

Biological Evolution

Darwin's Theory of Natural Selection

The most accepted theory of evolution

Charles Darwin studied birds on the Galapagos Islands. He noticed that birds that ate different kinds of food had differently-shaped beaks. Because of this observation he made a theory that all of the different bird species **evolved** (or changed) from one species of bird. His theory is called **natural selection**.

In Natural Selection, some organisms are born with a trait that improves their chance for survival. Because that organism is more likely to survive, it is more likely to pass on that **favorable trait** to its offspring.

Let's look at an example: The woolly mammoth was covered in fur during the ice age. This helped keep it warm in the cold temperatures. As the ice age came to an end, the temperature of the earth warmed up. Most woolly mammoths died because their fur made them too hot. However, mammoths with *less fur* had a favorable trait. They were able to survive in the warmer temperatures because they had less fur. Because they were able to survive, they reproduced and passed this

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Geological Time Scale

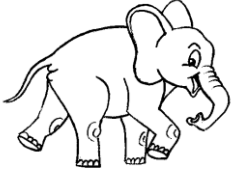
The history of all living organisms

The Earth was created 4.7 billion years ago. The geologic time scale is a timeline of earth's history that starts when the earth was created and goes until the present (RIGHT NOW!)

The Geologic Time Scale is split into 4 categories of time: **Eon** (the longest amount of time), **Eras** (which are marked by mass extinctions), **Periods** (which are marked by unique rock layers in the earth), and **Epochs** (which are the shortest amounts of time).

Humans were the last organisms to come around on earth according to the geologic time scale. The first organisms were single-celled (meaning they were only made of one cell). Then as time went on fish, insects, amphibians, reptiles, dinosaurs, birds, plants and mammals came around (in that order).

GEOLOGIC TIME SCALE			
ERA	PERIOD	EPOCH	SUCCESSION OF LIFE
CENOZOIC recent life	QUATERNARY 0-1 Million Years Rise of Man	Recent Pleistocene	
	TERTIARY 62 Million Years Rise of Mammals	Pliocene Miocene Oligocene Eocene	
MESOZOIC middle life	CRETACEOUS 72 Million Years Modern seed bearing plants, Dinosaurs		
	JURASSIC 46 Million Years First birds		
	TRIASSIC 49 Million Years Cycads, first dinosaurs		
PALEOZOIC ancient life	PERMIAN 50 Million Years First reptiles		
	PENNSYLVANIAN 30 Million Years First insects		
	MISSISSIPPIAN 35 Million Years Many crinoids		
	DEVONIAN 60 Million Years First seed plants, cartilage fish		
	SILURIAN 20 Million Years Earliest land animals		
	ORDOVICIAN 75 Million Years Early bony fish		
	CAMBRIAN 100 Million Years Invertebrate animals, Brachiopods, Trilobites		
PRECAMBRIAN Very few fossils present (bacteria-algae-pollen?)			



favorable trait onto their offspring. Because of genetics, the offspring had less fur too. Eventually over time the mammoths had less and less fur and eventually evolved into an elephant! (which has no fur at all!)

Extinctions (and how they happen)

Extinction is the process through which a species disappears from Earth. Extinction is natural and happens to most species over time. When the environment changes and a species cannot adapt quickly enough, the species becomes extinct.

Possibly Causes of Extinction:

- Temperature change
- Volcanic eruption
- Earthquakes
- Flooding or drought
- A change in food supply
- New predator that eats a species

A **mass extinction** happens when 50% or more of all species living on earth become extinct. That's half of the living things on earth!!! One well-known mass extinction was the extinction of the dinosaurs.

So how did the dinosaurs die? Some scientists think that an asteroid hit the earth and caused so much smoke and debris that the sun was blocked from earth. Others think that so many volcanoes erupted at the same time that they caused too much smoke and debris for the sun to shine on earth. No one knows for sure but we DO know that SOMETHING happened to block the sun from shining on earth!

DID YOU KNOW?

- 99.9% of all species that have EVER lived have become extinct
- An average species survives for 2-10 million years
- Humans are now causing extinction rates to go up

Fossils: the evidence for evolution

Fossils are the imprints or remains of organisms that were once alive. They also provide evidence for the geologic time scale.

Fossils form in the following way:

1. An animal dies and begins to decompose.
2. The remains of the animal are buried by sediment (dirt).
3. The sediment builds up and turns to rock.
4. The rock erodes from above the fossil, and humans find it.

Fossils can form in many different ways:

1. **Mold and cast fossils:** bones leave an imprint in the mud that becomes a mold for the shape of that animal.
 2. **Tracks and trails:** animals leave footprints in the mud which hardens and becomes a fossil.
 - a. We get lots of info from tracks and trails! We can tell how tall and heavy an animal was. We can also see if this animal travels alone or with others.
 3. **Traps:** whole organisms get stuck in tar pits, asphalt or amber.
 4. **Frozen:** we have found several animals frozen in ice. Example: We found almost a whole woolly mammoth frozen in the ice of Russia!
- **EXTRA INFO:** Most fossils form in **sedimentary rocks** (these are rocks that have layers!)

