

10.1 Early Ideas About Evolution

KEY CONCEPT

There were theories of biological and geologic change before Darwin.



10.1 Early Ideas About Evolution

► Early scientists proposed ideas about evolution.

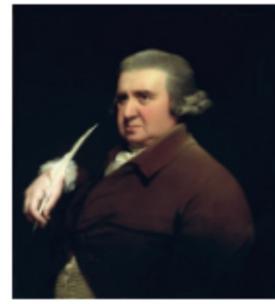
- Evolution is the biological change process by which descendants come to differ from their ancestors.
- A species is a group of organisms that can reproduce and have fertile offspring.

HORSE ANCESTOR (55 MYA)



10.1 Early Ideas About Evolution

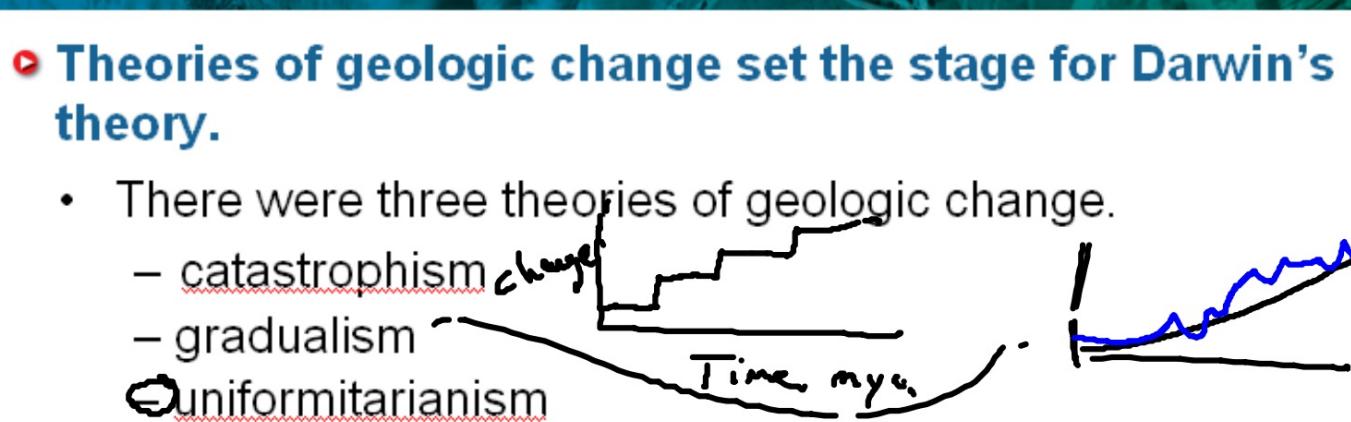
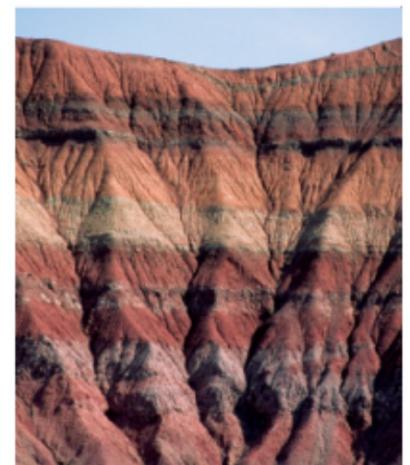
- There were many important naturalists in the 18th century
 - binomial nomenclature
 - Linnaeus: classification system from kingdom to species
 - Buffon: species shared ancestors rather than arising separately
 - E. Darwin: more-complex forms developed from less-complex forms
 - Lamarck: environmental change leads to use or disuse of a structure



