

DIGIT! FOSSILS

REAL FOSSILS



Contents

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1. Excavation block with fossils hidden inside
 - a. *Atrypa* shell
 - b. Stony coral
 - c. Snail aggregate
 - d. Shark's tooth
 - e. Fossilized resin
2. Hammer
3. Chisel
4. Sponge

You will also need newspaper, water, a small bowl, paper towels, and a small ruler. If any parts are missing or defective, please contact Thames & Kosmos customer service.

Dear Parents!

Please provide your child with assistance and support when digging out the fossils. 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 the fossils. 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!

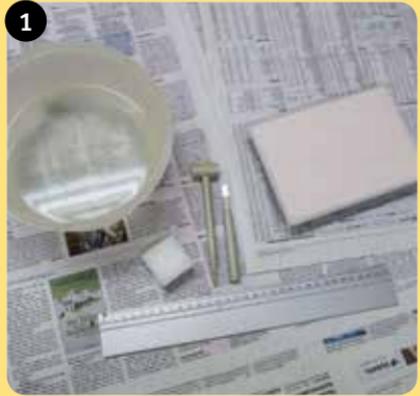
WARNING. Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

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.

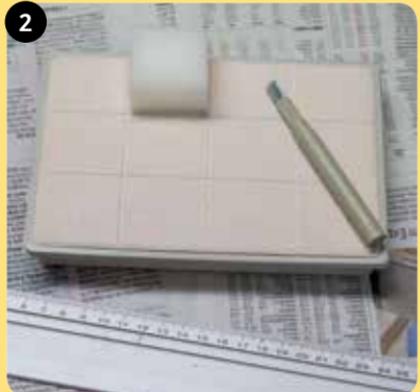
Keep the packaging and instructions as they contain important information.

Excavating

1. Start by looking for a suitable room 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. Make sure you have sufficient space available on a level, sturdy table, which you should cover with a few layers of newspaper to protect the surface. Get the excavation block and tools ready, along with a small bowl of water. You will also need a small ruler.



2. When excavating, proceed like a paleontologist. That's a scientist who studies evidence of life from a long time ago. 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.



Excavating

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.



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 fossil discovery, try digging gently all around it. You may have to moisten the layers of plaster again with the sponge.



5. Next, continue step by step in the same manner with the other squares — until you have exposed all the fossils.

6. Once you have dug up all the fossils, clean off any plaster still clinging to them. Rinse them one by one under running water while rubbing their surfaces with the sponge. It's best to put the stopper in the drain so you don't lose anything. Finally, dry off your discoveries with a piece of paper towel.



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



Digging Deeper

WHAT ARE FOSSILS?

Earth is very, very old. In earlier times, all kinds of plant and animal species lived on Earth; they no longer exist because they have since become extinct. The best-known extinct animal species are no doubt the dinosaurs.

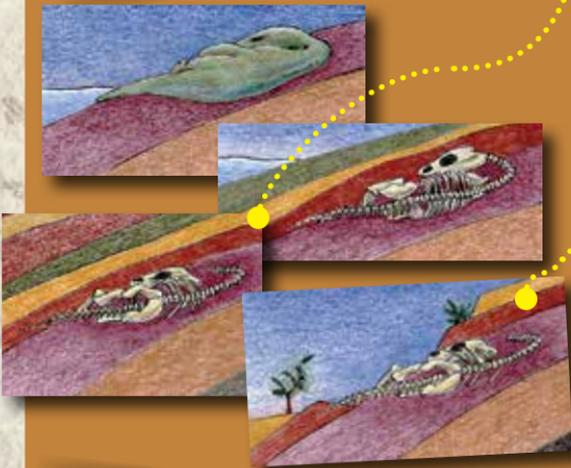
We know about extinct animal species because in many places the remains of their bodies — for example, their bones, impressions of their skin in stone, or their footprints — have been preserved. Sometimes, the entire bodies of insects are even preserved in amber.

Let's dig into the world of fossils and the history of Earth!

HOW FOSSILS ARE MADE

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 well due to its low oxygen content.

Over time, mineral layers, or **strata**, 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. 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. Of course, many more remain undiscovered beneath Earth's surface.



WHY FOSSILS ARE EXCITING

Fossils show us how life developed on Earth. Throughout most of Earth's history, the only life forms were the size of bacteria. In more recent rock, the remains of larger animals can be found — but only sea creatures such as ammonites and fish. Only much later did plants and then animals conquer dry land.

The younger the fossil-bearing rock, the more highly developed are the classes of life forms that can be found within them. The first land animals were insects and amphibians that had developed from fish. After that, reptiles arose; they were better adapted to life on land. They in turn were the ancestors of dinosaurs and mammals, with birds then developing out of a group of dinosaurs.

Over and over, entire groups of animals became extinct again — sometimes due to catastrophic events. The dinosaurs (and many other species living at the time) were wiped out by a massive asteroid impact.



