

Chapter 12: The History of Life

Section 12.1: Fossil Record

- A scientist who studies fossils is called a *paleontologist*. This type of scientist acts as a detective to who uses fossils to try and understand events that happened a long time ago.
- Scientists examine *fossils* to learn about the earth's history.



Fossils can provide us with lots of information like:

- what types of organisms lived in the past
- their *size*
- how they moved
- their *behavior*
- their teeth indicate whether they are *carnivores* or *herbivores*
- We can learn about the *climate* and *geology* too.



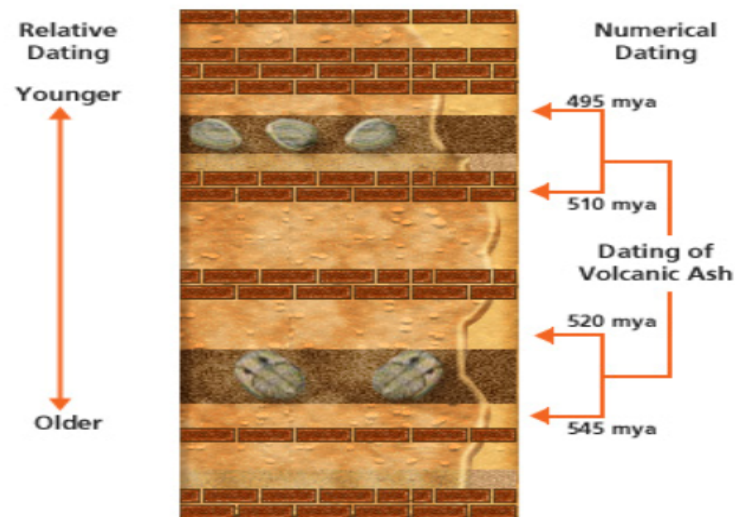
How do fossils form?

- First, they are *buried* in mud, sand, or clay.
- Over time, more *layers of sediment* are added on top.
- These particles begin to *compress* and harden to become *sedimentary rock*. This occurs at a relatively low pressure and temperature.
- Minerals eventually *replace* all the body's bone material.
- *Erosion* may finally *expose the fossil* millions of years after it formed.

Two ways to date fossils

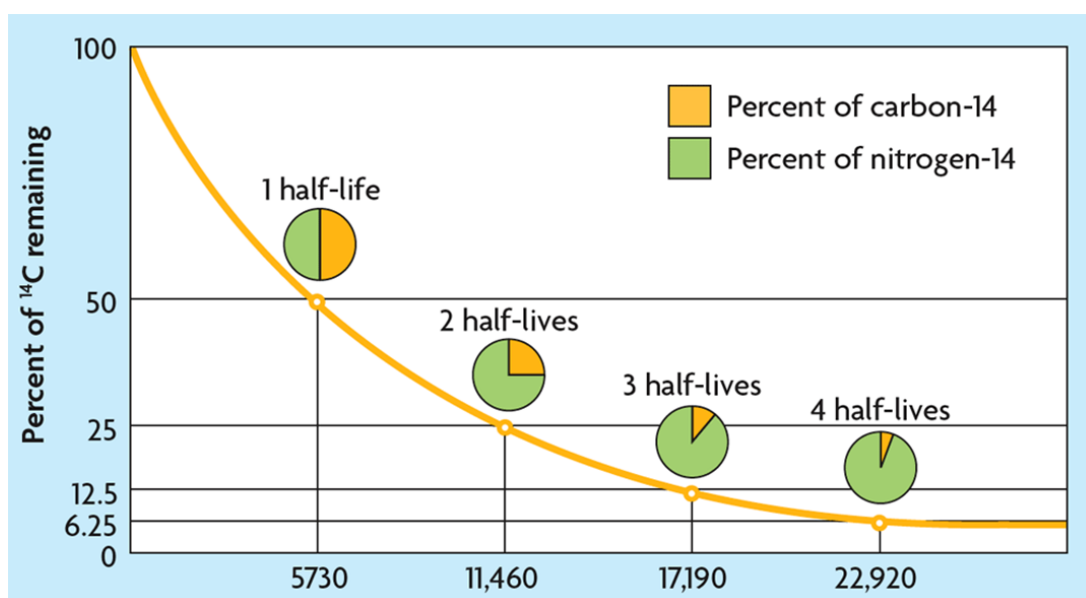
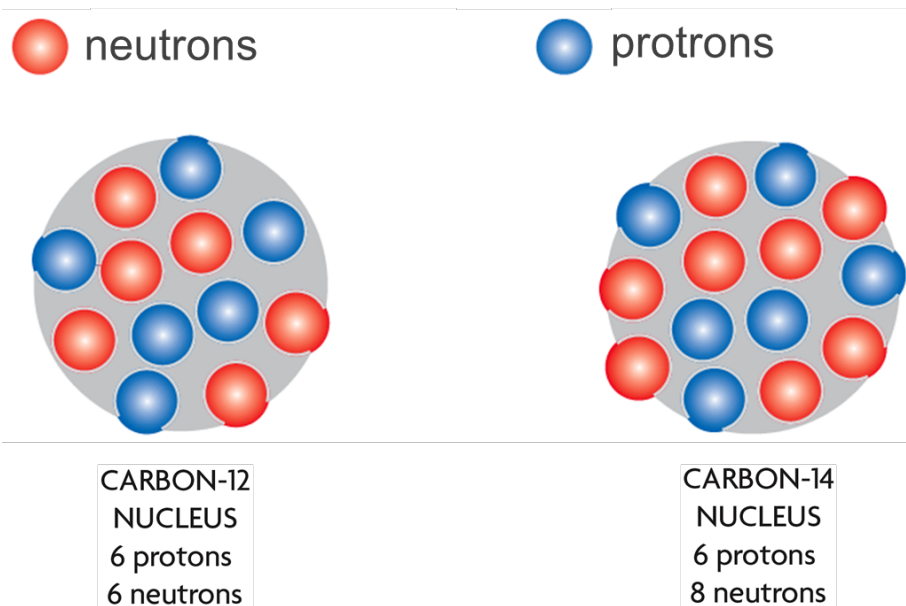
1) Relative Dating

