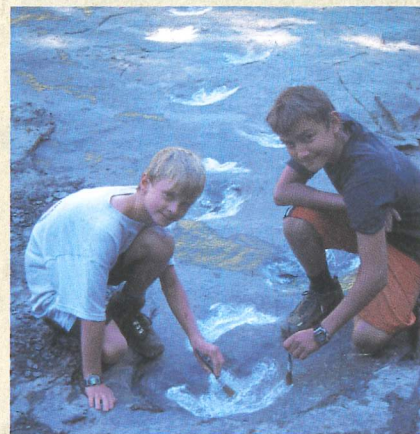


## NEWS Flash!! Dinosaur tracks discovered!

Two elementary school boys find evidence of Ankylosaur while tubing down Flatbed Creek.

MARY CHANG

In August 2000, two boys went tubing down Flatbed Creek near Tumbler Ridge, British Columbia. As they walked along the banks of the creek, they came across unusual impressions in the rock. What Daniel Helm and Mark Turner had discovered were 20 dinosaur footprints preserved in sedimentary rock that was over 90 million years old. Further investigations by scientists revealed more



CHARLES HELM

David Helm and Mark Turner discovered fossilized dinosaur footprints near Tumbler Ridge, British Columbia.

footprints, as well as fossilized dinosaur bones embedded in the rock only a few metres from the footprints. Across the creek, there were even more footprints.

### ▶ LEARNING TIP

Before you read this section, make a web to show what you already know about fossils.

## How Fossils Form

**Fossils** are rock-like casts, impressions, or actual remains of organisms that were covered by sediment when they died, before they could decompose (**Figure 1**). Only a tiny fraction of organisms are preserved as fossils. This is because most dead organisms decay or are eaten by scavenging animals. Also, soft tissue, such as muscle and body organs, does not fossilize well.



**Figure 1**  
A fossil of a turtle.

An organism that is suddenly buried by falling into mud or quicksand may become a fossil. An organism that is covered quickly by a landslide of sediment or blowing volcanic ash may also become a fossil. The layer of sediment that contains the organism is covered by other layers of sediment and gradually becomes sedimentary rock.

As the wet sediment becomes rock, minerals that are dissolved in the water gradually replace minerals in the body of the buried organism. Minerals in bone, shell, and parts of plants can be replaced this way. Eventually, particle by particle, all the minerals in the organism are replaced by minerals in the water. The final result is a fossil that looks exactly like the original organism but is in a rock-like form (Figure 2).

Ammonites were marine animals that looked like octopuses with shells. Although they no longer live on Earth, a close relative, called the chambered nautilus, still does. Vancouver Island and the Gulf Islands are well known for their ammonite fossils, like the one in Figure 2. Is there a rocky area near your school where your class could look for fossils?



**Figure 2**  
This ammonite, found in British Columbia, is 170 million years old.

## How Fossils Tell Us About Geological Change

Fossils record the history of changes to life on Earth. All the information we have from fossils is called the **fossil record**. The fossil record is important because it shows what types of animals and plants lived on Earth hundreds of millions of years ago. The fossil record also shows how life has changed over time. If you look at exposed layers of sedimentary rock from bottom to top, the fossils are like a series of snapshots of how life has changed on Earth, from the distant past near the bottom to more recent times near the top.

