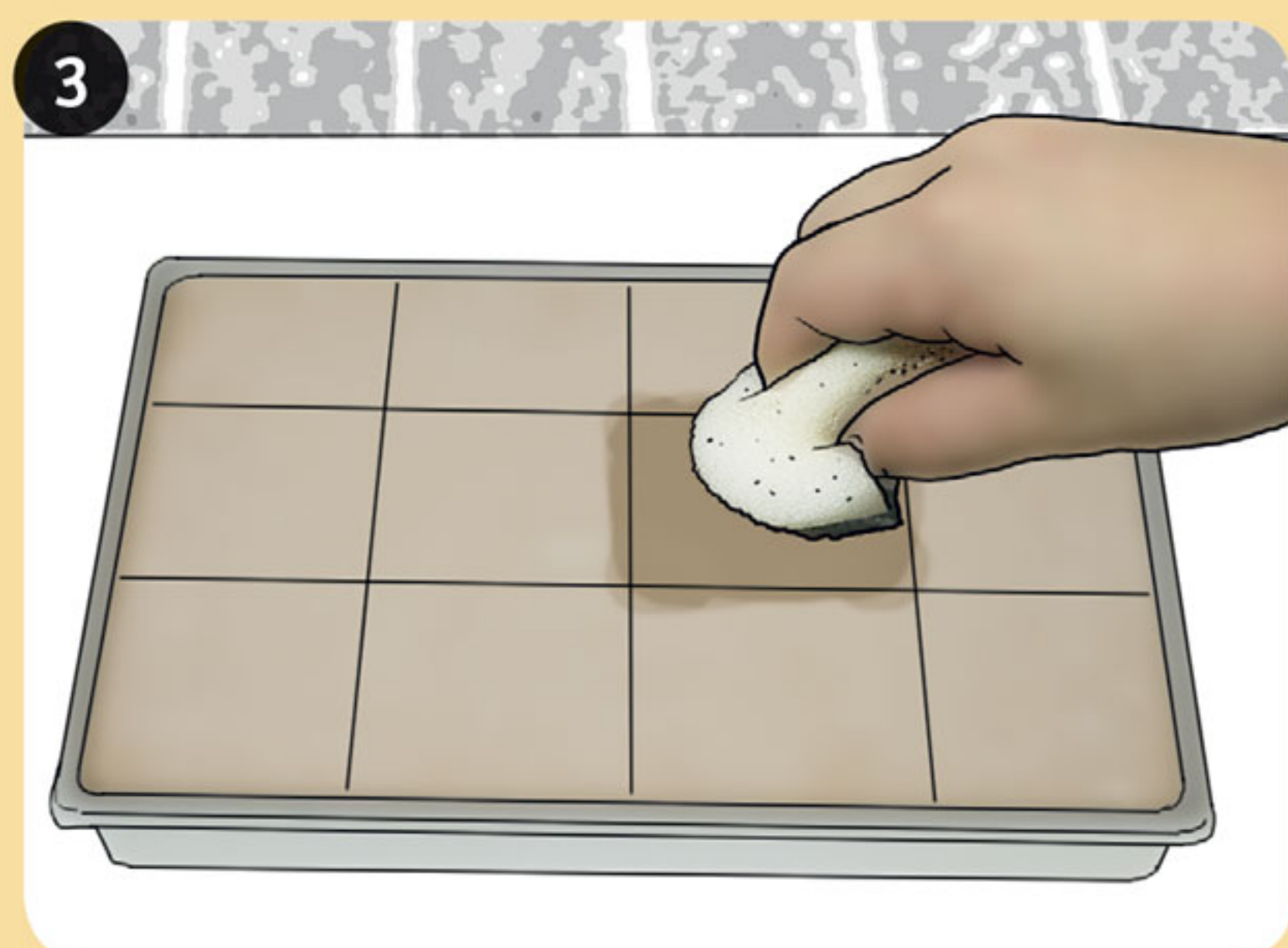
STEP 2

When excavating, proceed like a paleontologist. Divide your fossil site into squares by placing the dry sponge on the plaster block. Use the chisel and ruler to carve a grid pattern into the surface. The individual squares should be about the size of the sponge.



STEP 3

Start your excavation in any square that you like. First soak the sponge with water in the bowl. Then place the sponge on a square and carefully squeeze out the water.



