

17-1 The Fossil Record



Fossils and Ancient Life

Paleontologists are scientists who collect and study fossils.

All information about past life is called the **fossil record**.

The fossil record includes information about the structure of organisms, what they ate, what ate them, in what environment they lived, and the order in which they lived.

The fossil record provides evidence about the history of life on Earth. It also shows how different groups of organisms, including species, have changed over time.

The fossil record provides incomplete information about the history of life. Over 99% of all species that have lived on Earth have become **extinct**, which means that the species has died out.

How Fossils Form

Fossils can be as large as a complete, preserved animal, or as small as a fragment.

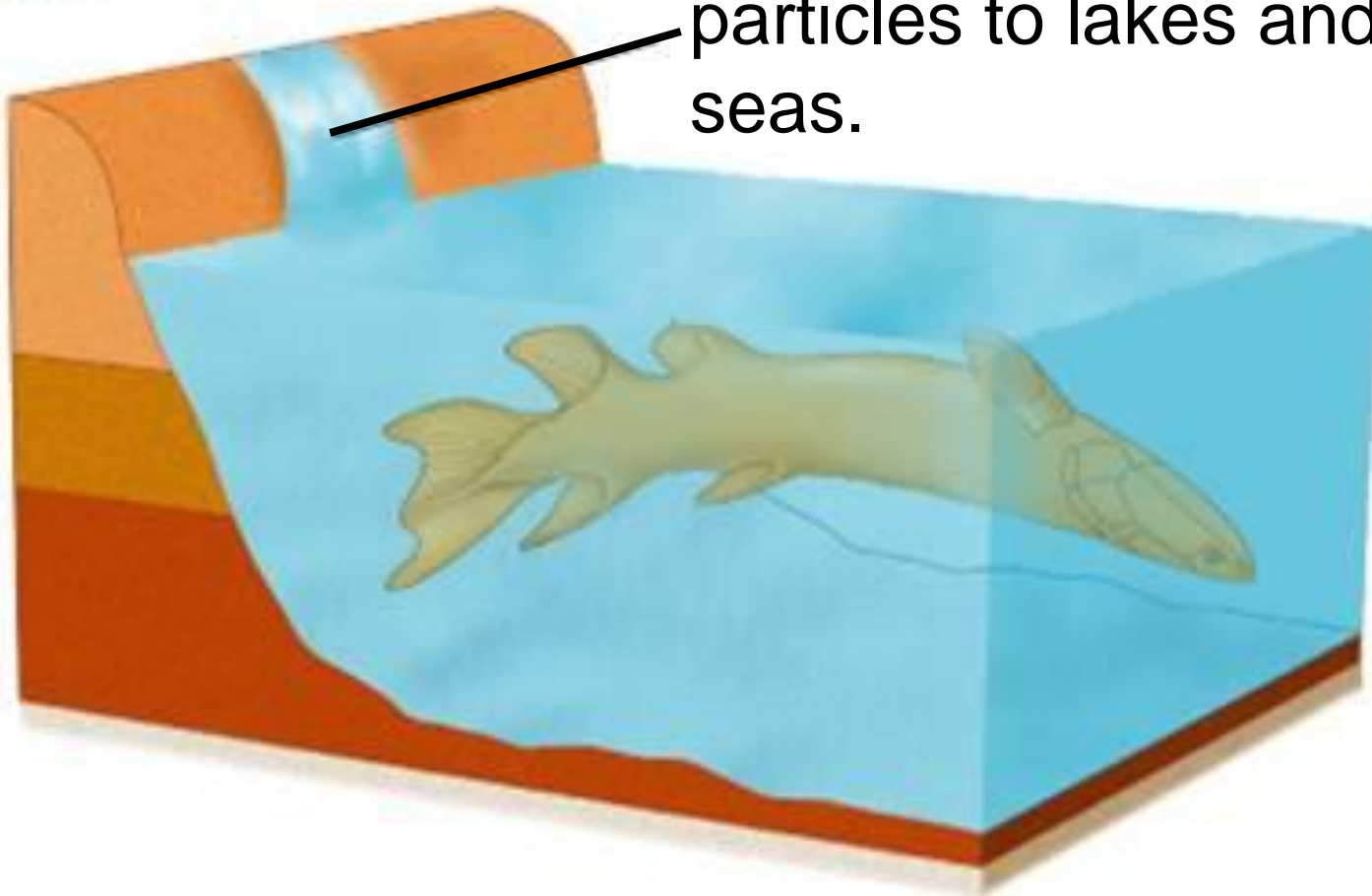
Most fossils form in sedimentary rock.

