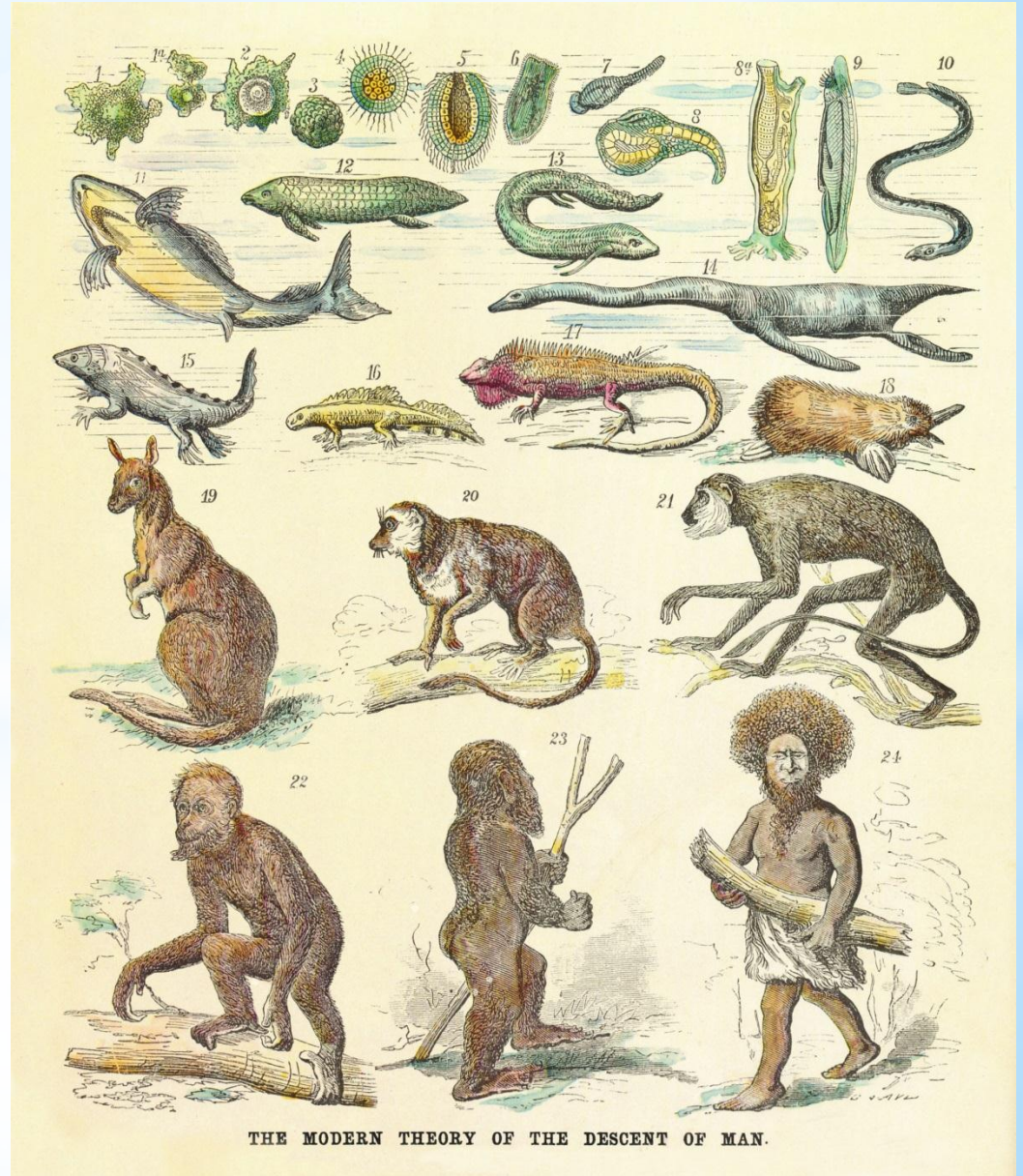
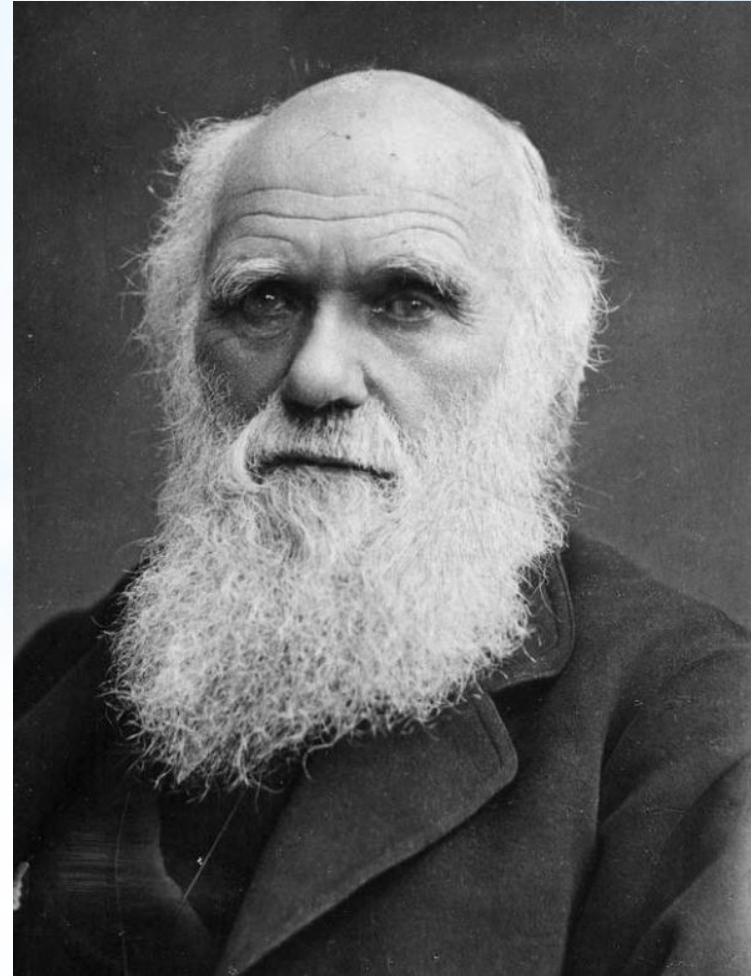


