

Environmental Changes

- Natural events and human impacts cause changes in environmental conditions
- Examples:
 - Pollution
 - Acid rain
 - Deforestation
 - Climate changes
 - Succession



Natural Selection

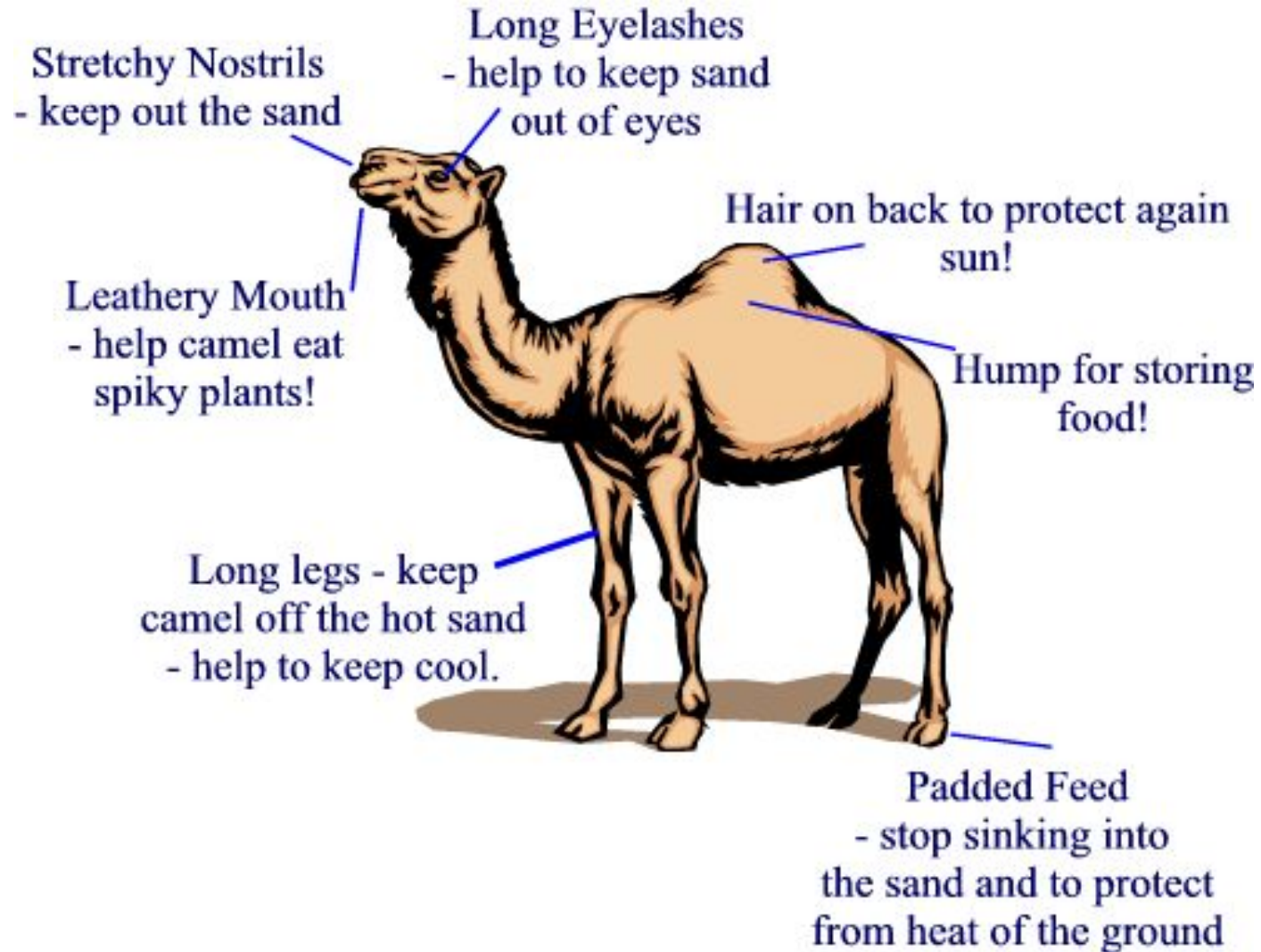


Short- and Long-Term Environmental Changes



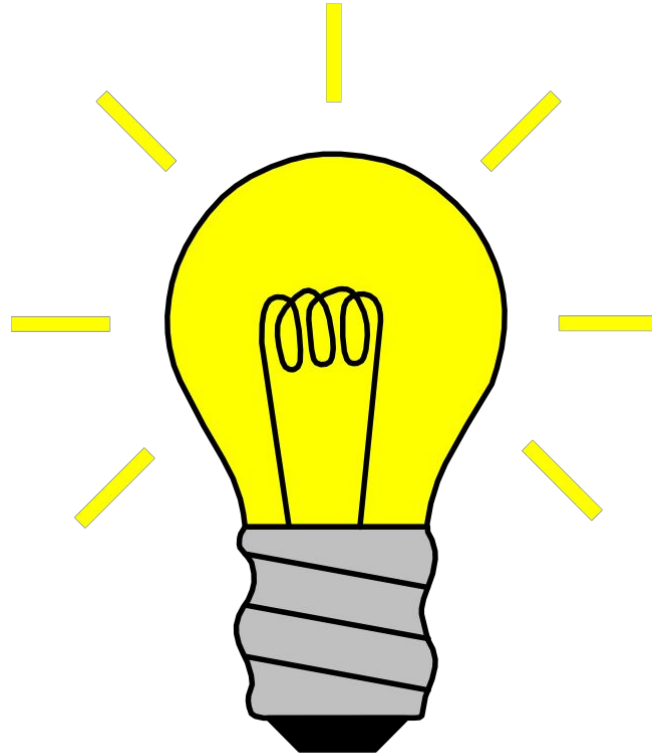
- Changes in the environment can affect the survival of individual organisms and entire species
 - Individual organisms live or die according to their inherited adaptations
- Extinction occurs when species are unable to adapt to environmental changes

