Earth Science

Chapter 9 – A View of Earth's Past

Section 2 – Precambrian Time and the Paleozoic Era

E.Q.: ***How is evolution related to geologic time and what are the major biological developments during the Paleozoic eras?***

STANDARDS:

SES4. Students will understand how rock relationships and fossils are used to reconstruct the Earth's past.

e. Use geologic maps and stratigraphic relationships to interpret major events in Earth history (e.g., mass extinction, major climatic change, tectonic events).

SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.

f. Relate changes in global climate to variation in Earth/Sun relationships and to natural and anthropogenic modification of atmospheric composition.

SES6. Students will explain how life on Earth responds to and shapes Earth systems.

d. Describe how fossils provide a record of shared ancestry, evolution, and extinction that is best explained by the mechanism of natural selection.

e. Identify the evolutionary innovations that most profoundly shaped Earth systems: photosynthetic prokaryotes and the atmosphere; multicellular animals and marine environments; land plants and terrestrial environments.

Objectives

- **Summarize how evolution is related to geologic change.**

- **Identify two characteristics of Precambrian rock.**
- **Identify one major geologic and two major biological developments during the Paleozoic Era.**

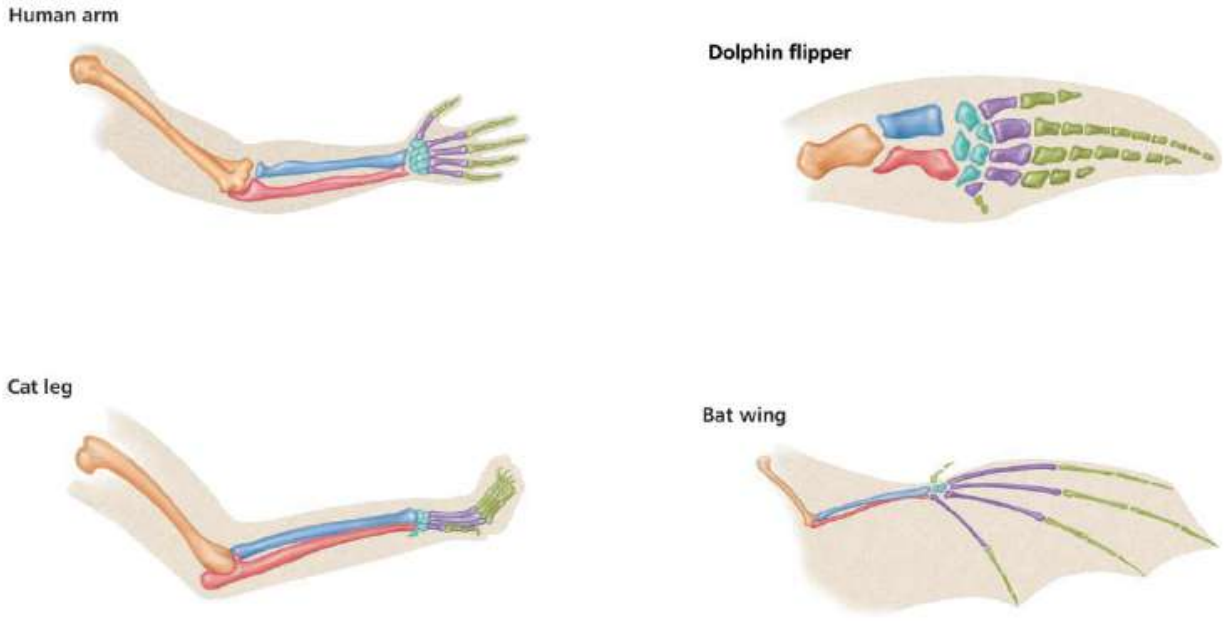
Evolution

evolution an inheritable change in the characteristics within a population from one generation to the next; the development of new types of organisms from preexisting types of organisms over time

- **By examining rock layers and fossils, scientists have discovered evidence that species of livings things have changed over time.**
- **Scientists call this process evolution.**

Evolution and Geologic Change

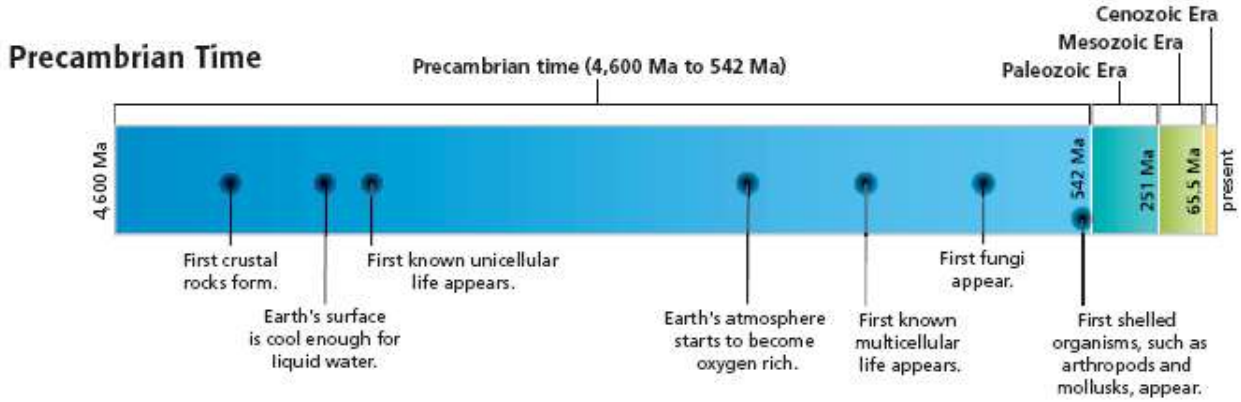
- **Scientists think that evolution occurs by means of natural selection. Evidence for evolution included the similarity in skeletal structures of animals.**
- **Major geologic and climatic changes can affect the ability of some organisms to survive.**
- **By using geologic evidence, scientists try to determine how environmental changes affected organisms in the past.**