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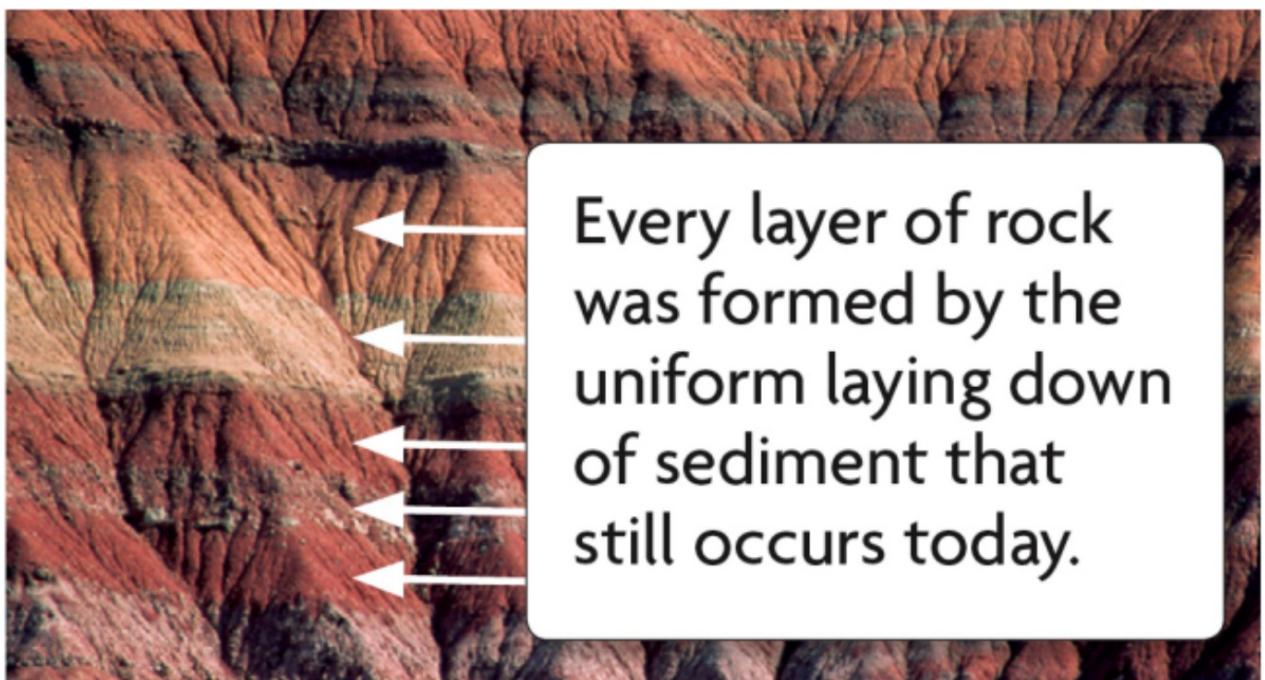
• Theories of geologic change set the stage for Darwin's theory.

- There were three theories of geologic change.
 - catastrophism
 - gradualism
 - uniformitarianism



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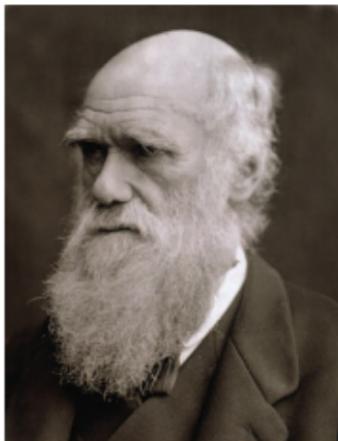
- Uniformitarianism is the prevailing theory of geologic change.



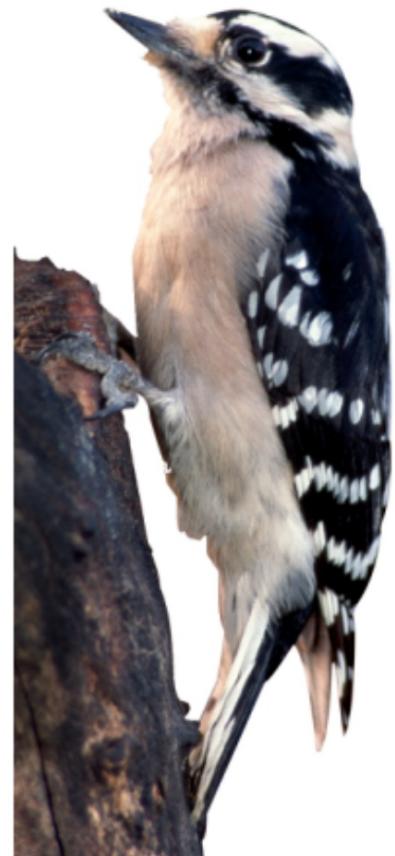
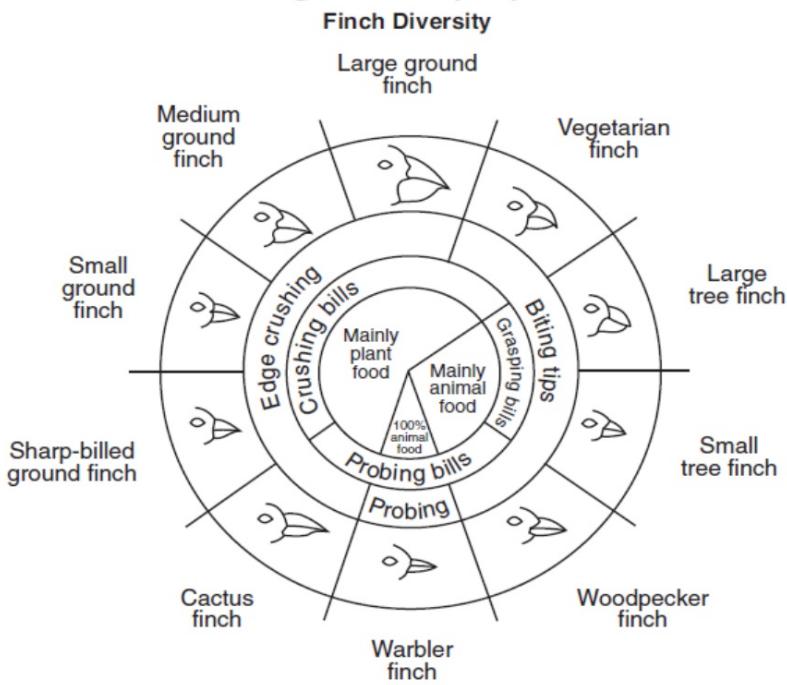
10.2 Darwin's Observations

