

Chapter 22 - A Descent with Modification: A Darwinian View of Life

I. Evolution

a) What is Evolution and Adaptation?

1. Change over time of the genetic composition of a population
2. Descent of modern organisms with modification from preexisting organisms

i. Evolutionary Adaptation

- Accumulation of inherited characteristics that enhance organisms' ability to survive in specific environments

b) Pre-Darwinian Theory of Evolution

ii. Lamarck

- Use and disuse: bodies of living organisms are modified through use or disuse of parts
- Inheritance of acquired characteristics – these modifications are inherited by offspring
- These ideas turned out to be wrong

c) Evolution by Natural Selection

iii. Darwin and Wallace developed the theory independently

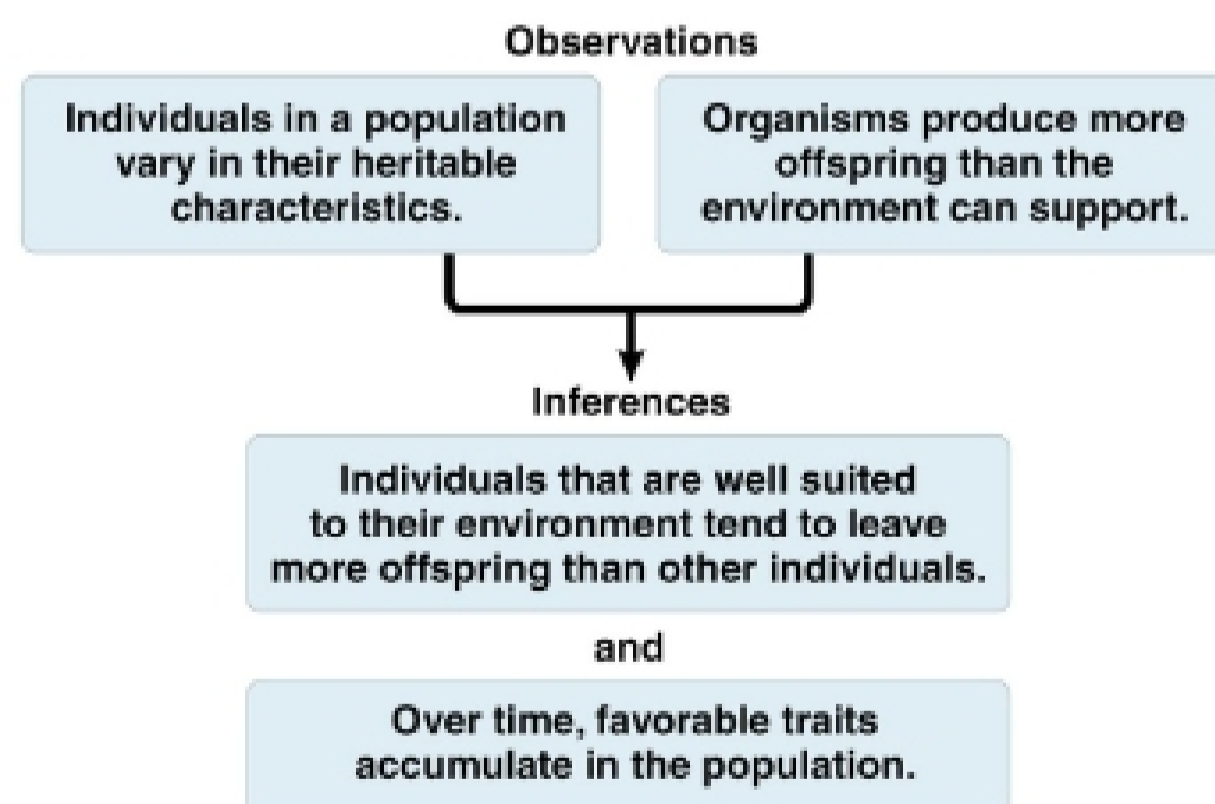
- Darwin – voyage of the Beagle to the Galapagos islands
- Wallace – naturalist in Indonesia

II. Natural Selection

- The unequal survival and reproduction of organisms due to environmental factors, resulting in the preservation or keeping of favorable adaptations
- This process "selects" what is best from what is available in the gene pool
- New characteristics are not created on demand