Early Ideas about Evolution



Though Darwin gets much of the credit today for his theory of evolution, he wasn't the first person to come up with the idea!



First off, what is evolution?

In the most general sense, evolution means: change over time.

So lot's of things “evolve” such as galaxies, the Earth, even Mario!



But the evolution we are concerned with is **biological evolution**, which is defined as:

“The process of biological change by which descendants come to differ from their ancestors”.



This essentially explains how new species arise from old ones.

Many scientists proposed ideas about evolution

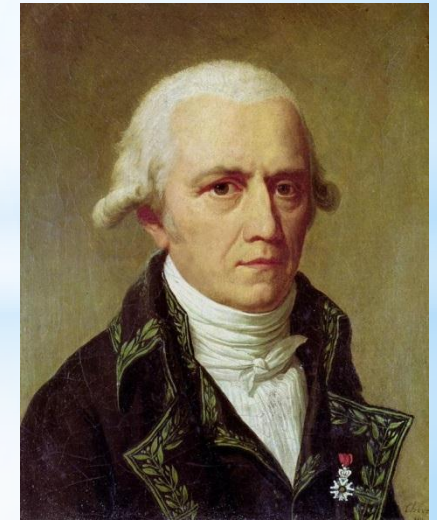
The 1700s were a time of great advances in science. This was called the Age of Enlightenment

Many scientists made valuable contributions to biology during this time, but also laid the foundations upon which Darwin would later build his ideas



Many scientists proposed ideas about evolution

Four scientists in particular had an impact on Darwin:



Carolus Linnaeus
(1707-1778)

George Louis
Leclerc de Buffon
(1707-1788)

Erasmus Darwin
(1731-1802)

Jean-Baptiste
Lamarck
(1744-1829)

