Changes Over Time

Chapter 6

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How do life forms changes over time ?

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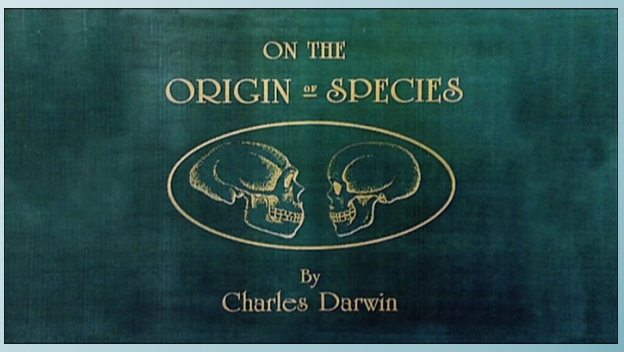
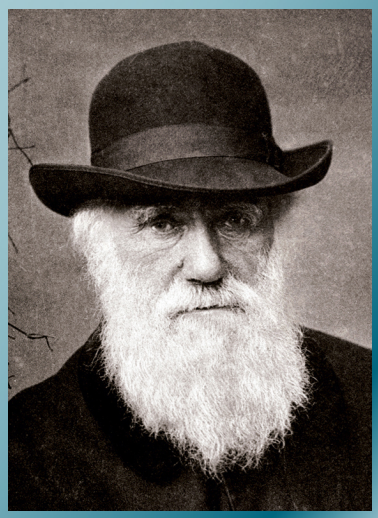
Darwin's Theory

Lesson 1





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What was Darwin's Hypothesis?

What is Natural Selection?

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What Was Darwin's Hypothesis?

Charles Darwin

Background

*graduated from college in 1831

*wanted to be a doctor; got sick at the sight of blood

*earned degree in theology

*interested in plants and animals

*signed on for a 5 year voyage aboard HMS Beagle as a naturalist- person who observes and studies the natural world

*observations from trip helped him form his evolution theory

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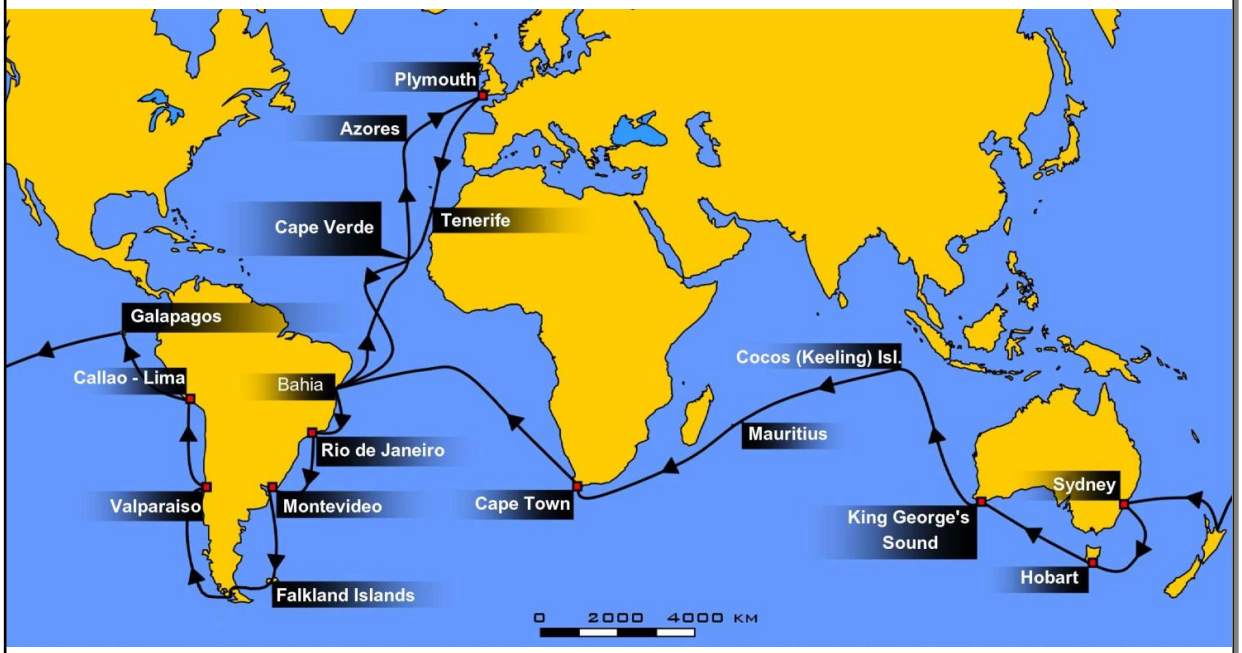