► Darwin observed differences among island species.

- Variation is a difference in a physical trait.
 - Galápagos tortoises that live in areas with tall plants have long necks and legs.
 - Galápagos finches that live in areas with hard-shelled nuts have strong beaks.



- An adaptations is a feature that allow an organism to better survive in its environment.
 - Species are able to adapt to their environment.
 - Adaptations can lead to genetic change in a population.



Adaptation:

Structural: body part of plant/animal that better enables survival

Functional: how an organism operates to better enable survival

Behavioral: an action of an organism that better enables survival



deep ocean
high elevations

10.2 Darwin's Observations

- Darwin observed fossil and geologic evidence supporting an ancient Earth.

- Darwin found fossils of extinct animals that resemble modern animals.
- Darwin found fossil shells high up in the Andes mountain



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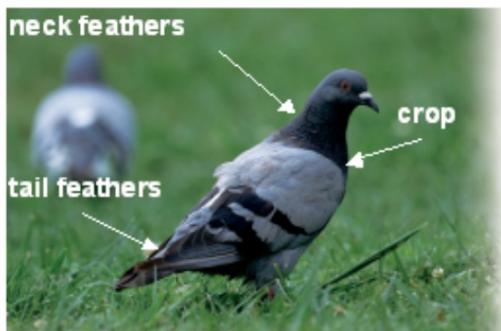
- He saw land move from underwater to above sea level due to an earthquake.
- Darwin extended his observations to the evolution of organisms.



10.3 Theory of Natural Selection

- ➊ Several key insights led to Darwin's idea for natural selection.

- Darwin noticed a lot of variation in domesticated plants and animals.
- Artificial selection is the process by which humans select traits through breeding.



10.3 Theory of Natural Selection

- Natural selection is a mechanism by which individuals that have inherited beneficial adaptations produce more offspring on average than do other individuals.
- Heritability is the ability of a trait to be passed down.
- There is a struggle for survival due to overpopulation and limited resources.
- Darwin proposed that adaptations arose over many generations.

► **Natural selection explains how evolution can occur.**

- There are four main principles to the theory of natural selection.
 - variation
 - overproduction
 - adaptation
 - descent with modification