Sedimentary rock forms when exposure to the elements breaks down existing rock into small particles of sand, silt, and clay.

Fossil Formation

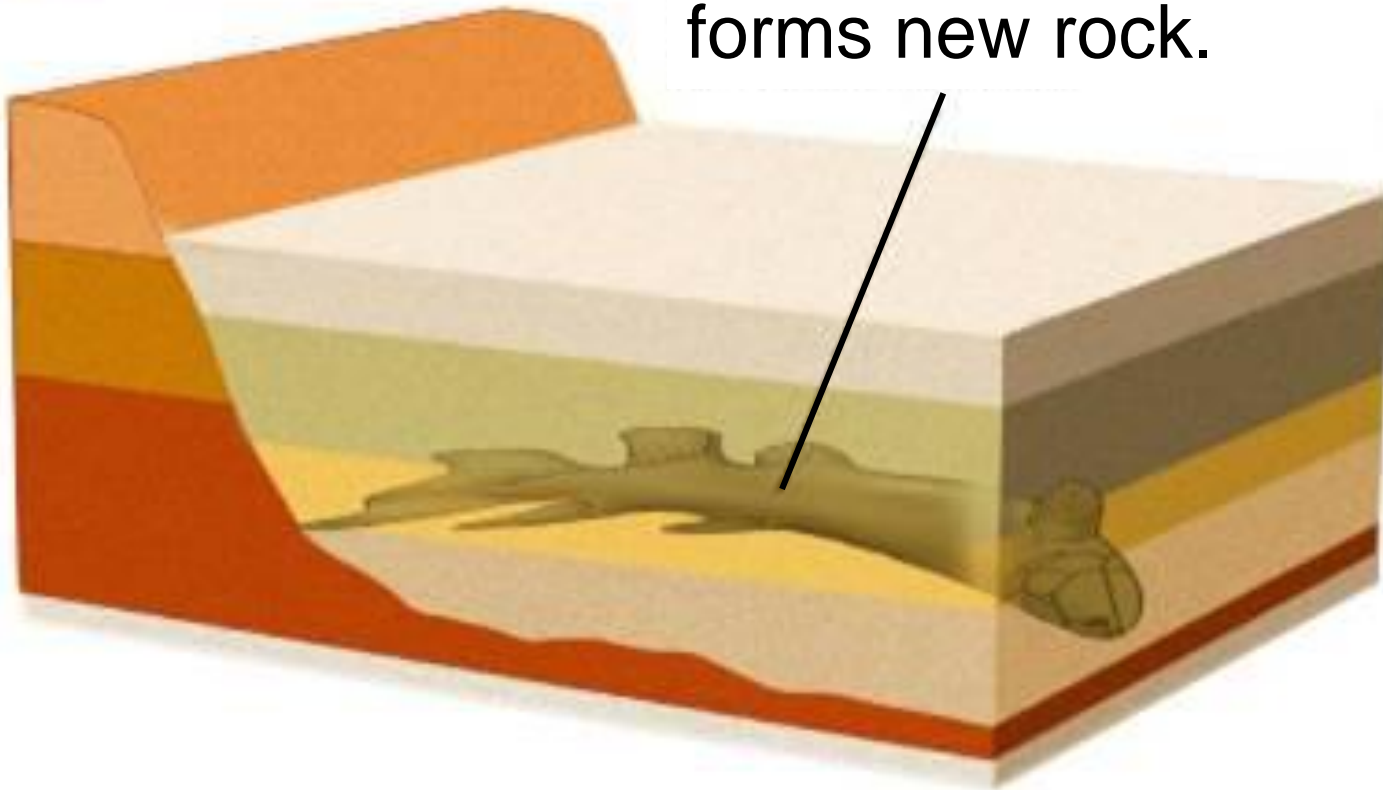
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Water carries small rock particles to lakes and seas.



