The Theory of Evolution

Chapter 15

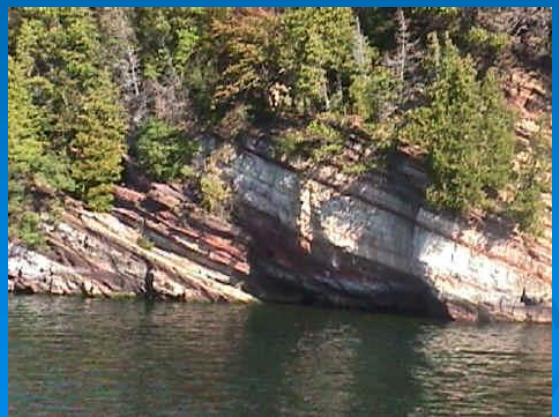
What is evolution?

Change over time

Theory -- well supported, testable explanation of phenomena that have occured in the natural world

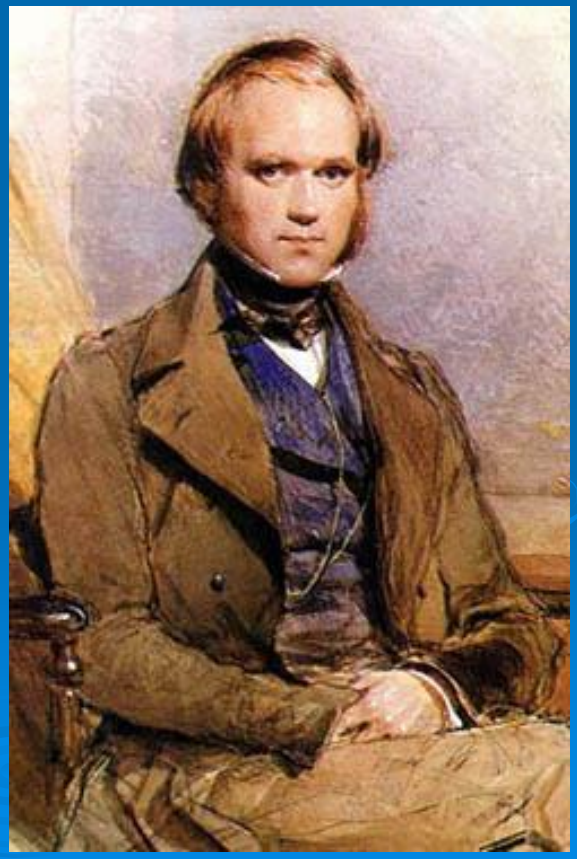
Evidence of change

- Many fossils were discovered that were very different from living animals
- Hutton and Lyell
  - Geological processes continue today as they did when the earth was first formed
  - Earth is SLOWLY changed by erosion, plate tectonics
  - Earth is 4.5 billion years old