STEP 4

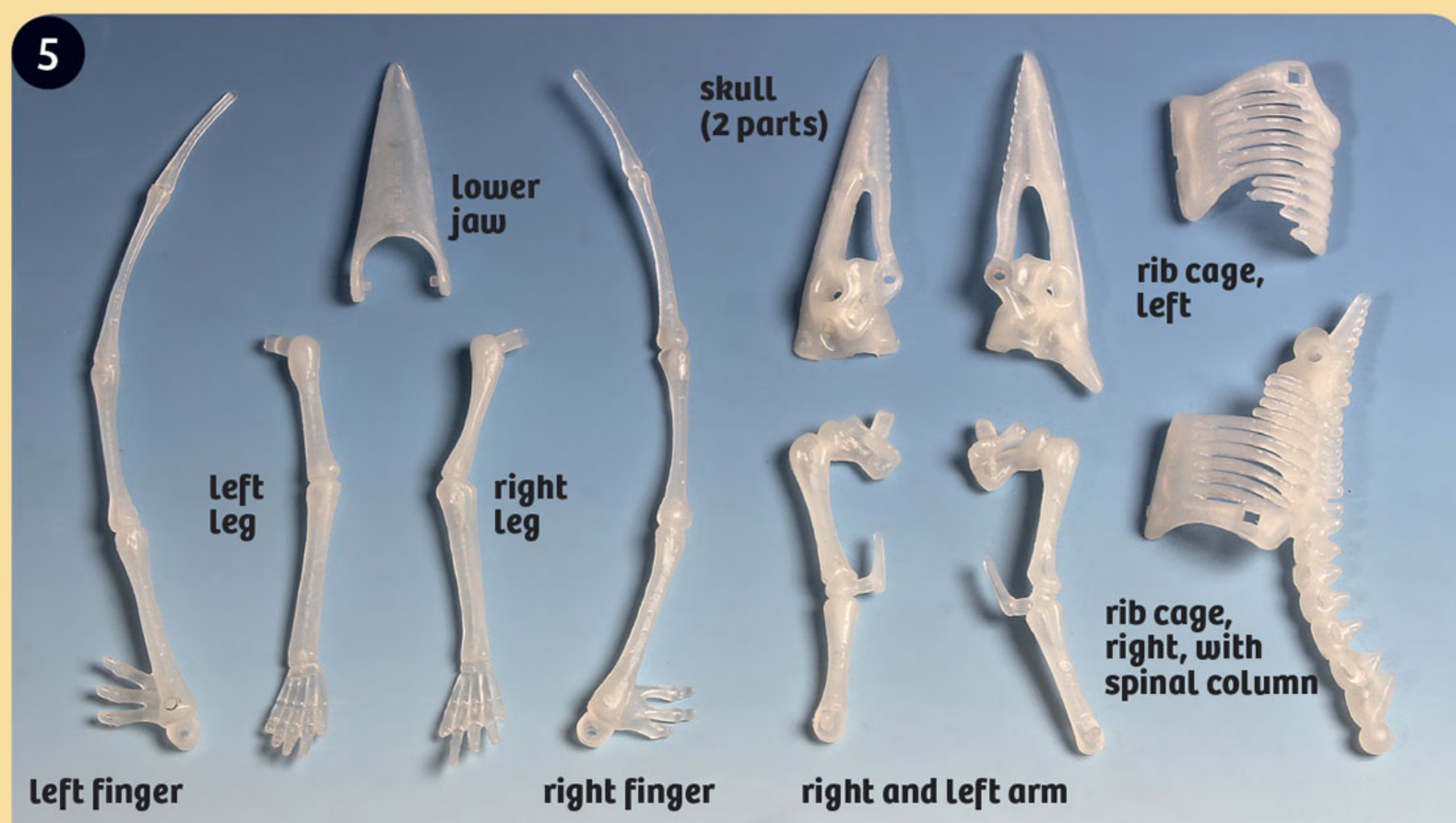
The water will turn the plaster in the square quite soft, so you can easily scrape off the surface with the chisel. When you come to harder spots, keep digging carefully with the hammer and chisel. As soon as you come across a piece of the skeleton, try digging gently all around it. You can also use the hook at the end of the hammer handle for this.





STEP 5

Next, continue step by step in the same manner with the other squares — until you have excavated all the parts of the skeleton. The picture below shows you all the bones hidden inside the block. Use it to figure out which parts you haven't found yet and what they look like.

