Fossil Detectives

Teacher Box

Courtesy of the Arizona Museum of Natural History

<u>Fossil Detective Teacher Box</u>

This Box consists of:

1. Educator background info
2. A pre-recorded lesson plan (Fossil Detectives)
3. 4 worksheets
4. 1 activity video and 1 activity lesson plan
5. Teachers Box with the following contents:

Fossil Detectives Teacher Box Contents
1 x Expandable luggage case
Protoceratops Replica Skull
Eubrontes footprint replica
Plesiosaur tooth in matrix
Fern fossil
4 pieces of dinosaur eggshell
Theropod egg replica
Sauropod Embryo in Egg Replica
Sauropod Egg replica
1 piece of amber with insect inclusion
Trilobite
Dinosaur Coprolite
Ammonite Toy
3 x unpolished ammonite fossils
Polished Ammonite fossils
2 x garfish scale fossil
Dinosaur skin impression
Petrified wood
Fossil Mollusk
2 x Enchodus teeth
2 x Mosasaur teeth

Some Learning objectives:

1. Understand that paleontologists study all kinds of prehistoric life (plants and animals), NOT just dinosaurs.
2. Highlight the importance of diversity and self-representation in STEM fields (including but not limited to race, gender, ability etc.), such as paleontology.
3. Paleontology, as with other sciences, relies on observation and inference skills to reconstruct past behavior, which are important components of the scientific method.
4. Know that fossils are the primary evidence used by paleontologists to reconstruct the past.
5. Recognize that there are different types of fossils including body and trace fossils.
6. Be able to apply the skills of observation and inference to a scientific problem such as paleontology.

1.) <u>Educator Background Information</u>

- Paleontology is a field of science that studies prehistoric life including plants, animals and other organisms and it is NOT limited to dinosaurs.
  - Paleontologists study life that is primarily extinct (no longer exists).
  - How do paleontologists learn about past life if it is extinct? They rely on evidence, primarily fossils which provide clues about what life was like in the past.
  - Examples of fossils include bones, teeth, claws, footprints, eggs, and imprints of things such as skin, feathers and leaves.
  - It is rare for fossilization to occur since it requires very specific conditions. Fossils are also subject to preservation bias, which means that some parts of an organism may preserve better than others, such as bones and teeth.
  - Fossils can also be difficult to find since they may only occur in specific geological deposits.
  - Paleontologists can divide up fossils into two main categories, body and trace fossils.
- Body fossils as the name suggests, are evidence of the body of the actual organism.
  - An example of a body fossil is a skull, such as that of the ceratopsian dinosaur *Protoceratops* **(Figure 1 and 2).**
  - Body fossils include mold and cast fossils.
- What can we learn from body fossils, such as a *Protoceratops* skull?
  - The approximate size of an animal.
  - Possible display behaviors, such as attracting mates, as indicated by the presence of a frill.
  - Teeth can help identify whether something was an herbivore or carnivore.
  - The presence of a beak, which was used for plucking plants to eat, is another line of evidence that this dinosaur was an herbivore. All ceratopsians have this feature (also called a rostral bone).
  - Possible evolutionary relationships to other dinosaurs, in this case other ceratopsians, such as *Triceratops* & *Zuniceratops*).
- Trace fossils are different from body fossils in that they are not evidence of the actual organism.
  - They can provide information about an animal's behavior.
  - Examples include tracks, scratch marks, burrows, etc.
- An example of a trace fossil is a dinosaur footprint or series of tracks.
  - In the accompanying video, we look at a *Eubrontes* footprint **(Figure 3).**
  - Sometimes scientists may not always know what dinosaur created a footprint or trackway. We refer to these as ichnospecies which is any species named from trace fossils.
  - There are often difficulties connecting a body fossil to the trace fossil due to the nature of trace fossils.
  - Some paleontologists believe that the *Eubrontes* footprint could have been made by the dinosaur *Dilophosaurus* **(Figure 4).**
- What types of information can we learn from a footprint?

    - An indication of size at the hip which is calculated by measuring the footprint and applying a simple mathematical equation.
    - Type of creature who made it by looking at the size, shape and number of toes.
    - The shape and function of the claws.
- A trackway (series of tracks) can provide even more information
    - Speed of animal (running or walking).
    - Evidence it traveled in herds.
    - Hunting behavior.
    - How they cared for young.
- Paleontology is a specific scientific discipline that relies on the scientific method to create and test hypotheses.
- A very important component of the scientific method is using our senses to make observations to gather information about the world around us and using that data to make informed conclusions or inferences.
- Practicing paleontology using clues from fossils is a great way to sharpen skills of observation and inference.
- Plesiosaur tooth **(Figure 5).**
    - Tooth is short and has a curved cone shape.
    - Small to no serrations or jagged ridges.
    - Terminates in a sharp point.
    - Based on these clues, these animals likely ate fish and other aquatic organisms of the time, like ammonites.
    - This is NOT a dinosaur but a marine reptile that lived during the Mesozoic Era **(Figure 6).**
- Mosasaur Teeth **(Figure 7).**
    - This is NOT a dinosaur but a marine reptile that lived during the Mesozoic Era **(Figure 8).**

- Enchodus teeth **(Figure 9)**
    - Found in the Cretaceous seaway or the western Interior seaway about 92 million years ago. This was a huge inland sea that stretched from the Gulf of Mexico in the South and then cut North America in half, so that there were two land masses, with one on either side of the sea.
    - Nicknamed the 'Sabre-tooth Herring' by paleontologists because it sported four gigantic front teeth that could grow about 2.4 inches long, which protruded out of the front of the fish's mouth.
    - This is NOT a dinosaur but a fish that lived during the Cretaceous period **(Figure 10).**
- Fern leaves preserved in shale **(Figures 11 and 12).**
    - Remember that not all fossils are from dinosaurs or even animals, they can also be from plants.
    - Leaves do not have hard parts that would be preserved, such as bone. Instead, when leaves are buried and exposed to extreme pressures and