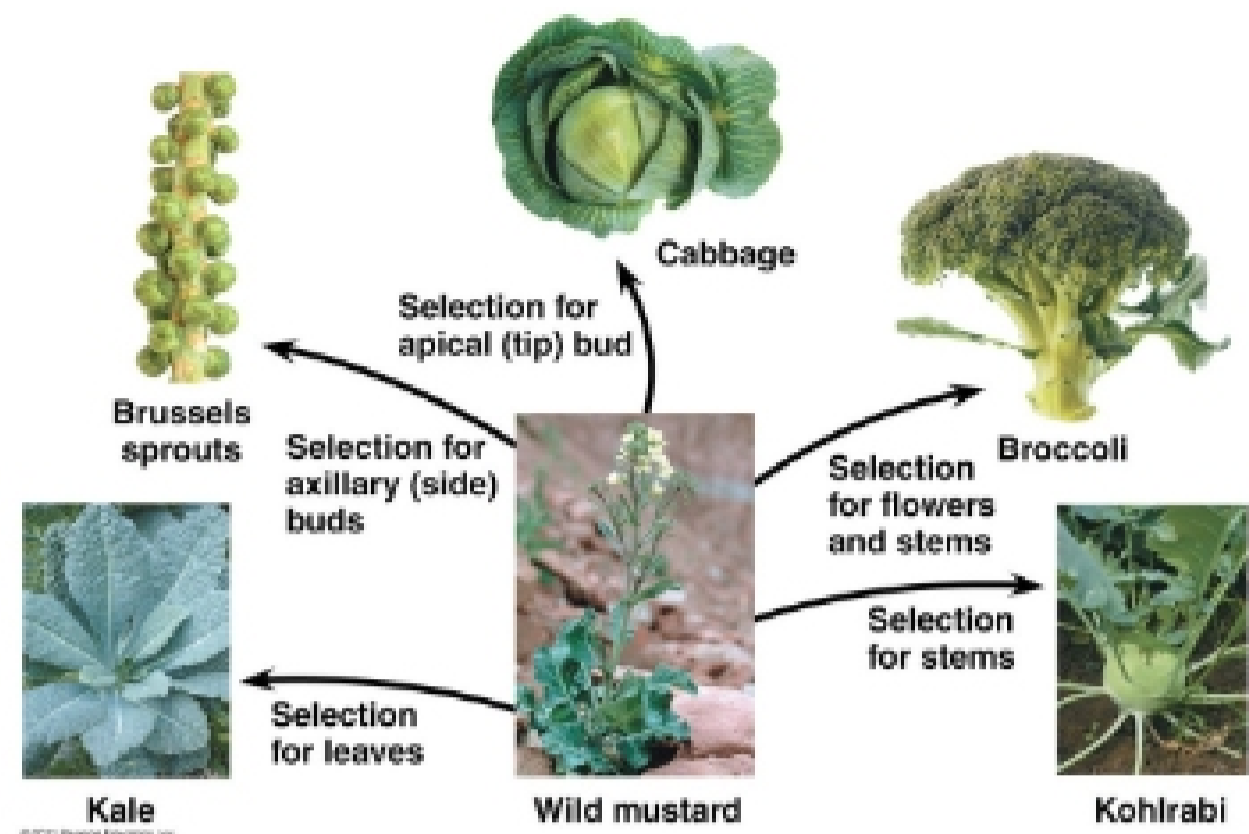
Mechanisms behind natural selection:

Observations → Drawing Inferences



Think about the 100-m dash track and field competition. How can we change this race to reflect the process of natural selection?

- Have people start at different times
- Make the race more difficult
- Change the track
- Change the resources
- Rewards/punishments for winners and losers



In natural selection: some individuals have traits that allow them to survive longer than other individuals so they will leave genes for their offspring that will be added to gene pool

III. Artificial Selection

- Selective breeding of organisms to encourage the occurrence of desirable traits
- Analogous to natural selection

Concept 22.3 – Evolution is supported by an overwhelming amount of scientific evidence

Examples of Natural Selection: Soapberry bug - beak size difference in different areas, use beaks to insert into balloon vine plants

