Sample Lesson #2

Studying Earth's Rock Layers

In the mid-1600s, some local fishermen caught a shark and brought it to Nicolaus Steno. Steno noticed that the shark's teeth were very similar to fossils called *tongue stones*. At the time, scientists did not know where fossils came from. But Steno recognized that tongue stones were ancient shark teeth. He wanted to understand how materials such as teeth became embedded in layers of rock.

The study of rock layers is called **stratigraphy**. Rocks form in layers. Each layer has characteristics based on the environment it formed in. As the environment changes, new layers with new characteristics build up on top of old layers. Each layer is different from the one below it. Steno's studies revealed four basic principles:

Law of Original Horizontality: Sedimentary rock layers are first deposited in a horizontal **position.** When sediment settles, it forms smooth, flat layers of rock.

Law of Superposition: Each layer (or bed) of rock is older than the one above and younger than the one below it. Sedimentary rocks deposit on top of each other over time. Therefore, if rock layers are undisturbed, the youngest layer will always be "positioned" on top.

Law of Lateral Continuity: Sediments are deposited in sheets and extend laterally in all directions. A rock layer continues until it encounters a solid object or is acted upon by later forces. For example, it can be assumed that layers separated by a valley were once continuous.

Law of Cross-cutting Relationships: Any feature that cuts across a layer of rock is younger than the rock layer it cuts across. For example, the Grand Canyon is younger than the rock that it cuts through.

These principles let scientists date layers of rock relative to each other. **Relative dating** identifies the basic order of events. It does not determine an exact age. It determines which layer came first, second, third, and so on.

Scientists use relative dating to develop Earth's geologic column. The **geologic column** is a graphic representation, or chart. It shows a series of rock layers with all the known rock formations from oldest (bottom) to youngest (top). Scientists may study Earth's entire geologic column or just a specific part of it.

A geologic column can show the layers of rock in a given area, or it can show Earth's entire geologic column.

- 1. Stratigraphy is the study of rock layers. The word comes from "stratum" which means *layer* and "graphy" which means *to write*. Together they mean _____.
 - A) the rocks contain ancient writings
 - B) rocks were an early form of paper
- C) Earth's history is written in its rock layers
- D) none of these

- 2. Relative dating determines _____. A) the age of the rock layers relative to each other C) the exact age of rock layers B) which layer came first, second, third, and so on D) both A and B 3. What is the geologic column? Underline your answer in the text. 4. Some of the processes that shape Earth happen quickly. Many of the processes that shape Earth happen gradually. Does sedimentary rock form gradually or suddenly? gradually suddenly 5. Why is each layer of sedimentary rock different? Highlight your answer in the text. 6. Complete each principle. Sediment is always deposited in even, (horizontal / vertical) layers. Younger layers are always (on top of / below) older layers. Layers (extend over large areas / are limited to a small area). Any feature that cuts into a layer, must be (older / younger) than the layer it cuts through. 7. In the geologic time scale, chunks of time are characterized by _____ A) the life forms that were present C) the planets that were forming B) the geologic activity that occurred D) both A and B 8. The idea of uniformitarianism tells us . Check all that apply. _____ Earth is very old. _____ Geologic changes happen very suddenly and in unpredictable ways.
 - We can learn about the past by studying the present.
 - ____ Most of the changes to Earth's surface are gradual.



Roadcuts, canyons, and cliffs expose layers of rock. We study these layers to learn about Earth's geologic history.