different minerals from groundwater, the plant leaves are replaced by new minerals that leave this fossil imprint.
    - Smashed carbon remains are also found.
    - Some early plants were as tall as short bushes. This is because plants get their energy from sunlight, so because the leaves were so small, the plant could not grow as big. The small fern leaves could not get as much sun as the large leaves of tall conifers could.
    - Animals that fed on these plants were those that fed close to the ground, like stegosaurs or ankylosaurs for example **(Figure 13).**
- Petrified wood **(Figure 14)**
- Dinosaur eggshell **(Figure 15).**
    - How can we tell if the eggshell is from a sauropod or a theropod?
    - Theropods (bipedal carnivores, examples include *T. rex* and raptors).
    - Sauropods (long neck, herbivorous dinosaurs).
    - We look at eggshell architecture including the pores, the structure of the shell and the general shape of the egg.
    - Theropod eggs are elongated, or oval shaped, like a potato **(Figure 16).**
    - Sauropod eggs are more spherical in shape, like a softball **(Figure 17).**
    - Not many studies have been done on why these egg shape differences exist. Some scientists suggest this is just the most natural way for the eggshell to form within the dinosaur.
    - Others have speculated the shape is due to differences in the shape of the mother's body while eggs are laid.
    - The theropod eggs are more closely related to the oval shaped eggs of birds today. Scientists speculate that this is because of the egg design is more suited toward animals with flight capabilities and this is what lead the theropods to evolve into the birds of today.
- Insect in amber **(Figure 18).**
    - Amber is fossilized tree resin, thicker than tree sap, which forms on the outside of the tree. When this resin hardened and then fossilized, it becomes the amber you see today, which we value as a gemstone. Because the resin is very thick and sticky like syrup, things like dirt, tree parts, insects, and even small animals could be caught in it **(Figure 19).**
    - Sometimes insects would fly into the tree resin and become stuck. This was the basis for the Jurassic Park and Jurassic World movie franchises. Scientists have studied the DNA that has been found in these insects and have not been successful in finding a valid set of DNA. The blood extracted from the insects, once analyzed, was found to be damaged from the millions of years it has been encased in amber. It has still been broken down by decomposing bacteria and the bacteria of the insect.
- Trilobite in matrix **(Figure 20).**
    - Trilobites are relatives of horseshoe crabs which are still alive today.
    - There are over 20,000 known species of trilobites that have been discovered.

    - Most trilobite fossils are from molted exoskeletons. Trilobites would grow too big for their shells, so they would lose their old shell as a new one took its place.
    - Their exoskeletons were segmented, so they could roll into balls for protection, like an armadillo does today.
    - Trilobites became extinct at the end of the Permian, the most devastating mass extinction event in earth's history, even bigger than the extinction of the dinosaurs!
    - Trilobites have three portions to their body, that is how they got their name!
    - Trilobites are the first known creature in the animal kingdom to have complex eyes and are one of the first animals to develop multiple limbs for movement.
    - Some trilobites could swim while others would burrow or crawl on the ocean floor **(Figure 21).**
- Coprolite **(Figure 22).**
    - Coprolite is the scientific name for fossilized feces. This coprolite is from a dinosaur, but we find coprolites from many different animals throughout the fossil record.
    - Lots of scientific information can be gleaned from coprolites. If we can identify the dinosaur that produced the coprolite, we can learn more about that dinosaur's diet based on what is found in the droppings. This is why this fossil was cut in half, to see what was inside. For example, we have found rocks in large sauropod droppings. Scientists have deduced with the help of these rock bearing coprolite fossils that sauropods would eat rocks to help with their digestion of plant matter.
- Hadrosaur skin impression **(Figure 23).**
    - Hadrosaur *Gryposaurus* reconstruction **(Figure 24)**
- Ammonites **(Figure 25 and 26).**
    - This is a body fossil, the shell of a squid-like creature **(Figure 27).**
    - This fossil has opal in it. Opal is considered a gem, but it is not a mineral. It does not have a specific crystalline structure, which is needed to be classified as a mineral.
    - Since this fossil contains opal, we need to know what types of environments opal forms in. Opals need a silica rich environment to form. Sands and clays are rich in silica so if an ammonite is buried in sand before it is fully fossilized, opal can form inside the shell.
    - This means the fossil was likely in a beach or river environment.
    - Sometimes the process of fossilization can ruin the fossil, for example if the pressures are too great and crushes the bone, or the water dissolves the bone before turning it to stone.
- Garfish scale **(Figure 28).**
    - The primary purpose of fish scales is to provide external protection to the animal.

  - There are several different types of fish scales which are categorized by different shapes & composed of different materials **(Figure 29).**
  - Basic architecture of scales is due to evolutionary relationships, with variation due to differences in lifestyle and habitat.
  - Garfish have ganoid scales which are diamond shape with an outer layer composed of an enamel-like material called ganoine **(Figure 29).**
  - Species of garfish are still alive today & the Museum has one downstairs in the aquarium by the Exploration Station **(Figure 30).**
- Fossilized Mollusk **(Figure 31)**

Visual aids:

Figure 1. *Protoceratops* replica skull.

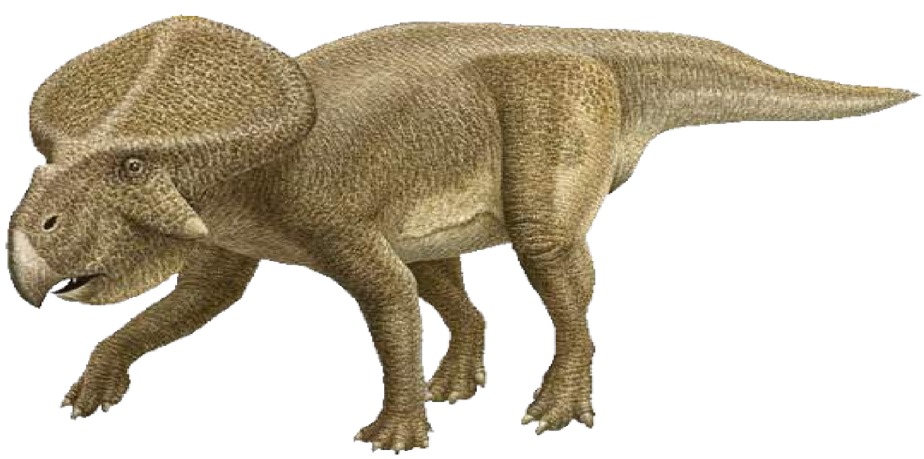


Figure 2. Fleshed out reconstruction of *Protoceratops*.