Adaptations – structures or behaviors that increase an organism's ability to survive in a given environment



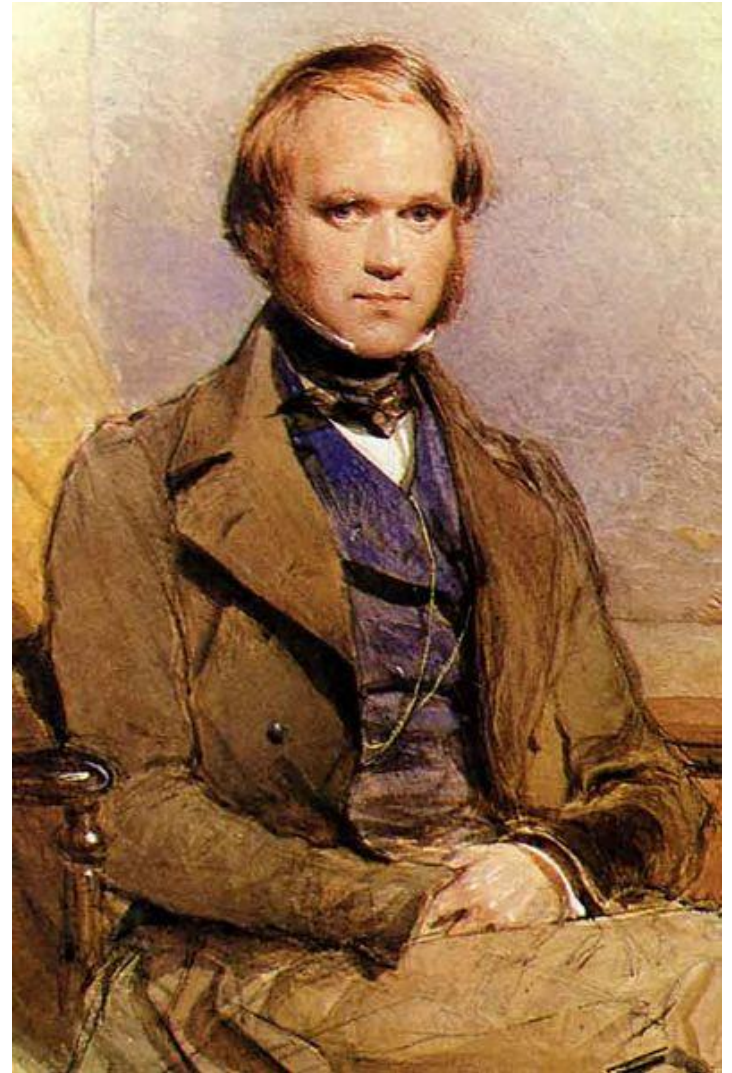
Big Science Idea

Individual organisms live or die;
only species (populations) adapt



Charles Darwin

- Born in England in 1809
- He studied medicine in Scotland
- From 1831-1836, he traveled on the HMS Beagle on a science expedition around the world and served as a naturalist
- In 1859, he published “The Origin of Species”



