Name: _____ Date: _____

CONTENT 18.2

18.2 Relative Dating

READ

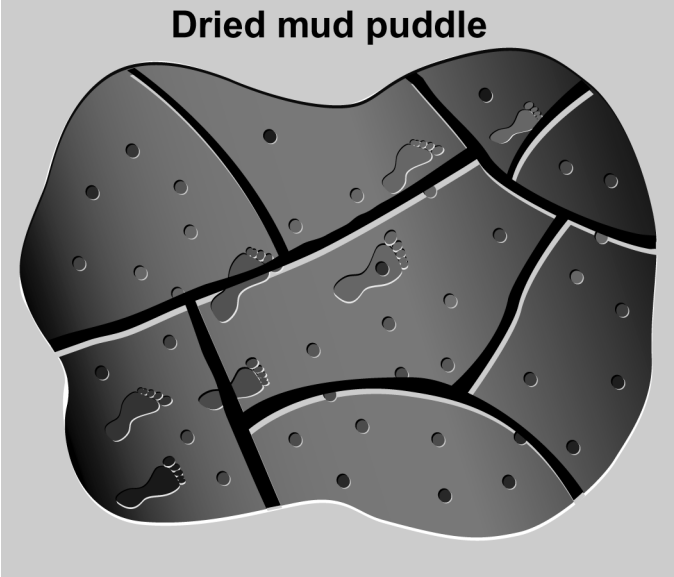
Earth is very old and many of its features were formed before people came along to study them. For that reason, studying Earth now is like detective work—using clues to uncover fascinating stories. The work of geologists and paleontologists is very much like the work of forensic scientists at a crime scene. In all three fields, the ability to put events in their proper order is the key to unraveling the hidden story.

Relative dating is a method used to determine the general age of a rock, rock formation, or fossil. When you use relative dating, you are not trying to determine the exact age of something. Instead, you use clues to sequence events that occurred first, then second, and so on. A number of concepts are used to identify the clues that indicate the order of events that made a rock formation.

PRACTICE

Sequencing events after a thunderstorm

Carefully examine this illustration. It contains evidence of the following events:

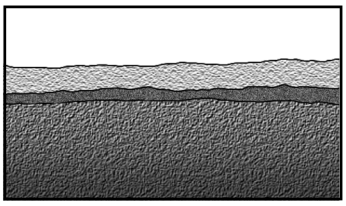


- The baking heat of the sun caused cracks to formed in the dried mud puddle.
- A thunderstorm began.
- The mud puddle dried.
- A child ran through the mud puddle.
- Hailstones fell during the thunderstorm.

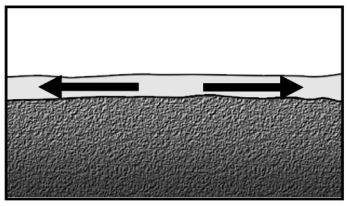
1. From the clues in the illustration, sequence the events listed above in the order in which they happened.
2. Write a brief story that explains the appearance of the dried mud puddle and includes all the events. In your story, justify the order of the events.

Determining the relative ages of rock formations

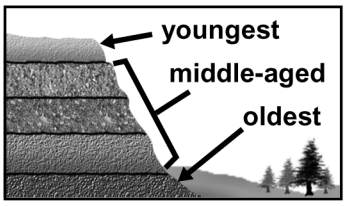
Relative dating is an earth science term that describes the set of principles and techniques used to sequence geologic events and determine the relative age of rock formations. Below are graphics that illustrate some of these basic principles used by geologists. You will find that these concepts are easy to understand.



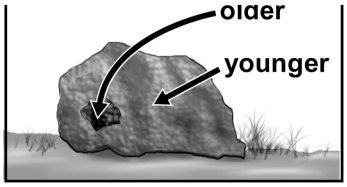
A. Original Horizontality



B. Lateral continuity

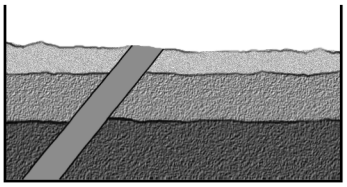


C. Superposition



D. Inclusions

E. Unconformities



F. Cross-cutting relationships

Match each principle to its explanation. One relative dating term will be new to you! Which is it? There is one explanation that does not have a matching picture. Write the name of this explanation.

Explanations

3. In undisturbed rock layers, the oldest layer is at the bottom and the youngest layer is at the top.
4. In some rock formations, layers or parts of layers may be missing. This is often due to erosion. Erosion by water or wind removes sediment from exposed surfaces. Erosion often leaves a new flat surface with some of the original material missing.
5. Sediments are originally deposited in horizontal layers.
6. Any feature that cuts across rock layers is younger than the layers.
7. Sedimentary layers or lava flows extend sideways in all directions until they thin out or reach a barrier.
8. Any part of a previous rock layer, like a piece of stone, is older than the layer containing it.
9. Fossils can be used to identify the relative ages of the layers of a rock formation.