Many scientists proposed ideas about evolution

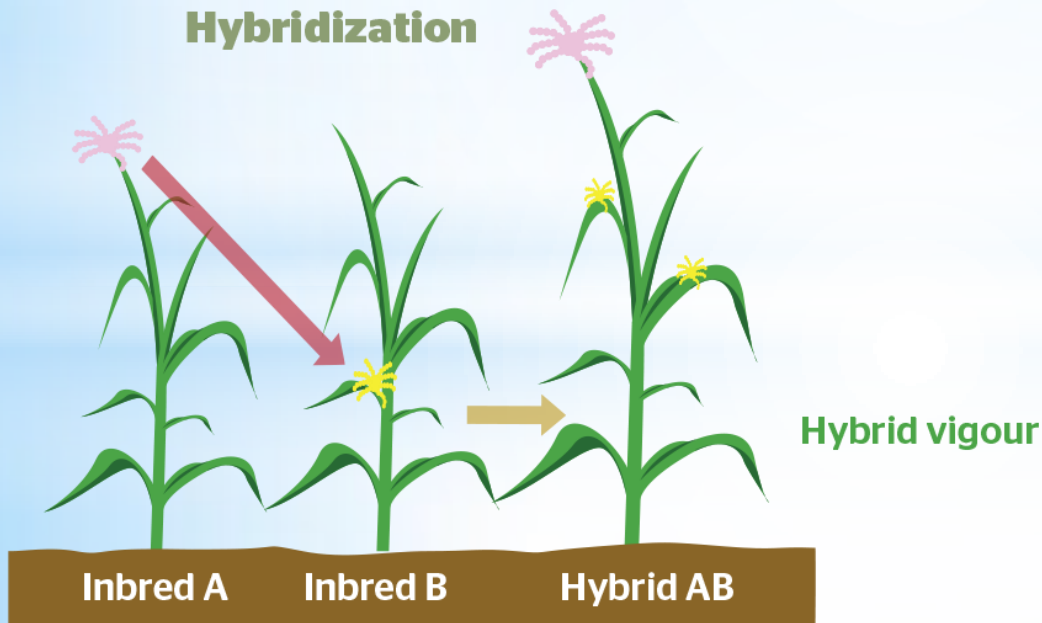
Carolus Linnaeus
(1707-1778)

Swedish botanist, physician and zoologist who developed a classification system for all types of organisms known at the time that is still used today.



Many scientists proposed ideas about evolution

2: Test crossing: sets of two inbred lines are crossed



Carolus Linnaeus
(1707-1778)

He abandoned the idea that organisms were fixed and proposed that organisms might change over time through hybridization.

Many scientists proposed ideas about evolution

George Louis Leclerc de Buffon
(1707-1788)

A French naturalist who used evidence of fossils to propose that species shared common ancestors instead of arising separately.

He also believed that the Earth was much older than 6000 years, as was commonly believed at the time.



Many scientists proposed ideas about evolution



Erasmus Darwin
(1731-1802)

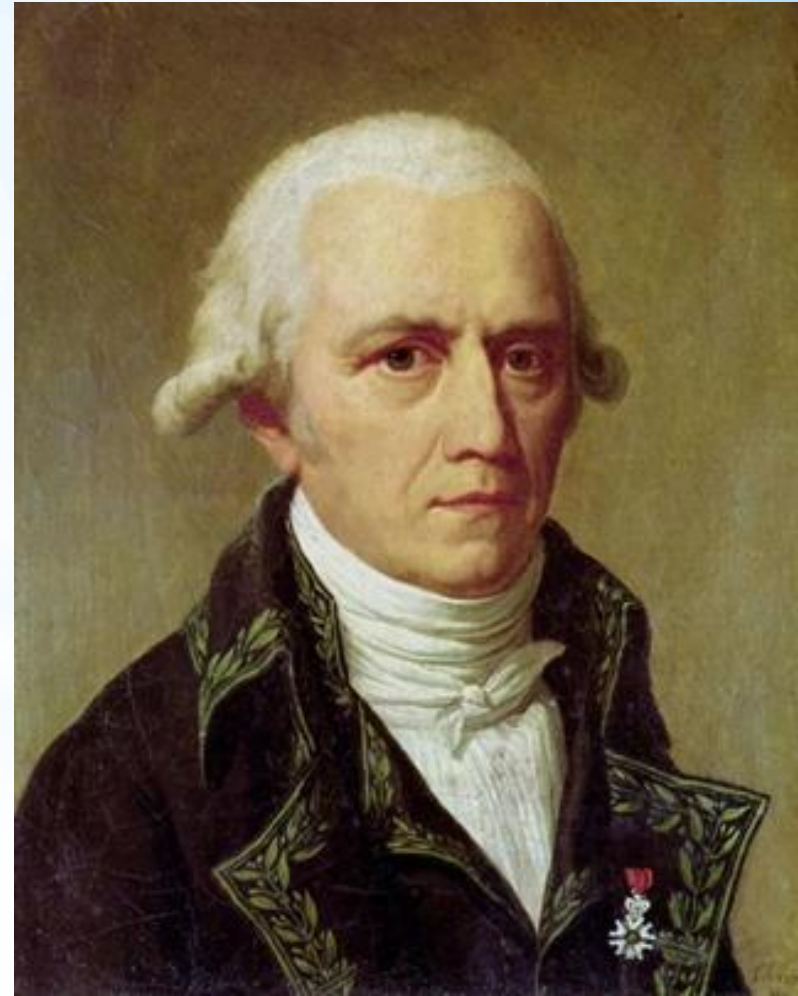
Charles Darwin's grandfather was a respected doctor and poet.