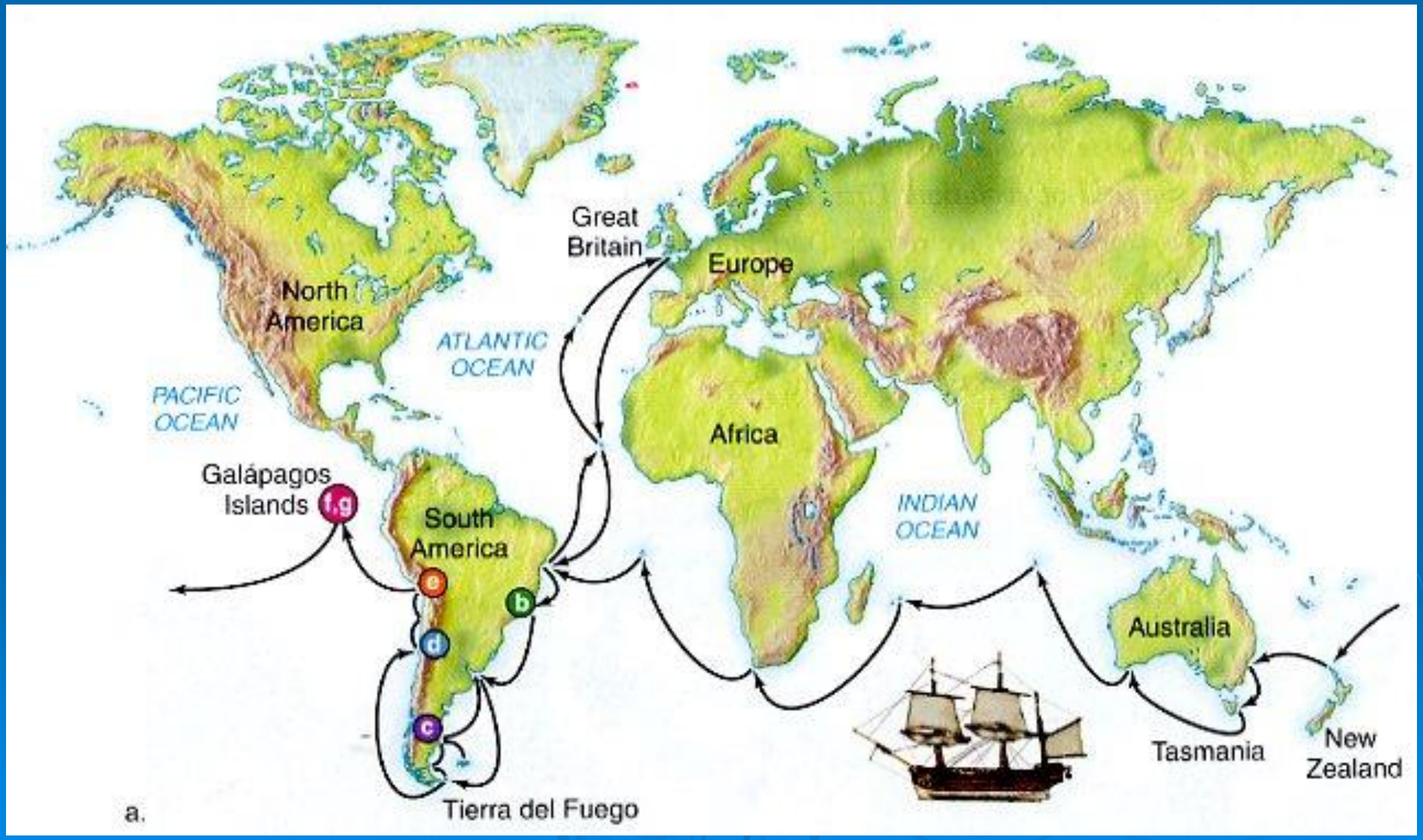


Darwin's travels

- H.M.S. Beagle 1831-1836
- Collected many specimens
- Observed much diversity



Darwin's Travels



Darwin's Observations

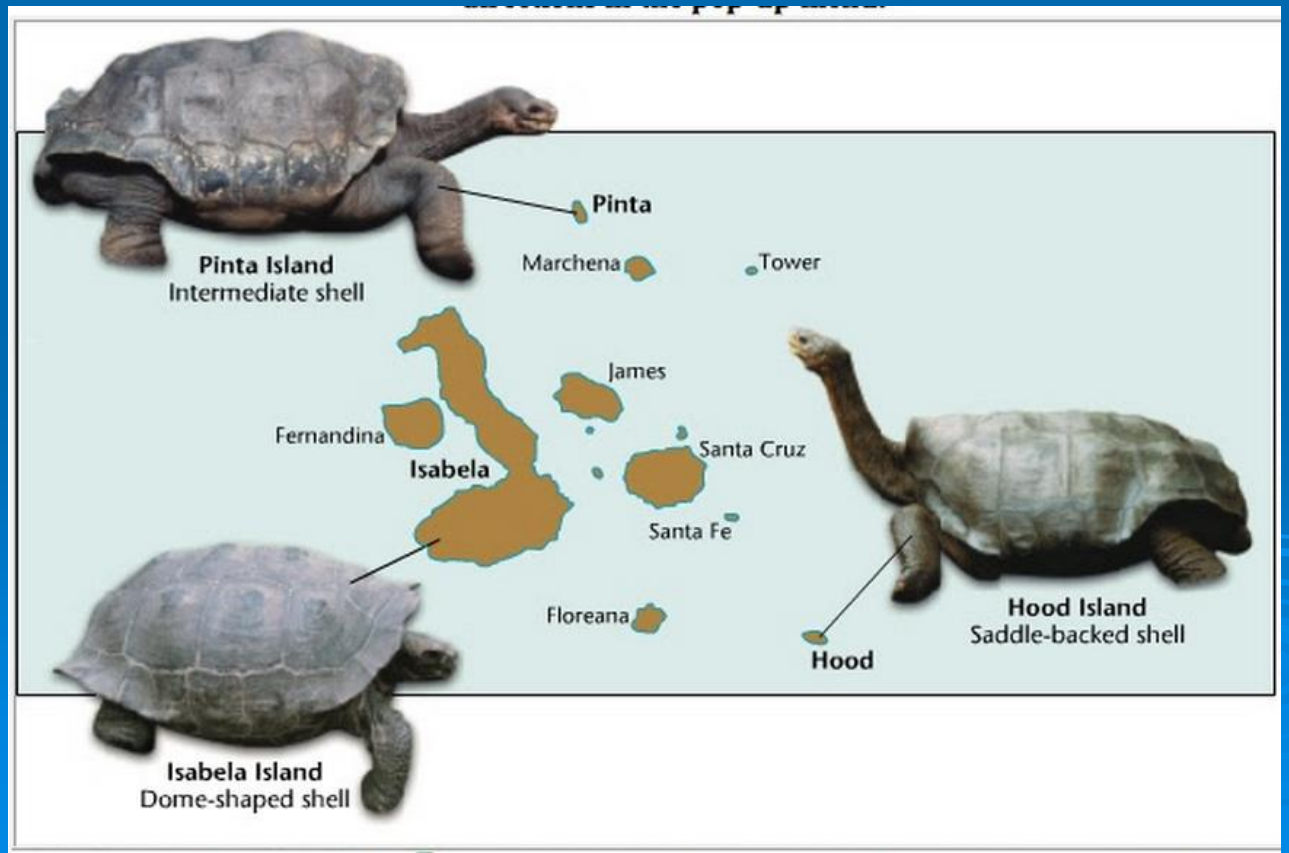
- Patterns of Diversity
  - plants and animals were well suited to their environment
  - Similar ecosystems on different continents had different species of animals
    - Grasslands in Europe, Argentina and Australia had very different animals
- Fossils
  - Why had some become extinct? Why did they look so different from animals today? Why were some similar to animals today?