***Figure 3. Eubrontes* footprint.**

Figure 4. *Eubrontes* trackway possibly made by the dinosaur *Dilophosaurus.*

Figure 5. ***Plesiosaur*** **tooth.**

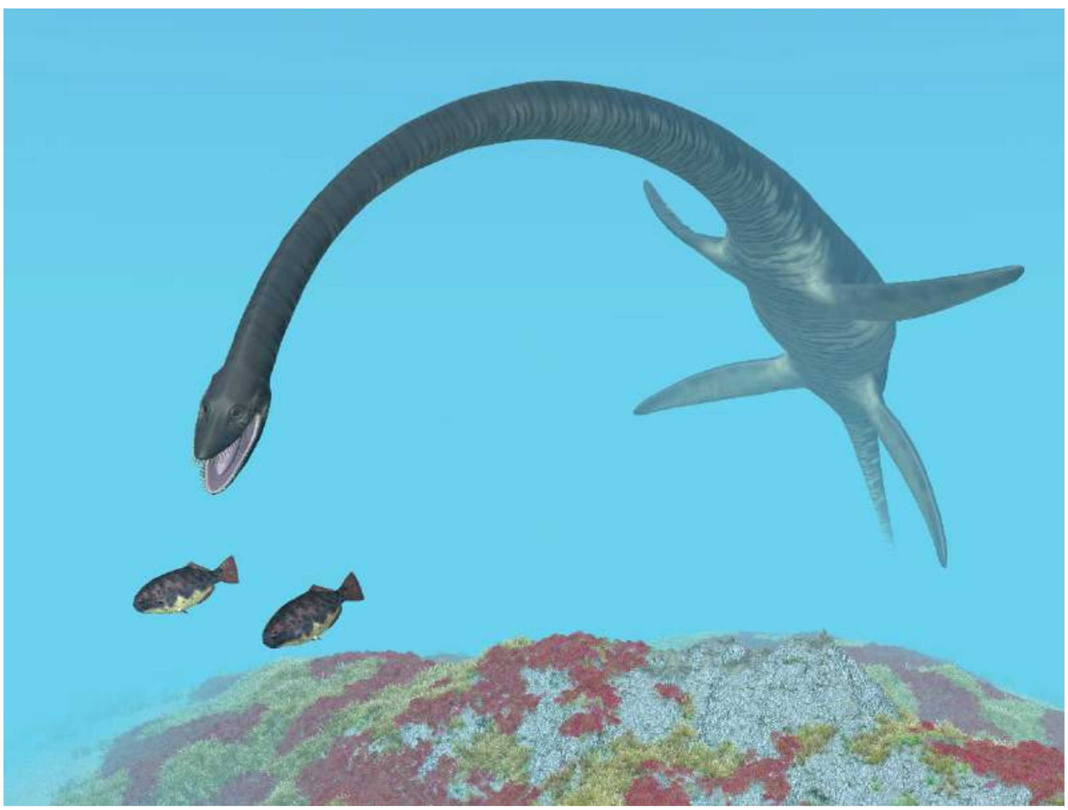


Figure 6. Fleshed out ***Plesiosaur*** **hunting a fish.**

Figure 7. ***Mosasaur*** **teeth.**

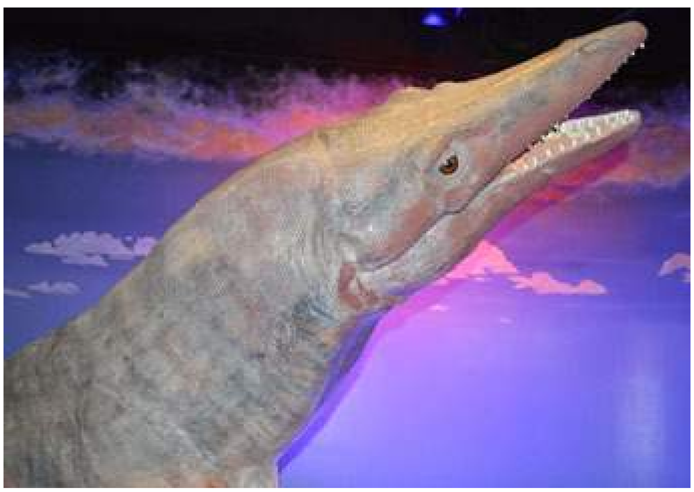


Figure 8. Reconstruction of a ***mosasaur*** **at AzMNH.**

Figure 9. ***Enchodus*** **teeth.**

Figure 10. ***Enchodus*** **being eaten by a plesiosaur.**

Figure 11. Fern leaves in shale.

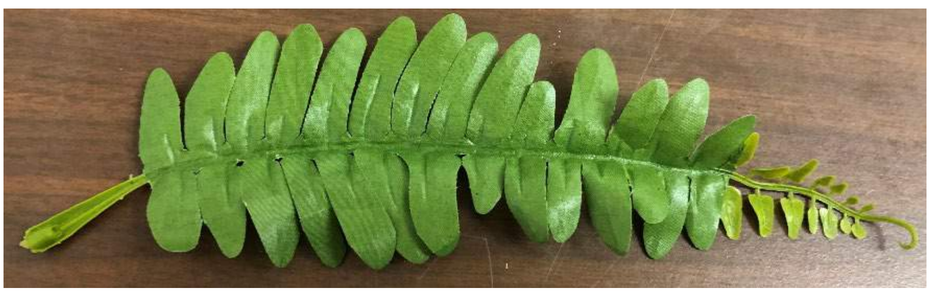


Figure 12. Replica fern leaf.