Keeping and Displaying Your Fossils

There are many ways of displaying the fossils that you have dug up. For example, you can place them in a display case on a piece of black or white paper or a piece of black velvet. Real fossil collectors, though, save their treasures individually in small boxes and also label them with their correct names.

You can easily make boxes like these yourself. You just need a sheet of heavy paper (ideally 32-lb paper from the stationery store, although printer paper works too), scissors, and a ruler.

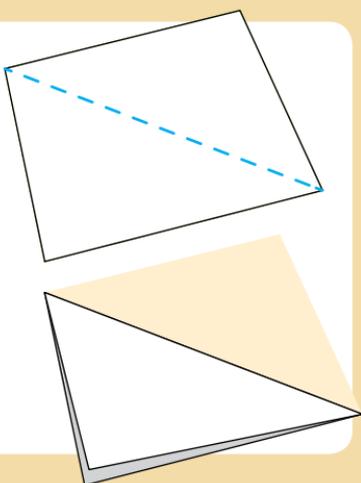
1. For each box, cut a piece of paper 10 cm by 10 cm (4 in. by 4 in.) in size.

2. Fold the sheet diagonally, or from one corner to the opposite corner, and then fold the paper back again.

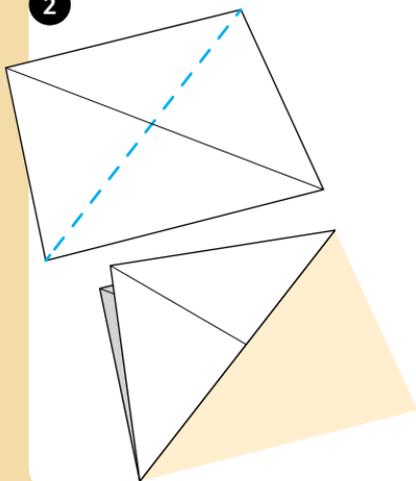
3. Fold each corner to the center and leave folded.

4. Fold one side to the center and then do the same with the opposite side.

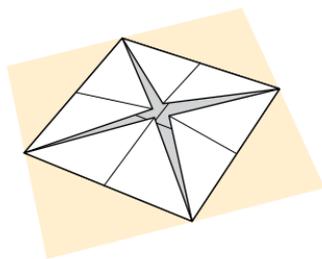
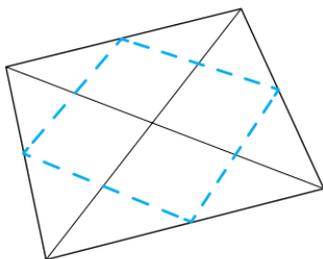
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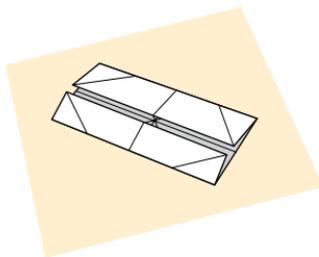
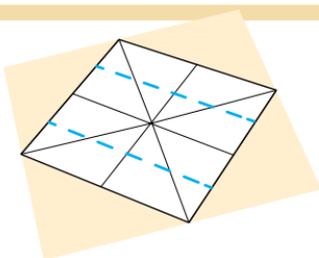
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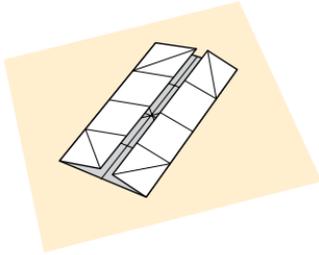
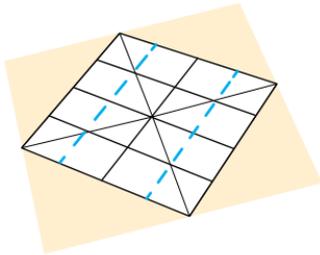
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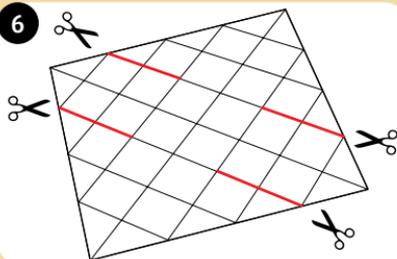
5. Unfold the two sides again and then do the same with the other two sides.

6. Unfold the sheet and cut along the lines shown in red.

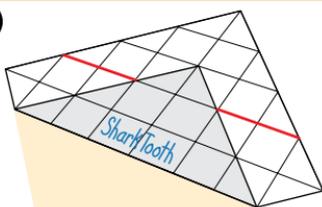
7. Now you can label the side section. Fold up the lower corner, and write the name of the specimen in the proper place as shown. If you prefer not to, of course, you can apply an adhesive label later on.