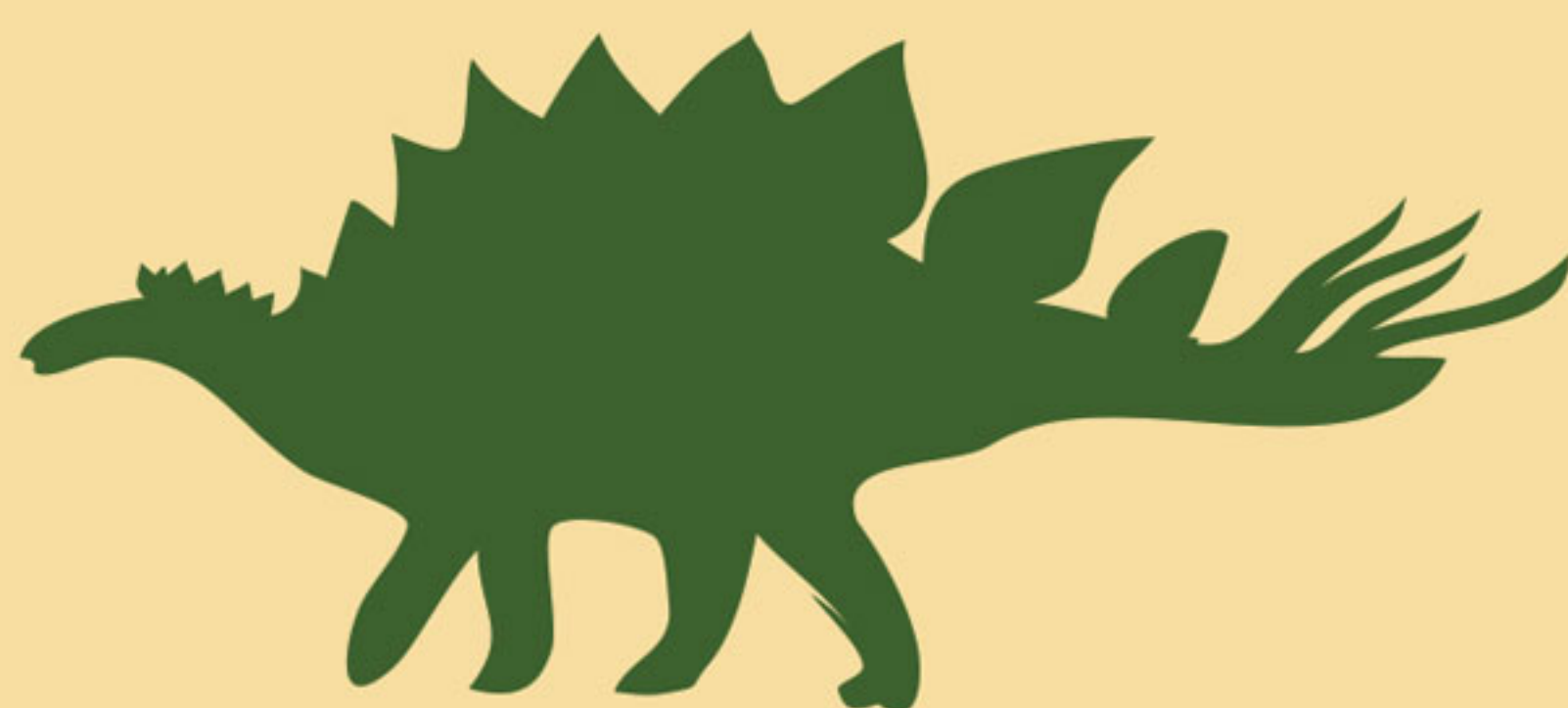


STEP 6

Finally, clean all the skeleton parts under running water using the sponge.

TIP! Put the stopper in the drain so you don't lose any pieces!

Then, let all the bones dry on a paper towel before assembling them.



