NOTES 6.1

Chapter 6 - The Environment and Changes Over Time
Lesson 1 - Fossil Evidence of Evolution

Fossil Formation

Some of the most important clues to Earth's past are fossils.

Q: What is a fossil?
A: the preserved remains or evidence of once-living organisms

Ex. bones, teeth, shells, footprints, animal burrows, leaves, stems etc.

Only the hard parts of organisms are preserved in fossils.

Most fossils form when organisms that die become buried in **sediments**.

Q: What are sediments?
A: particles of soil and rock

Layers of sediments build up and cover the dead organism.

Over millions of years, the layers harden to become **sedimentary rock**.

Q: What is sedimentary rock?
A: a type of rock that forms when particles from other rocks or the remains of plants and animals are pressed and cemented together

Q: What is one way in which a buried fossil can become uncovered?
A: digging, rain, erosion, weathering

There are 5 forms fossils can take -

1. Mineralization

Q: What are mineralized fossils?
A: a fossil in which minerals (rock) replace all or part of an organism

Ex. dinosaurs

2. Mold & Cast

Q: What is a mold?
A: a fossil formed when the impression of an organism is left in rock

Q: What is a cast?
A: a fossil that is a copy of an organism's shape

Mold Cast

3. Carbonization

Q: What are carbonized fossils?
A: a fossil formed when a dead organism is compressed over time and pressure releases liquid and gas from decomposing tissues

4. Trace Fossil

Q: What is a trace fossil?
A: the preserved evidence of the activity of an organism

Ex. animal tracks

5. Original Material

Q: What are preserved remains?
A: remains of any organism not preserved in traditional rock but another substance

Ex. fossils preserved in ice, tar pits, amber (1st Jurassic Park)

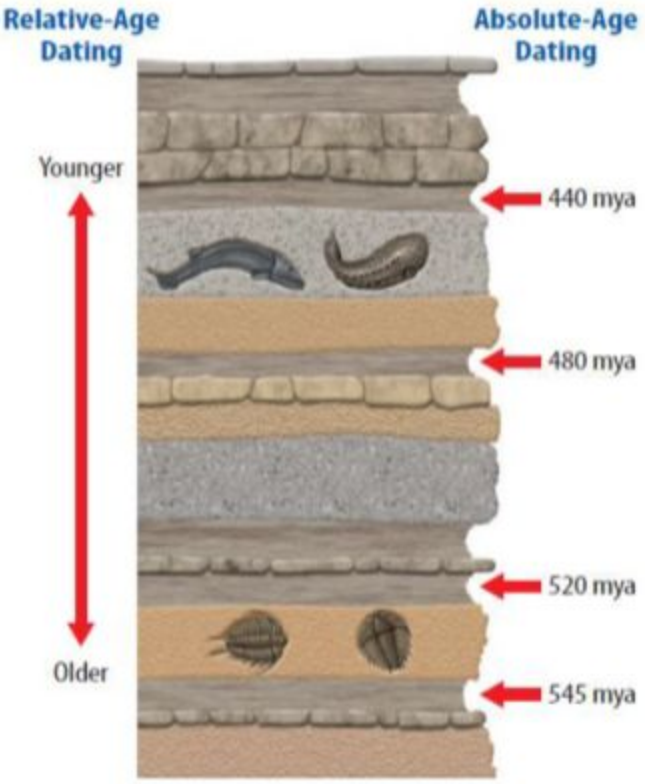
Determining a Fossil's Age

Scientists can determine a fossil's age in one of 2 ways –

Relative-age dating

Absolute-age dating

(numerical dating)



Relative-Age Dating

Scientists use relative-age dating to determine which of two fossils is older.

In a sequence of rock layers, the layers at the top are younger than the lower layers.

Therefore, fossils found in top layers are younger than fossils found in bottom layers.

- can only be used when the rock layers have been preserved in their original sequence
- used to determine whether one fossil is older than another
- DOES NOT determine actual age

Q: Which rock layers contain younger fossils?
A: those on the top layers

Absolute-Age Dating

Another technique, called absolute - age dating, allows scientists to determine the actual age of fossils.

The rocks that fossils are found near contain Radioactive elements

Q: What are radioactive elements?
A: unstable elements that decay, or break down, into different elements

The half-life of a radioactive element is the time it takes for half of the atoms in a sample to decay.