The Galapagos Islands

- Different islands had very different climates

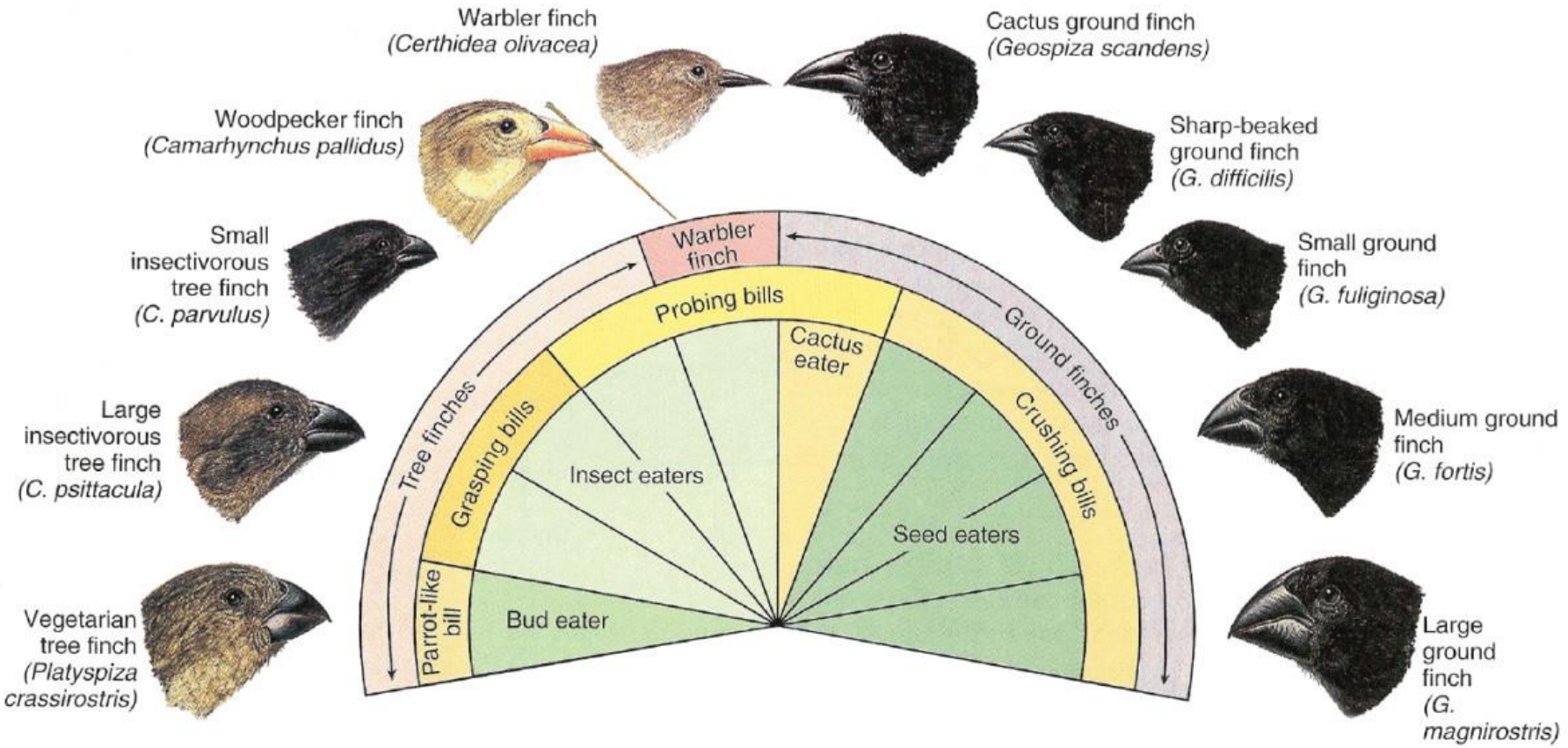
The Galapagos Islands

- Tortoises varied from one island to another
  - Long neck, open shell for hard to reach vegetation
  - Short neck, dome shaped shell = greater protection when vegetation is abundant



The Galapagos Islands

- Finches had different shaped beaks



The Galapagos Islands

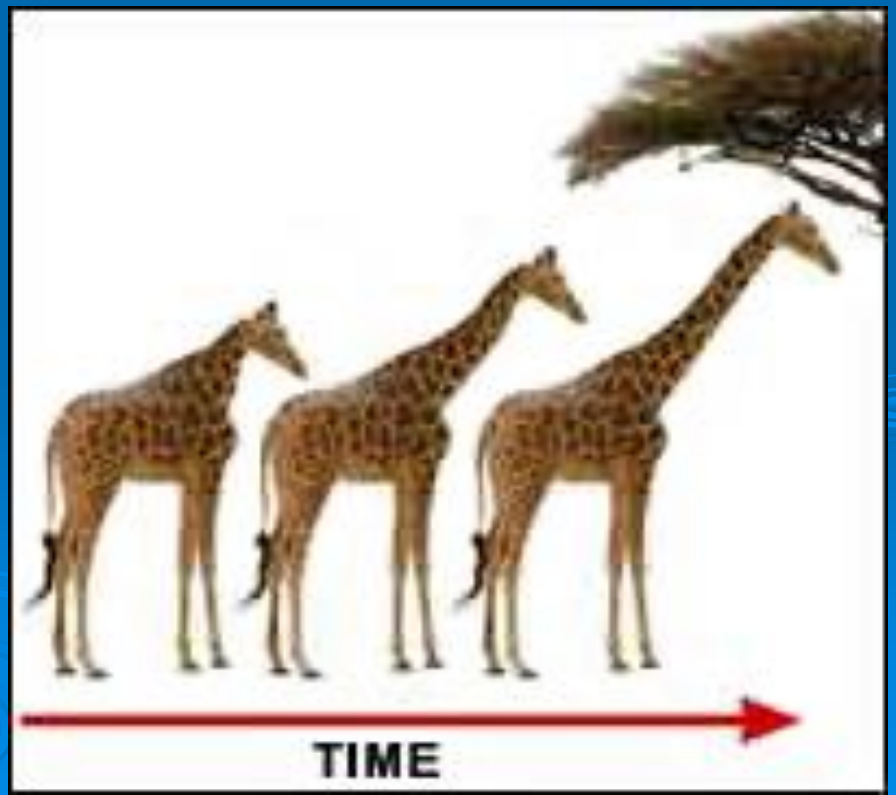
- Marine Iguanas -- only aquatic lizards in the world