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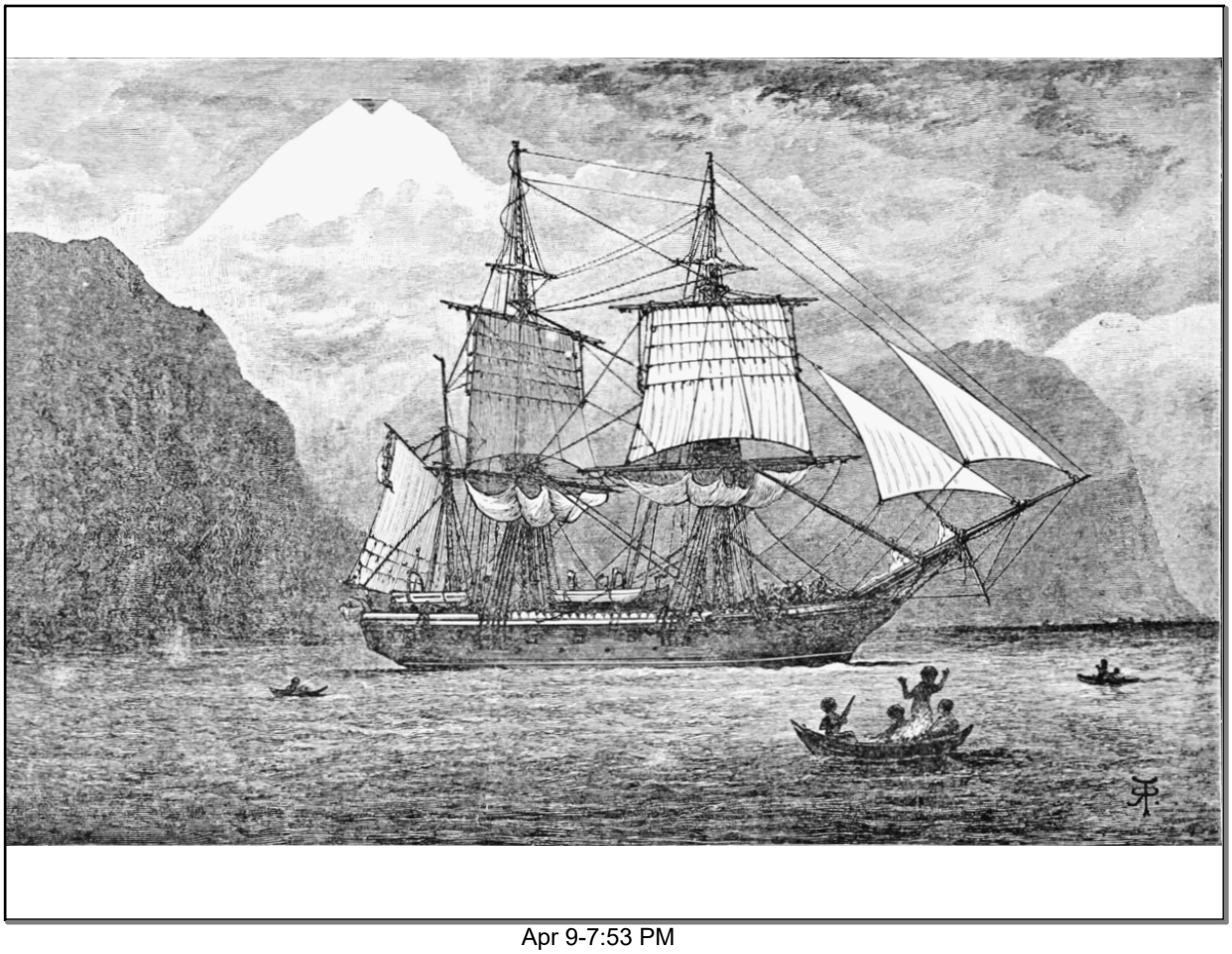