Scientists can compare the amount of a radioactive element in a sample to the amount of the element into which it breaks down to calculate the age of the rock and thus the age of the fossil.

- can be used when the rock layers have been disturbed and are not in their original sequence
- used to determine actual age, in numbers

The Fossil Record

Scientists have calculated the ages of many different fossils and rocks using the fossil record.

Q: What is the fossil record?
A: an incomplete record of all of the fossils ever discovered on Earth

Despite gaps in the fossil record, it has given scientists a lot of important information about past life on Earth because nearly all of the species preserved as fossils are now **extinct**.

Q: What does it mean to be extinct?
A: when no members of a species are still alive

Scientists use fossils of bones, teeth, and footprints to construct models of extinct animals.

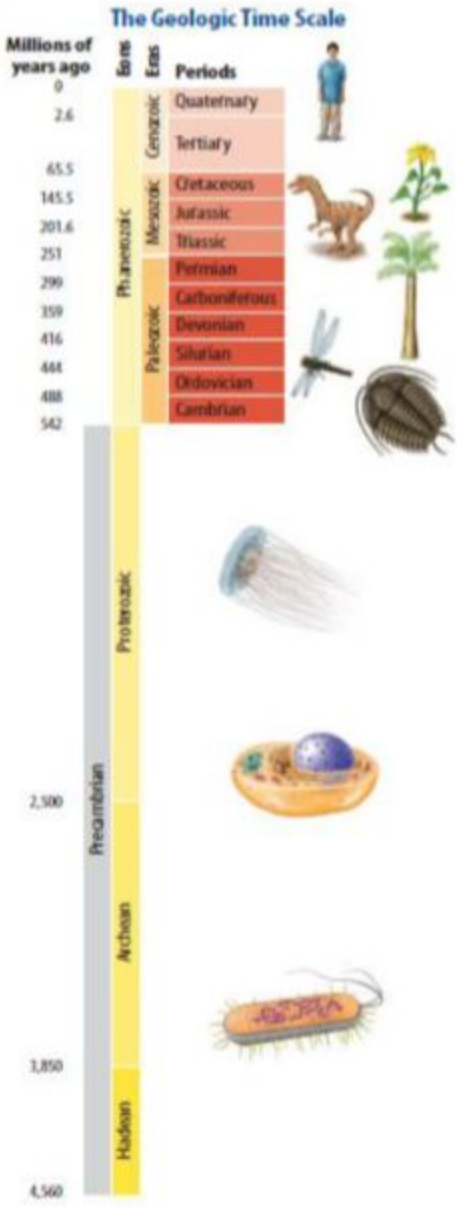
Fossils Over Time

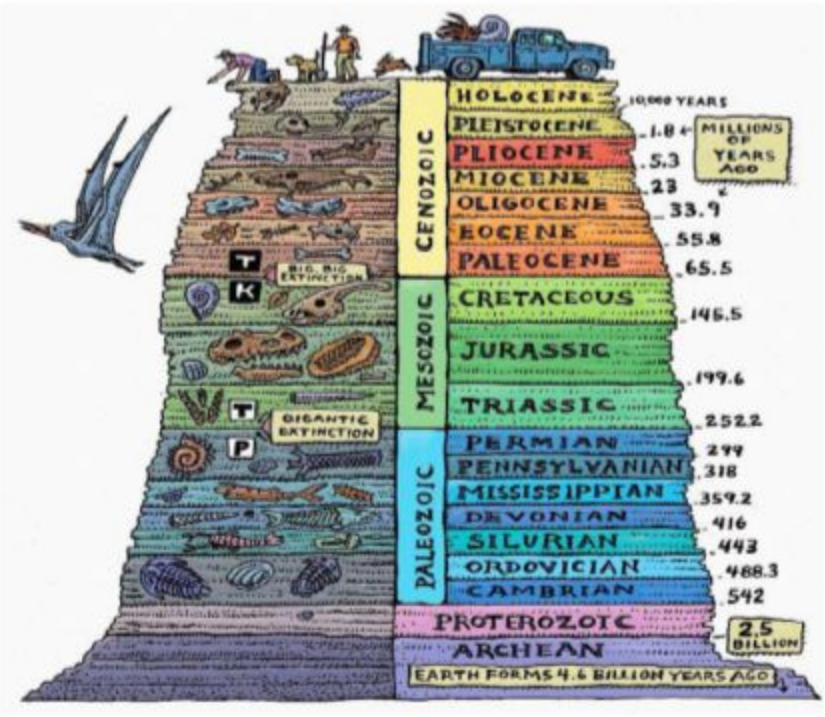
From this information, they have created a "calendar" of Earth's history - called the Geologic Time Scale that spans more than 4.6 billion years.