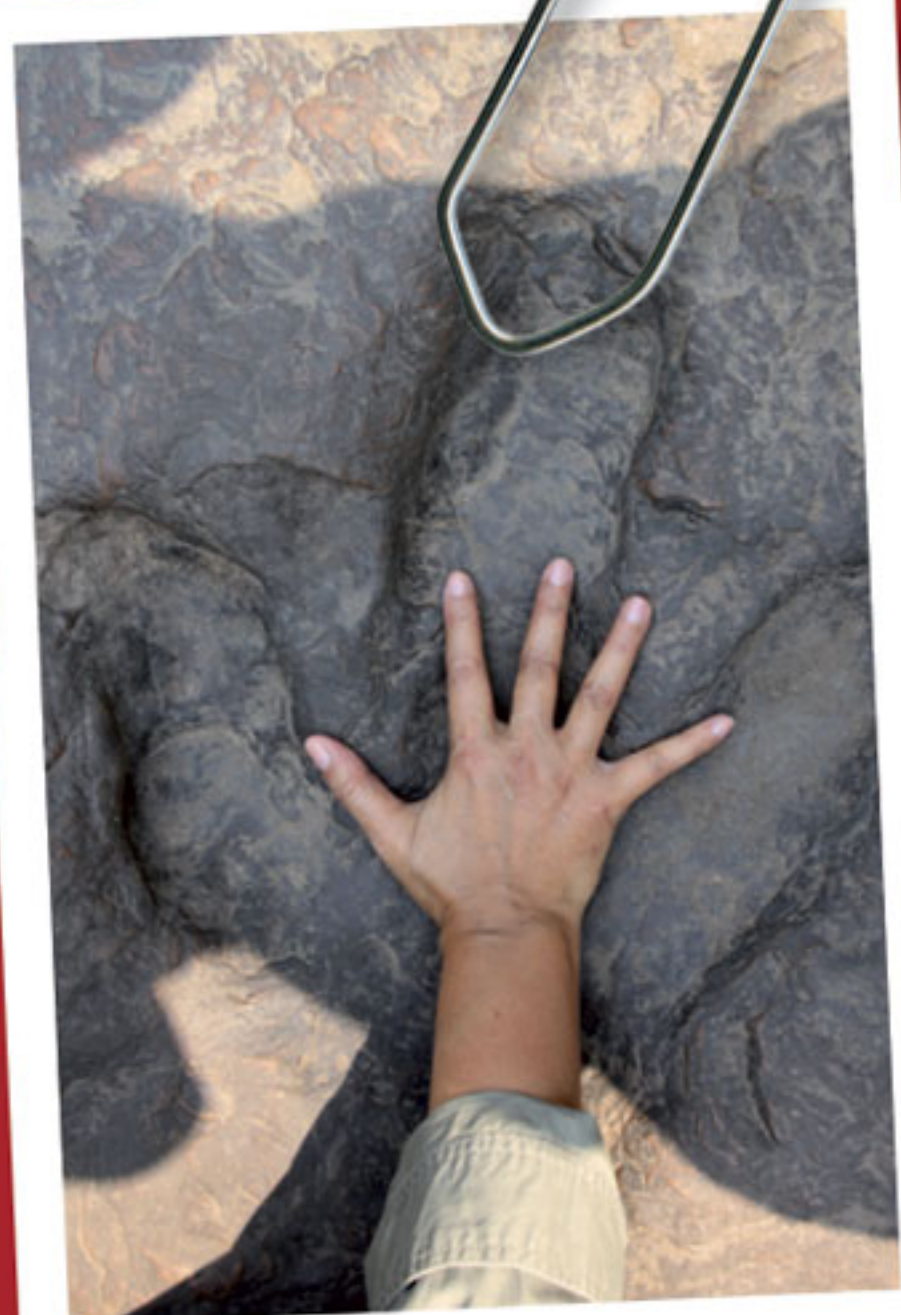
NOTE! After excavating and cleaning the skeleton, wash your hands thoroughly and clean the work area. Dispose of the newspaper along with any bits of plaster in the household trash.



? HOW DO WE KNOW SO MUCH ABOUT DINOSAURS?

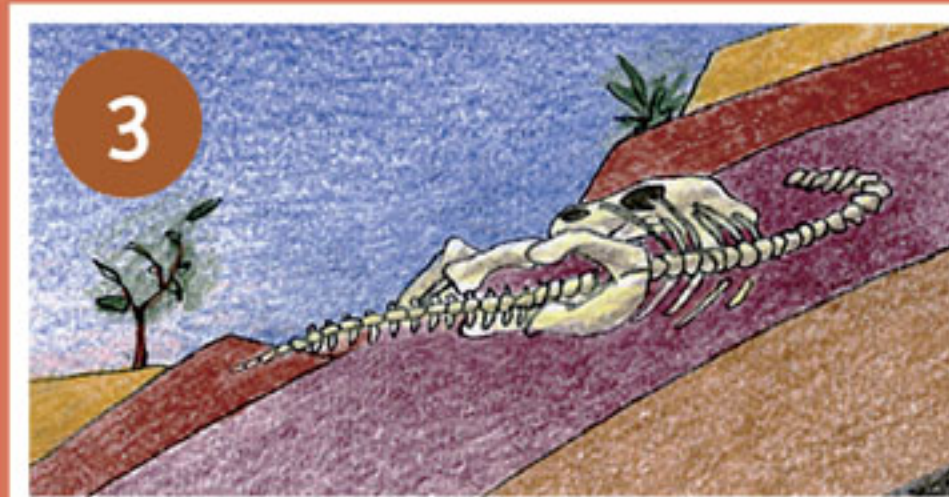
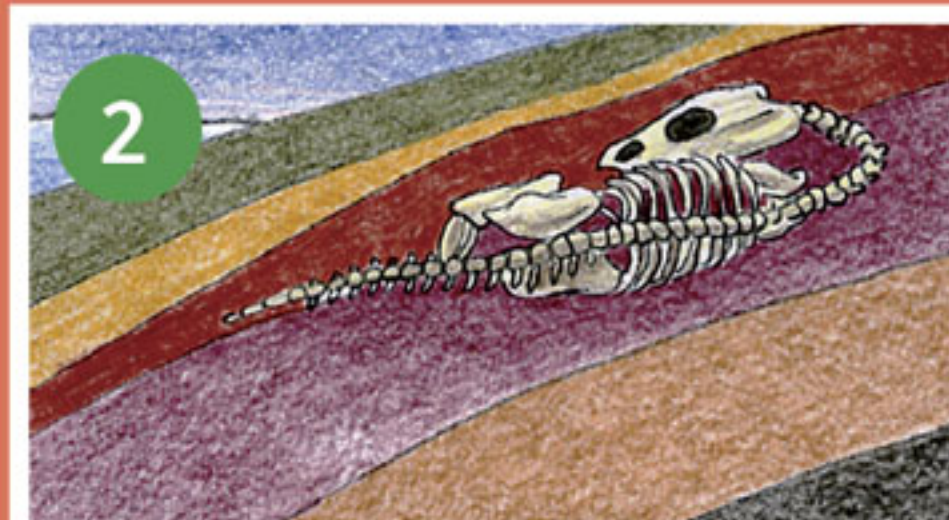
A long time ago, there were many animals and plants that no longer exist today. The dinosaurs, for example, became **extinct** millions of years ago. But some remains of their bodies have been preserved. When that has happened, bones, skin impressions, or footprints — in other words, **fossils** — may show up in stone.