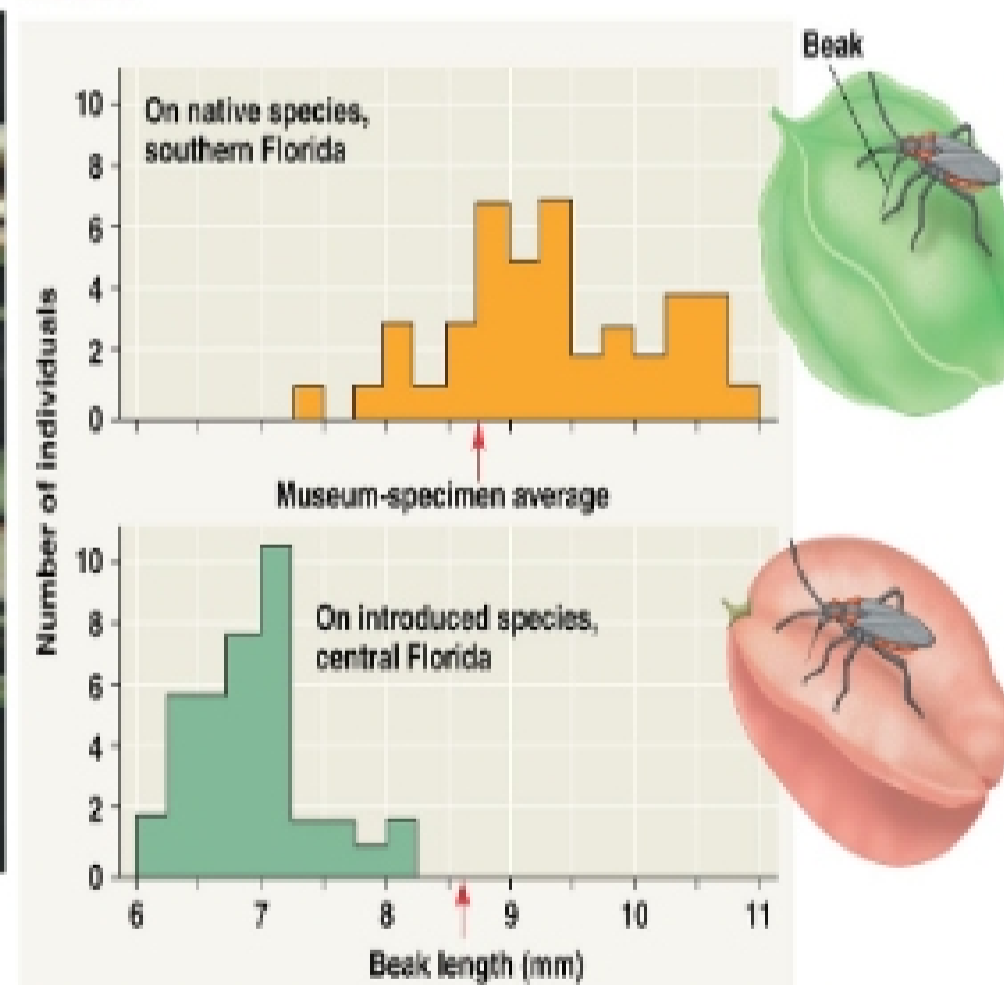
FIELD STUDY



Soapberry bug with beak inserted in balloon vine fruit

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RESULTS



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Within a few weeks of treatment with the drug 3TC, a patient's HIV population consists almost entirely of 3TC-resistant viruses. How can this best be explained?

- HIV has the ability to change its surface proteins to resist drugs
- The patient must have become re-infected with 3TC-resistant viruses
- HIV began making drug resistant versions of reverse transcriptase in response to the drug
- A few drug resistant viruses were present at the start of treatment, and natural selection increased in their frequency**

Insert images from textbook

- Homologous & Analogous Structures:

