



Fun with Fossils

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TOPIC: Fun with Fossils

THEME: Prehistory

DEPARTMENT: Education



Mould fossil

Source: National Museums of Kenya (NMK)

Lesson Objectives

1. To define prehistory and related terminologies.
2. To define fossils and identify the different types.
3. To describe how fossils are formed.
4. Appreciate the significance of fossil studies in unveiling earth's past life.

Learning resources

1. Text
2. Video
3. Photo

Prehistory: An Overview

Prehistory refers to the time period before the invention of writing.

The term **prehistory** is derived from two words: **pre**, which is from a Latin word meaning **before** and **history** which is a record of human events.

Prehistoric life refers to all things that lived on Earth before people learnt how to write, hence there are no written records.

Finding out about prehistory is done by a special group of people known as **paleo-scientists**. They are like time-travelling detectives who help us unlock mysteries of the past. They study special clues such as **fossils** and **artefacts** left behind from a long time ago.



*Ancient humans at the Cradle of Mankind Gallery
Source: Nairobi National Museum*

Paleo-science

Paleo-science is the study of climatic and environmental processes before there were written records. Paleo-scientists study the last hundreds to millions of years.

Some of the paleo-scientists include:

- **Palaeontologists:** These are scientists who study the history of life on Earth through the **fossil record**. They examine fossils, which are remains of ancient plants and animals. They can tell us fascinating stories about creatures that roamed the Earth millions of years ago. The study of fossils is called palaeontology.
- **Archaeologists:** Archaeologists focus on discovering clues about ancient people and how they lived. They piece together the daily lives of our ancestors by looking at **objects** or **artefacts** such as tools, pottery and ancient buildings among others.
- **Geologists:** These are experts who study the earth, what it is made of and how it was formed. Geologists help us understand the environment that surrounded ancient living organisms.

Paleo-science helps us learn about past life and their environment. For instance, we learn about extinct animals and plants.

We look into the past with all these amazing scientists working as a team. Each discovery, from fossils to ancient tools to rocks, is a piece of a grand puzzle showing us the captivating world of prehistory.

What are fossils?

Fossils are the preserved remains of any organism that once lived. Plants or animals that are **over 10,000 years old** are considered as fossils.

Fossils provide evidence that help scientists understand what life was like millions of years ago!

For example;

- *Paranthropus boisei* is an australopithecine believed to have lived approximately 1.7 million years ago and was found at Koobi Fora, East of Lake Turkana in Kenya.
- *Turkana Boy*, also referred to as *Nariokotome boy*, is a *Homo erectus* fossil believed to have lived around 1.5 to 1.6 million years ago. Estimated to have been 9 to 12 years old at the time of death, his remains were found at Nariokotome, in West Turkana, Kenya.

The oldest fossils are billions of years old!