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Diversity

Darwin was amazed by the diversity of living things that he saw during his voyage

* Wondered why they were so different from England

ex. insects that looked like flowers, sloths, etc

* Today, scientists know that organisms are much more diverse than what Darwin thought

* Identified more than 1.6 million species

* Species= a group of similar organisms that can mate with each other and produce fertile offspring

*Exact number of species in unknown- many places on Earth have not been studied

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Fossils

Darwin saw fossils that died long ago

fossil= the preserved remains or traces of an organism that lived in the past

*Some fossils puzzled Darwin

he saw that fossils of sloths were much larger than the living sloths

??? What happened to the ancient ground sloths?

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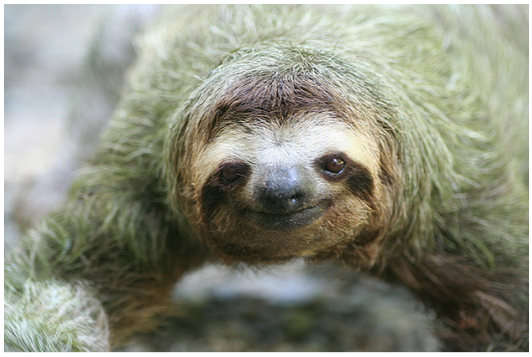

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Galapagos Organisms

The Beagle made many stops along the

Atlantic and Pacific coasts of South America

*From the Pacific, the ship sailed west to the Galapagos Islands
*Darwin observed many unusual organisms there
*Compared organisms from Galapagos Islands to organisms that lived elsewhere
*Compared organism living on the different islands

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Comparisons to South American Organisms

*Darwin discovered many similarities between organisms on the Galapagos Islands and those found in South America

* Many birds and plants resembled ones on the mainland

*Also noted many differences

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Darwin became convinced that species do not stay the same

* could change and even produce new species over time

*Darwin thought the island species were somehow related to the land species

*thought the island species had becomes different over time

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Comparison Among the Islands

*Darwin also discovered many differences among the organisms on the different Galapagos Islands

Example- tortoise on one island had a dome shaped shell, while the tortoise on another island had a saddle shape shell

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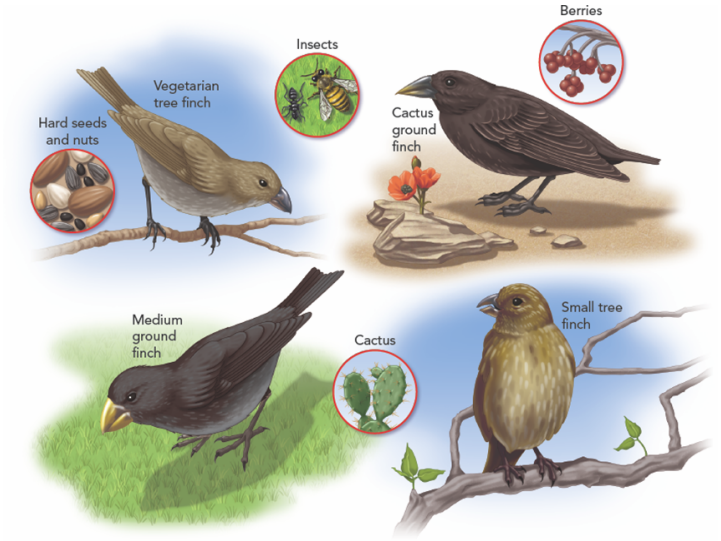
Adaptations

*Birds were also different from one island to the next



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*Darwin learned that all the birds were finches

*Concluded that the finch species were all related to a single ancestor that came over from the mainland

*Over time, different finches developed different beak shapes and sizes to suit the food it ate

beak shape is an example of an adaptation

adaptation- a trait that increases an organism's ability to survive and reproduce