Sequencing events in a geologic cross-section

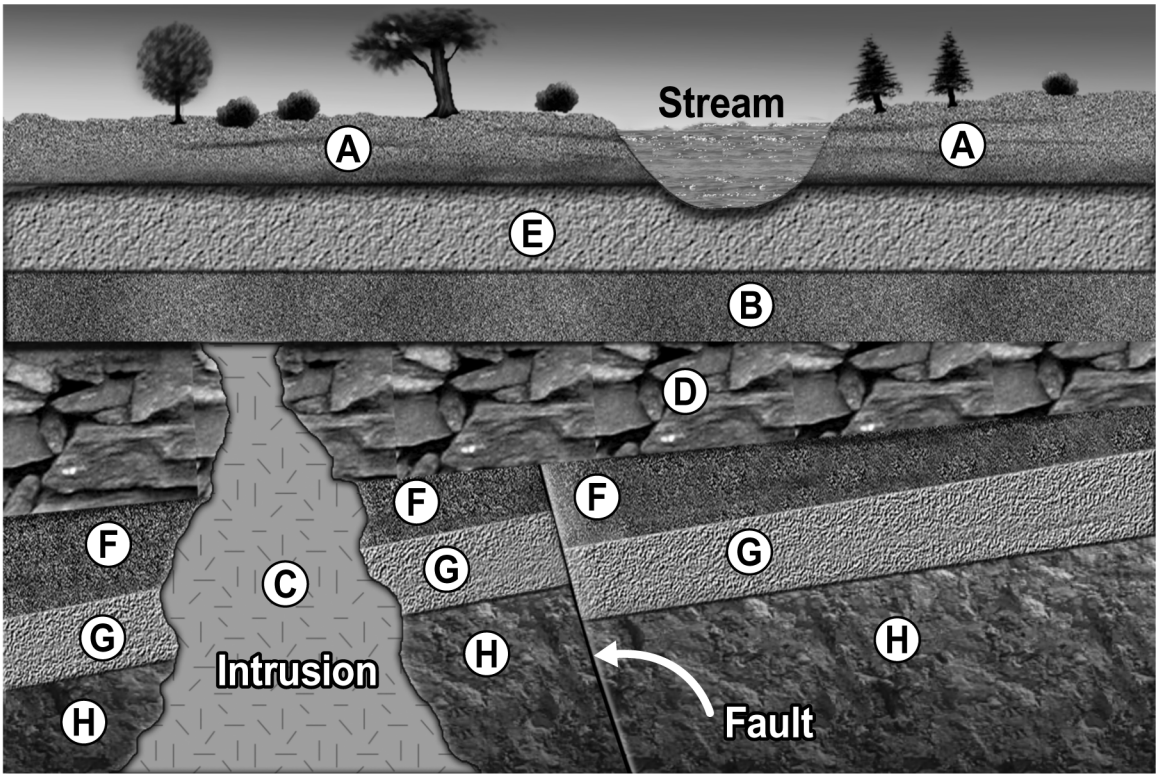
Understanding how a land formation with its many layers of soil was created begins with the same time-ordering process you used earlier in this skill sheet. Geologists use logical thinking and geology principles to determine the order of events for a geologic formation. Cross-sections of Earth, like the one shown below, are our best records of what has happened in the past.

Rock bodies in this cross-section are labeled A through H. One of these rock bodies is an intrusion. Intrusions occur when molten rock called magma penetrates into layers from below. The magma is always younger than the layers that it penetrates. Likewise, a fault is always younger than the layers that have faulted. A fault is a crack or break that occurs across rock layers, and the term faulting is used to describe the occurrence of a fault. The broken layers may move so that one side of the fault is higher than the other. Faulted layers may also tilt.

10. List the rock bodies illustrated below in order based on when they formed.

11. Relative to the other rock bodies, when did the fault occur?

12. Compared with the formation of the rock bodies, when did the stream form? Justify your answer.



Extension—Creating clues for a story

Collect some materials to use to create a set of clues that will tell a story. Examples of materials: construction paper, colored markers, tape, glue, scissors, different colors of modeling clay, different colors of sand or soil, rocks, an empty shoe box or a clear tank for clues.

Then, give another group in your class the opportunity to sequence the clues into a story. Follow these guidelines in setting up your story:

- Set up a situation that includes clues that represent at least five events.
- Each of the five events must happen independently. In other words, two events cannot have happened at the same time.
- Use at least one geology principle that you learned through this skill sheet.
- Answer the questions below.

13. Describe your set of clues in a paragraph. Include enough details in your paragraph so that someone can re-create the set of clues.

14. What relative dating principles are represented with your set of clues? Explain how these principles are represented.

15. Now, have a group of your classmates put your set of clues in order. When they are done, evaluate their work. Write a short paragraph that explains how they did and whether or not they figured out the correct sequence of clues. Describe the clue they missed if they made an error.