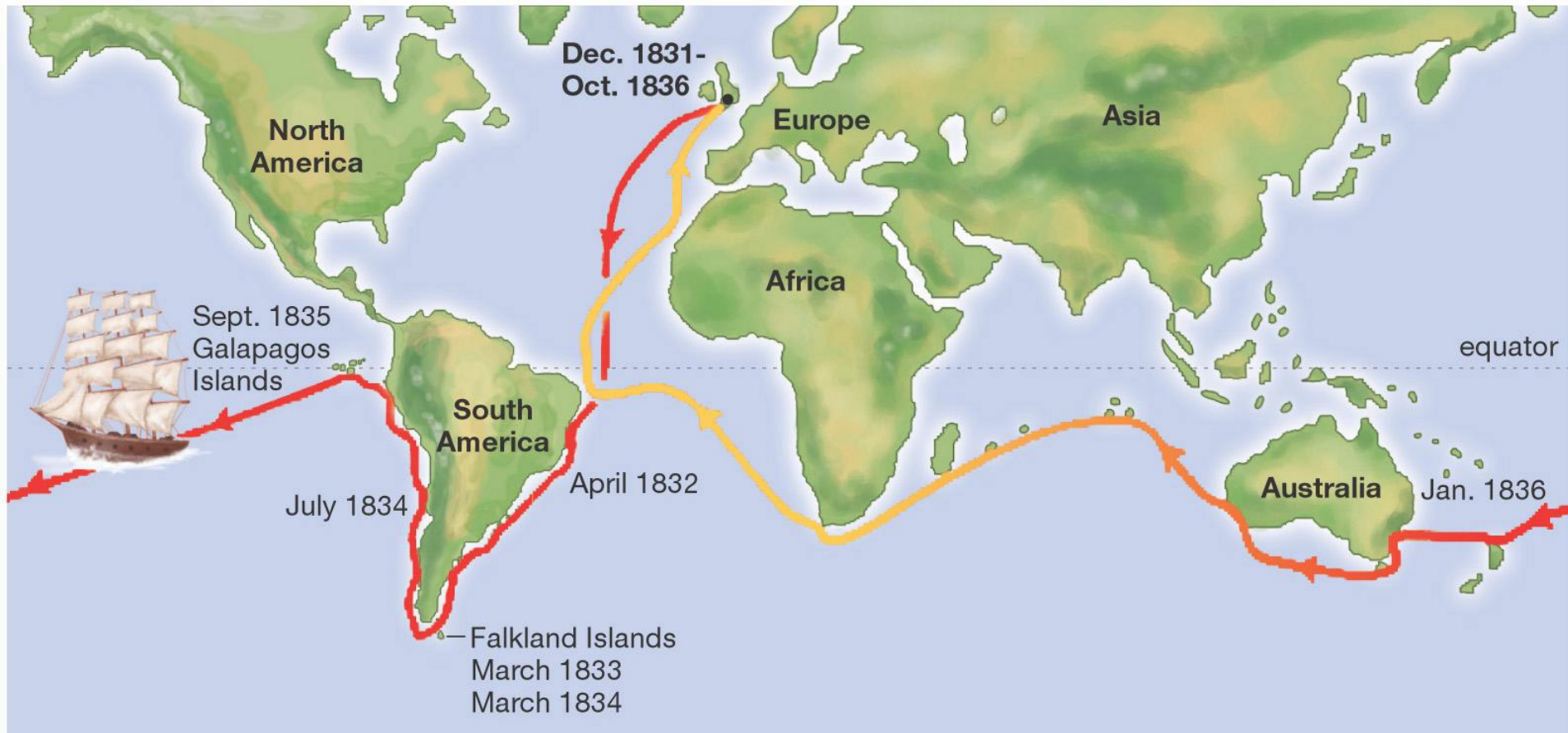
1809 - 1882

Darwin's Voyage

- In December 1831, Charles Darwin set sail from England on a five year trip around the world
- Darwin's observations of plants and animals along the way led him to develop the theory of evolution by natural selection



Voyage of the Beagle



Galapagos Islands

- In 1835, the Beagle reached the Galapagos Islands
- He noticed similarities and differences between organisms on the island and on the mainland
- Darwin thought that species must have blown out to sea during a storm and once they reached the island they reproduced
 - Eventually, the offspring became different from their mainland relatives.



[Darwin Reaches the Galapagos](#)