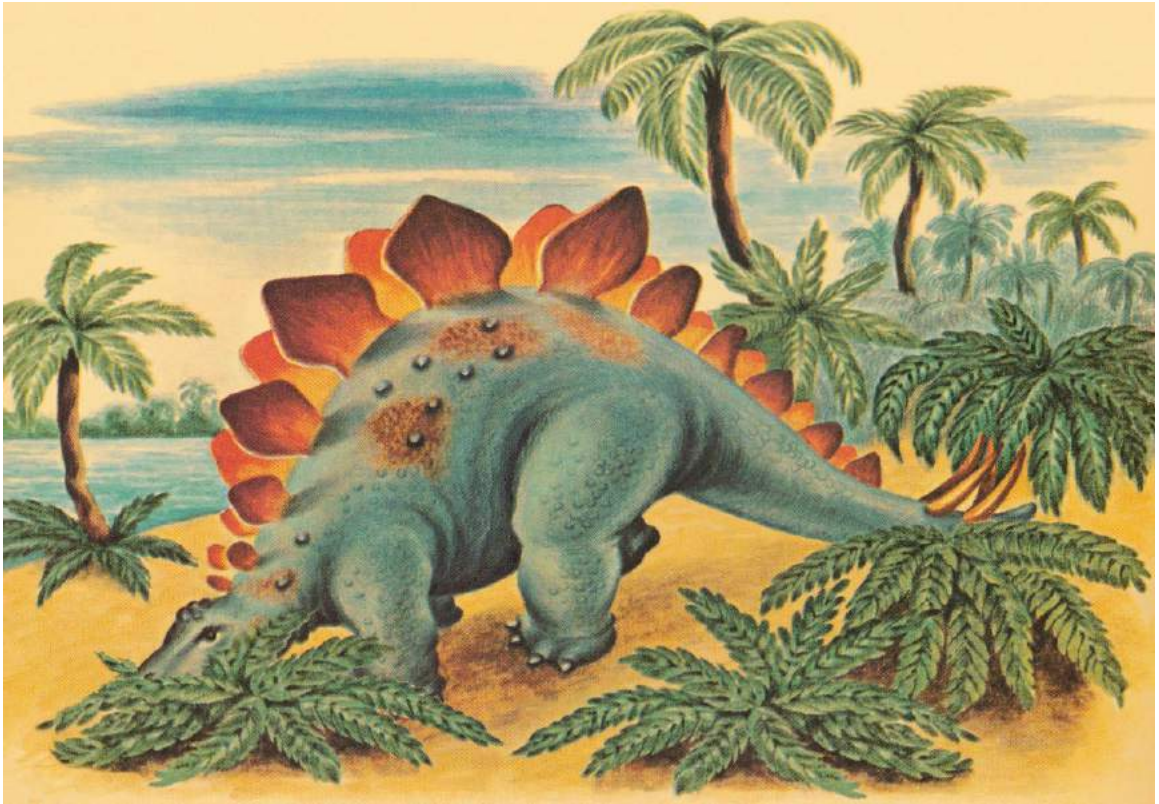


Figure 13. Fleshed out *Stegosaurus* eating ferns growing low to the ground.

Figure 14. Petrified wood.

Figure 15. Fossil eggshell fragments.

Figure 16. Theropod egg replica.

Figure 17. Sauropod egg replica.

Figure 18. Amber with insect.

Figure 19. Amber formation process.

Figure 20. Trilobite.

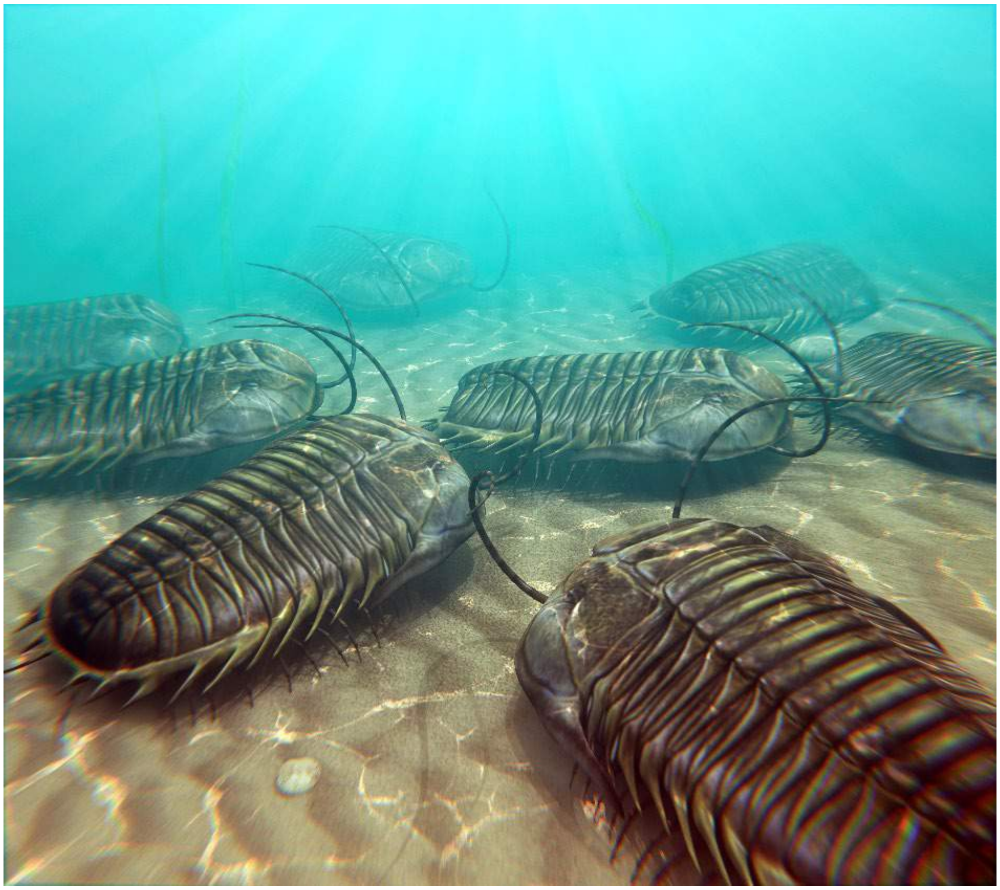


Figure 21. Artist's reconstruction of trilobites on the ocean floor.

Figure 22. Dinosaur Coprolite.

Figure 23. Hadrosaur skin impression.

