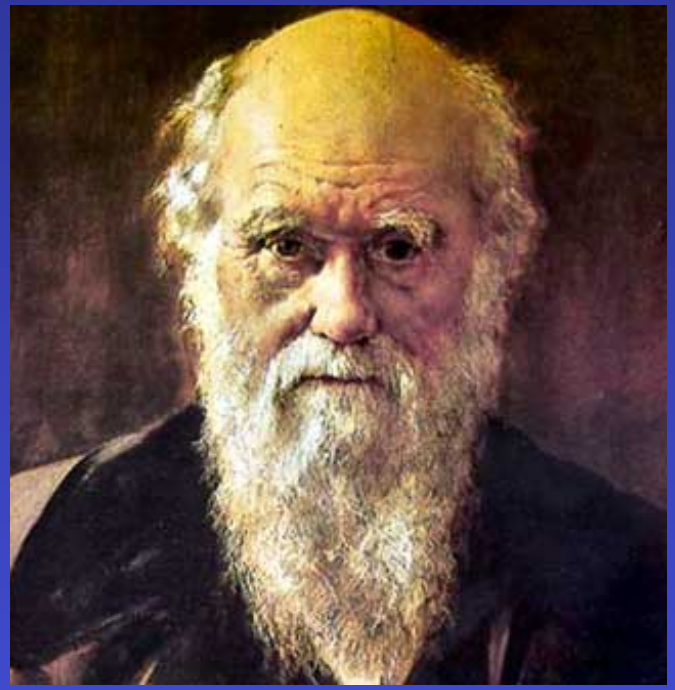
Evolution

"Nothing in biology makes sense except in the light of evolution."

- Theodosius Dobzhansky – Biologist (1900 – 1975)

Charles Darwin at age 31



Charles Darwin in later years

Charles Darwin (1809-1882)

Darwin started his career studying medicine in Edinburgh, Scotland. He hated this field, so his family sent him to Christ's College in Cambridge, England to study theology/religion.

During that period he loved to collect plants, insects, and geological specimens. Darwin's botany professor, John Stevens Henslow, helped to secure a place for Darwin as a geologist/naturalist on the surveying expedition of HMS *Beagle* to Patagonia (1831-1836).

Darwin's Voyage of Discovery

A reconstruction of the HMS Beagle sailing off Patagonia (South America).

The Voyage of the Beagle

Reaching the Galapagos

- After spending three years surveying the coasts of South America, *The Beagle* stopped at the Galapagos Islands to collect tortoises for meat to be eaten on the return home.
  - ***The Beagle* was in the Galapagos for 5 weeks (Sept 15 - Oct 20, 1835)**
  - **Islands Visited: San Cristobal, Floreana, Isabela, Santiago, and Pinta**

- While there, Darwin observed many unusual life forms such as giant tortoises and bizarre iguanas

- He compared organisms found on the Galapagos to organisms found on South America


Pinta
Marchena
Roca Redonda
Tower
The Galapagos Islands
Santiago
Fernandina
North Seymour
Baltra
Rabida
Santa Cruz
Pinzon
San Cristobal
Santa Fe
Crossman
Isabela
Tortuga
Floreana
Espanola

