Evolution

all life on Earth is related

changes have accumulated in populations of organisms over time, eventually those changes add up to new species

"descent with modification"

idea of evolution has been around a long time, since the early 1800s

but Biblical scholars of 1700s pinpointed the exact time of creation from an examination of lifetimes in the Bible

the earth was created: Oct 23, 4004 BC at 9 am

thus Earth is only 6000 yrs old

educated people at time believed creation as revealed in Genesis--each species on Earth was product of unique & special act of creation

however, geologists were the first scientists to throw doubt on creationism

fossil discoveries by geologists in the late 1700-1800s showed: life forms that no longer exist

life forms similar to those living today, but different

life forms where they should not be found

fish fossils on mountaintops

so, scientists began forming ideas of evolution
that organisms have changed over time, but there was a problem: 6000 yrs is not enough time for changes to occur

Charles Lyell, Father of Geology, 1830's
geology shows earth cannot be only 6000 yrs old
geological processes are extremely slow

ex.- Hadrian's Wall in Great Britain
built by Romans 2000 yrs ago, wall stands as built, little erosion, little wearing away
the many geological features we see on Earth; mountains, Grand Canyon, etc, had to take vast amounts of time to form
geologic evidence today says Earth is 4.5-4.6 bill yrs old
geologists have divided Earth into geologic time periods based on rock layers, geological changes in Earth & fossils of life forms found in rocks

Geologic Timescale
puts the history of the Earth into eras, periods, & epochs
based on ages of rock layers, complexity of fossils found in rock layers
data accumulated from all over the world

Precambrian Era dates from 4.6 bill yrs ago to ~550 mya
from **formation of earth to earliest known microfossils**
bacteria and photosynthetic bacteria (3.5 bill years)
to first eukaryotes (2.1-1.4 bill) **including protistans**
to first invertebrates (first multicellular organisms)
all in the seas

Paleozoic Era dates fr. ~550 mya to ~250 mya
this is the **era of ancient life**
includes 6 periods:
-Cambrian: the Cambrian Explosion, a huge increase in the number of animal life, all invertebrates, all in the seas
-Ordovician: the colonization of land by plants
-Silurian: seedless vascular plants, jawed fishes
-Devonian: the Age of Fishes, fishes, the first vertebrates appeared, also first tetrapods & insects
-Carboniferous: first seed plants, amphib & insect diversity
-Permian: gymnosperms, reptile diversity, amphib decline
life in sea was dominant

Mesozoic Era dates fr ~250-65 mya
also known as **middle life,**
includes Triassic, Jurassic, & Cretaceous periods
includes the first evergreens to flowering plants, dinosaurs arose in the Triassic, ruled the Earth in the Jurassic, and died out in the Cretaceous by a mass extinction
the Jurassic is known as the **Age of the Dinosaurs**
as the dinosaurs were dying out, the mammals and birds appeared

Cenozoic Era dates fr. ~65 mya-present
also known as **recent life**
includes 3 periods: Paleogene, Neogene & Quaternary
also includes 7 epochs: Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene, & Holocene
flowering plants and mammals dominate this era
Cenozoic also called the **Age of Mammals**
Holocene is called the Age of *Homo sapiens*
we live in the Cenozoic era, Quartenary Period, Holocene E

Geology of Plate Tectonics can help explain where species are located on earth

-the continents are part of plates of Earth's crust that move or drift

-another name is continental drift

during the Paleozoic Era, all continents were joined together in one land mass, Pangaea

by middle of Mezozoic, land masses were split into a northern and southern mass, although Australia & New Zealand split off from the southern mass

we see animals present here that are found nowhere else on earth

by the end of the Mezozoic, the continents had moved into the present day locations