He proposed that all living things were descended from a common ancestor and that more-complex forms of life arose from less-complex forms.

He didn't have an explanation for how this happened however.

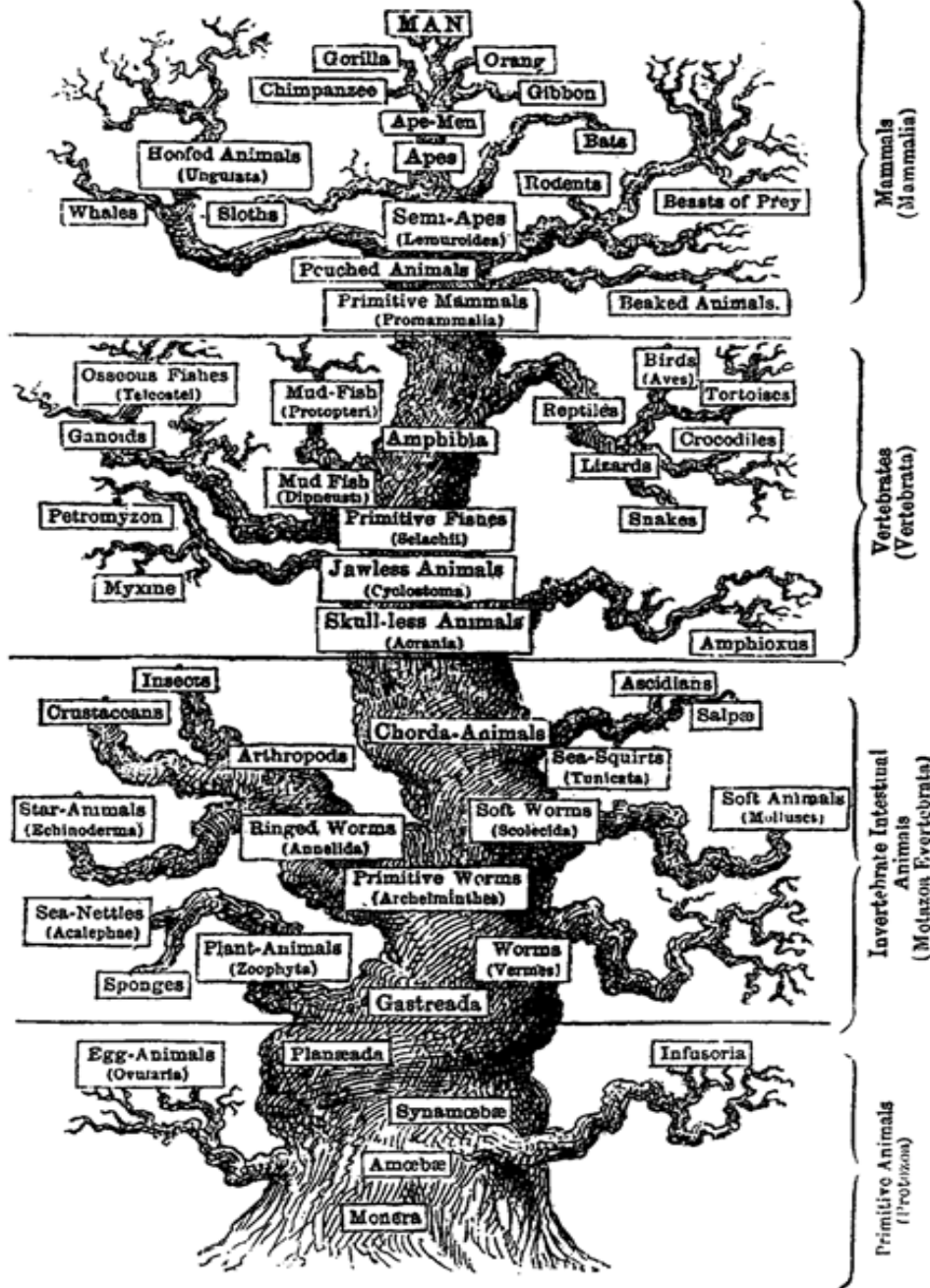
Many scientists proposed ideas about evolution