- Determines the **relative** age of fossils by using the principle that the *newest* layer of soil is on top and as you dig *deeper, the age of the soil increases*.
- This means *younger* soil/rock is on top and the *older* soil/rock is down below.



2) Radiometric Dating of Fossils

- This method determines the specific age of fossils by using *radioactive isotopes*.
- Radioactive isotopes have specific *half-lives* at which they break down and decay.
- For example, Carbon-14 has a half-life is 5730 years. This means that *every* 5730 years there is *half of the original material* left.



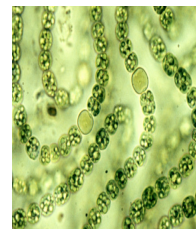
Age of the Earth

- Scientists estimate that the earth is about **4.5 billion** years old.



Oldest Fossils

- The oldest fossils known have been found in Precambrian rocks and are around **3.4 billion** years old.
- These fossils resemble modern day species of **photosynthetic cyanobacteria**.



- Even today, in Western Australia you can find living representations of large masses of cyanobacteria. They are called **stromatolites** and are believed to be the **oldest** form of life on earth. They were believed to be extinct before being discovered in 1954.



Section 12.2 The Geological Time Scale

The geological time scale is divided into four large eras. *Eras* last tens to hundreds of millions of years and consist of two or more periods

- *Precambrium*
- *Paleozoic*
- *Mezozoic*
- *Cenozoic*

EVENT Estimated Years Ago

| | |
|-----------------------------|--------------------|
| Earliest evidence of life | 3.4 billion |
| Paleozoic Era begins | 543 million |
| First Land plants | 443 million |
| Mesozoic Era begins | 248 million |
| Triassic Period begins | 248 million |
| Jurassic Period begins | 206 million |
| First dinosaurs | 225 million |
| First birds | 150 million |
| Cretaceous period begins | 144 million |
| Dinosaurs become extinct | 65 million |
| Cenozoic Era begins | 65 million |
| Primates appear | 65 million |
| Humans appear | 200,000 |

- *Periods* last tens of millions of years.
 - > most *commonly used units of time* on time scale
 - > associated with *rock* systems.

- *Epochs* last several million years

| PALEOZOIC ERA |
|--|
| PERMIAN PERIOD 286–248 mya |
| CARBONIFEROUS PERIOD 360–286 mya |
| DEVONIAN PERIOD 410–360 mya |
| SILURIAN PERIOD 440–410 mya |
| ORDOVICIAN PERIOD 505–440 mya |
| CAMBRIAN PERIOD 544–505 mya |

- Also seen in the geological time scale are various *mass extinction* where large numbers of organisms disappear from the fossil record almost at once.
- Scientists have various theories about the cause of the last major mass extinction. One major theory states that a *large meteorite collided* with earth and wiped out about two-thirds of all the living species at the time, including dinosaurs.

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