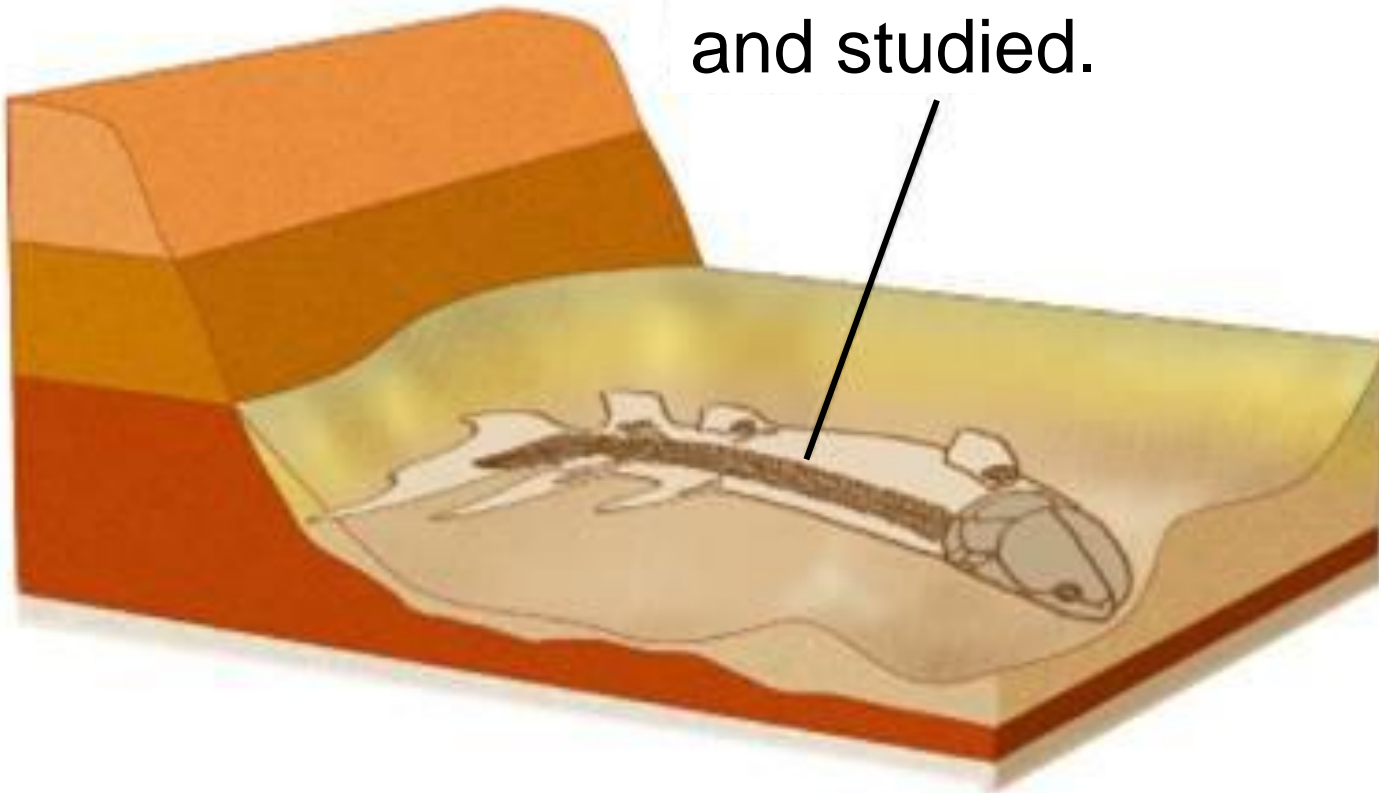
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Dead organisms are buried by layers of sediment, which forms new rock.