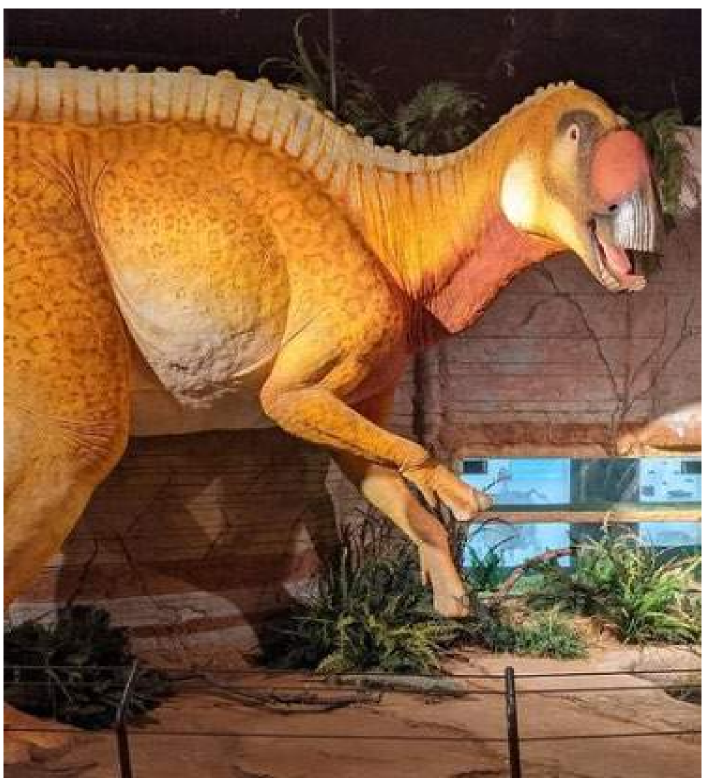


Figure 24. Reconstruction of a the Hadrosaur Gryposaurus

Figures 25 and 26. Unpolished and polished ammonite fossils.

Figure 27. Ammonite reconstruction.

Figure 28. Garfish scale.

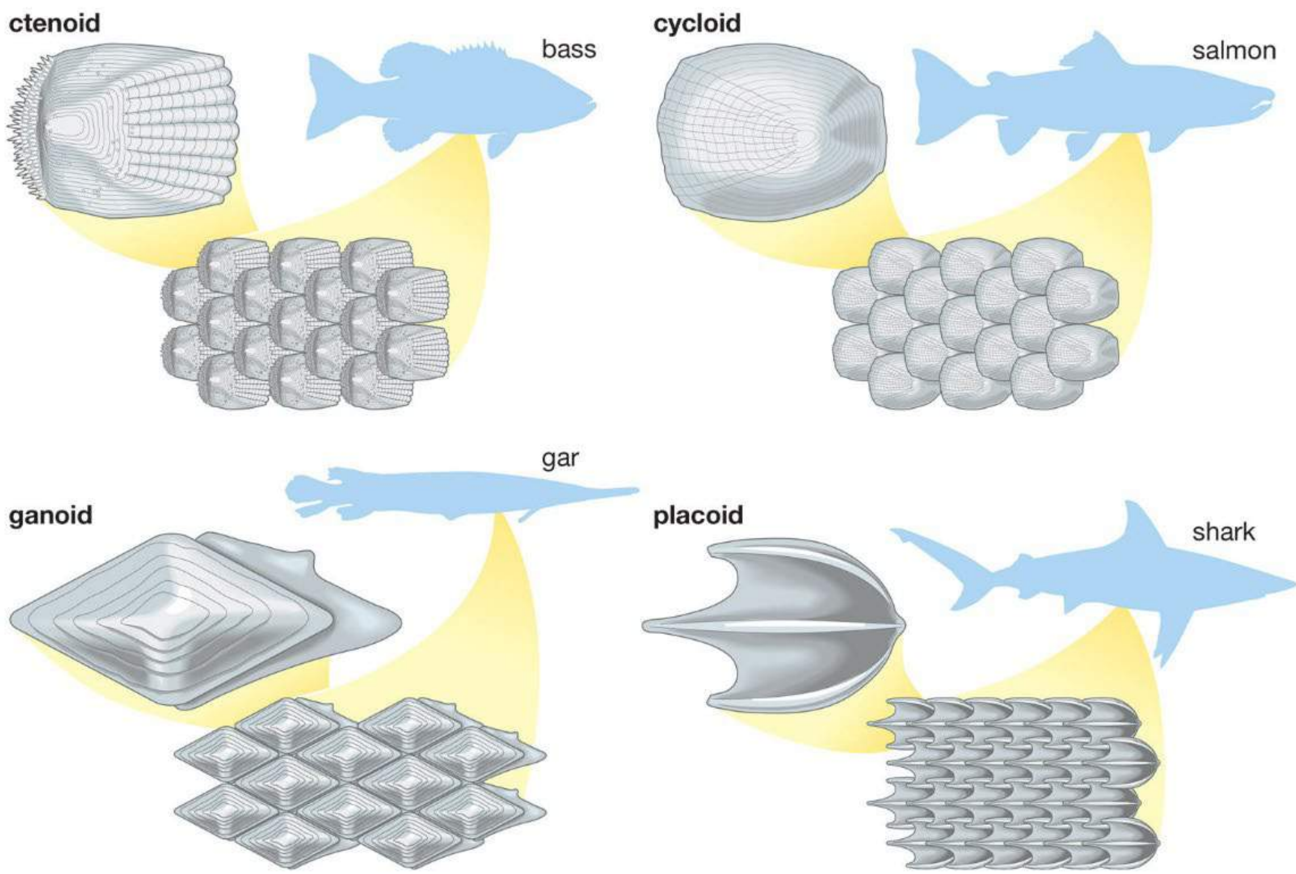


Figure 29. Different types of fish scales.

Figure 30. Garfish at the Arizona Museum of Natural History.

Figure 31. Fossil Mollusk.

Vocabulary List:

Carnivore = an animal whose food and energy requirements derive solely from animal tissue or meat, whether through hunting or scavenging.

Excavated = to remove earth carefully and systematically from an area in order to uncover something buried beneath the earth's surface.

Extinct = when a species, family or other group of living organisms is no longer represented by living or extant members.

Herbivore = an animal whose food and energy requirements derive solely from plant-based materials.

Ichnospecies = a paleontological term that refers to cases where a species is known from trace fossils such as footprints, coprolites or nests.

Inference = a conclusion or opinion that is formed based on known facts or evidence.

Observation = gaining factual information from a primary source using the senses. This is a key component of the scientific method.

Paleontologist = a specialized type of scientist who studies prehistoric life.

Prehistoric = used to refer to a time period prior to written records.