In 1809 (the year of Darwin's birth), the French naturalist Lamarck proposed that all organisms evolved toward perfection and complexity.



Jean-Baptiste Lamarck
(1744-1829)

PEDIGREE OF MAN.



Lamarck's theory that man is the most perfect form, and living things evolved toward this perfection on the tree of life.

Lamarck's Theory of Evolution

Lamarck observed that characteristics of living things could change over time.

For example, if muscles are used, they **grow stronger**.

These are called “**acquired characteristics**” because organisms aren't **born with them**.



Lamarck's Theory of Evolution

(a) Lamarck's view

Original, short-necked ancestor



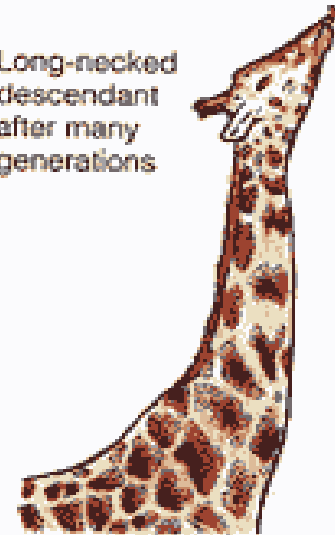
Keeps stretching neck to reach leaves higher up on tree



And continues stretching until neck becomes progressively longer



Long-necked descendant after many generations



Lamarck proposed that organisms can **pass on** these acquired characteristics to their **offspring**.

For example: **ancestors** of giraffes had **short** necks. Lamarck's theory goes that since giraffes had to stretch to get **food**, their necks became **longer** and they could pass this trait to their offspring.

Lamarck's Theory of Evolution

Lamarck did not propose **how** traits were passed on to offspring, and we know now his explanation of evolution was flawed.



Darwin's Observations



Darwin however was influenced by Lamarck's idea that changes in **physical** characteristics could be **inherited** and were driven by the **environment**.

Darwin's Observations

When Darwin was just **21** he joined the crew of the **HMS *Beagle*** as the ship's naturalist.



