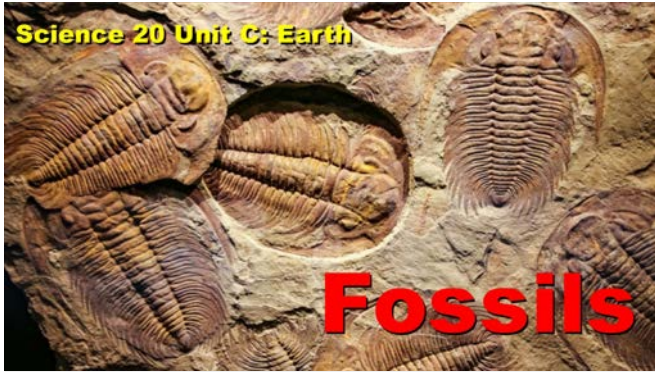


Science 20 Unit C: Earth

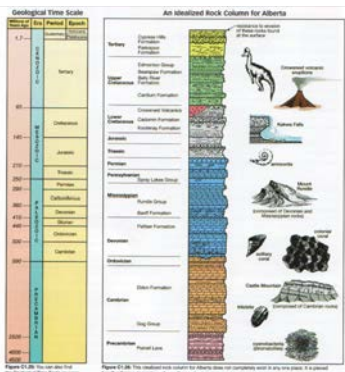


POS Checklist:

- describe common types of fossilization, i.e., actual remains, molds or imprints, tracks, trails or burrows, as direct evidence of evolution and describe the significance of the fossil record in Canada's Burgess Shale
- explain how sedimentary rock layers along with fossils can provide evidence of chronology, paleoclimate, evolution and mass extinctions; e.g., index and transitional fossils, fossils of reptiles and certain types of plants usually indicate a warm, tropical climate

Recall: the geologic timeline:

For long periods of time, the **evidence of life was small.**



For nearly 4 billion years, the only **fossil** evidence we have found has been the remains of **cyanobacteria**: the **stromatolite** formations.



However, all this changed in the early **Paleozoic** era. In the **Cambrian** period, we suddenly see many new lifeforms and lots of **new fossils**.

This means that a lot of **new life** was created at the beginning of the Cambrian era.

We will look at 4 main types of fossils:

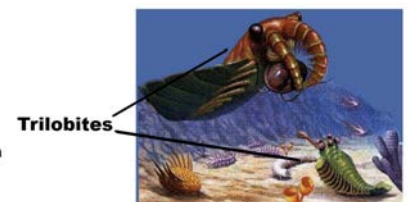
- actual remains
- trace fossils
- transitional fossils
- index fossils

Why the sudden explosion of life?

Geologists believe that high atmospheric **oxygen** levels in the **oceans** at the time gave rise to a huge diversity of new living beings in the oceans. Creatures such as:



Recall we have **evidence** of oxygen at this time from **banded iron**.



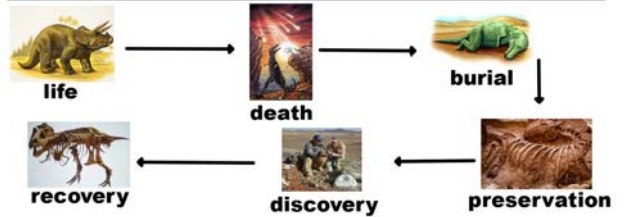
The **trilobite** is one of the most common Cambrian fossils. About half of the fossils found in this period are trilobites.



So how were these fossils created?

Fossilization

The process by which any trace of the existence of ancient life is preserved within rock.



3 Types of Fossils:

1. Actual Remains

- parts of an organism's **body** is maintained, sometimes through **petrification**.



•**hard parts** (shells, teeth, tusks) are found **unchanged** in the rock

•**soft parts** (bones, some flesh/skin) are **chemically changed** through petrification



If the original material is replaced by a mineral (eg. Silica) then the fossil is petrified



2. Trace Fossils

Sometimes no remains of an actual organism but only evidence of their presence - these are called **trace fossils**.

Trace Fossils: tracks, imprints or trails recorded in rock as evidence of past life.



Cyanobacteria, some of Earth's earliest life that turned sunlight and **CO₂** into **oxygen** left behind these trace fossils of calcium carbonate.



Many very soft organisms simply left imprints behind in sedimentary rock.

Fossils can also form in volcanic lava as the lava can cool so quickly that it creates an impression of the object.

tree outline



Imprints of wings has lead paleontologists to believe some types of dinosaurs evolved into early bird species.



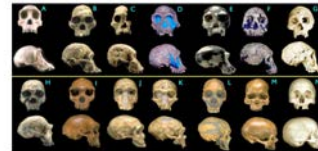
Burrows or tracks and footprints left behind are good examples of trace fossils.



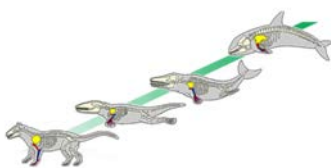
3. Transitional Fossils

Studying sets of similar fossils can lead to conclusions of evolution for many species.

Transitional fossils: show the changes over time of related species.



Transitional fossils are used to show the link between different species over very long periods of time.



Evolution of a Whale from a quadruped.



Evolution of a pidgeon from a ornitholestes.



<https://www.youtube.com/watch?v=IYr3sYS9e0w>

4. Index Fossils

Index fossils give us an idea of **environmental** conditions at the time of fossilization.



ex) If sea creatures are found in a particular strata, what does that tell us about that time?



ex) If palm leaves are found in a particular strata, what does that tell us about that time?

There are many index and other fossils to be found in Western Canada.

The Burgess Shale, 80 km west of Banff, is home to many **Cambrian** fossils.

It is considered the most important source of Cambrian fossils on Earth and has been declared a World Heritage Site by the United Nations.



Index fossils found at the Shale include many trilobites, creatures that live underwater, as well as **tropical plant** life.



This indicates that the **Alberta** and BC was once covered in **water** and very **warm**.

Alberta's Tropical Sea

For millions of years, Alberta was located close to the **equator** and was repeatedly submerged and lifted above the ocean's surface.

For millions of years after the Paleozoic Era, most of Alberta was above the ocean's surface.

During the **Cambrian** Period, **life** only existed in **water** (no plants or animals were on land).



Previously formed Precambrian rock was eroded and sediments washed downriver to the ocean on Alberta's shoreline eventually transformed into the sandstones and shales that form the Rocky Mountains.



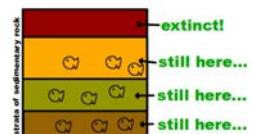
The **Burgess Shale** contains fossils showing a complete marine ecosystem.

Extinctions

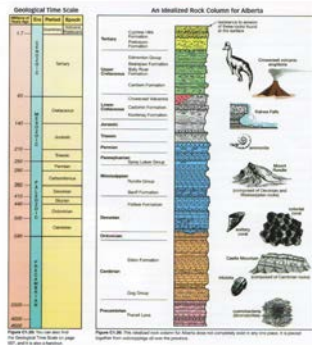
Fossils also show evidence of **mass extinctions**.



For example, if we notice a particular type of fossil **stops appearing** at a certain layer of rock, we can bet we stop finding fossils because of a mass extinction.



In fact, **geologic time** is **broken down by mass extinction**: each new period or epoch usually starts after a big extinction of some sort.



**Practice: Page 335 #2-5
UA**