Similarities and Differences

The giant tortoises
(*Geochelone nigra*) in the
Galapagos

- 2 m long
- Saddle-shaped shell



Nearest relative- Chacos
Tortoise (*Geochelone
chilensis*) in Argentina

- just 20cm long
- Dome-shaped shell



Similarities and Differences

Marine Iguanas of the Galapagos

- **Large claws for gripping slippery rocks, eat seaweed**



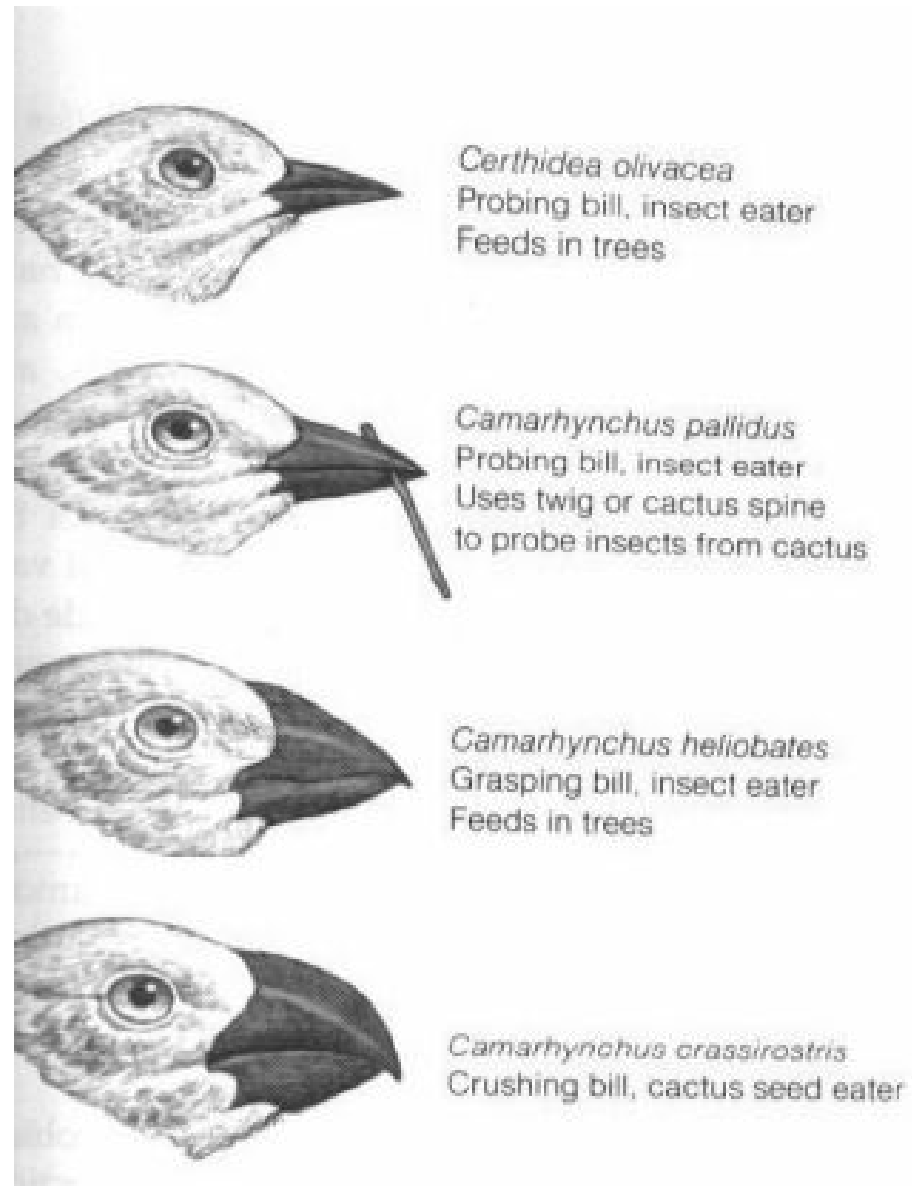
Green iguanas in South America

- **Smaller claws for climbing trees, eat leaves**



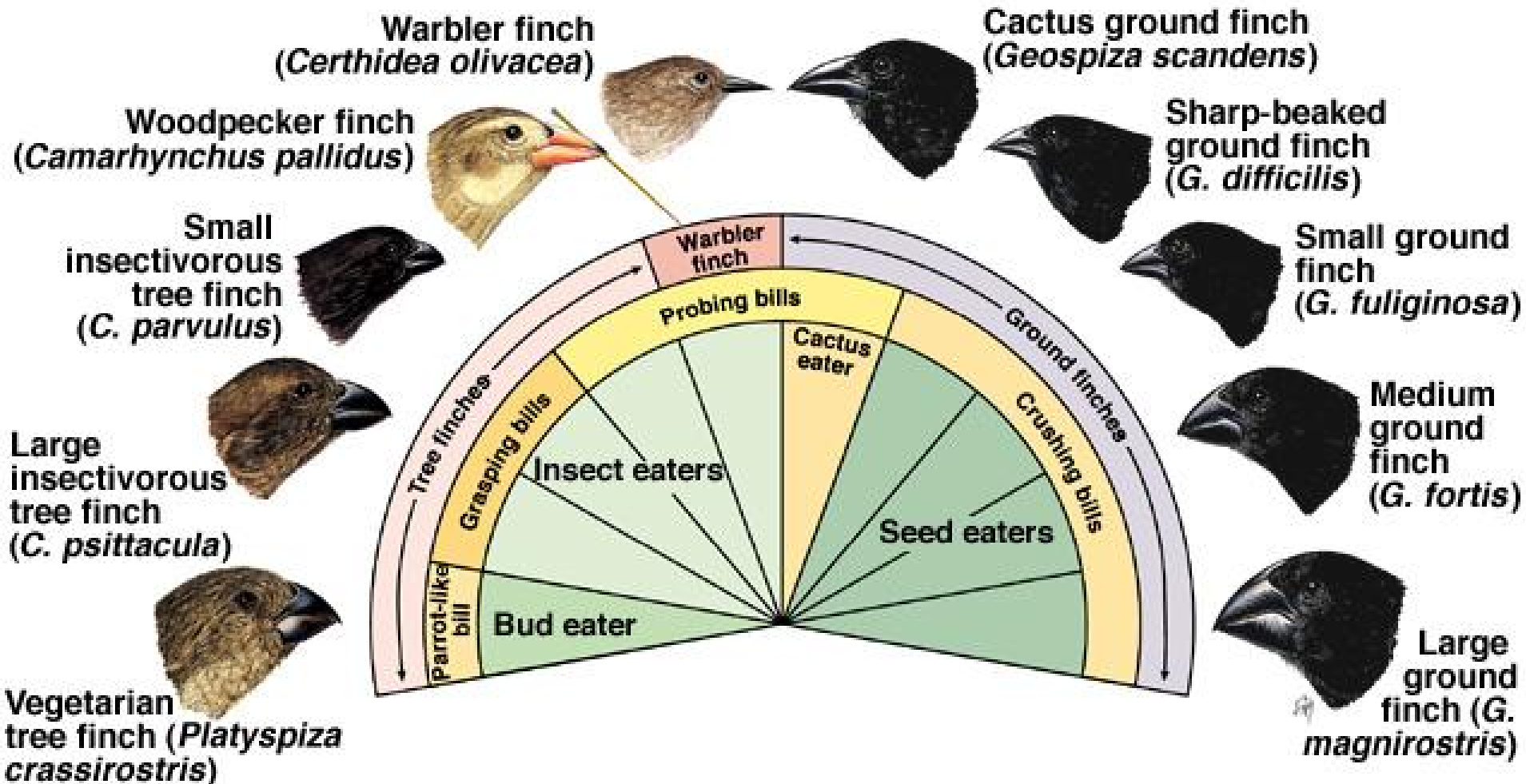
Adaptations

- Darwin studied the different finches on the island
 - He noticed that each species had a different beak shape, which related to the type of food it ate
- Beak shape is an adaptation
 - Adaptations are structures or behaviors that increase an organism's ability to survive