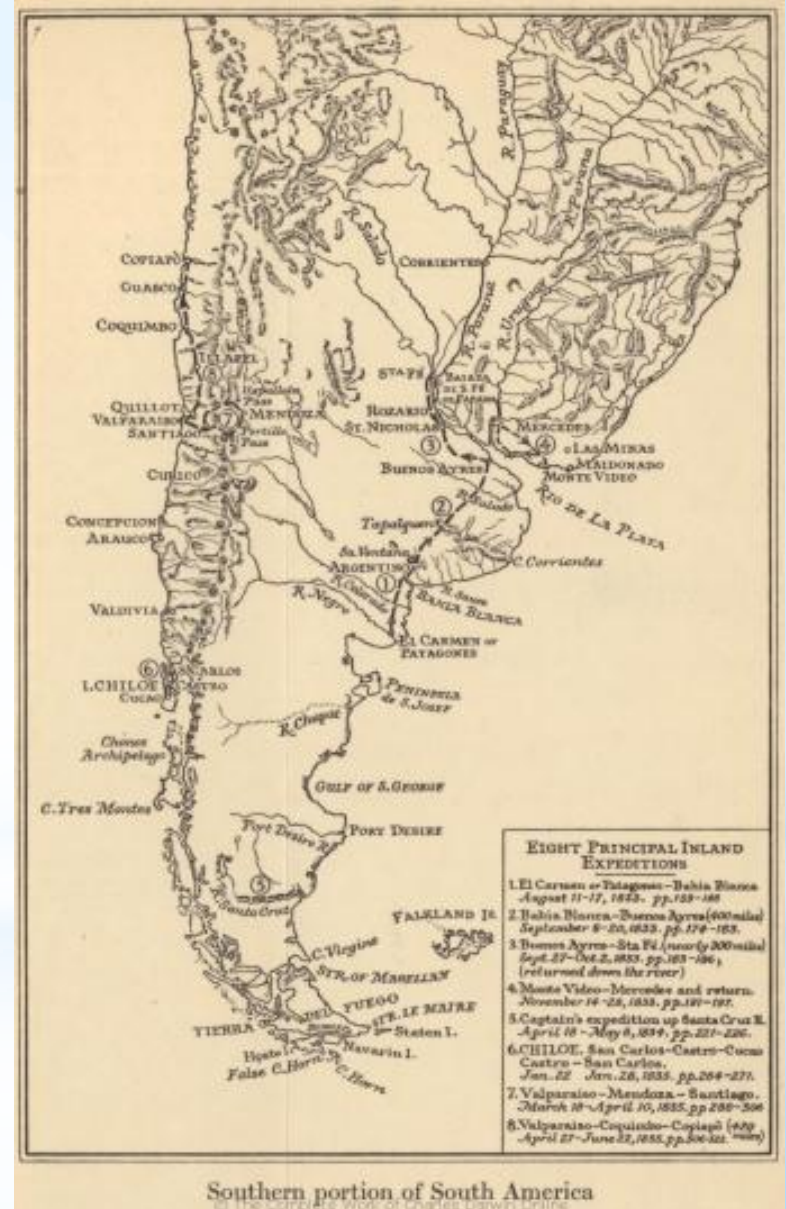
Darwin's Observations

The ship was on a mission to chart the coastline of **South America**, and would circumnavigate the globe, before Darwin returned home again.



Darwin's Observations

When the ship reached South America, Darwin spent much of his time onshore where he was struck by the **variation** of traits among similar **species**.



Darwin's Observations

Darwin noted that the species found on one island looked similar but noticeably different from species found on nearby islands or the mainland.



Iguana from South American mainland



Marine iguana from the Galapagos Islands

Darwin's Observations



The differences between species was especially noticeable in the Galapagos Islands, off the coast of Ecuador.

Darwin's Observations

Galapagos tortoises for example came in two varieties:



Saddle-backed tortoises have long necks and legs, lived in areas with tall plants.



Domed tortoises, have shorter necks and legs, lived in areas rich in mosses and short plants.

Darwin's Observations

These observations led Darwin to realize that species may somehow be able to **adapt** to their surroundings.