Preservation bias = in paleontology this refers to the phenomenon in which some fossils, or parts of a fossil are better preserved and represented in the fossil record than others.

Replica = an exact copy or model made to look like an original.

Rostral Bone = is a bone that forms part of the snout in various vertebrates. In a ceratopsian dinosaur, it forms the upper part of a parrot-like beak.

Sauropods = are characterized by large body size, a long neck and tail, a four-legged stance, and an herbivorous diet. These reptiles were the largest of all dinosaurs and the largest land animals that ever lived.

Theropod = a carnivorous dinosaur of a group whose members are typically bipedal and range from small and delicately built to very large. Perhaps the best-known example is *Tyrannosaurus rex*.

Opportunities to connect with the Museum

Visit the Arizona Museum of Natural History website to find additional educator resources:

www.arizonamuseumofnaturalhistory.org/

Connect with our paleontologists and staff through Educator Pro Connect:

www.educatorproconnect.org

Educator PRO Connect supports teachers in Arizona, by connecting them with STEM and industry professionals to enhance real-world classroom applications and bring awareness to college and career pathways.

2.) <u>A pre-recorded lesson plan (Fossil Detectives)</u>

This video features educator Danielle Vernon who introduces students to fossil specimens from our collection at the Arizona Museum of Natural History. Learn about what paleontologists do, what fossils are and how they formed. Students also get to put on their detective hats to practice observation and inference skills whilst identifying mystery fossils. Information covered includes iteration of the material covered in the educator's background information and links to four worksheets and an activity.

https://www.youtube.com/watch?v=Neylj1sfoUY

Video Runtime: 14 minutes, 34 seconds

3.) <u>Worksheets</u>

The following worksheets are intended to supplement the Arizona Museum of Natural History pre-recorded video lesson entitled 'Fossil Detectives'. Look for symbols at the top right corner of the video for accompanying worksheets or activities.

Worksheet

Activity

Answer key/tips for grading worksheets:

Worksheet 1 Imagine yourself as a paleontologist! The primary objective of this worksheet is to be able to define the term 'paleontologist' and to encourage students to represent themselves as a paleontologist so that they can envision themselves in this career. Encourage self-representation in students through written or artistic form (drawing, sketching, use of photos etc.).

Worksheet 2 Mold and cast fossils. The primary objective is to be able to identify mold and cast fossils after watching the 'Fossil Detectives' and 'Mold and Cast Fossils' activity videos. The worksheet features 6 fossils. Top row from left to right, both are mold fossils. In the middle row, left to right include a mold/cast fossil combination and a cast fossil. Bottom row, from left to right a cast fossil and a mold fossil. Ask students if they can thing of mold and cast analogies in real life such as ice cubes and ice trays, Jell-O in a mold, cakes in a cake tin etc.

Worksheet 3 Mystery footprints. The primary objective is to have a general understanding of what the scientific method is with a specific focus on the concepts of observation and inference. Review the scientific terms on the worksheet and get students to fill in the missing word. The answer key is observation, qualitative, quantitative and inference. For the second portion, students get to practice their skills of observation and inference. For example, in Frame 1, an observation would be that the two tracks have footprints of different shapes and sizes. The inference would be that they were made by two different dinosaur species. A conclusion to the activity would be that two dinosaurs fought, and one was injured or eaten, whilst the other walked away.

Worksheet 4 Fossil Detectives. The primary objective of this worksheet is to help students further hone their skills of observation and inference using actual fossil examples. Encourage them to write down what they see, what facts they know about a specimen and what logical conclusions they can make. This worksheet is meant to supplement the 'Fossil Detectives' pre-recorded video lesson plan.

<u>Worksheet 1</u>

Imagine yourself as a paleontologist!

Explanation:

Paleontologists are specialized types of scientists that study prehistoric life from fossilized evidence to infer what life was like long ago. When students are asked to picture a paleontologist, many will think of stereotypes, often from pop-culture references such as the *Jurassic Park* and *Jurassic World* movie franchises. Among others, this stereotype typically features middle age to older Caucasian males. Although this is certainly the case some of the time, this stereotype can be problematic in that it fails to represent true diversity in STEM fields, such as paleontology, particularly in areas such as race and gender. It is also important for students to see self-representation in the sciences, particularly those interested in pursuing them as potential careers.

In this lesson, students will begin by defining what they think a paleontologist is in their own words. Students will then create their very own career 'vision board' where they will represent themselves as a paleontologist through a variety of artistic materials. Through drawing, cutting out and pasting of pictures and photos of themselves, students will represent how they would see themselves in that career role. Once this is complete, encourage them to think about what they would find, where they would be, what they would wear and what tools they would need to be a professional paleontologist. Have them share their poster boards with the class!

Objectives:

1. To be able to define that paleontologists are a specialized type of scientist that study prehistoric life from fossilized evidence to infer what life was like long ago.
2. To highlight the importance of diversity in the sciences, including paleontology. This includes, but is not limited to, diversity in race, ethnicity, and gender.

Supplies:

1. A large piece of cardstock or poster board (any color will do)
2. Pens, pencils or markers
3. Scissors
4. Glue
5. Photos, magazine or newspaper clippings or any other materials to represent one's self

Instructions:

1. Start by encouraging students to define what a paleontologist is in their own words. Get them to write it down somewhere on their posterboards.

2. Show students pictures or videos of paleontologists. You could start with more stereotypical representations, such as Dr. Alan Grant in Jurassic Park, and then show diverse examples from the field.
3. Get students to depict themselves as a paleontologist on their posterboard. Encourage them to think about what would they look like and what would they wear? They can use whatever medium they like, such as drawing, cutting out photos or pictures or writing.
4. Ask students what types of tools they would need to do their job as a paleontologist. What would these tools be used for? What kinds of settings would they be conducting their work in; would it be in a lab or in the field?
5. Share it with the class!

Worksheet 2

Mold and cast fossils

Explanation:

This worksheet is intended to supplement the Arizona Museum of Natural History pre-recorded video lesson entitled ‘Fossil Detectives’. You can also find a pre-recorded video that highlights a mold and cast fossil making activity in this module.