Beak Shape

Darwin's Finches



Some of Darwin's Observations

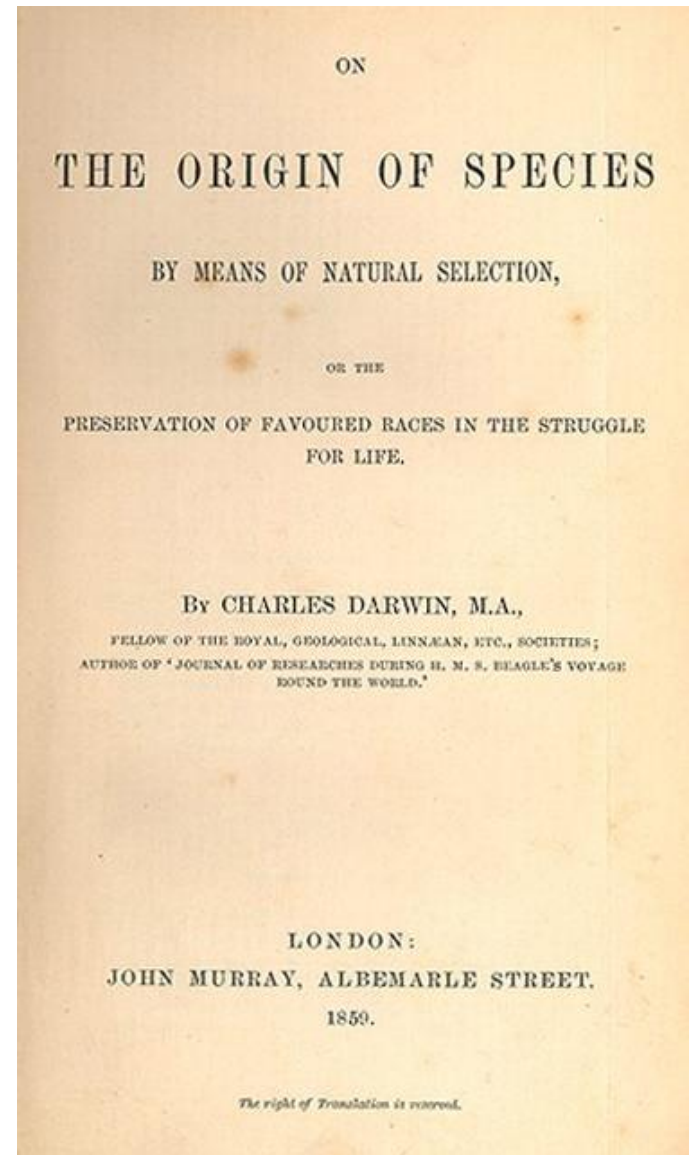
- The mainland species were related to the island variety
 - There were differences, but they were adapted to their particular environment
 - Darwin thought that species gradually changed over many generations and became better adapted to new conditions.
- * **Generation**: a group of individuals born and living about the same time

Evolution

- Plants and animals that arrived on the Galapagos Islands faced conditions that were different from those on the mainland
 - **Darwin thought that the species gradually changed over many generations and became better adapted to the new environment**
 - **This change in species over time is called evolution**

Origin of Species

- Darwin proposed his theory of evolution by natural selection in a book called, “Origin of Species”



Natural Selection

- **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**
- Darwin identified factors that affect natural selection:
 - Overproduction
 - Competition
 - Variation



Overproduction

- **Most species produce far more offspring than can possibly survive**
 - There would not be enough resources for all of them
 - Ex. Sea Turtles lay more than 100 eggs at one time



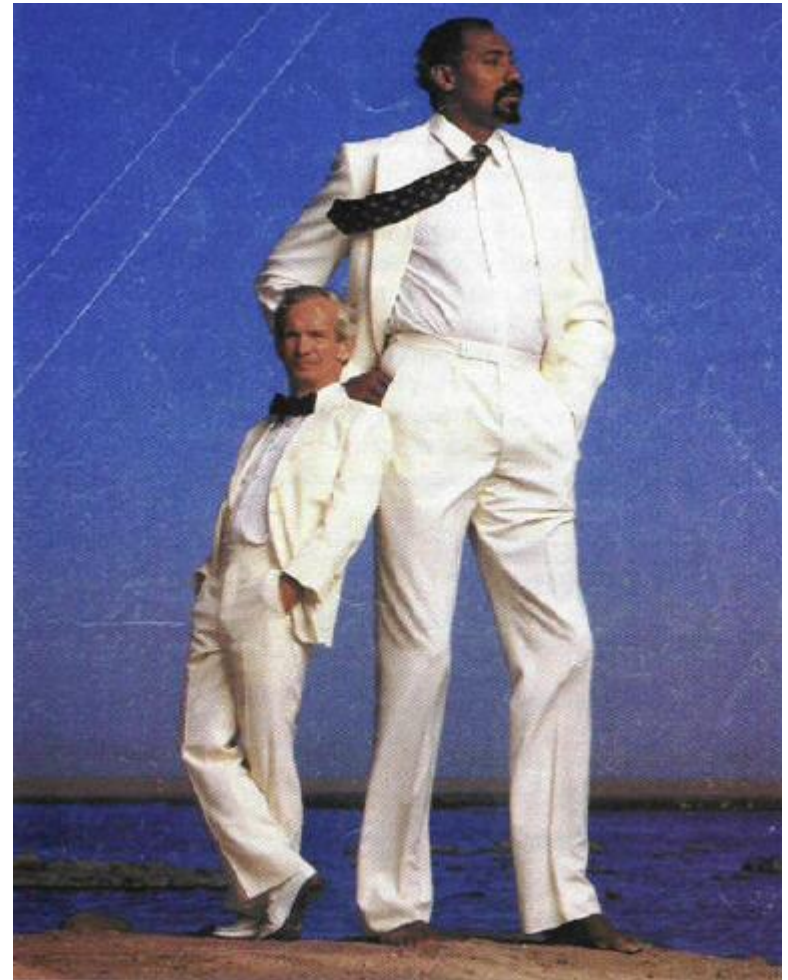
Competition

- **The members of a species must compete with each other to survive**
- Life in the wild is competitive, organisms with the most beneficial traits will prosper. This is commonly known as “Survival of the Fittest”