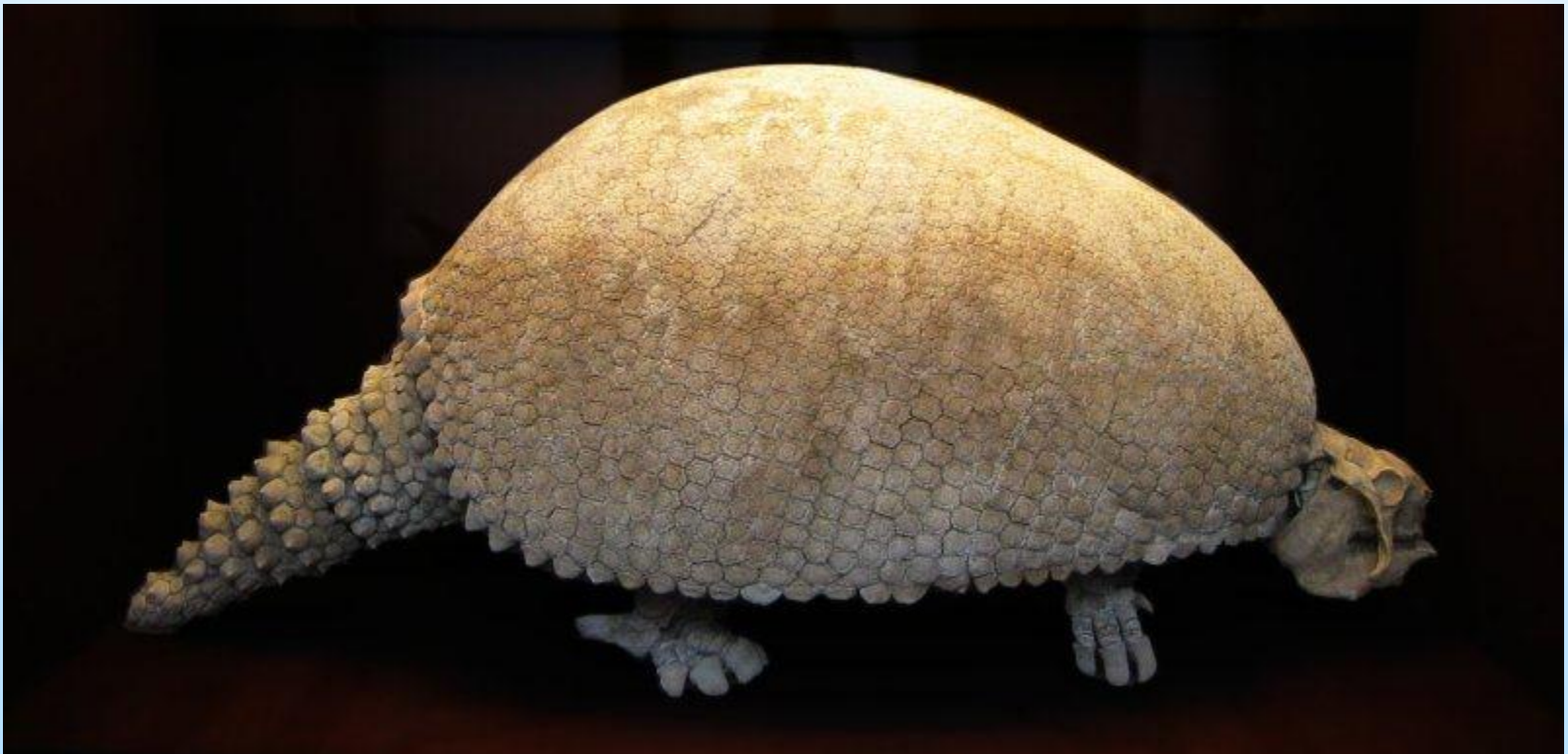
An adaptation is a feature that allows an organism to **better survive** in its environment.



Darwin's Observations

Darwin also found fossil evidence of species changing over time.