Geological change

- James Hutton -- 1795
  - Tectonic forces push and move layers of rock
  - Natural forces shape mountains, valleys, etc
  - Very slow process, millions of years
- Charles Lyell -- 1830
  - Processes that shaped Earth millions of years ago continue in the present
- Earth is extremely old and has changed over time

Lamarck's theory

- Acquired traits
- The more you used something, the bigger it became
- These acquired traits could be passed on
- NOT CORRECT

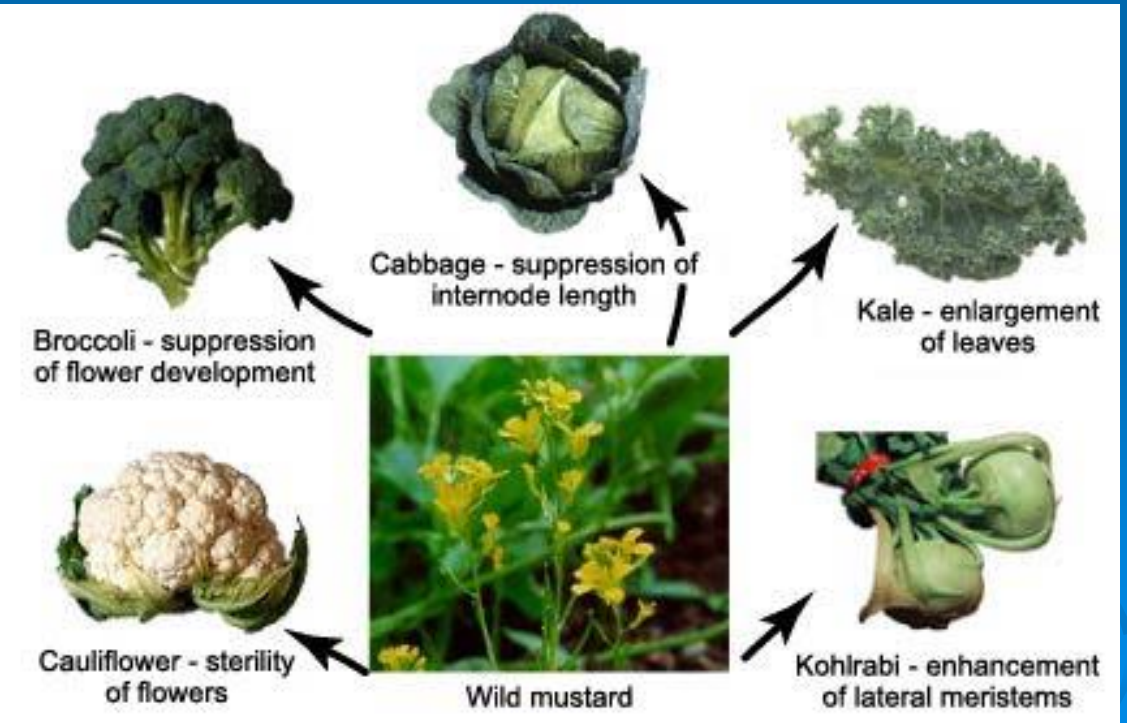


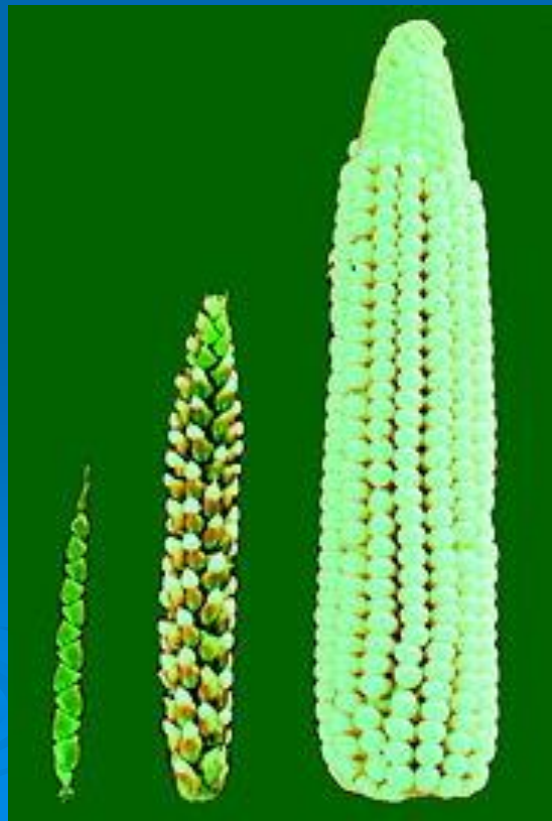
On the Origin of Species

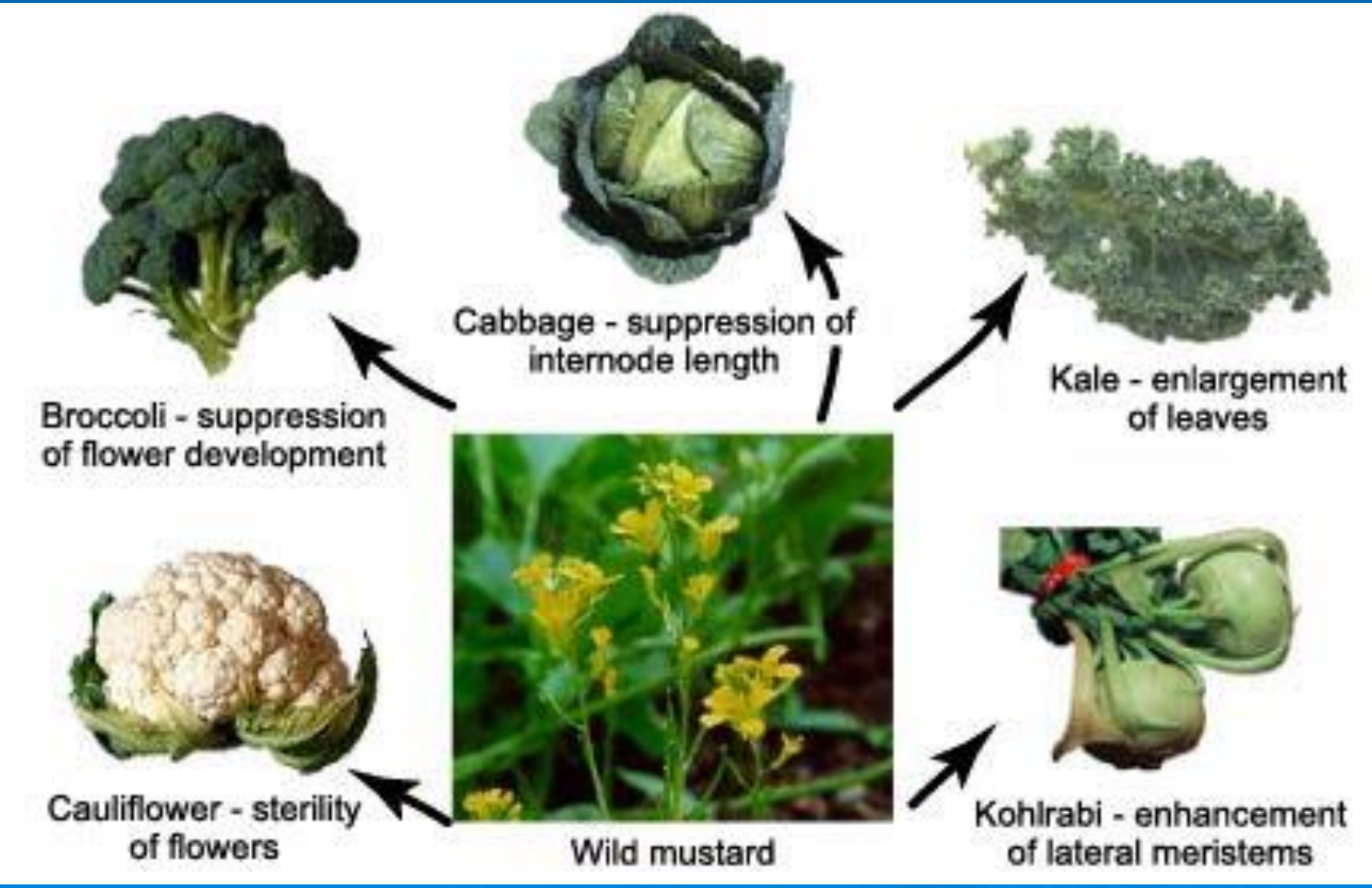
- Darwin published his theory of evolution in 1859
- Natural Selection
- Very controversial at the time