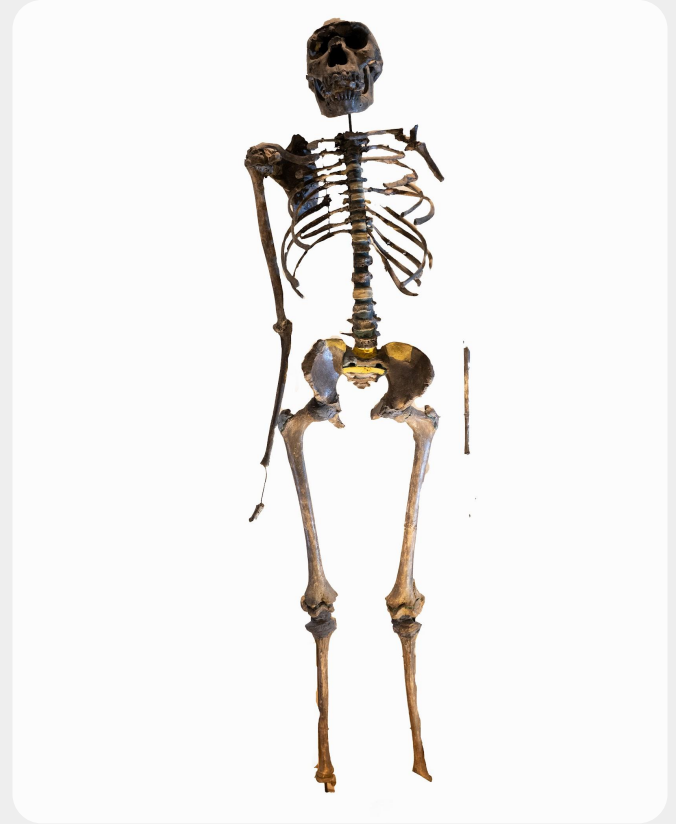


Cranium of Paranthropus boisei
Source: Cradle of Mankind Gallery at Nairobi
National Museum

Interesting fact

Turkana boy is the most complete Homo erectus fossil to ever be found! This discovery set Kenya on the world map. Turkana Boy together with more than 350,000 fossils, about 700 of which belong to ancient humans, are preserved at the National Museums of Kenya.

These spectacular discoveries earned Kenya the title **Cradle of Mankind**.



*Skeleton of Turkana Boy/Nariokotome boy (Homo erectus)
Source: Cradle of Mankind Gallery at Nairobi National
Museum*

How are fossils formed?

Fossils are formed through **fossilisation**. This is the process of an animal or plant becoming preserved in a hard, petrified form. To petrify is to convert into a stone or stony substance.

The process of fossilisation occurs when an animal or plant dies and is covered by a layer of sediments such as plant material and tiny parts of rock or soil. When the remains are buried soon after death they are protected from decay. The sediments form layers of rocks covering the animal or plant remains. By this time, what remains of the organism would be the hard parts such as bones, shells and teeth.



*Animal bones covered by layers of sediments.
Source: NMK - Education*

Types of Fossils

Palaeontologists study two basic types of fossils: body fossils and trace fossils.

1. Body fossils

Body fossils are the remains of the actual body parts of ancient plants and animals such as bones, teeth and shells. Only the hard skeleton is preserved and the soft tissue such as skin, muscle and organs rots away after death.

Examples of body fossils include:

Mould and cast fossils: When an animal dies, all the soft parts of the body decay. The skeleton is covered by layers of rock. Eventually, the bones of the skeleton also break down leaving an empty space in the shape of the animal or plant. This is called a **mould fossil**.

This empty space can be filled with sediments that harden to form a **cast fossil**.

Sometimes the mould and cast are found together.



*Mould and cast fossil
Source: NMK - Education*

Petrified or replacement fossils: These types of fossils form when the hard parts of a plant or animal are replaced by minerals after they are buried. This happens when groundwater and other sediments seep into the bone or wood and replace it with minerals.

For instance, an animal dies and slowly becomes covered with soil, mud or silt. The soft parts on the inside of the bones decay leaving the hard parts. These bones, shells or teeth have small pores. Over thousands or millions of years, these pores can be filled with minerals that harden thus replacing the bone. This replacement explains why **fossil bones are heavier than real bones**. This process is called **permineralization**.



Petrified fossil
Source: NMK - Paleontology Lab



Petrified wood
Source: NMK - Education

Fossils are discovered when processes such as **erosion** bring their remains to the surface.

Did you know?

Most of the fossils in Kenya were formed through the process of permineralization?

Examples: fossils of the early human ancestors such as *Homo habilis*, *Homo rudolfensis* and *Homo erectus* among others.



Homo habilis
Source: Smithsonian Institution



Petrified fossil
Source: Cradle of Mankind Gallery at Nairobi National Museum

Task:

- Fill a cup or bottle halfway with water and add a few drops of ink.
- Stir the mixture to allow the ink to dissolve evenly throughout the water.
- Cut a strip of white printing paper and slowly immerse it halfway into the ink mix.
- You will notice the part of the paper strip that was immersed acquires the colour of the ink while the part of the paper that wasn't immersed is still white.