3

The preserved remains may be later discovered and studied.



Interpreting Fossil Evidence

Paleontologists determine the age of fossils using relative dating or radioactive dating.

Relative Dating

In **relative dating**, the age of a fossil is determined by comparing its placement with that of fossils in other layers of rock.

Rock layers form in order by age—the oldest on the bottom, with more recent layers on top.

Relative Dating



Index fossils are used to compare the relative ages of fossils.

An **index fossil** is a species that is recognizable and that existed for a short period but had a wide geographic range.

Relative dating allows paleontologists to estimate a fossil's age compared with that of other fossils.

Radioactive Dating

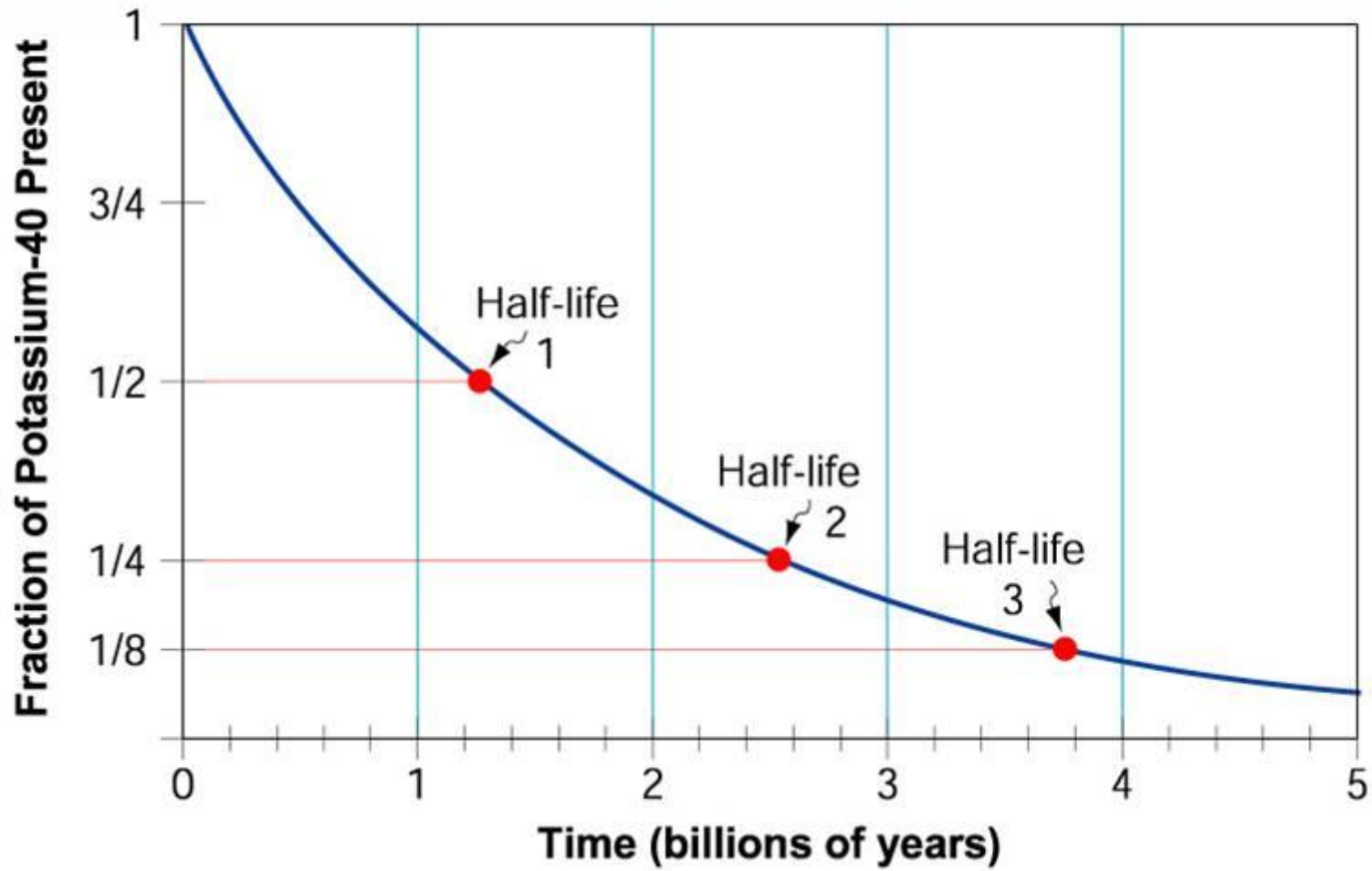
Scientists use radioactive decay to assign an absolute age to rocks.