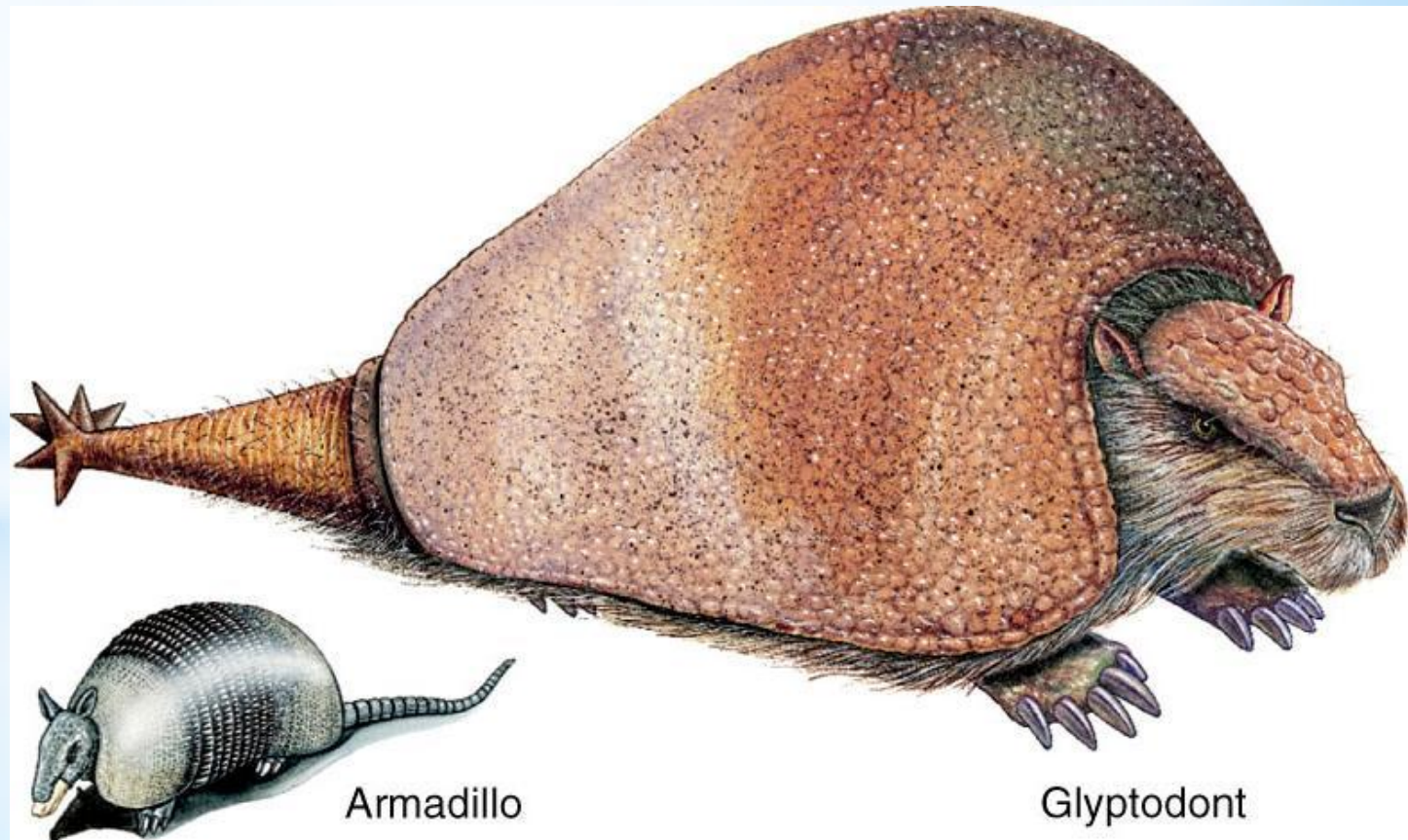
In Argentina, he found fossils of huge animals such as *Glyptodon*, a giant armadillo.



Darwin's Observations

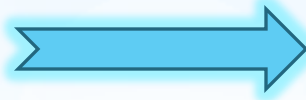
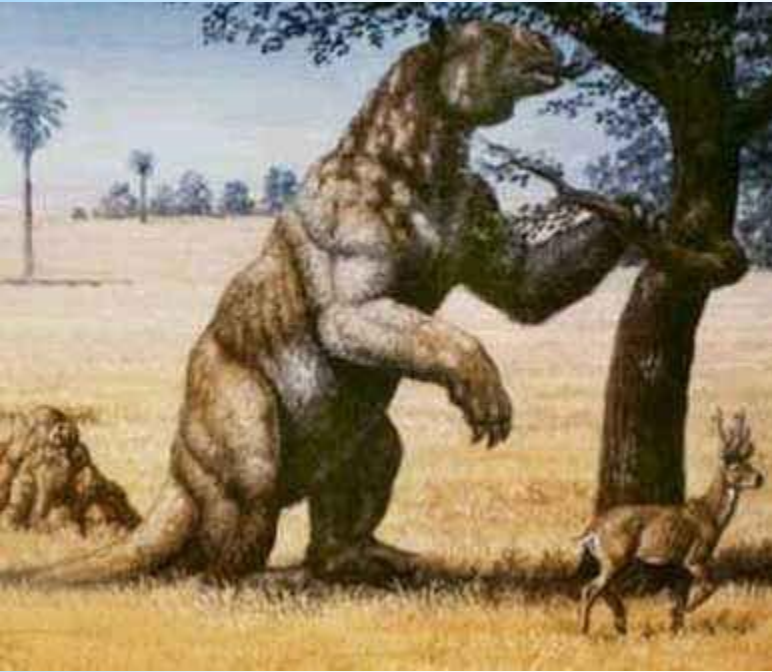
The fact that these fossils looked like living species suggested that modern animals might have some relationship to fossil forms.

These fossils suggested that in order for such changes to occur, Earth must be much more than 6,000 years old!



Armadillo

Glyptodont



“This wonderful relationship in the same continent between the dead and the living will, I do not doubt, throw more light on the appearance of organic beings on our earth, and their disappearance from it, than any other class of facts.”

--The Voyage of the Beagle, ch. 8