Sometimes during the fossilization process, it is not the actual remains of an organism that preserve but rather an impression or three-dimensional representation of them. This can happen when an organism slowly decomposes over long periods of time and leaves a hollow cavity in the sediment that surrounded it. Paleontologists refer to this impression as a mold fossil that can be filled with minerals such as silica over time, filling in the mold and making a replica, or cast fossil of what that organism would have originally looked-like.

Objectives

1. To understand that body fossils can be further divided into mold and cast fossils.
2. To understand the processes involved in mold and cast fossil formation.
3. To be able to identify mold and cast fossils.

Supplies

1. A printout of the mold and cast fossils worksheet
2. Pens or pencils

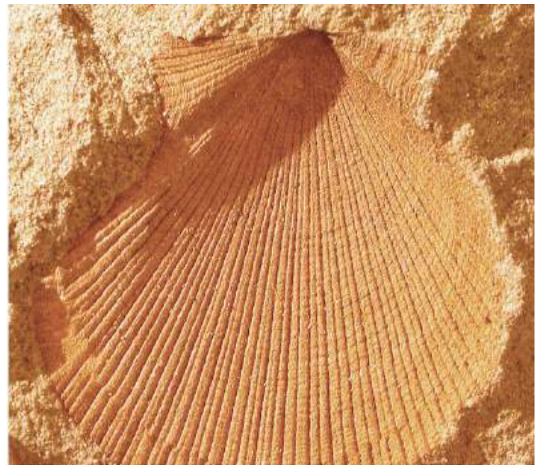
Instructions

1. Watch the pre-recorded video lesson entitled ‘Fossil Detectives’

2. Using the worksheet provided, encourage students to identify which are mold versus cast fossils by looking at the pictures below and writing the answers down on the line provided.

3. Encourage a discussion about what mold and cast examples one might find in everyday life!

Mold and Cast Fossils!



Many great examples of molds and casts can be found in the home or kitchen such as ice cubes and ice trays. Can you think of more examples of molds and casts from everyday life? Write them down on the lines below.

<u>Worksheet 3</u>

Mystery Footprints

Explanation

The scientific method has been used in the natural sciences since the 17th century. It is one of the primary ways that scientists, including paleontologists, construct, and test scientific hypotheses. Paleontologists use these hypotheses to infer what prehistoric life might have been like a very long time ago. Some of the steps involved in the scientific method include making observations using our senses, asking a testable question, formulating a hypothesis, conducting an experiment to collect data, analyzing the data and then modifying, and testing the hypothesis to draw conclusions **(Figure 1).** The conclusions that we draw based on these observations are called inferences.

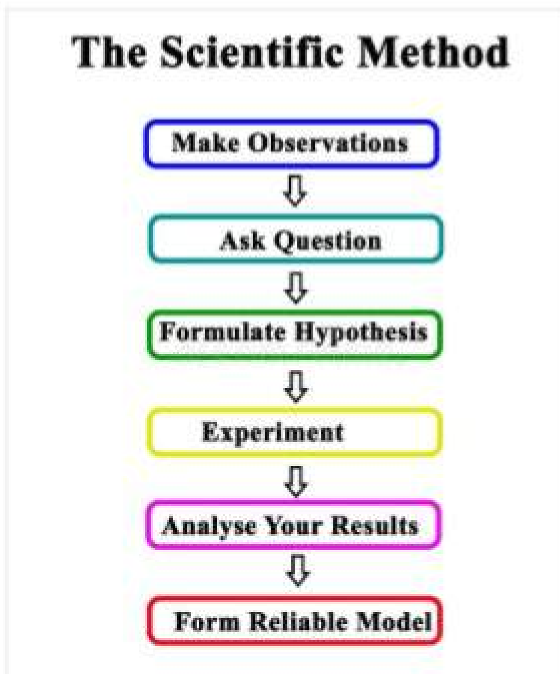


Figure 1. A simplified representation of the scientific method.

Objectives

1. Students will understand what the scientific method is and what it can be used for.

2. Students will be able to define observation and inference.

3. Students will practice their observation and inference skills using a mystery footprints activity.

Supplies

1. A printout of the mystery footprints activity worksheet
2. Pens or pencils

Instructions

1. Start with a brief discussion about the scientific method and the various steps involved in the process, making sure to highlight the concepts of observation and inference.
2. Explain that since paleontology is a science, it too uses the scientific method to help scientists construct and test hypotheses to make inferences about prehistoric life.
3. Print out and complete the mystery footprints worksheet, beginning with the fill in the blanks section.
4. Then have students start with Frame 1 in the diagram and note three observations that they can make. For example, in Frame 1, there are two tracks of footprints and the tracks are different in shape and size. Then ask them what they can infer, for example because the footprints are different in shapes and sizes, they are likely from two different species of dinosaurs.
5. What can they conclude, or infer, happened to these dinosaurs by the end of Frame 2?