Variation

- **Any difference between individuals of the same species**
 - Ex. Some newly hatched turtles are able to swim faster than others
 - Every species exhibits variation



Selection

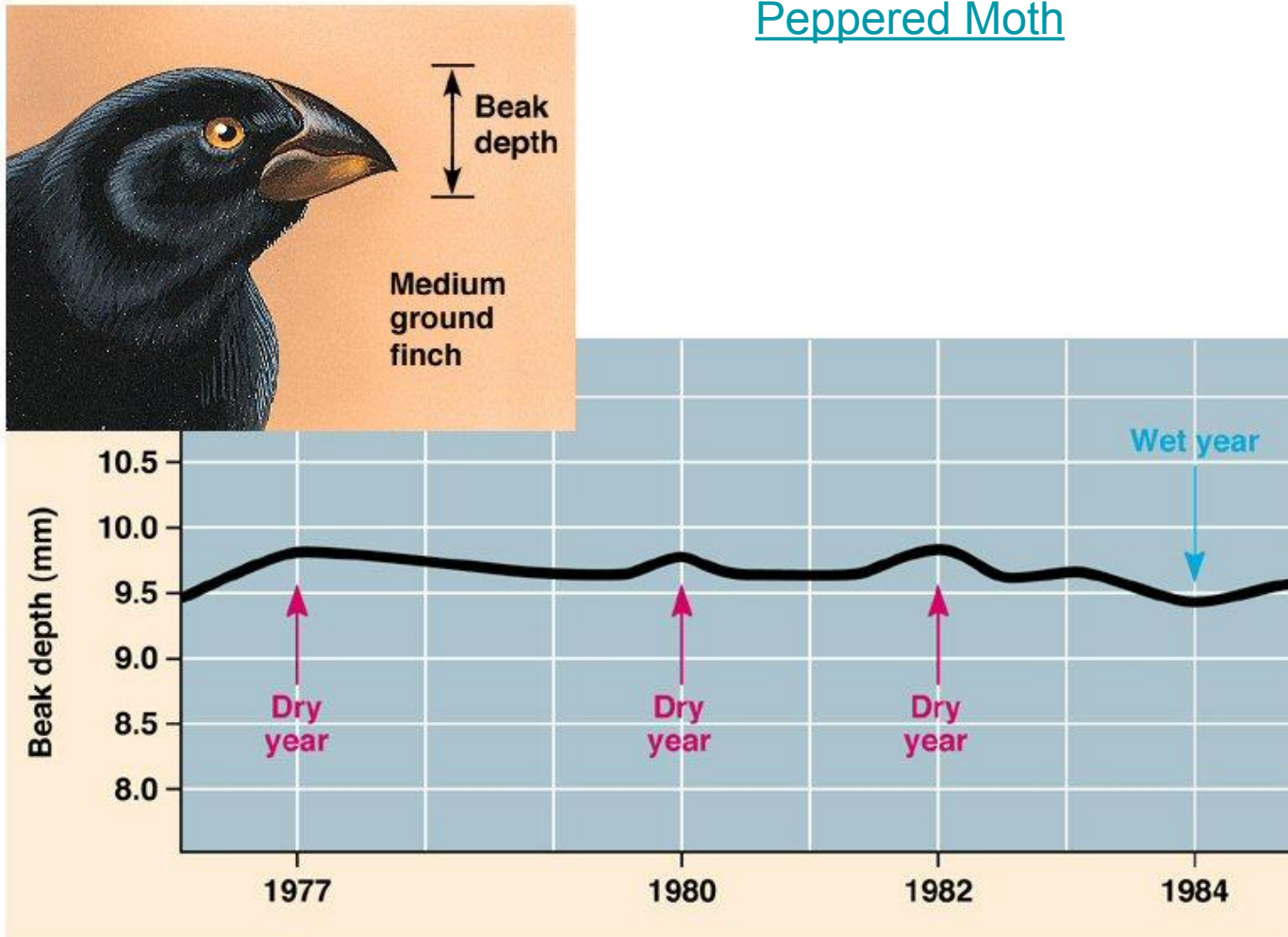
- Darwin observed that some variations make individuals better adapted to their environment
- Those individuals are more likely to survive and reproduce
- If their offspring inherit the trait, they will be more likely to survive and reproduce
- After many generations, more members of the species will have the helpful trait
- In effect, the environment has “selected” organisms with helpful traits to be the parents of the next generation

Selection (continued)

