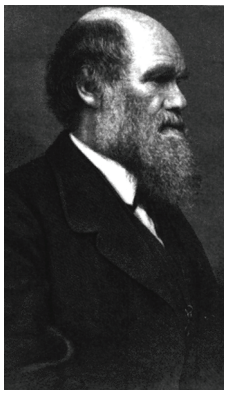
Name:_____ Date: _____

SKILL and PRACTICE 13.1

Charles Darwin

Charles Darwin, a naturalist, was the first person to propose the theory of natural selection to explain evolution. He did so in his book, On the Origin of Species by Means of Natural Selection. Darwin believed in evolution, that evolutionary change was gradual, that natural selection was the mechanism for evolution, and that all life on earth evolved from a few common ancestors.

A privileged childhood



Charles Darwin was born in Shrewsbury, England on February 12, 1809. His father was a wealthy doctor, and his grandfather was Josiah Wedgwood, designer of the famous Wedgwood china. Although his mother died when he was eight, Charles had a happy childhood, cared for by older siblings. As a boy, he loved to collect specimens from nature, especially beetles. At sixteen, he went to Edinburgh to study medicine, but Charles did poorly there. The following year he went to Cambridge to study for the ministry; he graduated in 1831.

The *HMS Beagle*

After graduation, Darwin took a nonpaying job as a naturalist on the ship, *HMS Beagle*. It was meant to be a three-year trip to study the South American coasts and some Pacific islands.

The trip lasted five years. Darwin studied rock formations, fossils, and all living things wherever they went. He noticed that the living things were similar to fossils found nearby, but they were not the same. He also noticed that living things from one place were similar to, but not the same as, living things from other places. For example, ostriches found in one part of Argentina were different from ostriches found in another part of that country, and both were different from those found in Africa. He began to look for a way to explain how these living things had changed.

Back in England

Darwin returned to England in 1836 and married his cousin, Emma Wedgwood in 1839. Unfortunately, Darwin had gotten a tropical disease, later identified as Chagas's disease, from a beetle bite in South America. It plagued him for the rest of his life.

For many years, Darwin led a double life. Publicly, he studied things such as barnacles and cross-pollination of plants. He published books about data he had collected on the HMS Beagle. He received many awards and honors and belonged to many important scientific societies.

Privately, he worked on his theory of evolution. He developed his theory about natural selection to explain how living things change over time. Natural selection is the process whereby individuals best suited to an environment tend to survive, reproduce, and have more progeny, while those less suited decrease in population and even in some cases become extinct. Over long periods of time, natural selection could account for the variety of species within a population of organisms, along with the species found in the fossil records (extinct and non-extinct). He shared his ideas with a few friends, but he did not publish them, fearing the firestorm that could ensue. So, he quietly gathered evidence to support his theory.

The Origin of the Species

In 1858, Darwin received a package that forced him to take a stand. A young English scientist named Alfred Russell Wallace sent him an outline of a theory about evolution and natural selection. It was identical to Darwin's! He had to publish his theory or let Wallace take the credit for something that he had worked on for nearly twenty years.

The Origin of the Species was published in 1859. The book sold out immediately and was reprinted many times during his lifetime. In it, Darwin wrote about the evolution of plants and animals, based partly on observations he made in the Galapagos Islands. He left the sensitive topic of human evolution for two later books.

Darwin died of heart problems in 1882. His wife wanted to bury him in the countryside that he loved. However, Parliament insisted that he be buried in Westminster Abby near the grave of Sir Isaac Newton.

Reading reflection

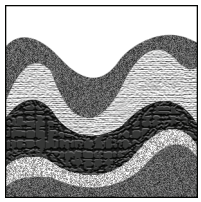
1. **Research:** Darwin's maternal grandfather was Josiah Wedgwood, the designer of famous Wedgwood pottery. Use the library or the Internet to find information about his life and pictures of some of his work.
2. What was Darwin's first job after graduating from college?
3. What were Darwin's responsibilities on the *HMS Beagle*?
4. What observation did Darwin make of living things and fossils found in the area?
5. What observations did Darwin make regarding ostriches?
6. In what way were Darwin's observations regarding living things and fossils and his observations about ostriches important?
7. How did Darwin get Chagas's disease? Research the symptoms of the disease.
8. In what way did Darwin lead a double life?
9. Why did Darwin put off publishing his theories of evolution and natural selection?
10. Why was it important that Darwin included his theory of natural selection in the book with his theory of evolution?
11. Why do you suppose Darwin did not include his ideas about the evolution of man in his book *The Origin of the Species*?
12. **Research:** After his death, a woman named Lady Elizabeth Hope claimed that Darwin renounced his theory of evolution just before he died. Use the library or the Internet to find out the true story about what Darwin said on his deathbed.

PRACTICE 2

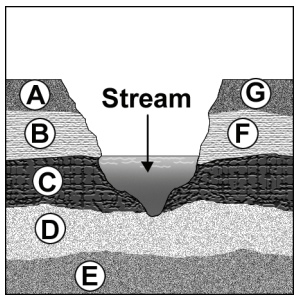
Determining the order of events in a geologic cross-section

Helpful information: To answer some of the questions, you need to understand some terms: fault, metamorphic rock, and intrusion. A fault is a region on Earth's surface that is split in two pieces. In other words, a fault is a crack on Earth's surface. Metamorphic rocks are formed when one kind of rock is changed by heat and pressure. When pressure is applied to layers of rock, the rock layers become wavy. An intrusion occurs when molten rock pushes its way through a rock or rock layers.

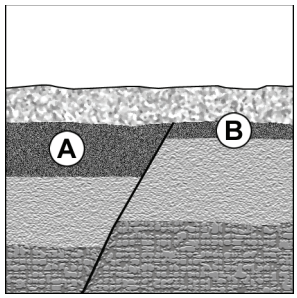
1. Use arrows to indicate the direction in which the following rock layers were compressed to make a metamorphic rock.



2. For the graphic at right, indicate the order in which the rock layers formed. Some layers formed at the same time. What relative dating concepts did you use to determine the order of the rock layers?



3. Look carefully at the graphic below. Why is layer B smaller than layer A? Which direction did the fault shift? How do you know?



4. Two faults are shown in this geologic cross-section at right. Place the rock layers and the two faults (A and B) in the order in which they happened.