16.1

Welcome to Lesson 16.1, "Darwin's Voyage of Discovery." In this lesson, we'll state Charles Darwin's contribution to science and describe the three patterns of biodiversity noted by Darwin. Charles Darwin was born in England on February 12th, 1809, the same day as Abraham Lincoln. In 1831, he joined the crew of the HMS *Beagle* on a five-year voyage. The purpose of the voyage was to map coastlines and harbors around the world. No one knew it, but this would become one of the most important scientific voyages in history. The *Beagle* set sail at a time when scientists were revolutionizing views of the natural world. Geologists were suggesting that the Earth was ancient and had changed over time. Biologists were suggesting that life had also changed, a process called **evolution**. Darwin developed a theory of biological evolution that offered a scientific explanation for the unity and diversity of life, by proposing how modern organisms evolved through descent from common ancestors.

Darwin's work is so important because it revealed that the living world changes continuously. Evolutionary theory helps us understand and respond to important events, such as the emergence of drug-resistant bacteria and new strains of influenza. It helps us to predict the dangers we face if human actions were to drive too many species to extinction. Charles Darwin was fascinated by the diversity of life he saw during his trip. During a single day in a Brazilian forest, he collected 68 species of beetles--and he wasn't looking for beetles. He was intrigued by how well suited to their local environments plants and animals seemed to be. He was impressed by the many ways different organisms obtained food, protected themselves, and produced offspring. He was also puzzled by where different species lived--and did not live. He filled his notebook with observations.

Darwin wanted to explain this diversity in a scientific way. He kept observing, asking questions, and formulating hypotheses: seeking larger patterns into which his observations might fit. He came to focus on three patterns of diversity: species vary globally; species vary locally; and species vary over time. Darwin noticed that different, yet ecologically similar, species inhabited separate, but ecologically similar, habitats around the globe. In the grasslands of South America, he found flightless ground-dwelling birds called rheas. Rheas look and act a lot like ostriches. Then, when Darwin visited Australia's grasslands, he found another large flightless bird: the emu. Darwin also noticed that rabbits and other European grassland species didn't live in similar grasslands in South America and Australia. Australian grasslands, on the other hand, were home to kangaroos and other animals found nowhere else.

Darwin noticed that different yet related species often occupied different habitats within a local area. For example, Darwin found two species of rheas in South America: one thrived in Argentina's grasslands, while a smaller species was adapted to the colder, harsher grass- and scrublands to the south. Other examples of local variation came from the Galápagos Islands, about a thousand kilometers off the Pacific coast of South America. These islands are close to one another yet have different ecological conditions. Several islands were home to distinct forms of giant land tortoises. Darwin saw differences among the tortoises but didn't think much about them. In fact, like other travelers, Darwin ate several tortoises and tossed the remains overboard without studying them closely. Then, Darwin learned from the islands' governor that the tortoise shells varied in predictable ways from one island to another.

Someone who knew the animals well could identify which island an individual tortoise came from, just by looking at its shell. Darwin also collected **fossils**. Scientists already knew that these remains formed a fossil record that told the story of organisms no longer living, although researchers didn't yet know how to read and interpret that record.

Darwin noted that the fossil record included many extinct animals that were similar to, yet different from, living species. The most striking examples were fossils of extinct giant animals called glyptodonts. Glyptodonts look like giant versions of modern armadillos, which live in the same area. Darwin wrote: "This wonderful relationship in the same continent between the dead and the living will, I do not doubt, hereafter throw more light on the appearance of organic beings on earth, and their disappearance from it, than any other class of facts." On the voyage home, Darwin thought about the patterns he'd seen.

When he returned to London, he sent his specimens to experts for identification. They set the scientific community abuzz. His Galápagos mockingbirds belonged to three separate species found nowhere else. The little brown birds Darwin thought were wrens, warblers, and blackbirds were actually all species of finches. They, too, were found nowhere else, although they all resembled a single common finch species from South America. Yet the island species were all different from the mainland species and from each other. The same was true of tortoises, marine iguanas, and many plants that Darwin collected. The evidence caused him to wonder if the species might not be fixed and unchanging, as people thought back then. Could organisms change over time, through some natural process? Could Galápagos species have evolved from common South American ancestors? He spent years actively researching and filling notebooks with ideas about species and evolution.