Now imagine your paper to be bone and the ink to be minerals from the soil.

Whole body fossils/true form fossils: These fossils form when an organism is preserved entirely in its natural form; such as when an animal or a plant is preserved in ice or trapped in tree resins such as amber. They do not decay but look exactly like they did when the animal or plant died.

Task:

Make yourself a modern true form fossil by covering a maize or bean seed in clear glue.



Examples of body fossils/true form fossils

Praying mantis preserved in amber, Frozen mammoth and Mummified cat

Source: American Museum of Natural History, National Geographic, Natural History Museum - London.

2. Trace Fossils

Trace fossils are marks left behind by an ancient organism while it was alive. They provide evidence about the movements and activities of these organisms, but not necessarily about their appearance.

Trace fossils include:

Footprint and track-ways fossils: These are footprints or tracks that show the movement of an animal. These fossilised trails happen when an animal makes an imprint in the soil or mud. It dries, hardens and then is covered in layers of sediment. Over time, the layers harden into rock and preserve the footprints.

Task:

Make your own footprints by stepping on mud or wet sand.

Burrow fossils: These occur when an animal makes markings by burrowing into sand or mud.

Coprolite fossils/ animal poop: This is animal poop that becomes fossilised. Scientists study it to figure out where the animal might have come from or what they might have eaten.

For example, if an animal poop contains traces of bone fragments, this is evidence that the animal might have been a carnivore.



1.5 million years old *Homo erectus* footprints from Ileret, Kenya
Source: Scientific Reports

What Do Fossils Tell us?

Fossils provide evidence of past life and environment: They help us learn about how the environment, animals and plants that were on the earth at different times in the past, including our own human ancestors and their relatives, looked like and how they changed over time.

Age of different life forms: Fossils can tell us how long life forms have existed on earth. Palaeontologists can identify a time period for a certain fossil because those that are buried at the bottom of a deep layer of sediment are most likely the oldest; and those that are towards the top of a layer are most likely the youngest.

Fossils explain how animals of the past lived, what they ate and how they died: They give a glimpse of how plants and animals in the past grew, what they ate and their interactions. For instance, by looking at the teeth of extinct animals, scientists can determine their diet. A fossil with long pointed teeth indicates that the animal was likely a carnivore, while a fossil with flat, smooth teeth shows the animal was likely a herbivore.

DIY Activity – Creating a Mould and Cast Fossil

A mould is the impression and space that an organism's body or body part leaves in the sediment. A cast is the material that fills that space. When creating a mould and cast fossil you will need the following materials:

- A piece of modelling clay
- Objects to make fossils of such as plastic animals, small sea shells, coins, buttons or any other material that can create an impression.
- A candle
- Match box or a lighter

NB: This activity requires adult supervision because fire is involved.

Procedure:

1. Place the clay on a flat surface and press it into a pancake shape. You may use your hand or a rolling pin.
2. Pick the object and press it on the modelling clay to make an impression. You may make several impressions depending on the size of the object.
3. Slowly and carefully pull the object out of the clay.
4. The impression of the object in the clay forms a mould of the object.

5. Request your supervisor, who could be your parent, guardian, teacher or any other adult - to light a candle and let some wax melt.
6. Fill the mould with melted wax.

(When animals rot beneath the soil, the space they leave behind can be filled with minerals from groundwater leaving something like a statue of the organism behind! The wax is like those minerals)

7. Let the wax dry. The time it takes to dry depends on the depth of the impression (the flatter the mould, the quicker it dries).
8. When the wax has dried, peel back the wax from the clay.

The shape of the wax is a cast of the object.

9. Sometimes there is excess wax around the cast fossil. Break off the excess wax with your fingers or scissors.

NB: Many fossils have excess material around them and have to be cleaned to see the original fossil.



Expected result of DIY Activity - Creating a Mould and Cast Fossil
Source: NMK Education