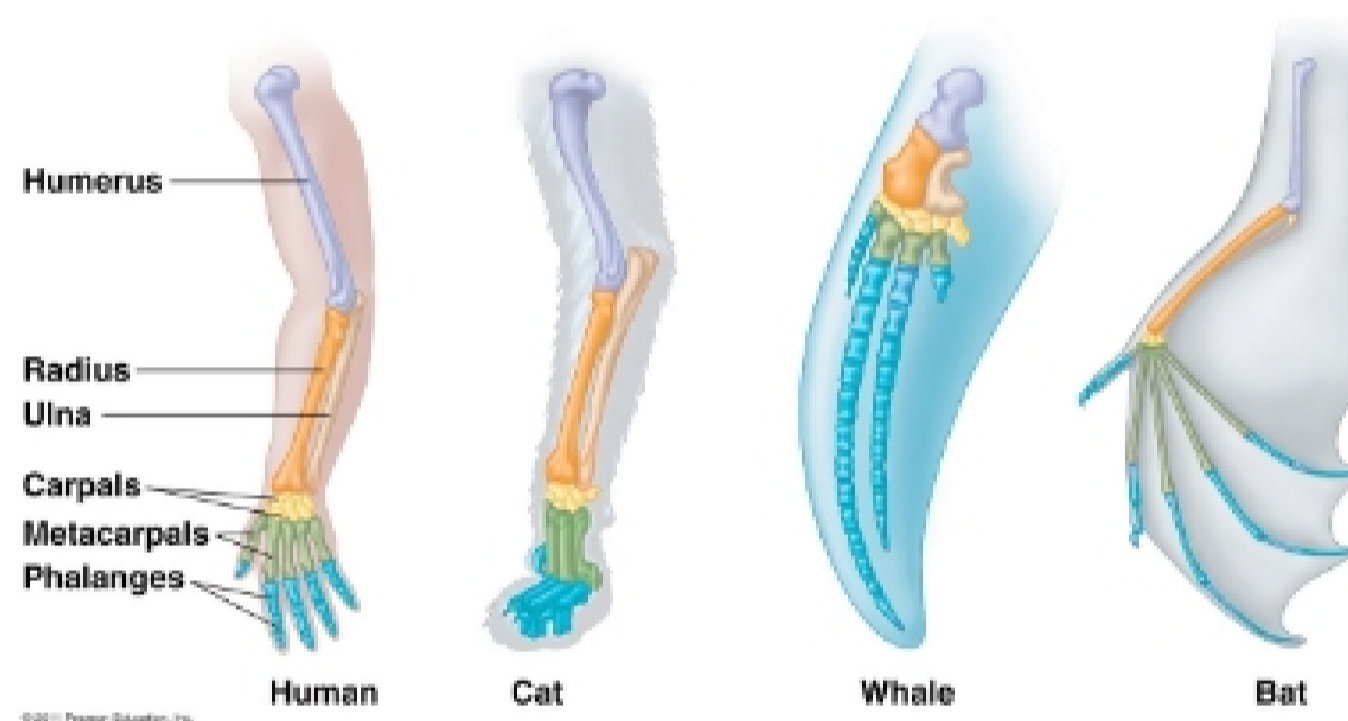
Homologous

- Structures or other attributes in different species that resemble each other because of common ancestry

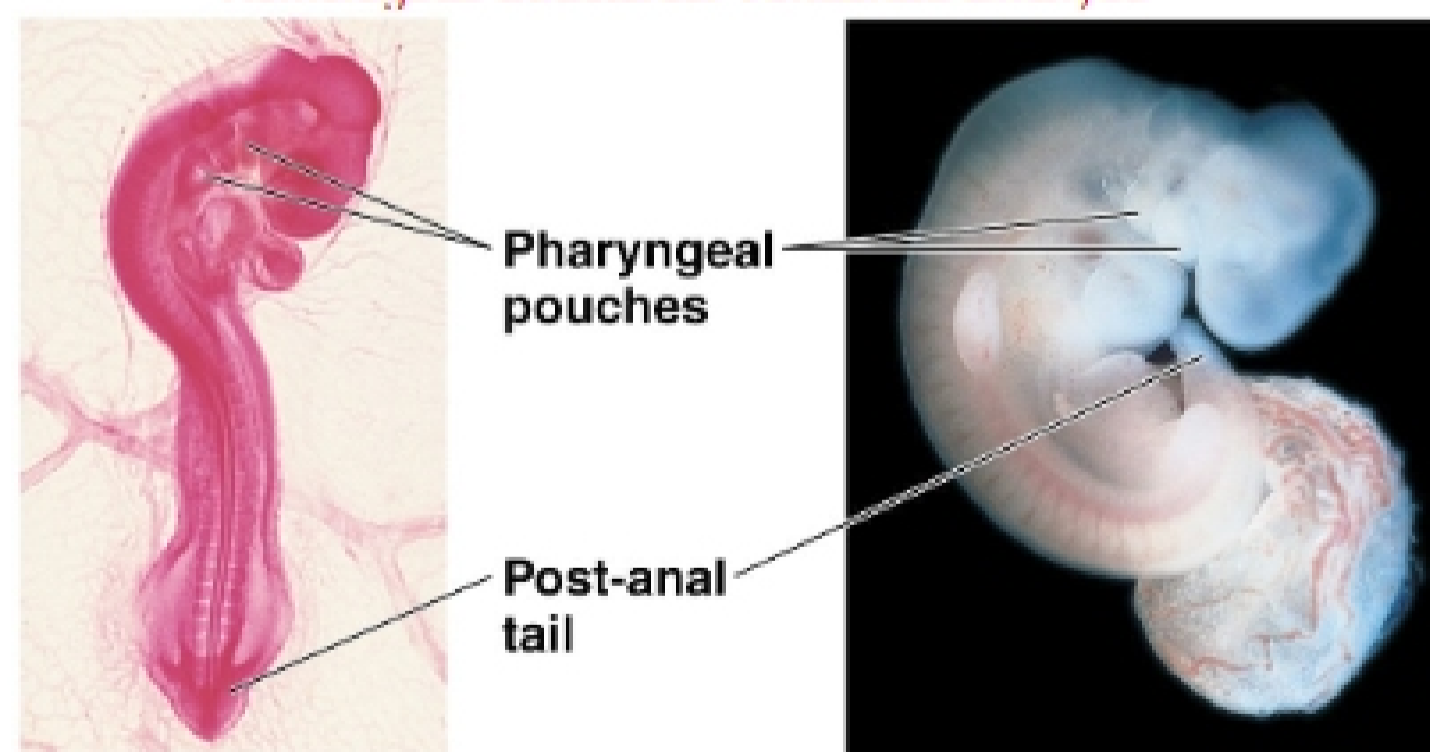
Analogous

- Structures that are similar in function but not in structure and developmental and evolutionary origin

Homologous Structures: Mammalian Forelimbs



Homologous Structures: Vertebrate Embryos



Chick embryo (LM)

Human embryo

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- All vertebrates share similar developmental genes