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OVERPRODUCTION



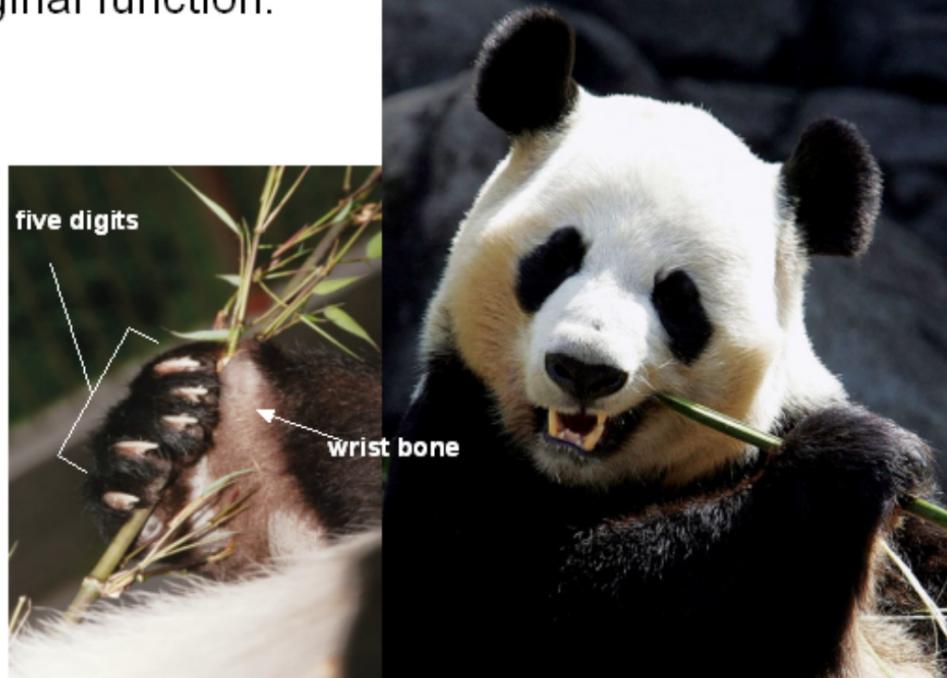
ADAPTATION



10.3 Theory of Natural Selection

• Natural selection acts on existing variation.

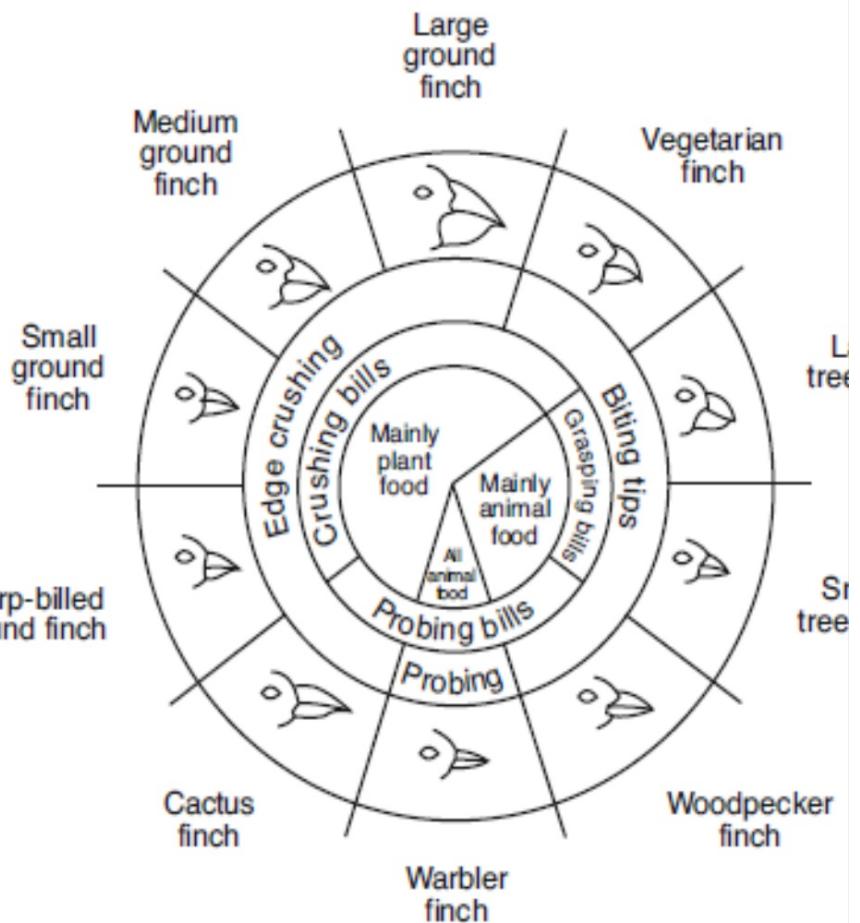
- Natural selection can act only on traits that already exist.
- Structures take on new functions in addition to their original function.



Kickoff:

1. Which species of finch has an edge-crushing bill that can also probe into plants for food?
2. One finch that would most likely compete with the warbler finch for food is the
3. The large ground finch, sharp-billed ground finch, and small tree finch inhabit the same island. If the insect population decreases, which finch would most likely be affected? Support your answer.

Variations in Beaks of Galapagos Islands Finches



from: Galapagos: A Natural History

10.4 Evidence of Evolution

KEY CONCEPT

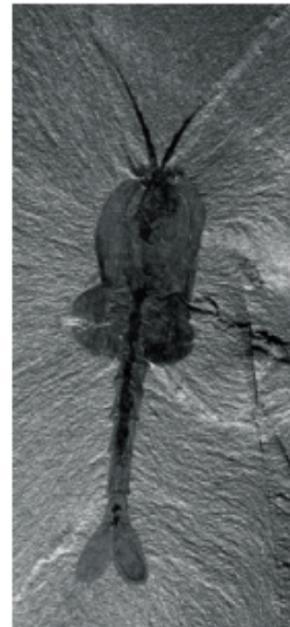
Evidence of common ancestry among species comes from many sources.