Natural Variation

- Charles Darwin observed genetic diversity among organisms in same species
- Artificial selection = selective breeding
  - farmers choose to breed only the animals or plants with a certain valued trait






Cabbage - suppression of internode length
Broccoli - suppression of flower development
Kale - enlargement of leaves
Cauliflower - sterility of flowers
Wild mustard
Kohlrabi - enhancement of lateral meristems

Survival of the Fittest

- All organisms need food, shelter, space
- Organisms compete
- Adaptation – inherited trait that helps an organism survive in its environment
- That organism will produce the most offspring and pass on its adaptations

Natural Selection

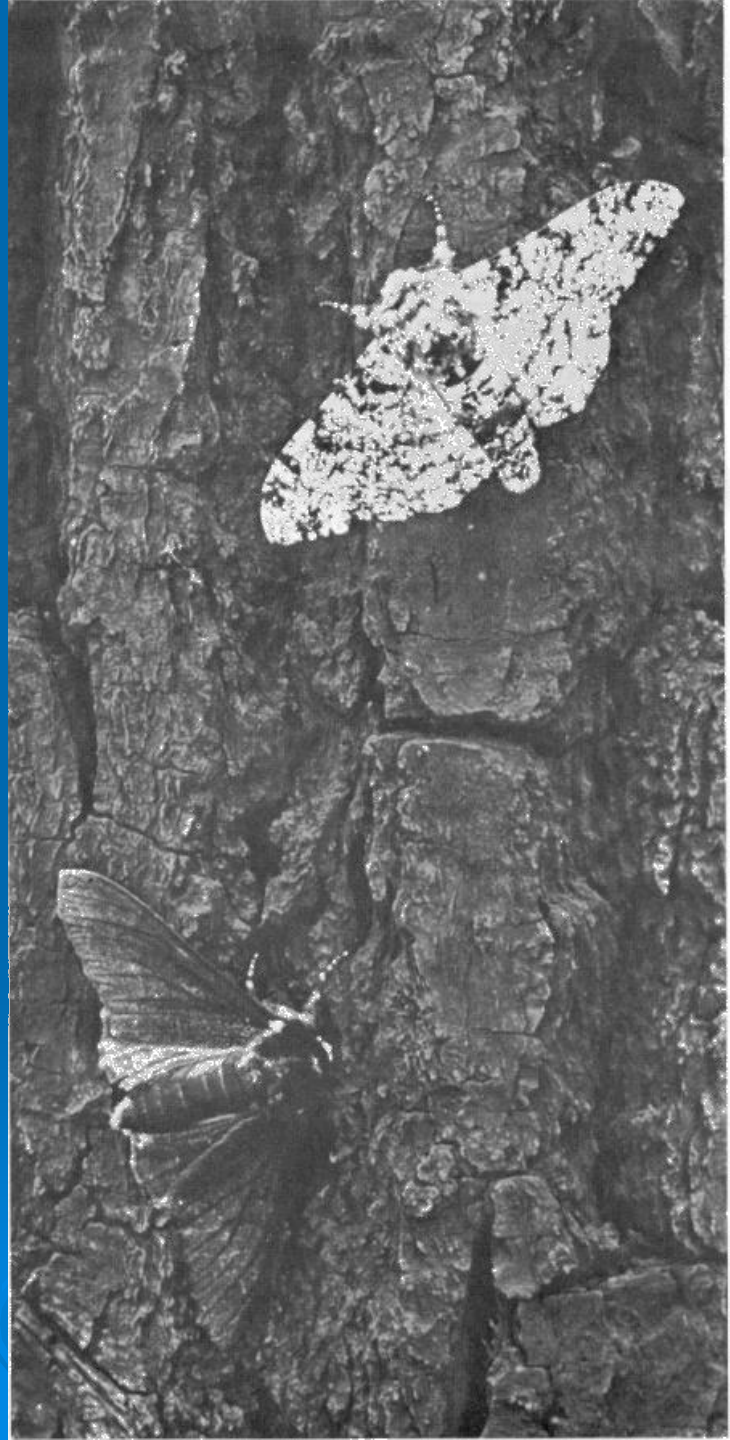
- Darwin's hypothesis for how evolution occurs
- Certain animals are better adapted for a specific environment
- Those animals survive longer
- Produce more offspring
- Pass on their genes
- Many of their offspring will also inherit that adaptation