Some elements are radioactive and steadily break down into nonradioactive elements.

Radioactive dating is the use of half-lives to determine the age of a sample.

A **half-life** is the length of time required for half of the radioactive atoms in a sample to decay.

Radioactive Decay of Potassium-40



In radioactive dating, scientists calculate the age of a sample based on the amount of remaining radioactive isotopes it contains.

Carbon-14 begins to decay when an organism dies.

Carbon-12 is not radioactive and does not decay.

By comparing the amounts of carbon-14 and carbon-12 in a fossil, researchers can determine when the organism lived.

Geologic Time Scale

Paleontologists use a scale called the geologic time scale to represent evolutionary time.

Scientists first developed the geologic time scale by studying rock layers and index fossils worldwide.

The basic divisions of the geologic time scale are eras and periods.

Geologic time begins with Precambrian Time, which covers about 88% of Earth's history.

Geologic Time Scale		
Era	Period	Time (millions of years ago)
Precambrian Time	Vendian	650–544

Eras

Geologists divide the time between Precambrian time and the present into three **eras**:

- Paleozoic Era
- Mesozoic Era
- Cenozoic Era

The Paleozoic began about 544 million years ago.

Many vertebrates and invertebrates lived during this time.

Geologic Time Scale		
Era	Period	Time (millions of years ago)
Paleozoic	Permian	290–245
	Carboniferous	360–290
	Devonian	410–360
	Silurian	440–410
	Ordovician	505–440
	Cambrian	544–505

The Mesozoic began about 245 million years ago.

Dinosaurs lived during this time.

Mammals began to evolve during this era.

The Cenozoic began about 65 million years ago and continues to the present.

Mammals became common during the Cenozoic.

Geologic Time Scale		
Era	Period	Time (millions of years ago)
Mesozoic	Cretaceous	145–65
	Jurassic	208–145
	Triassic	245–208

Geologic Time Scale		
Era	Period	Time (millions of years ago)
Cenozoic	Quaternary	1.8 – present
	Tertiary	65 – 1.8

