

Chapter Eight: The History of Life on Earth

Teacher Notes

Lesson One: Evidence of the Past

- Fossils-the remains or physical evidence of an organism preserved by geological processes.
- The Age of Fossils
 - Relative Dating-any method of determining whether an event or object is older or younger than other events or objects.
 - Absolute Dating-any method of measuring the age of an object or event in years.
 - more precise
 - may use atoms; when the atoms decay they release energy; the half-life is used to determine the age.
- The Geologic Time Scale-the standard method used to divide the Earth's long natural history into manageable parts.
 - Divisions in the Geologic Time Scale
 - Is divided into large blocks of time; these large blocks can be divided into smaller blocks.
 - Eras-characterized by the type of organism that dominated the Earth at the time.
 - This time scale changes as more information is discovered; very little is known about the earliest stages of Earth.
 - Mass Extinctions
 - Extinct-describes a species that has died out completely; it does not reappear.
 - Mass Extinction-occurs when many species all die out at the same time
- The Changing Earth-plants now found in the tropics have been found as fossils in Antarctica-Was Antarctica located near the poles>
 - Pangaea-Alfred Wegener proposed that at one time all continents were connected as one large mass that he called Pangaea.
 - Do the Continents Move?
 - Plate Tectonics-the theory that explains how large pieces of the Earth's outermost layer, called tectonic plates, move and change shape.
 - Tuzo Wilson stated that the outer crust is broken into seven large, rigid plates and several smaller ones. The continents and oceans ride on top of these plates. The motion causes the continents to move.
 - Adaptations to Slow Changes-some organisms are able to adapt and change to fit the environment; other organisms are unable to change with the environment and die out.

Lesson Two: Eras of the Geologic Time Scale

- Precambrian Time-the period in the geologic time scale from the formation of the Earth to the beginning of the Paleozoic era, from about 4.6 billion to 543 million years ago.
 - example-the bottom of the Grand Canyon
 - atmosphere was made of gases such as water vapor, carbon dioxide, and nitrogen; volcanic eruptions, meteorite impacts, and violent storms were common.

-How Did Life Begin

-life developed from simple chemicals in the oceans and in the atmosphere. Energy from radiation and storms could have caused these chemicals to react. Some of these reactions formed the complex molecules that made life possible. Eventually these molecules may have joined to form structures such as cells.

-atmosphere didn't contain oxygen gas; first organisms didn't need oxygen to survive. First organisms were prokaryotes (single-celled organisms)

-Photosynthesis and Oxygen

-Cyanobacteria appeared 3 billion years ago. They use sunlight to produce their own food; this process also releases oxygen

-this led to the formation of a new layer of gas called the ozone

-Multicellular Organisms-after a billion years eukaryotes appeared (more complex multicelled organisms)

-The Paleozoic Era-the geologic era that followed Precambrian time and that lasted from 543 million to 248 million years.

-appearance of sponges, corals, snails, clams, squids, and trilobites

-Life on Land-plants, fungi, and air-breathing animals slowly appeared on land.

-Fossils indicate that some of the first animals on land were crawling insects; these were followed by large salamanders and then reptiles and winged insects.

-largest mass extinction took place at the end of the Paleozoic Era which took out as many as 90% of this era's organisms.

-The Mesozoic Era-the geologic era that lasted from 248 million to 65 million years ago; also called the Age of Reptiles.

-Life in the Mesozoic Era

-Dinosaurs are the most well known reptile of this period

-Most important plants were conifers which formed large forests.

-The Extinction of Dinosaurs

-one hypothesis states that a large meteorite hit the Earth and generated giant dust clouds and enough heat to cause worldwide fires. The dust and smoke caused sunlight to be blocked out. The plants died out and then the dinosaurs had nothing to eat.

-The Cenozoic Era-the most recent geologic era, beginning 65 millions years ago; also called the Age of Mammals.

-The Age of Mammals

-Mammals have dominated this era; early mammals were small

-largest mammals appeared later

-some had long legs for running or special teeth for eating

-some had large brains

-The Cenozoic Era Today

-humans appeared during this era

-climate has changed many times and has included ice ages

Lesson Three: Humans and Other Primates

- Primate-a type of mammal characterized by opposable thumbs and binocular vision
 - includes humans, apes, monkeys, and lemurs
 - The First Primates
 - first primates appear after dinosaurs died out; they had similar to monkeys, apes, and humans
 - Apes and Chimpanzees
 - chimpanzees are thought to be the closest relative to humans
 - does NOT mean humans are descended from chimpanzees
 - it means we share a common ancestor
 - Hominids-a type of primate characterized by bipedalism, relatively long lower limbs, and lack of a tail.
 - includes humans and human-like ancestors
 - bipedalism-walking primarily upright on two feet
- Hominids Through Time
 - have found at least 18 types of hominids (although scientists don't all agree on these classifications of some)
 - The Earliest Hominids
 - had traits more humanlike than apelike
 - included the ability to walk upright, smaller teeth, flatter faces, and larger brains.
 - oldest fossils have been found in Africa (6 to 7 million years old)
 - Australopithecines
 - similar to apes but had slightly larger brains, some used stone tools, and they climbed trees and walked on two legs.
 - found in several places in Africa
 - A Variety of Early Hominids
 - some had slender bodies, humanlike jaws, and teeth with small ape-like skulls; probably lived in forests and grasslands and were vegetarians
 - some had large bodies and massive teeth and jaws, unique skull structure and small brains; tropical forests and ate tough plants
 - Global Hominids
 - had larger more complex brains, rounder skulls, and flatter faces, showed advanced tool-making and walked upright.
 - were members of the group Homo, which includes humans
 - they were found on many continents and were probably scavengers that ate a variety of foods; they may have migrates with climate changes
 - Homo habilis lived 2 million years ago
 - Homo erectus appeared 1 million years ago; as tall as modern humans
- Recent Hominids
 - Neanderthals
 - lived in Europe and western Asia; may have lived as early as 400,000 years ago.
 - hunted large animals, made fires, and wore clothing
 - cared for sick and elderly and buried dead with cultural rituals
 - Early and Modern Humans

-Homo sapiens-the species of hominids that includes modern humans and their closest ancestors and that first appeared about 100,000 to 150,000 years ago.

-probably migrated out of Africa 100,000 to 500,000 years ago.

-have smaller, flatter face and a more rounded skull

-first to create art including sculptures, carvings, paintings, and clothing