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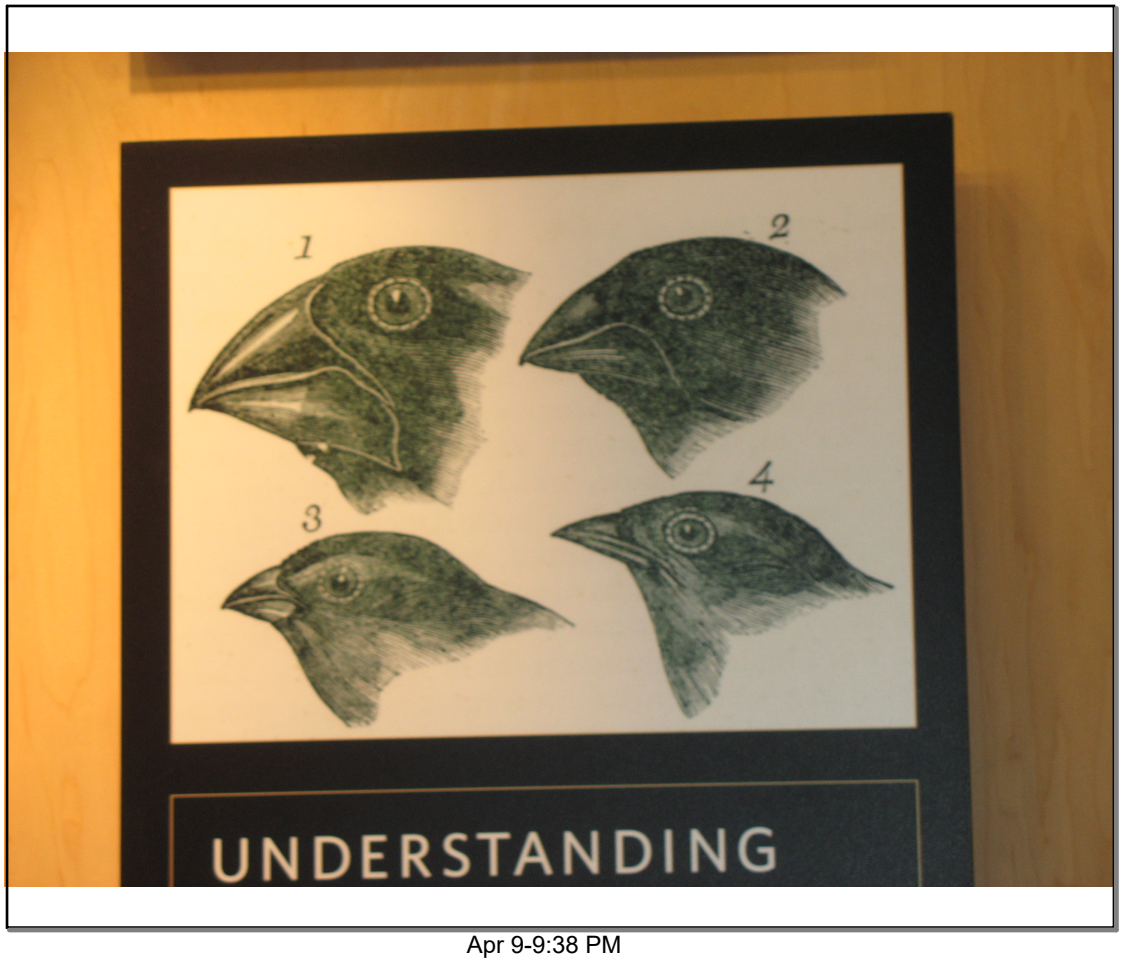

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Darwin's hypothesis

Based on his observation, Darwin was convinced that organisms can change over time

*The process of change over time is called evolution

*Darwin wanted to know how the organisms changed and consulted many scientists

Using his observations, Darwin reasoned that plants or animals that arrived on the Galapagos Islands were faced with different conditions than what they has on the mainland

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* Darwin hypothesized that species change over many generations and become better adapted to new conditions

*Darwin's ideas are often referred to as a theory of evolution

Scientific theory- well-tested concept that explains a wide range of observations

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Artificial Selection

*Darwin studied the offspring of domesticated animals that were produced by artificial selection to try to understand how evolution could occur

*Artificial selection- only the organism with a desired characteristic are bred

ex. Darwin's pigeons

*Darwin thought that a process similar to artificial selection might happen in nature

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What is Natural Selection?