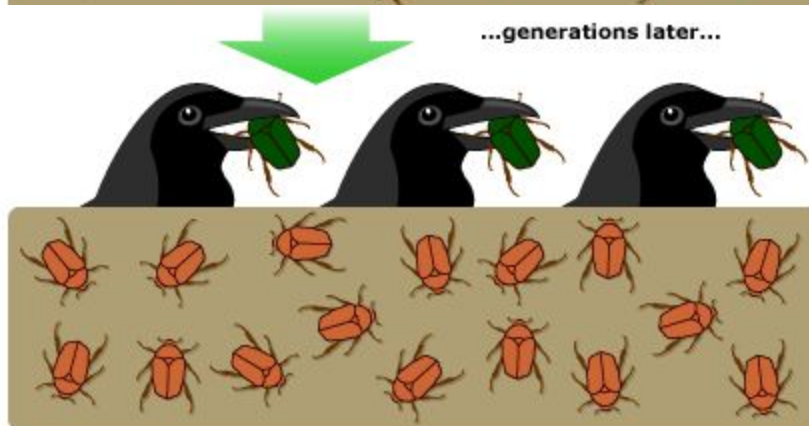
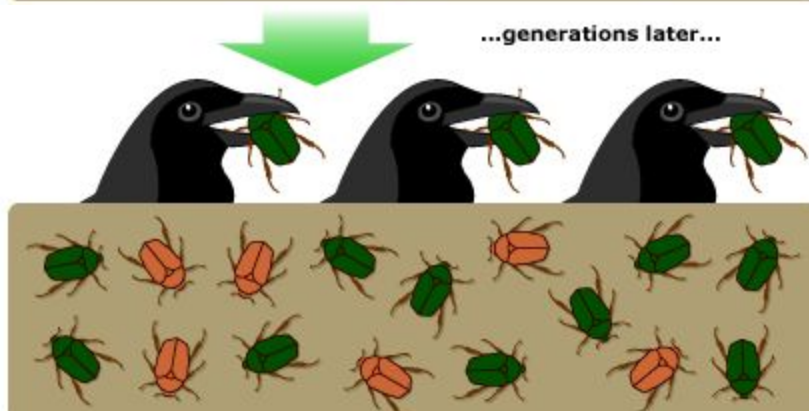
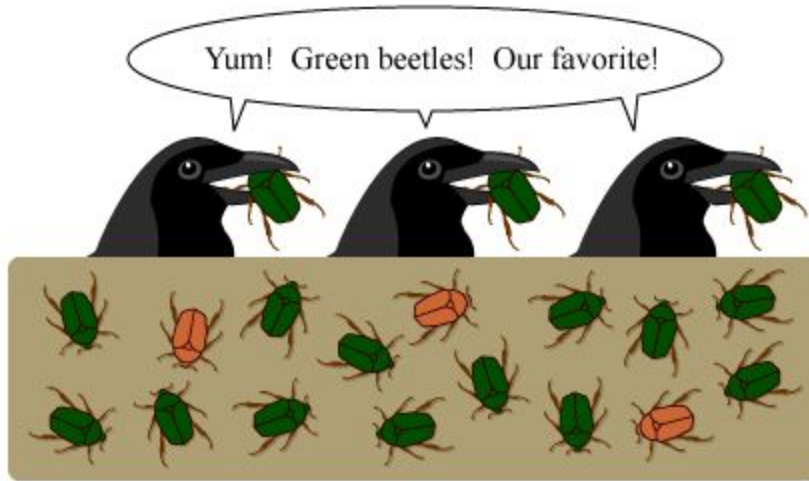
- Darwin proposed that over a period of time, natural selection can lead to change
- Helpful variations gradually accumulate in a species, while unfavorable ones disappear
- A change in environmental conditions can affect an organism's ability to survive, and therefore lead to selection
- Survival determines if a trait is favorable

Natural Selection at Work

Peppered Moth



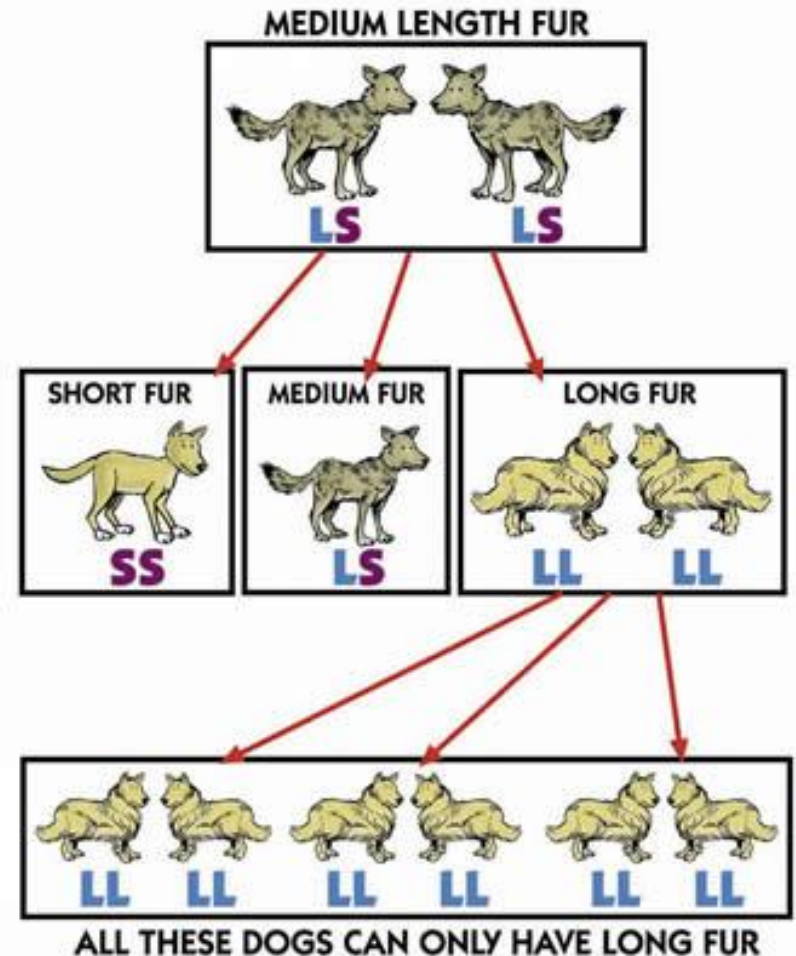
Natural selection, in a nutshell:



Green beetles have been selected against, and brown beetles have flourished.

The Role of Genes in Natural Selection

- Only traits that are inherited can be acted upon by natural selection



How might new species form?