The largest length of time in the scale is Precambrian Time – about 87% of Earth's history- or 4 billion years!

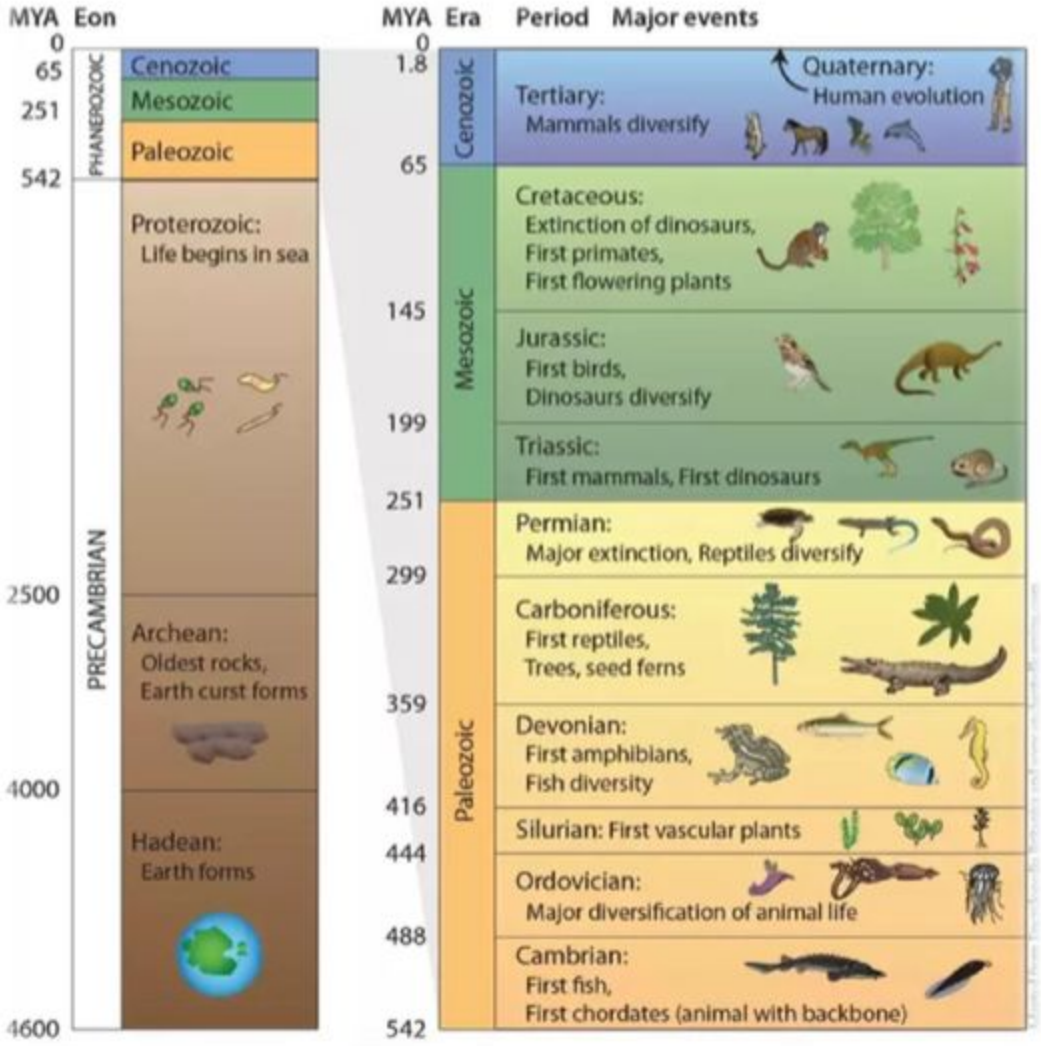
After the Precambrian, the scale is divided into **3** major eras -

- **Paleozoic era** — *Old life*
- **Mesozoic era** — *Middle life*
- **Cenozoic era** — *New life*