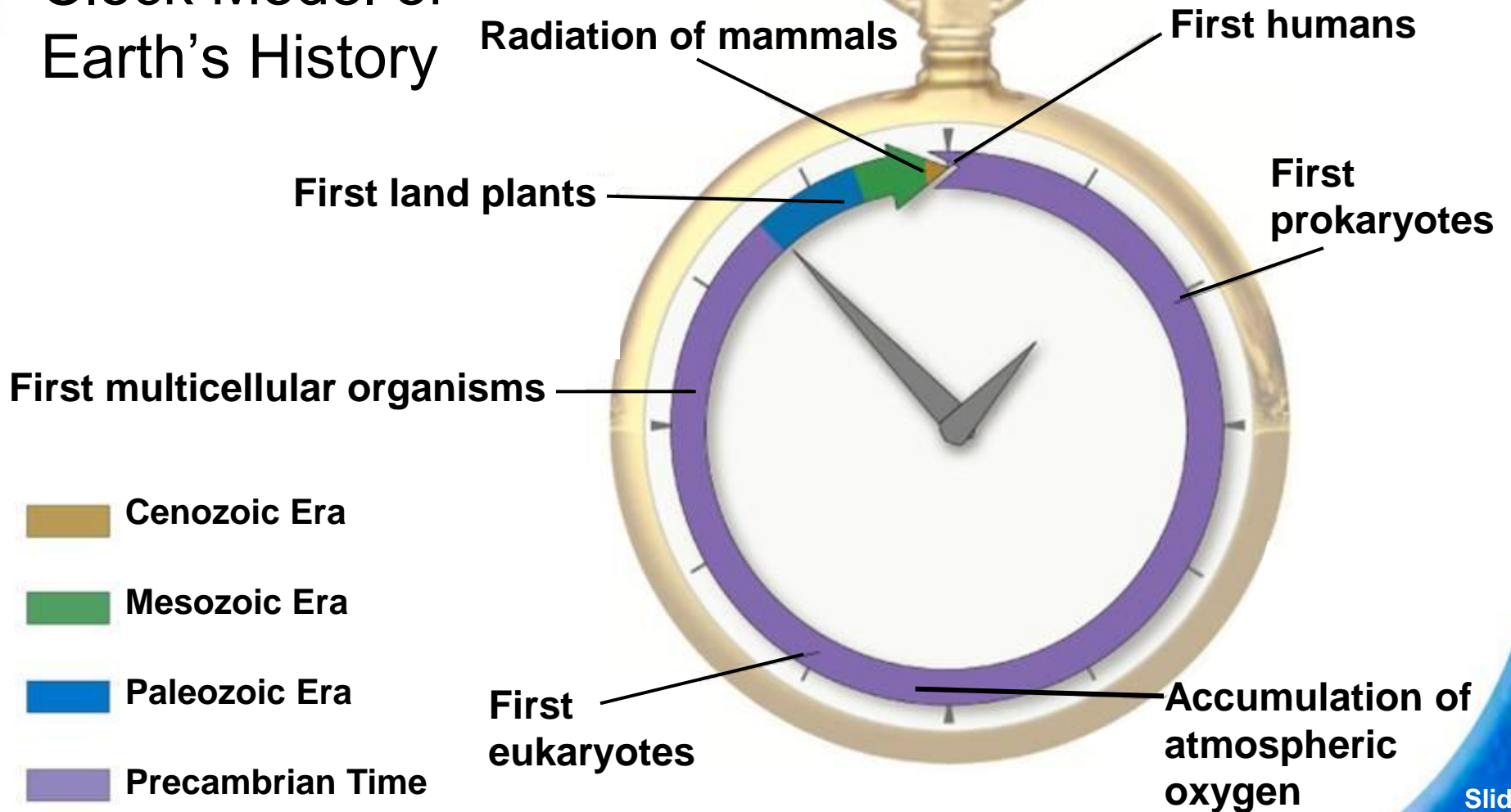
Periods

Eras are subdivided into periods, which range in length from tens of millions of years to less than two million years.

Many periods are named for places around the world where geologists first discovered the rocks and fossils of that period.



Clock Model of Earth's History



17-1 Section QUIZ

Continue to:

Section QUIZ

- or -

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17-1 Section QUIZ

1 Which of the following statements about fossils is NOT true?

- a. Most fossils form in sedimentary rock.
- b. Fossils occur in a particular order.
- c. Only a small portion of fossils are from extinct organisms.
- d. Fossils can be used in relative dating of rock formations.

17-1 Section QUIZ

- 2 The fossil record consistently shows evidence that
- a. all forms of life have existed in all geologic eras.
 - b. living organisms have only been on Earth for a short time.
 - c. living things have changed over time.
 - d. ancient life-forms are much the same as forms found living today.

17-1 Section QUIZ

3

Index fossils assist paleontologists in dating rocks because they represent species that

- a. were widely distributed and existed for a very long time.
- b. existed in a single location for a short period of time.
- c. were widely distributed and existed for a short time.
- d. existed in a single location for a very long time.

4 Determining the age of a fossil by comparing its placement with fossils in other layers of rock is called

- a. carbon-14 dating.
- b. fossil-indexing.
- c. relative dating.
- d. absolute dating.

5 According to the geologic time scale, geologic time begins with

a. Precambrian Time.

b. the Paleozoic Era.

c. the Quaternary Period.

d. the Cambrian Era.