10.4 Evidence of Evolution

• Evidence for evolution in Darwin's time came from several sources.

- Fossils provide evidence of evolution.
- Fossils in older layers are more primitive than those in the upper layers.

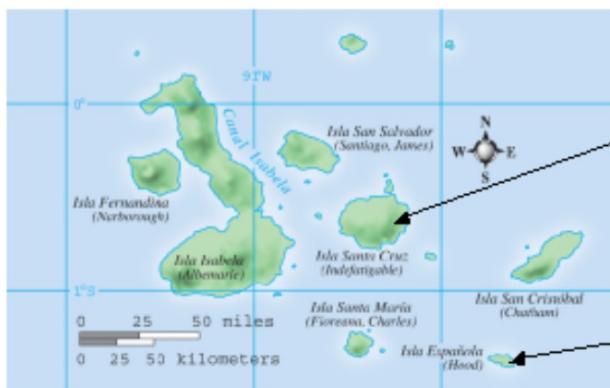


10.4 Evidence of Evolution

- The study of geography provides evidence of evolution.
 - island species most closely resemble nearest mainland species
 - populations can show variation from one island to another

Speciation - geographic isolation

behavioral
temporal

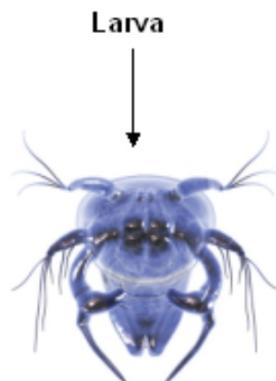


10.4 Evidence of Evolution

- Embryology provides evidence of evolution.
 - identical larvae, different adult body forms
 - similar embryos, diverse organisms



↑
Adult crab



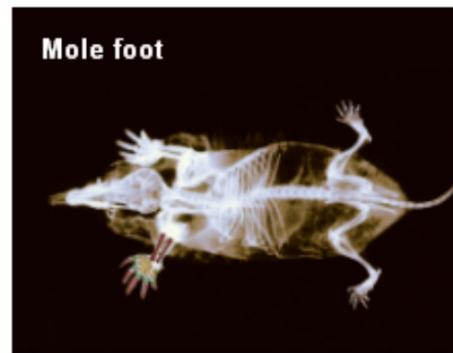
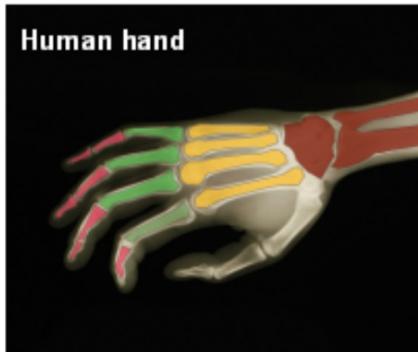
Larva



↑
Adult barnacle

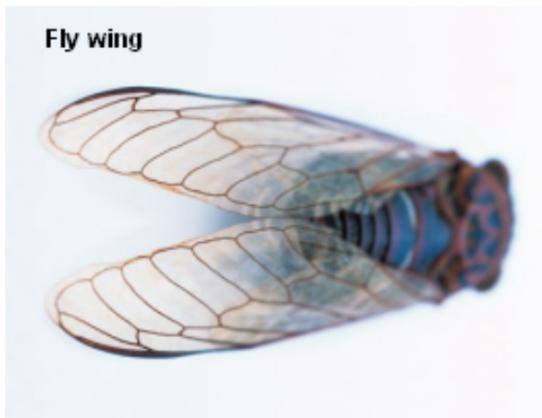
10.4 Evidence of Evolution

- The study of anatomy provides evidence of evolution.
 - Homologous structures are similar in structure but different in function.
 - Homologous structures are evidence of a common ancestor.



10.4 Evidence of Evolution

- The study of anatomy provides evidence of evolution.
 - Analogous structures have a similar function.
 - Analogous structures are not evidence of a common ancestor.



10.4 Evidence of Evolution

• Structural patterns are clues to the history of a species.

- Vestigial structures are remnants of organs or structures that had a function in an early ancestor.
- Ostrich wings are examples of vestigial structures.