The Geologic Time Scale



QI: When did the 1st land plants appear? AI: Paleozoic era

Q2: When did the 1st dinosaurs evolve? A2: Triassic period

Q3: What eon did the 1st bacteria evolve? A3: Precambrian

Q4: What period did humans evolve? A4: Quaternary period

Q5: What era did the 1st insects evolve? A5: Paleozoic era

Q6: What eon did the 1st cells evolve? A6: Precambrian

Q7: What era did the 1st inverts (jellyfish) evolve? A7: Paleozoic era

Extinctions & Evolution

Q: What is extinction?
A: when the last individual organism of a species dies

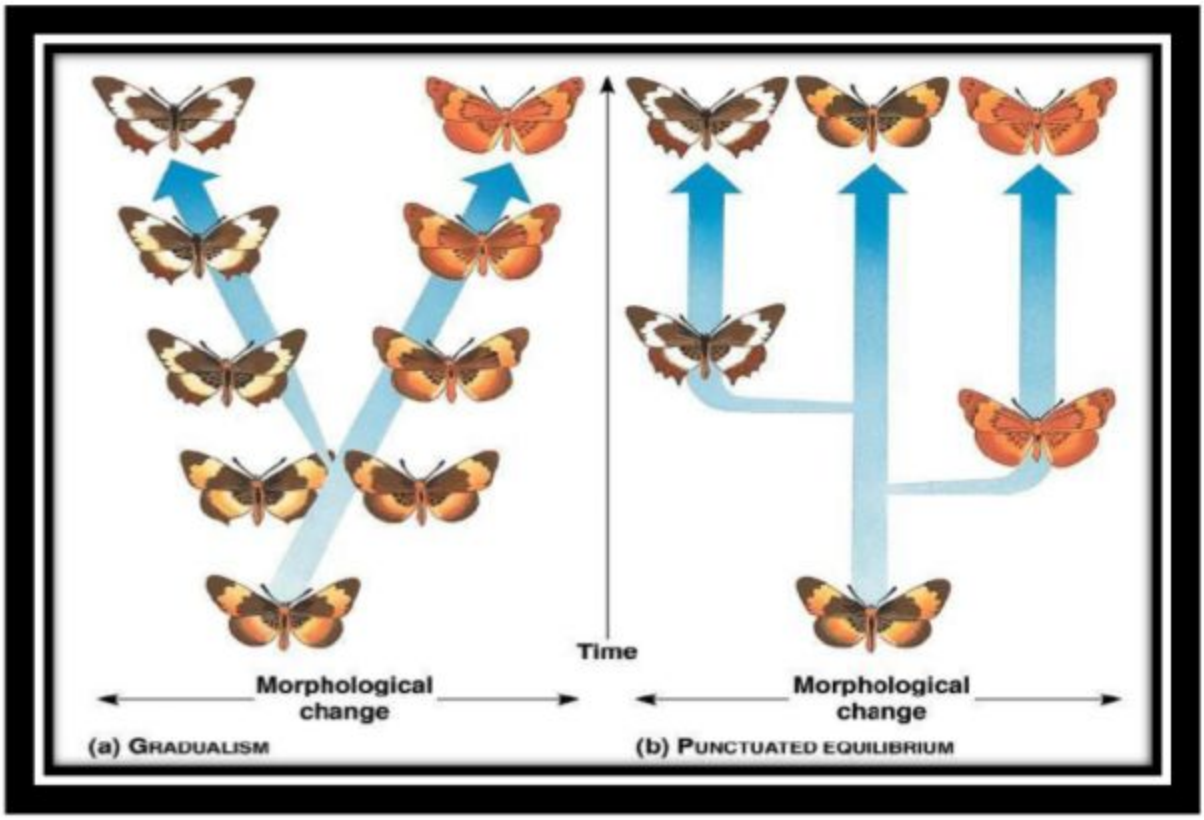
Because the fossil record is incomplete, many questions about evolution remain unanswered & theories exist – 2

gradualism tiny changes in a species gradually add up to major changes over very long periods of time

- evolution occurs slowly but steadily
- contains intermediate forms

Punctuated equilibrium species evolve quickly when groups become isolated and adapt to new environments

- species evolve during short periods of rapid change
- contains no intermediate forms



Scientists think that evolution can occur gradually at some times and fairly rapidly at others, known as

Biological evolution

Q: What is biological evolution?
A: the change over time in populations of related organisms