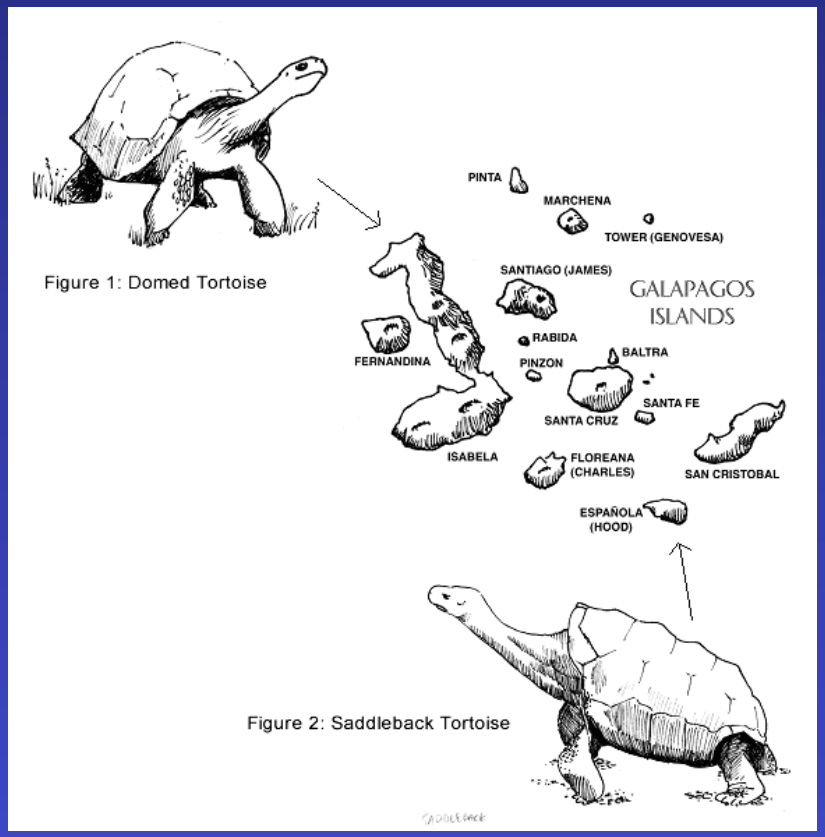
Comparisons to South American Organisms

- Many organisms on the Galapagos resembled those on South America.
- They were similar, but had obvious differences
- Because of these observations, Darwin **hypothesized** that a small number of different plant and animal species had come to the island and reproduced.
- Eventually, their offspring became different from their mainland relatives.

Comparisons Among the Islands

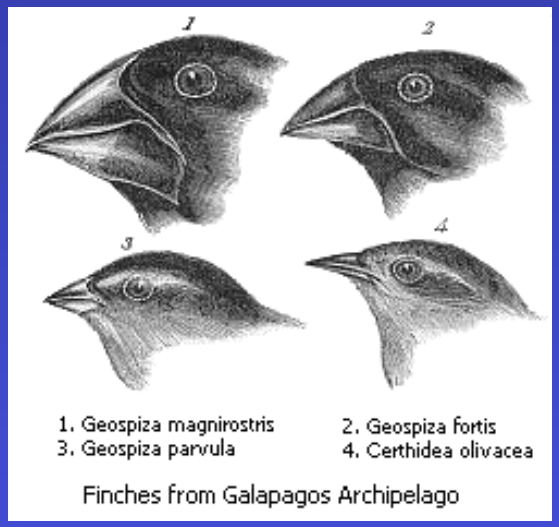
- THEN as he traveled from island to island, Darwin noticed that there were many differences among the organisms.

- On one island tortoises had dome-shaped shells, and on another they had saddle shaped shells.
  - The differences were so distinct, a government official on the islands told Darwin that he could tell which island a tortoise came from just by looking at their shells.



Adaptations

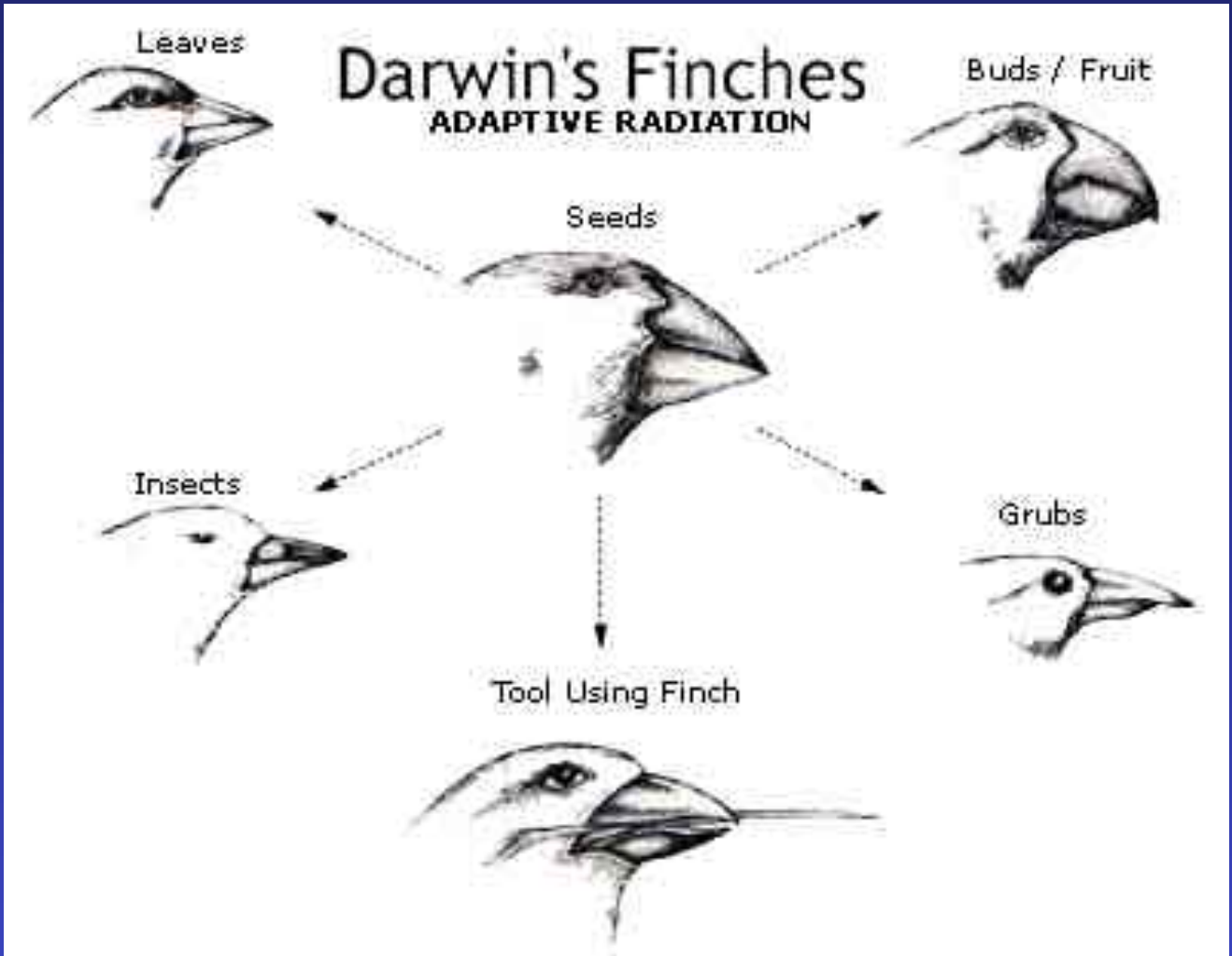
- Darwin ALSO saw many organisms were different between the islands
- Some of Darwin's most important research came from his in depth study of the Islands' finches.
- He realized each species of finch was well suited to the life it led
- Those that ate nuts had large strong beaks to crack the shells
- If they ate insects from trees they had sharp, thin beaks
- **For what reason did the birds differ from each other from island to island?**