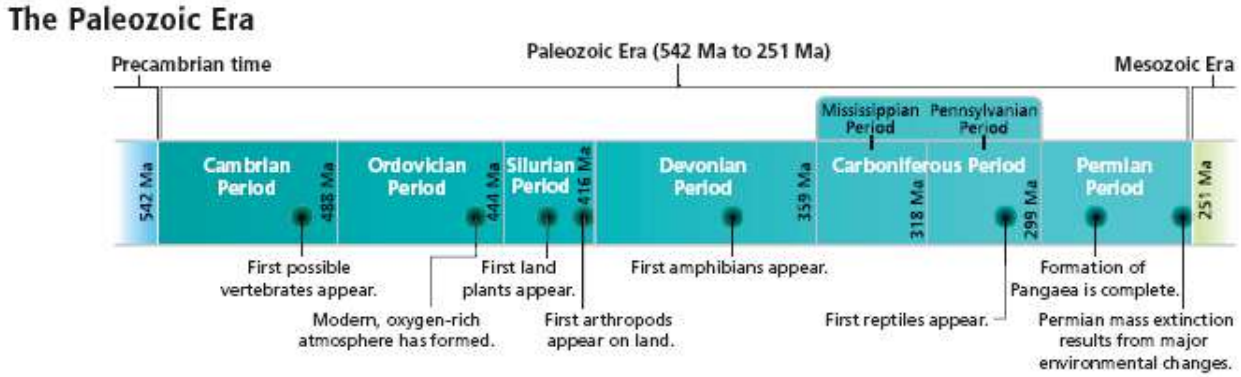


Precambrian Time

Precambrian time - the interval of time in the geologic time scale from Earth's formation to the beginning of the Paleozoic era, from 4.6 billion to 542 million years ago.

- **The time interval that began with the formation of Earth and ended about 542 million years ago is known as Precambrian time, which makes up 88% of Earth's history.**





- **The Precambrian rock record is difficult to interpret, therefore we do not know much about what happened during that time.**
- **Most Precambrian rocks have been so severely deformed and altered by tectonic activity that the original order of rock layers is rarely identifiable.**

<u>Precambrian Rocks</u>

- **Large areas of exposed Precambrian rocks, called shields, exist on every continent.**
- **Nearly half of the valuable mineral deposits in the world occur in the rocks of Precambrian shields.**

- **These valuable minerals include nickel, iron, gold, and copper.**

Precambrian Life

- **Fossils are rare in Precambrian rocks mostly because Precambrian life-forms lacked bones, or other hard parts that commonly form fossils.**
- **One of the few Precambrian fossils that have been discovered are stromatolites.**
- **The presence of stromatolite fossils in Precambrian rocks indicates that shallow seas covered much of Earth during that time.**

The Paleozoic Era

Paleozoic Era - the geologic era that followed Precambrian time and that lasted from 542 million to 251 million years ago.

- **Paleozoic rocks hold an abundant fossil record. The number of plant and animal species on Earth increased dramatically at the beginning of the Paleozoic Era.**
- **Because of this rich fossil record, the Paleozoic Era has been divided into seven periods.**

The Cambrian Period

- **The Cambrian Period is the first period of the Paleozoic Era.**
- **Marine invertebrates thrived in the warm waters that existed during this time.**
- **The most common of the Cambrian invertebrates were trilobites. Scientists use many trilobites as index fossils to date rocks to the Cambrian Period.**
- **The second most common animals of the Cambrian Period were the brachiopods, a group of shelled animals.**
- **Fossils indicated that at least 15 different families of brachiopods existed during this period.**

- **Other common Cambrian invertebrates include worms, jellyfish, snails, and sponges.**

Reading Check

Name three common invertebrates from the Cambrian Period.

Your answer should include three of the following: brachiopods, trilobites, jellyfish, worms, snails, and sponges.

The Ordovician Period

- **During this period, populations of trilobites began to shrink, and clamlike brachiopods and cephalopod mollusks became the dominant invertebrate life-form.**
- **Colonies of graptolites also flourished in the oceans, and the first vertebrates appeared.**
- **The most primitive vertebrates were fish, which did not have jaws or teeth and were covered with thick, bony plates.**

The Silurian Period

- **During the Silurian Period, echinoderms, relatives of modern sea stars, and corals became more common.**
- **Scorpion-like sea creatures called eurypterids also existed during this period.**
- **Near the end of this period, the earliest land plants as well as animals evolved on land.**

The Devonian Period

- **The Devonian Period is called the Age of Fishes because fossils of many bony fishes were discovered in rocks of this period.**
- **On type of fish, called a lungfish, had the ability to breathe air. Another type of fish, Rhipidistians, were air-breathing fish that had strong fins that may have allowed them to crawl onto the land for short periods of time.**

- **Land plants, such as giant horsetails, ferns, and cone-bearing plants also began to develop during this period.**

The Carboniferous Period

- **In North America, the Carbiniferous Period is divided into the Mississippian and Pennsylvanian Periods.**
- **During this time, the climate was warm, and forests and swamps covered most of the world.**
- **Amphibians and fish continued to flourish, and the first vertebrates that were adapted to live on land appeared.**

The Permian Period

- **The Permian Period marks the end of the Paleozoic Era, because a mass extinction of a several life-forms occurred at the end of this period.**
- **During this time, the continents had joined to form Pangaea, and as a result, the seas that covered the world retreated.**
- **As the seas retreated, several species of marine life became extinct. But, reptiles and amphibians survived the environmental changes.**