Researchers dig up these discoveries, study them, and compare them to others. In this way, **scientists** figured out about 200 years ago that some of these fossil remains came from enormous animals. Before then, people had thought they were the remains of human-like giants!



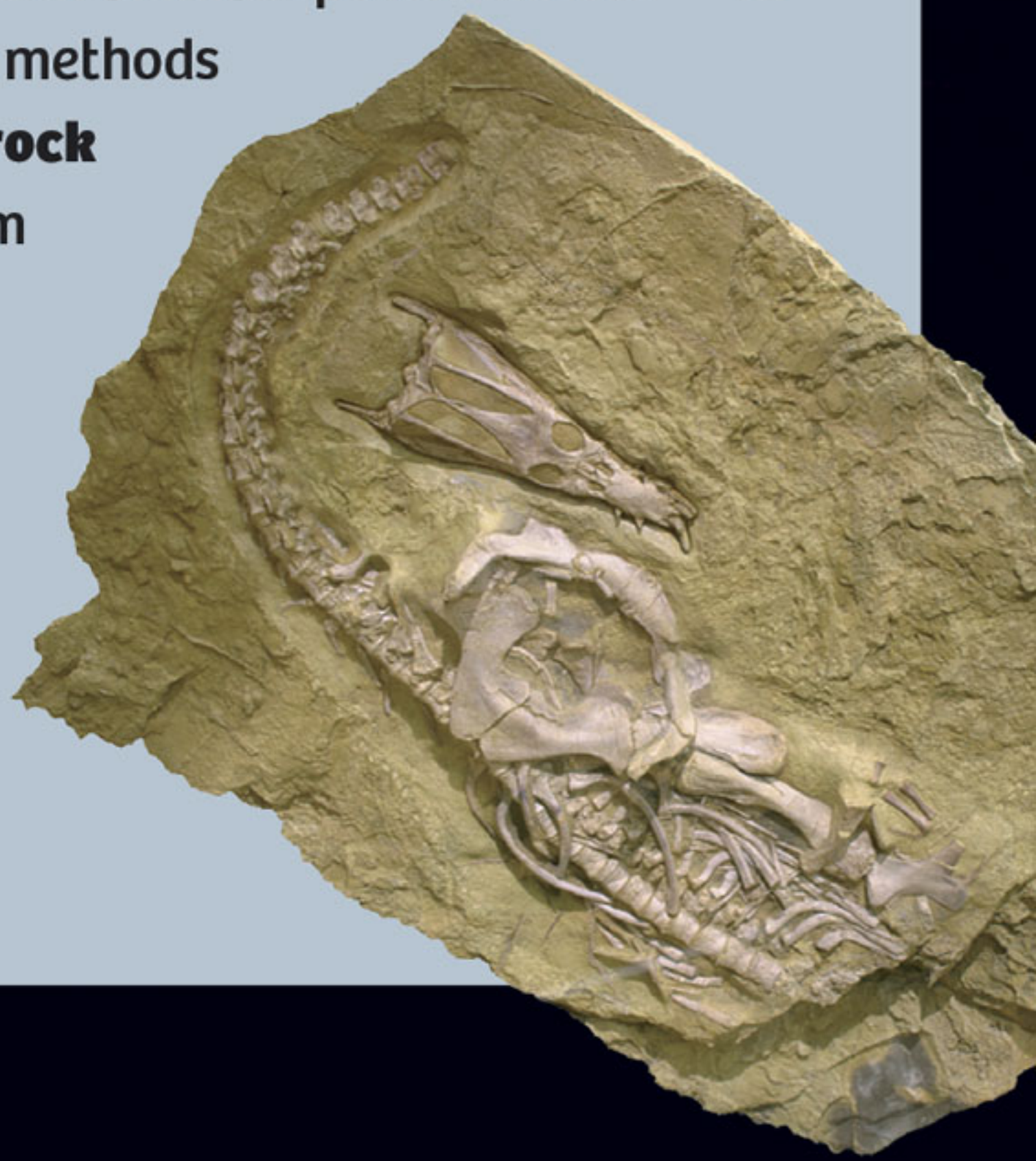
HOW FOSSILS ARE CREATED

- 1 When animals die, scavengers eat their remains or they decay over time. Only in very rare cases are their **bones** or **imprints** saved. This may happen, for example, when they become embedded in sludge, which can preserve the remains due to its low oxygen content.
- 2 Over time, extra **layers** may settle on top of them and protect the animals' remains. Although the flesh itself will quickly decay, mineral-rich groundwater may penetrate the spaces that remain behind. This causes the embedded bones to "**turn to stone**": the bone material is replaced by minerals, with the shape of the bone remaining intact.
- 3 In some areas, **rain** and **wind** may then carry off the superimposed layers over millions of years, revealing the fossils at the surface, where they can be dug up.



? HOW DO WE KNOW HOW OLD A FOSSIL IS?

Of course you would want to know when a given animal species existed — in other words, how old a fossil is. There are several methods for that. For example, you know that if **layers of rock** have been left undisturbed, the ones on the bottom will be older — just like a stack of newspapers in your living room. So that gives you a relative sequence for the fossils embedded in the rock. But there are also **radioactive** atoms in nature that change into other atoms at a certain rate. Based on the ratio of the two types of atoms, you can determine the age of the fossil or the layer of rock in which it is located.



Assembling the Skeleton

STEP 1

Start with the two sections of the rib cage. The two halves are connected to the spinal column and breastbone with plug connectors.

1



STEP 2

Now attach the rear legs to the hip bones by the plug connectors. The gently curved toe bones should be pointing up.

2



STEP 3

Then attach the arm bones to the shoulder bones. Make sure that the thorn-like bones between the lower arm and hand are pointing forward, and that the connectors for the fingers are pointing up.

3





STEP 4

Now, attach the finger bones to the hand, with the three short fingers pointing forward.

4



STEP 5

The head is assembled from the two skull halves and the lower jaw. Before pressing the pieces tightly together, attach the head to the neck by the ball joint.

5



STEP 6

As a final touch, assemble the black display stand and mount your pterosaur on it. Or, you can suspend the skeleton by a transparent thread attached to the ceiling.