Finches from Galapagos Archipelago

Darwin's Finches

Observe the different feather colors, and different size and shape of the beaks.



Adaptive radiation = a process in which organisms quickly change into a variety of new forms, particularly when a change in the environment makes new resources available

Adaptations (continued)

- **Variations** are any difference in traits (aka mutations)
  - Differences in beak shapes are called **variations**
  - A GOOD beak shape is called an adaptation **(good mutation or variation)**

- **Adaptation:** A trait that helps an organism survive and reproduce.
  - The finches weren't the only organisms that developed specific traits

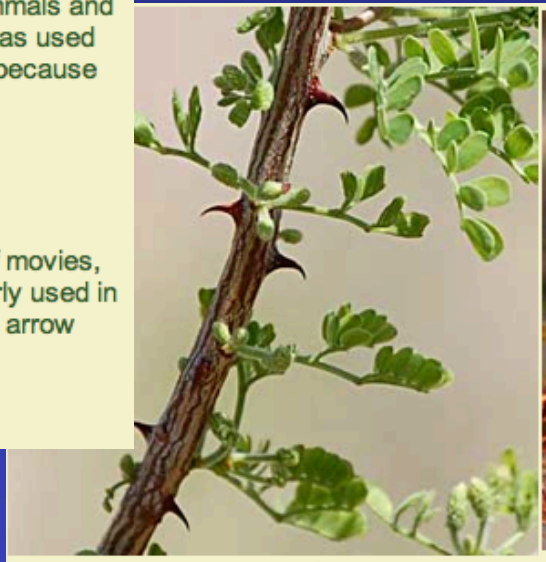
What adaptation could a plant have that would make it less likely to be eaten by an animal?

Plant Adaptations: Defending Against Herbivores

Foxglove gives us medical *digitalis*, used in heart treatment. Because it is poisonous in all parts, Foxglove has earned sinister folk-names: Witches' Gloves; Dead Man's Bells. Leaves of the upper stem are especially toxic; just a nibble can kill.

Tall larkspur, a Delphinium, a native wildflower, kills sheep and cattle on high rangelands. Garden **Delphinium** is also extremely toxic to mammals and insects. In old Transylvania,a delphinium was used to keep witches from the stables, perhaps because the wild delphinium flower there is black.

Monkshood, called Wolfsbane in werewolf movies, contains the nerve poison *aconitum*, formerly used in Western medicine, once widely used as an arrow poison in hunting cultures.



cat's claw acacia of the desert

gooseberry spines leave nothing to chance

cholla cactus spines are emphatic

prickly pear cactus