

# 10.2

## Darwin's Observations

**KEY CONCEPT** Darwin's voyage provided insights into evolution.

### ▶ MAIN IDEAS

- Darwin observed differences among island species.
- Darwin observed fossil and geologic evidence supporting an ancient Earth.

### VOCABULARY

**variation**, p. 302

**adaptation**, p. 302



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**Connect** Lyell's views of gradual geologic change greatly influenced Darwin's thinking. In 1831, the ship HMS *Beagle* set sail from England to map the coast of South America and the Pacific islands. Hired at first to keep the captain company, Darwin was interested in observing the land and its inhabitants. During the voyage, he read Lyell's *Principles of Geology*. When the ship reached South America, Darwin spent most of his time ashore, where he found much evidence supporting Lyell's views.

### ▶ MAIN IDEA

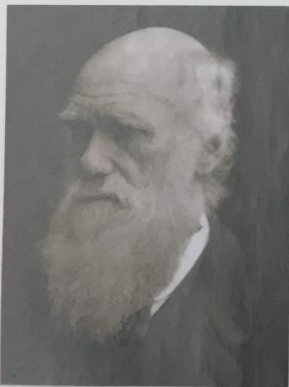
## Darwin observed differences among island species.

Darwin, shown in **FIGURE 10.3**, was struck by the variation of traits among similar species that he observed in all his travels. In biology, **variation** is the difference in the physical traits of an individual from those of other individuals in the group to which it belongs. Variation can occur either among members of different species (*interspecific variation*) or among individuals of the same species (*intraspecific variation*). Darwin noted that the species found on one island looked different from those on nearby islands and that many of the islands' species looked different from those on the nearest mainland.

The differences between species on different islands was especially noticeable in the Galápagos Islands, an island chain off the coast of Ecuador in South America. Some differences seemed well suited to the animals' environments and diets, as shown in **FIGURE 10.4**. For example, saddle-backed tortoises, which have long necks and legs, lived in areas with a lot of tall plants. Domed tortoises, with their shorter necks and legs, lived in wet areas rich in mosses and short plants. Similarly, finches with strong, thick beaks lived in areas with a lot of large, hard-shelled nuts, while those species of finch with more delicate beaks were found where insects or fruits were widely available.

These observations led Darwin to realize that species may somehow be able to adapt to their surroundings. An **adaptation** is a feature that allows an organism to better survive in its environment. Adaptations can lead to genetic change in a population over time.

**Connect** What adaptations did Darwin see in the finches of the Galápagos Islands?



**FIGURE 10.3** Darwin spent more than 20 years compiling evidence before publishing in 1859 his ideas on how evolution works.

## FIGURE 10.4 Adaptations Within Species

Galápagos tortoises (*Geochelone elephantopus*) are evidence that species can adapt to their environments.



Domed tortoises have short necks and legs, and live in areas with low vegetation.



Saddle-backed tortoises have a high shell edge, allowing them to stretch their long necks.

**Explain** Why do these tortoises of the same species look different?



### MAIN IDEA

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

On his voyage, Darwin found fossil evidence of species changing over time. In Argentina, he found fossils of huge animals, such as *Glyptodon*, a giant armadillo. The fact that these fossils looked like living species suggested that modern animals might have some relationship to fossil forms. These fossils suggested that, in order for such changes to occur, Earth must be much more than 6000 years old.

During his voyage, Darwin also found fossil shells of marine organisms high up in the Andes mountains. Darwin later experienced an earthquake during his voyage and saw firsthand the result: land that had been underwater was moved above sea level. This experience explained what he saw in the Andes. Darwin's observations on his voyage supported Lyell's theory that daily geologic processes can add up to great change over a long period of time. Darwin later extended the ideas of an old Earth and slow, gradual change to the evolution of organisms.

**Infer** What could account for fossils of marine organisms being found on top of modern-day mountain ranges?

## 10.2 ASSESSMENT



### REVIEWING MAIN IDEAS

1. What accounts for the **variation** Darwin observed among island species?
2. What did Darwin learn from the fossils that he observed on his voyage?

### CRITICAL THINKING

3. **Apply** Explain how wings are an **adaptation** for birds.
4. **Synthesize** How did Darwin's observations support Lyell's theory of an ancient Earth undergoing continual geologic change?

### Connecting CONCEPTS

5. **Ecology** Some birds in the Galápagos Islands build nests in trees, while others hide eggs in rock crevices. What could account for this difference in nesting behaviors?