

## 7<sup>th</sup> Grade Earth's Surface

### Chapter 4: A Trip Through Geologic Time

#### Lesson 1 ( Fossils)

**Fossils** – preserved remains or traces of living things

Most fossils form when living things die and are buried by sediment. The sediment slowly hardens into rock and preserves the shapes of what was buried.

#### Kinds of Fossils:

##### 1. Molds and Casts

**mold** – a hollow area in sediment in the shape of an organism or part of an organism

**cast** – a solid copy of the shape of an organism  
– the opposite of a mold

- A mold forms when the organism or part is buried in sediment.
- The organism breaks down and leaves a hollow area.
- Later, water seeps into the mold and deposits minerals that harden over time to eventually fill in the mold (a **cast** is created).
- Molds and casts can preserve **very fine** details.

##### 2. Petrified fossils

- Water carrying dissolved minerals seeps into spaces within the buried organisms.
- Over time, the minerals come out of the solution and harden, filling in all the spaces.
- Some of the original organism remains, but the minerals have preserved it.

##### 3. Carbon films

- All living things contain carbon.
- When sediment buries an organism, some of the materials that make up the organism evaporate, or become gases.
- These gases escape from the sediment leaving a thin film of carbon behind.
- Carbon films can show the very delicate parts of **leaves** and **insects**.

##### 4. Trace fossils

- Provide evidence of the activities of ancient organisms, such as footprints, trails, and burrows.

##### 5. Preserved remains

- Some processes can preserve the actual remains of an organism with little or no change.
- Being trapped / buried in tar, encased in amber (hardened tree resin, or sap), and freezing have all been known to preserve ancient organisms.

**Paleontologist** – a scientist who studies fossils

**Archeologist** – a person who studies human history and prehistory through the excavation of sites and the analysis of artifacts and other physical remains

**Fossil record** – all the information collected about fossils by scientists throughout history

#### The Fossil Record Shows :

- evidence about the history of life (what past life forms looked like)
- evidence of past environments (Fossils show shallow seas once covered Iowa.)
- evidence of past climates (Coal found in Antarctica shows how its climate has changed.)
- how organisms have changed (evolved) over time

- Evolution** – the change in living things over time
- Older rocks contain fossils of simpler organisms.
  - Younger rocks contain fossils of more complex organisms.
  - This shows that life on Earth has changed as simple organisms gave rise to complex plants and animals.

### Lesson 2 ( The Relative Age of Rocks)

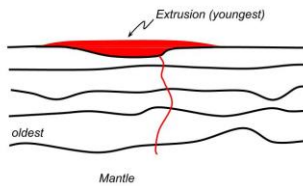
- Relative age** – the age compared to the age of something else
- “Older than” or “younger than” are used.

- Absolute age** – the number of years that have passed since something was born or formed

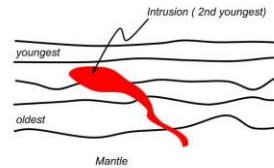
**Law of Superposition:**

- In **undisturbed** horizontal rock layers, the oldest layer is at the bottom.
- Each higher layer is younger than the layer below it.

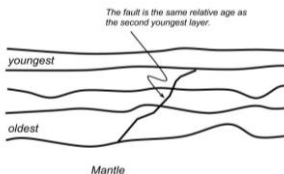
- Extrusion** – an igneous rock layer formed when lava flows onto Earth’s surface and hardens
- is always younger than the rock layers below it



- Intrusion** – an igneous rock layer formed when magma hardens beneath Earth’s surface
- is always younger than the rock layers around and beneath it



- Fault** – a break in Earth’s crust
- a fault is always younger than the rock it cuts through



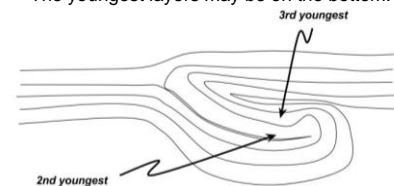
- Index fossils** – fossils that are widely distributed and that represent organisms that existed for a geologically short period of time
- are useful because they tell the relative ages of the rock layers in which they occur

**Rock layers can change to make it more difficult for scientists to age some rocks.**

**Two Ways Rock Layers Can Change:**

**1. folding**

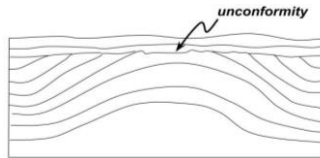
- Forces inside Earth fold rock layers so much the layers are turned over completely.
- The youngest layers may be on the bottom.