In 1858, Darwin and Alfred Russel Wallace, another British biologist, both proposed the same explanation for how evolution occurs

*Darwin described his explanation in his book, *The Origin of the Species*

*Darwin proposed that evolution occurs by means of Natural Selection

Natural Selection- is the process by which individuals that are better adapted to their environment are more likely to survive and reproduce than other members of the same species

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*Darwin identified factors that affect the process of natural selection

overproduction

variation

competition

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Overproduction

Darwin knew that most species produce far too many offspring than can possibly survive

* not enough resources to live on like food,

water, living space

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Variation

Members of a species differ from one another in their traits

* Any difference between individuals of the same species is called a variation

ex. sea turtles may differ in color, size, ability to swim ...

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Competition

Since food, space and other resources are limited, members of a species must compete with one another for survival

*competition does not always mean physical fighting

*usually is more indirect

ex. slower turtle caught by predator while faster one escapes

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Selection

Darwin observed that some variations make individuals better adapted to their environment

* individuals are more likely to survive

*offspring may inherit helpful characteristics

* offspring will be more likely to survive and pass those traits on

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The environment selects organisms with helpful traits to become parents of the next generation

Darwin proposed that over a long period of time, natural selection can lead to change.

Helpful variations may accumulate in a species, while unfavorable ones may disappear

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Environmental Change

A change in the environment can affect individuals, organisms with specific traits or entire species

*changes that affect an organism's ability to survive and reproduce leads to natural selection

example monkey flower plant does not grow in soils with a high concentration of copper. Due to genetic variation some varities are able to grow near copper mines

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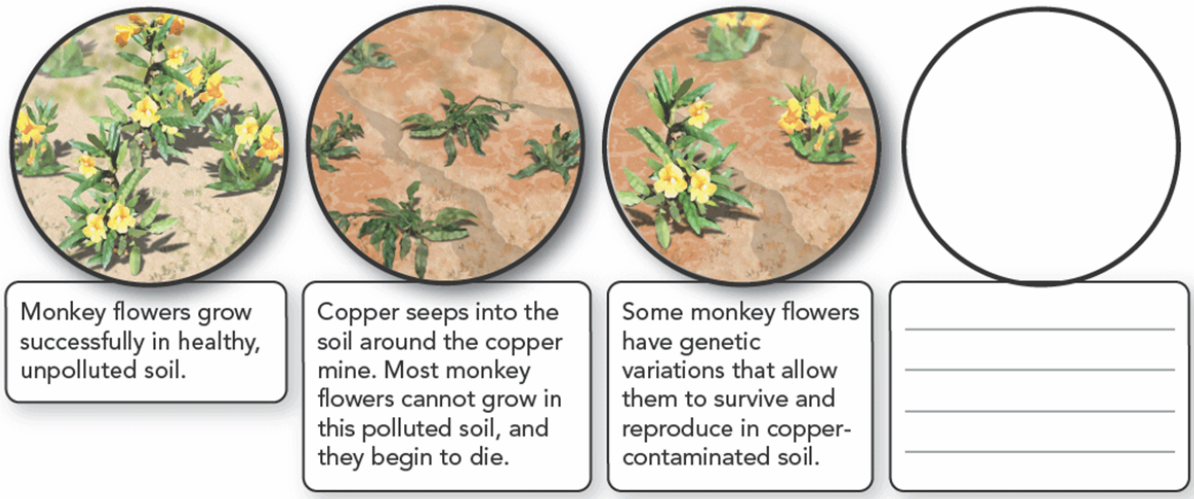
Environmental Change
When copper contaminated the soil surrounding the monkey flowers, the environment changed. What do you think the area will look like in ten years?



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Genes and Natural Selection

Without variations, all members of species would have the same traits and have the same chances of surviving and reproducing.

Darwin could not explain what caused the variations or how they were passed on.

Scientists later learned that variations can result from changes in the genes and shuffling different forms of those genes

Only traits that are inherited, or controlled by genes that are passed on to offspring can be acted upon by natural selection

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