It's All Relative

Background: During the late 18th and early 19th centuries, William Smith, a cartographer and engineer spent much of his time studying the rocks all over England and Ireland. While building canals to move coal from the country to the cities, Smith observed certain patterns in the order of the sedimentary rocks throughout the countryside. It got to the point where he could see an outcrop of a particular rock type and predict the underlying strata. It was his close study of the bedrock that led to the development of the **law of superposition**. According to this law, any sedimentary rock stratum is older than the strata lying above it and younger than the strata lying below it. Smith was also able to correlate sedimentary rock strata over large distances when he started to identify **fossils** that appeared only in certain rock layers. Fossils are the remains of past life forms that have been preserved through different methods and are used for information about earlier flora and fauna that inhabited the Earth. The fossils used by Smith, now known as **index fossils**, that worked best in the identification of rock layers were those that appeared in the rock record abruptly, covered a large geographic area, lasted for a short duration of time, and died out abruptly. Of particular importance to Smith were the ammonoids (see *Earth Science Reference Tables*). After decades of very tedious study, William Smith developed the very first geologic map. With the use of rock types and index fossils, he was able to **correlate** rocks from one end of England to the other.

Objectives: By the end of this activity, the student will be able to:

Standard: 4
Key Idea: 1.2*i*, 1.2*j*

Standard: 6
Key Idea: 2
models

1. use the *Earth Science Reference Tables* to organize a set of fossils chronologically,
2. correlate, based on fossil evidence, the stratigraphy of his/her location with that of an adjacent location, and
3. describe the characteristics that make a fossil a good index fossil.

Materials: Each group of students should receive the following:

Pack of five fossil cards
Roll of string
Scissors for cutting string
Masking tape
Paper clips
Earth Science Reference Tables

Procedure:

1. Use your *Earth Science Reference Tables* to identify the epoch of occurrence and the age (in millions of years) of each of the fossil specimens in your group. Write this information in **Table 1**.
2. Arrange the fossils according to age (oldest on the bottom) and attach, according to the directions of the teacher, to the string at your location. Assume that each fossil in your collection represents a stratum that is about 0.5 meters in thickness.
3. Using the string and the paper clips, correlate the fossils in your stratigraphic section, to the next one in a clockwise direction. The string should be pulled taught so it does not sag, but not too tight that it deforms the stratigraphic section. The string should attach the tops of each correlated stratum. Make sure to appropriately show missing strata by having it "pinch out," or by showing it dive into the floor, or come out of the ceiling.
4. Record (sketch) the fossils found at all locations in **Table 2**.
5. Answer the questions on the next page.
6. Carefully remove your strings and fossil cards in preparations for the next class.

Table 1

Location number_____

Youngest

Fossil name_____Epoch_____Age_____

Fossil name_____Epoch_____Age_____

Fossil name_____Epoch_____Age_____

Fossil name_____Epoch_____Age_____

Fossil name_____Epoch_____Age_____

Fossil name_____Epoch_____Age_____

Oldest

Fossil name_____Epoch_____Age_____