Mystery footprints

Fill in the missing words

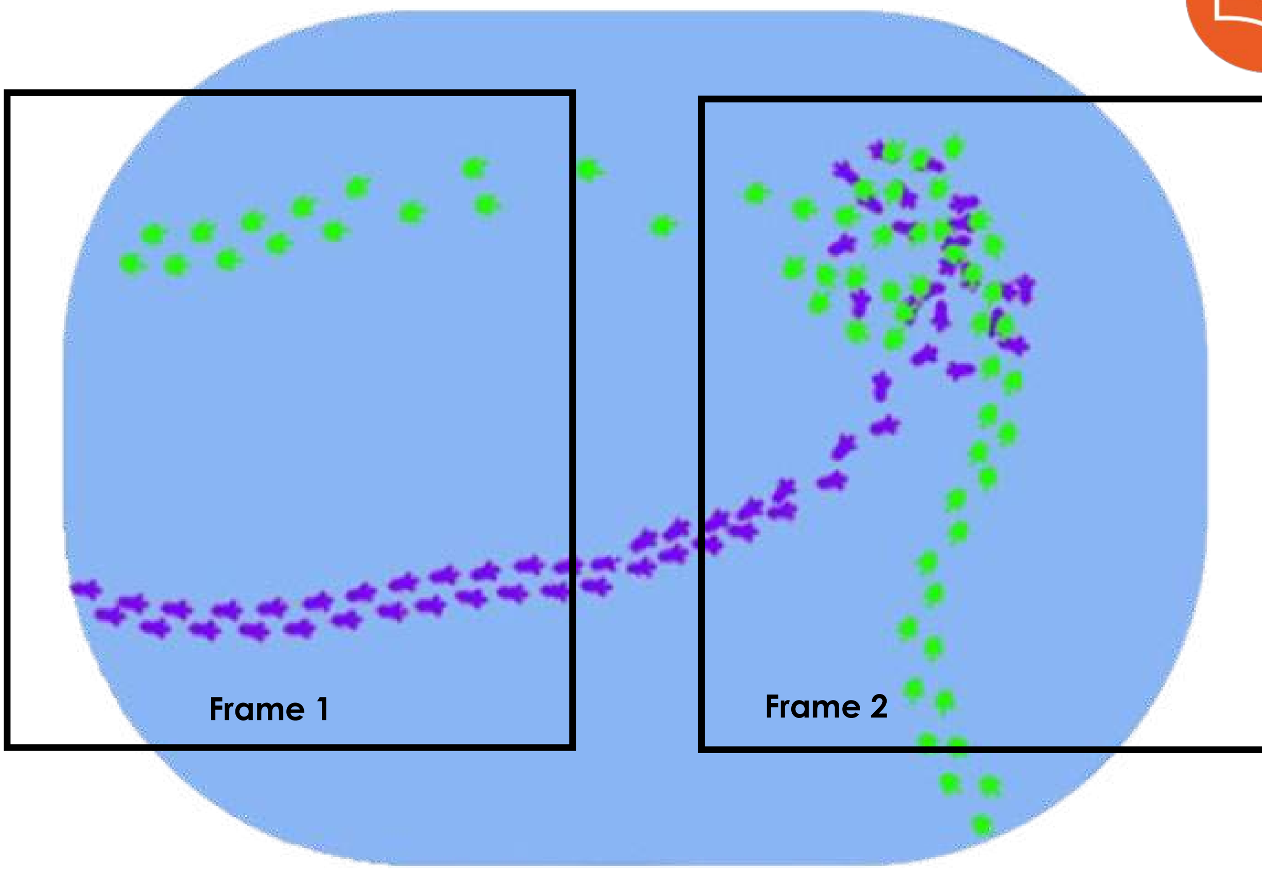
Quantitative Qualitative Observations Inference

One of the most important skills used in the sciences, such as paleontology is the ability to make________________________________ using our senses. Although we typically rely on our eyes and sense of sight for observations, we can use our other senses to help us notice things about the word around us.

Observations can either be qualitative or quantitative.

__________________________________ data is information that describes the qualities or characteristics of something which might be hard to measure or count. For example, the sky is blue, or the popcorn tastes salty. ___________________________________ data refers to observations that can be expressed numerically by being measured or counted using special equipment. For example, we can measure temperature using a thermometer and we can measure the length of something using a ruler.

After we make our observations, we are able to make logical conclusions about the world called____________________________________.



Observations in Frame 1	Inference from Frame 1
1.	
2.	
3.	

Observations in Frame 2	Inference from Frame 2
1.	
2.	
3.	

Conclusion:

Worksheet 4

Fossil Detectives

Explanation

This is the accompanying worksheet to the Arizona Museum of Natural History pre-recorded video entitled 'Fossil Detectives'.

Instructions

1. You can either watch the video beforehand or pause it as each fossil is shown allowing students time to complete the worksheet.
2. Before completing the worksheet, make sure to discuss the scientific method and define the key concepts of observation and inference for your students.
3. As students view each specimen, ask them what they can observe about the fossil, what facts they know about it and what they can infer about it and complete the following worksheet.

Start by completing an example together by looking at this plesiosaur tooth.

What do we observe?	What do we know?	What do we infer?
-Short and a curved cone shape tooth. -Small to no serrations (jagged ridges) on the tooth. -Comes to a sharp point.	-It is from a plesiosaur. -It is a body fossil.	-It ate meat and because it was aquatic, probably fish.

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

What do we observe?	What do we know?	What do we infer?

4.) Activity Description

Mold and cast fossil Activity

In this activity, students get to create their very own mold and cast fossils using common classroom and household materials. To learn how, watch the video below or find the instructions on the next page!

https://www.youtube.com/watch?v=2sq6ik1Y_yA

Video Runtime: 3 minutes, 39 seconds

Mold and cast fossils activity

Explanation

Sometimes during the fossilization process, it is not the actual remains of an organism that preserve but rather an impression or three-dimensional representation of them. This can happen when an organism slowly decomposes over long periods of time and leaves a hollow cavity in the sediment that surrounded it. Paleontologists refer to this impression as a mold fossil that can be filled with minerals such as silica over time, filling in the mold and making a replica, or cast fossil of what that organism would have originally looked-like.

Objective

1. To gain an understanding of the processes involved in making mold and cast fossils.

Supplies

1. Modelling Clay or Play-Doh.
2. Objects to make your mold fossil (toys, shells, shark teeth, buttons, coins etc.)
3. Elmer's white school glue or glitter glue.
4. Rolling pin or something to help flatten your clay.

Instructions

1. Roll out your clay and make sure the top is flattened and smooth.

2. Press the object into the clay without making the impressions too deep (otherwise the glue takes too long to dry). When organisms are buried, sometimes they leave an impression or 3D representation of their body outline or surface in the sediment (represented by the clay).

3. Slowly and carefully remove the object from the clay. Try not to have the clay stretch or smear while you do this. In nature, an organism will decay over time (which means they are eaten by bacteria). By removing the object from the clay, you are acting in a similar way as the bacteria.

4. The impression that the object left in the clay formed a mold, even after it has been removed. This represents your mold fossil.

5. Now take your Elmer's Glue and fill the mold. Normally when an organism has decayed underneath the sediment, the space can be filled with minerals, like silica, from groundwater. In this case, the glue represents those minerals.

6. Let the glue dry for around 24 hours although it should be complete once the glue turns clear.

7. When the glue has dried, very gently peel out the glue from the clay. The glue has been transformed into a cast of the original object. Many organisms have been preserved as casts and mold fossils.

8. Whilst doing this activity you might find that there is excess glue around the cast 'fossil'. You can gently remove it with your fingers or a pair of scissors. It is quite common for real fossils to have excess material that needs to be cleaned away too!