## 2. gaps in the geologic record

- When rock layers erode away, older rock layers may be exposed.
- Then new rock layers begin to form on top again.
- Some layers appear to be missing at that location, creating an **unconformity**.

**Unconformity** – a gap in the geologic record where rock layers have disappeared due to erosion



## Lesson 3 ( Radioactive Dating )

**Radioactive decay** – the process in which the nuclei of atoms of one element break down to form atoms of a different element

- This releases smaller, faster-moving particles and energy.

**Half-life** – the time it takes for half of the radioactive atoms to decay

- Not all elements are radioactive, and the rate of decay of each radioactive element never changes.

## Radioactive dating:

- Radioactive elements occur naturally in igneous rock.
- As these elements change into new stable elements, the composition of the rock changes.
- The absolute age of rock can be determined by comparing the amount of radioactive element with the amount of stable element in the rock.

### Example:

If a rock contains 25% of the Carbon-14 that it used to have, **two** half-lives have passed. The half-life of Carbon-14 is 5,730 years, so this rock is **11,460** years old. (  $5,730 \times 2$  )

**Carbon-14 dating** – a process used to determine the absolute ages of fossil remains

- All plants and animals contain carbon (they are organic) and some carbon-14.

## Lesson 4 ( The Geologic Time Scale )

**Geologic time scale** – a record of the geologic events and the evolution of life forms as shown in the fossil record

- The scale was divided according to major changes in life forms at certain times.

**Precambrian Time** – the earliest time of Earth's history

- makes up about 88% of Earth's history

**Era** – one of three long units of geologic time between the Precambrian and the present

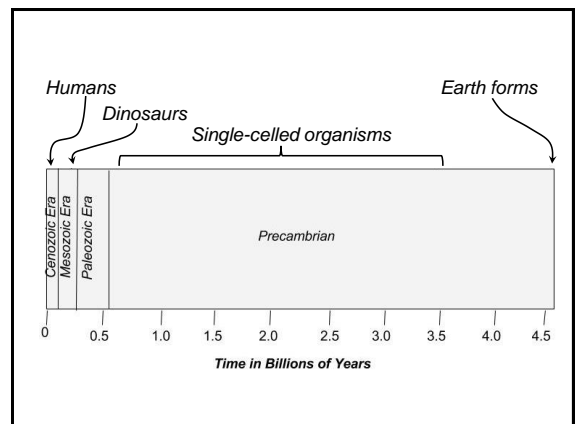
- Each era is divided into smaller units called **periods**.

**Period** – one of the units of geologic time into which geologists divide eras

- Periods make up eras.

## Three Eras of Cambrian Time:

1. Cenozoic Era ( most recent )
2. Mesozoic Era
3. Paleozoic Era



## Lesson 5 ( Early Earth )

### What Scientists Believe About How Earth Formed and Early Earth:

1. Earth is about **4.6 billion years** old.
2. The **moon** is about the same age as Earth and formed when Earth collided with another object.
3. **Earth began** as a giant ball of dust, rock, and ice in space that was pulled together by gravity.
4. The **gravitational pull increased** as Earth grew larger because it developed more and more mass.
5. The collision of the early particles made Earth hot enough to melt, allowing the **densest materials to sink to Earth's core**.
6. The **less dense material was left on the surface** to harden as crust and mantle.

7. Earth's **first atmosphere** contained mostly hydrogen and helium that were easily blown away by solar winds. ( energy from the sun )
8. **Today's atmosphere** came from collisions with comets that added carbon dioxide ( CO<sub>2</sub> ), water vapor, nitrogen, and oxygen.
9. **The oceans** were formed as volcanoes added more water vapor to the air and the added water vapor cooled, condensed, and formed rain.
10. Fossils of the **earliest known living things** are of single-celled organisms from about 3.5 billion years ago.
11. About **2.5 billion years ago** many organisms began using the sun's energy to put oxygen into the air through the process of **photosynthesis**.
12. As the amount of oxygen in the air grew, **a layer of ozone ( O<sub>3</sub> )** developed to protect Earth from the sun's ultraviolet rays. This allowed organisms to live and grow on land.