6



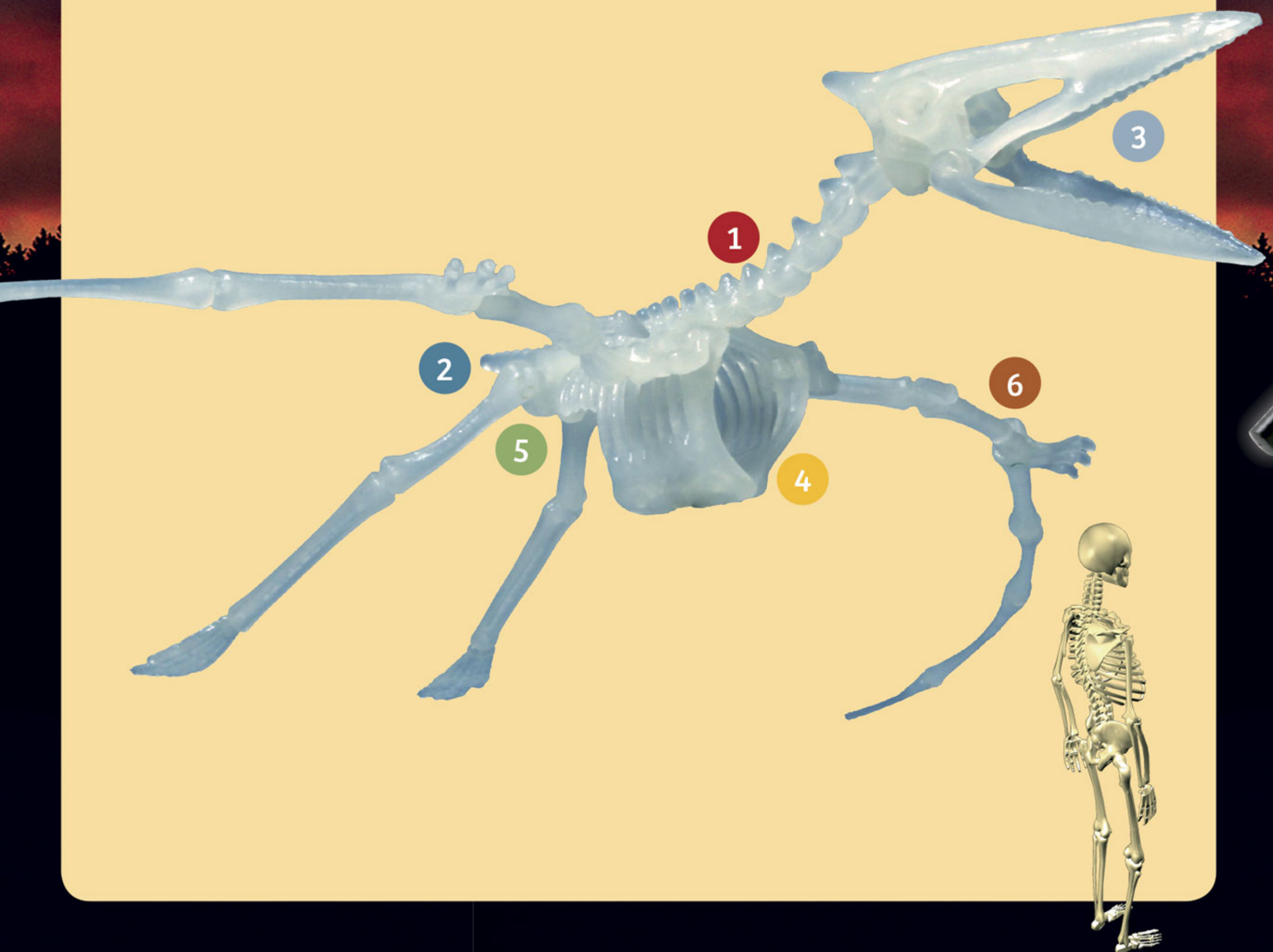


THE PTEROSAUR SKELETON

Take a look at your assembled skeleton, and see how it compares with the skeletons of present-day animals or humans.

- 1 The **spinal column** shows that the pterosaurs were vertebrates — just like us and all other mammals, as well as dinosaurs, birds, reptiles, amphibians, and fish, but not insects or snails, for example. The spinal column held the skull, ribs, hip bones, and front and rear legs.
- 2 At the rear, it ended in a short **tail**. But there were also pterosaurs that had a long tail, which may have helped to steer them in flight.
- 3 In comparison with the body, the **skull** is astonishingly large. With its giant bill, it resembles the head of a bird — but with an important difference: today's birds have no teeth.
- 4 The **ribs** form the rib cage, which stabilizes the body and protects the internal organs.
- 5 Mounted to the **hip bones** are the rear legs consisting of thigh, shank, and clawed feet.
- 6 What really gets your attention, of course, are the **arms**. They consist of upper and lower arm sections and the greatly lengthened hands, each with three fingers equipped with claws. The fifth finger has regressed, but the fourth is very long, the better to hold the tightly stretched wing membrane.

This differentiates pterosaurs from birds, which have wings formed by the entire forearm, and bats, which have their wing membrane attached to four fingers.