- **Geographic isolation** – when some members of a species become cut off from the rest of the species
- A new species might form when a group of individuals remains separated from the rest of its species long enough to accumulate different traits
- Geographic isolation may have occurred on a worldwide scale during continental drift

[Underwater Masters of Disguise](#)

Key Ideas

- Long term survival of species is due to the selection pressure of environmental conditions
- Selection works on entire populations of organisms
- In interactions with the environment in future generations, those traits may no longer aid survival , and the organisms having them will die

Misconceptions



Adaptation doesn't involve trying.

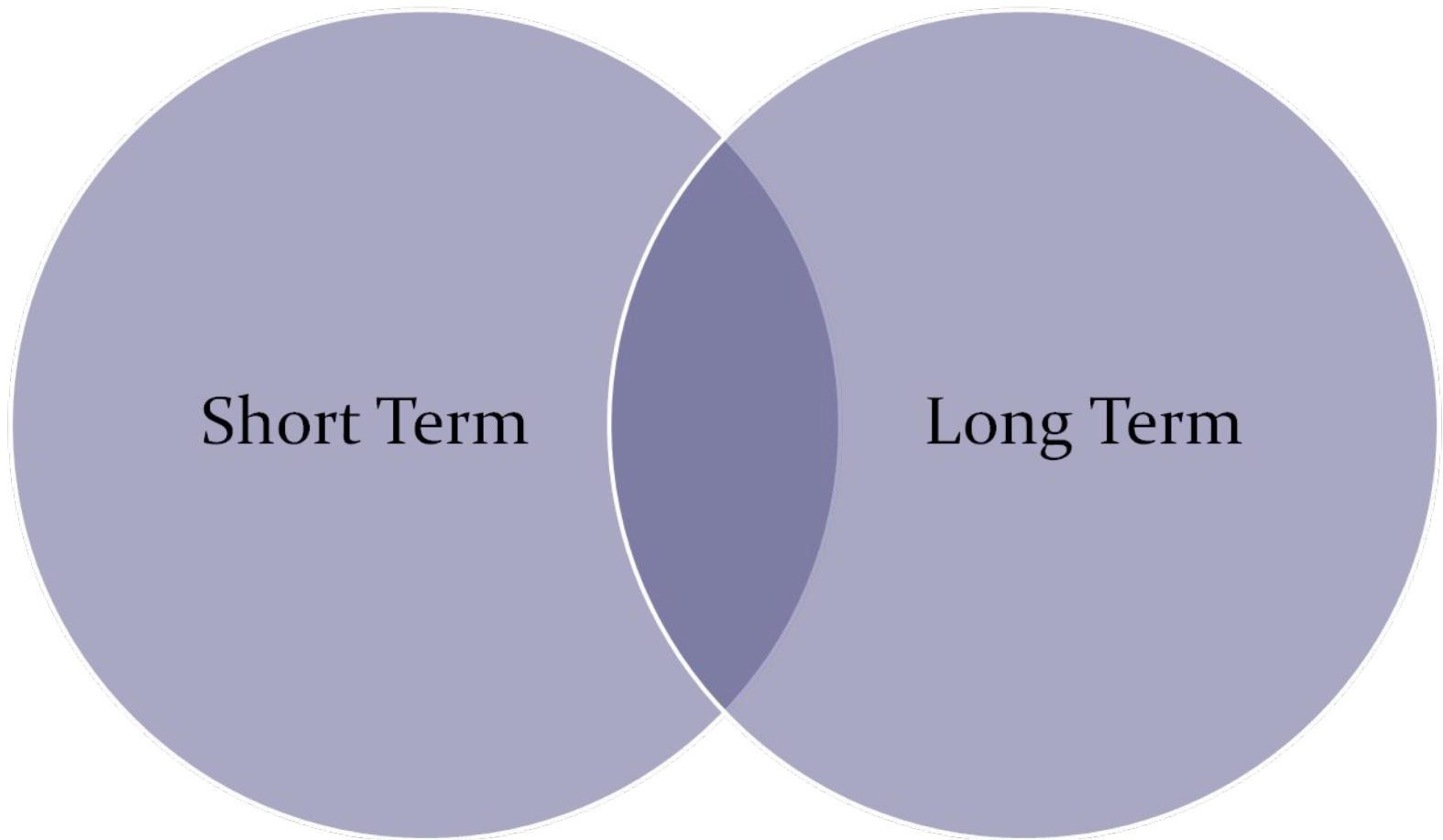


Natural selection does not grant organisms what they "need".

Darwin's Conclusions

- Species have changed over generations through **adaptations**
- The changes allow them to **survive and reproduce** in a new environment.
- Darwin proposed that evolution occurs by means of **natural selection**
- **New species** may form when a group of individuals is isolated from the rest of the population

In your science journals draw a Venn Diagram to compare...



Venn Diagram Word/Sentence Bank

1. Climate Change
2. Drought
3. Hurricane
4. Can cause extinction
5. Can recover from change in a short time
6. Floods
7. Can cause permanent change to ecosystem
8. Ice Age
9. Volcanic eruptions
10. Can cause the genes of an organism to change
11. Can cause the genes of an entire population to change
12. Forest Fire

Venn Diagram Word/Sentence Bank

1. Climate Change-LT
2. Drought- LT
3. Hurricane-ST
4. Can cause extinction-LT
5. Can recover from change in a short time-ST
6. Floods-ST
7. Can cause permanent change to ecosystem-LT
8. Ice Age-LT
9. Volcanic eruptions-LT
10. Can cause the genes of an organism to change-ST
11. Can cause the genes of an entire population to change-LT
12. Forest Fire- Both, depends on the severity and effects on populations.