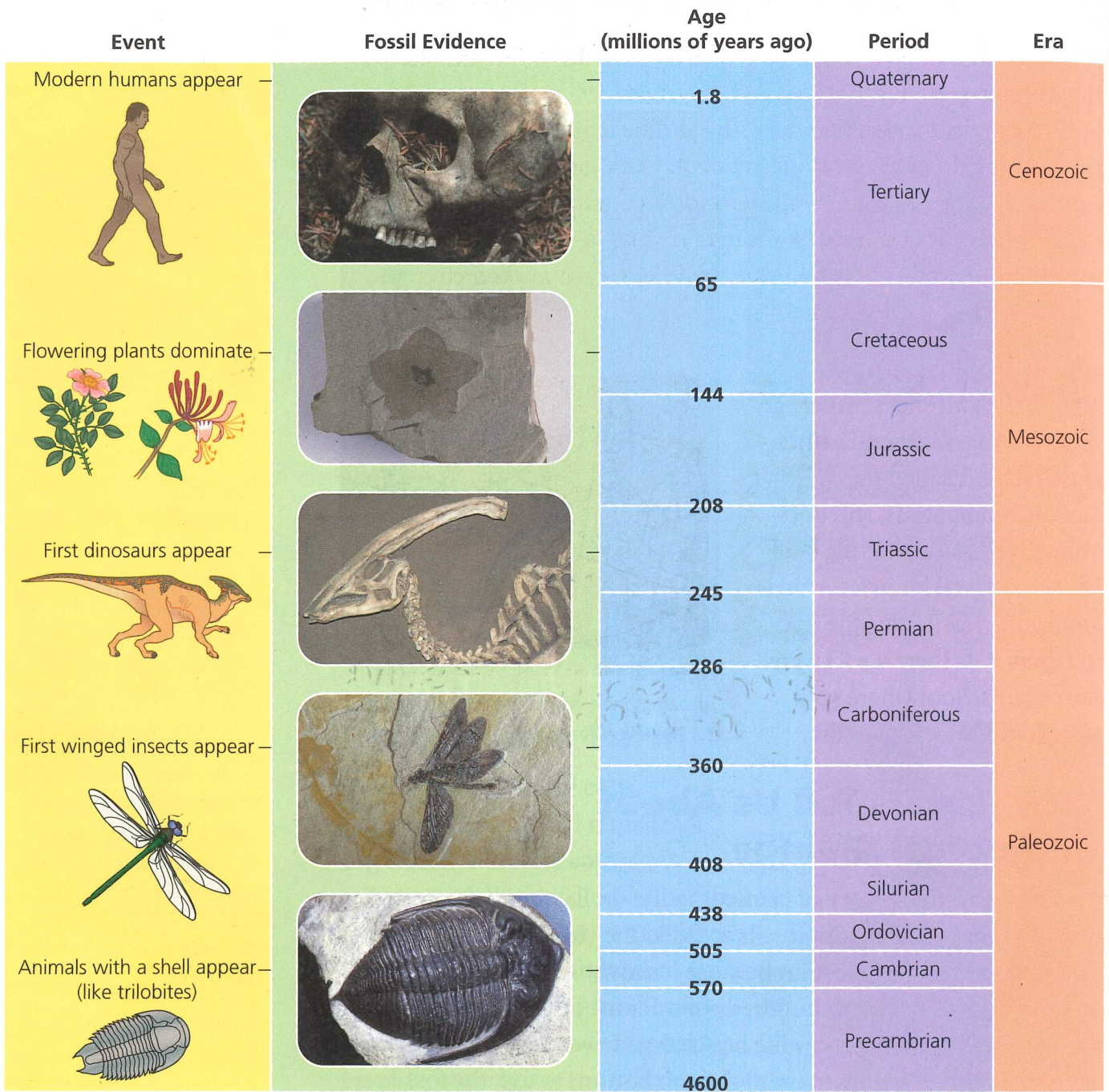


Scientists have used fossils to make a time line of the changes in life on Earth. This time line is called the **geologic time scale** (Figure 3).

**LEARNING TIP**

Observe how Figure 3 is organized. You can read it across and down. Each tells a different story.

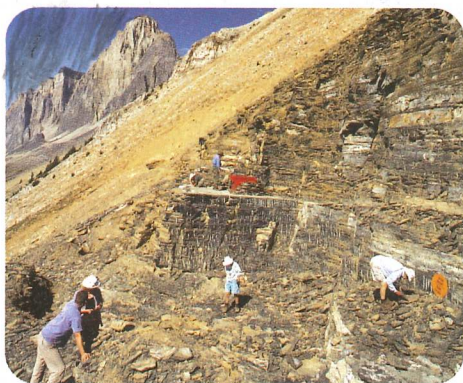
Geologists use fossils to compare the ages of rocks. For example, if a certain type of ancient fossil is found in rocks in two different places, then these rocks were probably formed about the same time.



**Figure 3**  
Geologic time scale

Geologists also use fossils to track how Earth has changed or how parts of Earth have moved over time. The oldest known fossils in Canada are located at the Burgess Shale in Yoho National Park, near Field in eastern British Columbia (Figure 4). The fossils here are not dinosaur fossils. They are fossils of soft-bodied marine organisms that existed on Earth 500 million years ago, in a period of geologic time known as the Cambrian era. These fossils are so rare and unusual that the area has been made a World Heritage Site by the United Nations.

The rock that contains these fossils is black shale. Geologists determined that the rock originally formed in the ocean, close to a reef where the marine organisms lived. The reef was at the edge of the ancient North American continent. Occasional underwater mudslides trapped the organisms and, over many millions of years, their bodies were covered by more than 8 km of sediment. Forces inside Earth gradually moved the fossils eastward to their current location, high in the mountains.



**Figure 4**

The Burgess Shale (left) is one of the most famous fossil finds in the world. This Burgess Shale fossil (right) is so strange that the geologists who first saw it thought they must be hallucinating. They named it *Hallucinogenia*.

### ▶ CHECK YOUR UNDERSTANDING

1. Describe how fossils form.
2. Why do very few organisms become fossils?
3. Would you expect to find fossils of dinosaur bones in rock that was 250 million years old? Why or why not?
4. Why are fossils found in sedimentary rock but not in metamorphic rock? (Think about how the three families of rock are formed.)
5. Write "Fossils" in the middle of your page. Then make a mind map of all the things that scientists have learned from fossils.

### ▶ LEARNING TIP

Compare what you learned about fossils in this section to what you already knew about fossils.