Check It Out

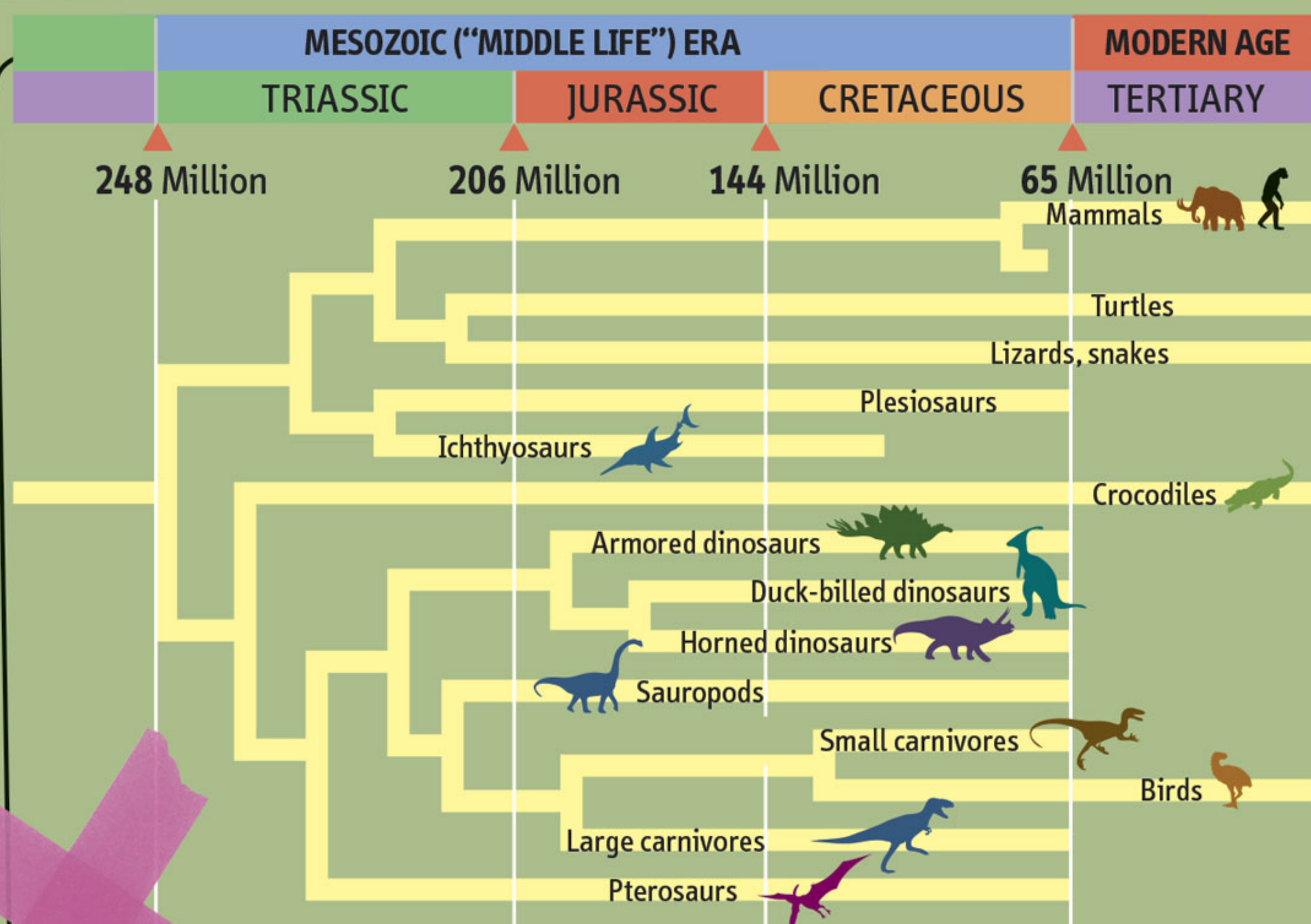


WHEN DID THE PTEROSAURS LIVE?

It was **230 million years** ago that the first dinosaurs evolved from reptiles. For over 160 million years after that, they ruled Earth. As a point of comparison, consider that humans of our species have only been around for about 150,000 years.

The time period during which dinosaurs lived is called the **Mesozoic ("Middle Life") era**. The Mesozoic era is divided into three periods: **Triassic**, **Jurassic**, and **Cretaceous**.

During these periods, many new dinosaur species arose, existed for a few million years, and then died out again. So the many different dinosaurs that we know of by no means lived at the same time.



HOW DID THE WORLD LOOK AT THE TIME OF THE DINOSAURS?

There was a much warmer and wetter climate across the entire globe. The plant-eating dinosaurs fed on ferns, conifers, redwoods, and ginkgo trees. Flowering plants and broad-leaved trees did not develop until the end of the dinosaur age.

Even the globe itself looked quite different in the time of the dinosaurs. At the beginning of the dinosaur age, all the land masses lay together in one giant continent, known as **Pangaea**. Later, this supercontinent broke apart, and the pieces became the various **continents** of today. That is also the reason why dinosaur remains can be found on all of today's continents.





PTEROSAURS — FLYING PREHISTORIC CREATURES

Pterosaurs were the first flying vertebrates. Some were hardly bigger than a sparrow, while others had a **wingspan of up to 20 meters (66 feet)**. Their wings had no feathers but instead bore a delicate membrane similar to that of a modern-day bat.

Some pterosaurs had a **bony crest** on their head, the function of which is still unknown. Some had a long tail, presumably for steering. Their bones were hollow but strengthened by bridges and sponge-like structures — thus being both light and strong.

All of the pterosaurs known today were **meat eaters**. The smaller, tailed types were presumably skilled flyers, able to catch lake and ocean fish in flight with their sharp **beaks**. Others stood in shallow water pecking on crustaceans and mollusks.



? WHY THE SKELETON GLOWS IN THE DARK

In daylight, the bones of your pterosaur skeleton look more or less white. But if you look at them in the dark, they will start to glow with a greenish-yellow light. It can look a little creepy, as if you were looking at the ghost of a long-dead dinosaur.

This effect has a completely natural explanation, however. The plastic bones contain a glow-in-the-dark dye material. This material is called **zinc sulfide**, and it stores light from the sun or a lamp shining on the skeleton. And in the dark, the stored light is emitted for a while.

After it stops glowing, you can “recharge” the dye material again anytime.



? WHY ARE THERE NO MORE DINOSAURS TODAY?

At the end of the Cretaceous period, the last dinosaur species died out. But why?



The most plausible theory is that a meteorite crashed into Earth. A **meteorite** is a solid object from space that does not burn up as it approaches Earth and impacts with the ground. The dinosaurs may have been buried by it, killed by the resulting **tidal wave**, or died from **dust clouds** that covered the sun.

It is also possible that there was a very powerful **volcanic eruption** that changed Earth’s climate. Or, new plants and animal species may have evolved so that the dinosaurs could no longer find their usual food.