8. Lift the two triangular side pieces and fold the A sections inward, with their tips meeting in the middle of the box.

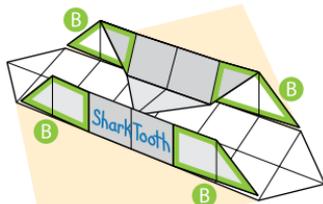
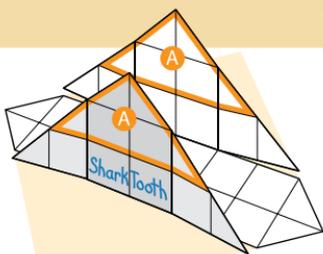
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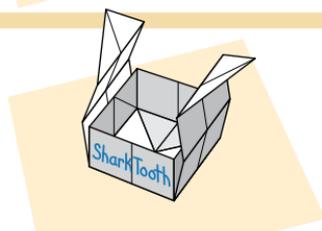
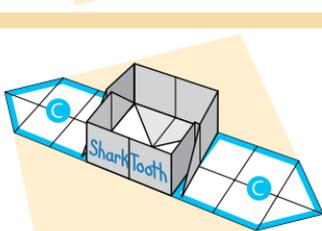
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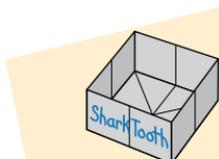
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9. Then fold the B sections inward at a right angle, and fold the C sections in over the B sections.

10. This is how the box should look now. If it is not stable enough, you can help hold it together with a few drops of all-purpose glue. Place some cotton wool in the box, and rest your fossil on top.

10



Check It Out

DETERMINING THE AGE OF FOSSILS

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.

Also, there are 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.



EARTH'S HISTORY — SHORTENED TO A YEAR

Earth is an inconceivable 4.6 billion years old. Even if you were just to try counting that high, you would have to keep counting without a break for 146 years. But you can understand Earth's history better by thinking of it shortened to a year.

In those terms, our planet came into existence on January 1. Life developed at the start of April, but the first fish took until the middle of November to start swimming the seas. Dry land was conquered in the beginning of December. In the middle of December, the first **dinosaurs** appeared, and in the evening of December 26, they disappeared again. But it was not until December 31, 4 hours before midnight, that the first prehistoric man trotted across the African steppe. And just before the gong struck midnight on the final day of the year, modern man appeared.



FACT SHEET: FOSSILIZED SHARK'S TOOTH

The shark from which this tooth came swam through the seas when *Tyrannosaurus rex* dinosaurs roamed the land. That was around 70 million years ago. At that time, these elegant predators were already hunting fish in the ocean. They were the ancestors of the sharks of today. Sharks often lose and replace their many teeth, which is why large numbers of fossil sharks' teeth can be found in many places.



The Fossils from Your Kit

FACT SHEET: ATRYPA SHELL



Although this fossil looks like the shell of a mussel — which is a kind of mollusk called a bivalve — it is actually the shell of a brachiopod, a completely different phylum. In prehistoric times, brachiopods such as *Atrypa* lived together on the ocean floor with mussels and snails.

Protected by the shell was a soft body with fine tentacles that filtered food out of the seawater. *Atrypa*s were attached to the ocean floor by a fleshy stalk, keeping them in place.

Your specimen is a type of *Atrypa* that first appeared 485 million years ago. Most of the brachiopods lived well through the Jurassic period, but only comparatively few species of brachiopods are still live today.

FACT SHEET: FOSSILIZED RESIN

When the resin of a tree dripped into marshy water, it formed a drop or clump that occasionally became preserved as a fossil. Very old resin sometimes formed amber, which can be up to 50 million years old. Younger tree resin is called “copal” — which you will find in your excavation block. You can polish its dull surface to a bright shine with a piece of cotton cloth. Use a drop of household vinegar to help it along.

Sometimes, the resin became a deadly trap for smaller animals — such as insects or spiders — that became caught in its sticky mass. In that way, the resin sometimes preserved small creatures that would otherwise have left no trace behind.



FACT SHEET: SNAIL AGGREGATE

Snail shells are often very small. When the snails living inside them die, they can form a layer of various shell types on the ocean floor. If this sediment as a whole becomes a fossil, you can recognize many different sizes and shapes of snail shells within it. Your specimen is cut in such a way that you can even see the spiral hollow space inside some of the shells.



FACT SHEET: STONY CORAL

This fossil is a tiny part of a long-lost coral reef. Corals are without a doubt the greatest master builders in the world. These are the little creatures that are responsible for creating mighty coral reefs, thus building a habitat for an incredibly diverse array of species. Corals have been around for many millions of years. They form a limestone skeleton that stays behind after they die, which is clearly visible in your fossil. And when billions of these limestone skeletons have accumulated, they become reefs.