3 parts of Natural Selection

- Struggle of Existence
  - Harsh environment
  - High birth rates + shortage of resources = competition for food and space
- Survival of the Fittest
  - Adaptations help individual survive longer, produce more offspring (fitness)
- Descent with modification
  - Adaptations are passed to offspring and gradually the species changes

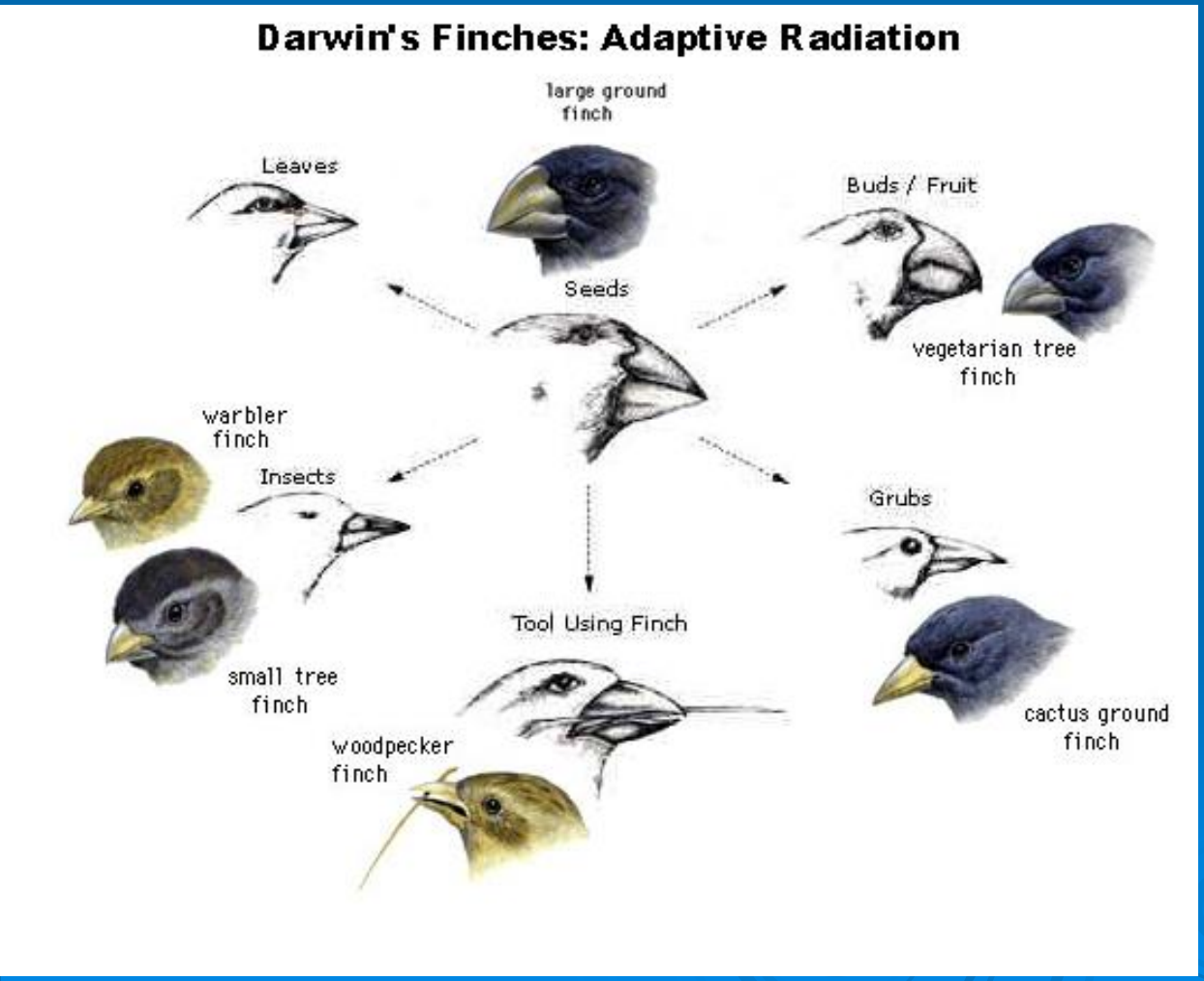
Examples of Natural Selection

- Moths in England



Examples

- Finches on Galapagos Islands

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Common Descent

- Idea that all species are derived from common ancestors