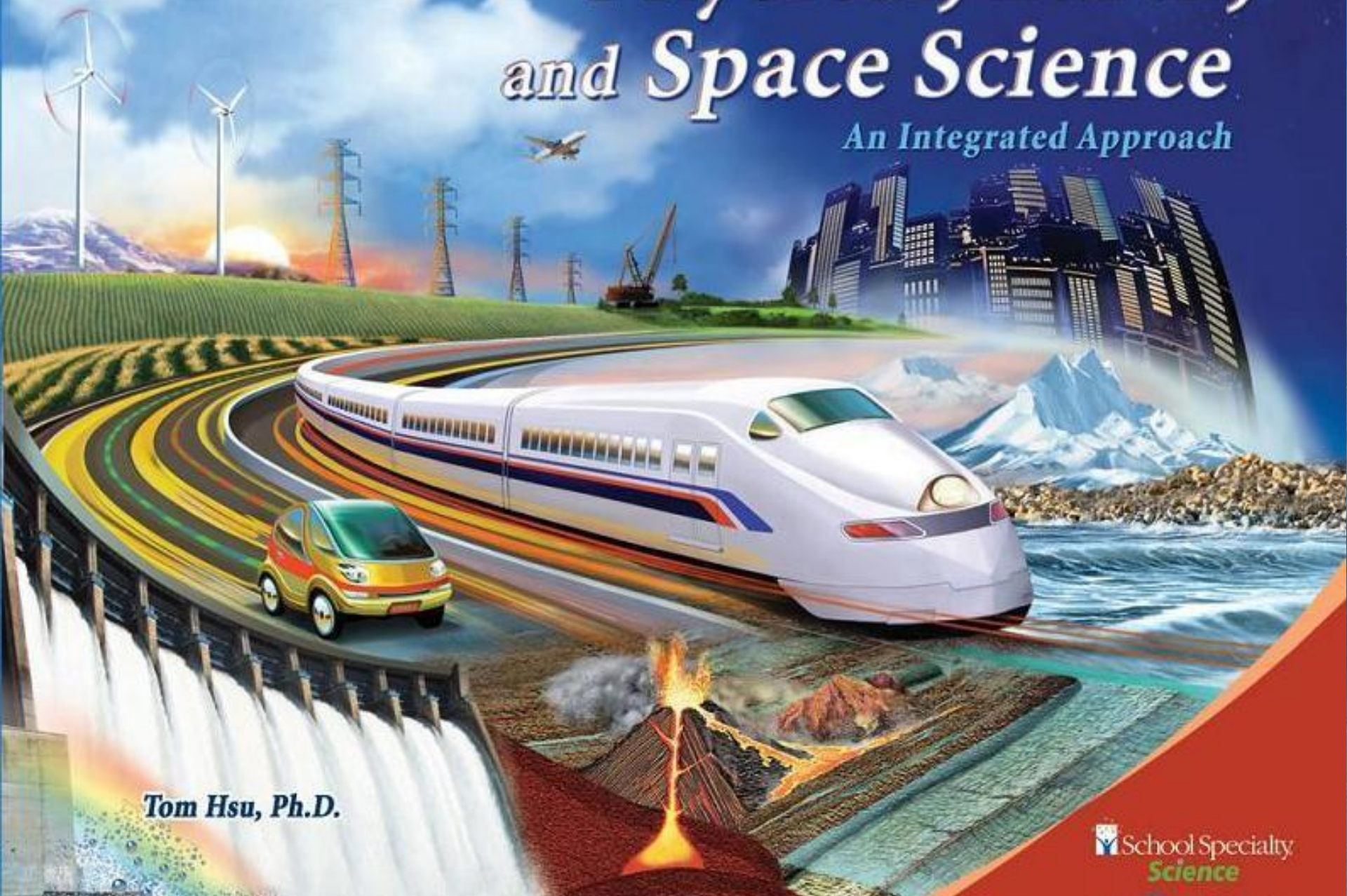


cpo science

Physical, Earth, and Space Science

An Integrated Approach



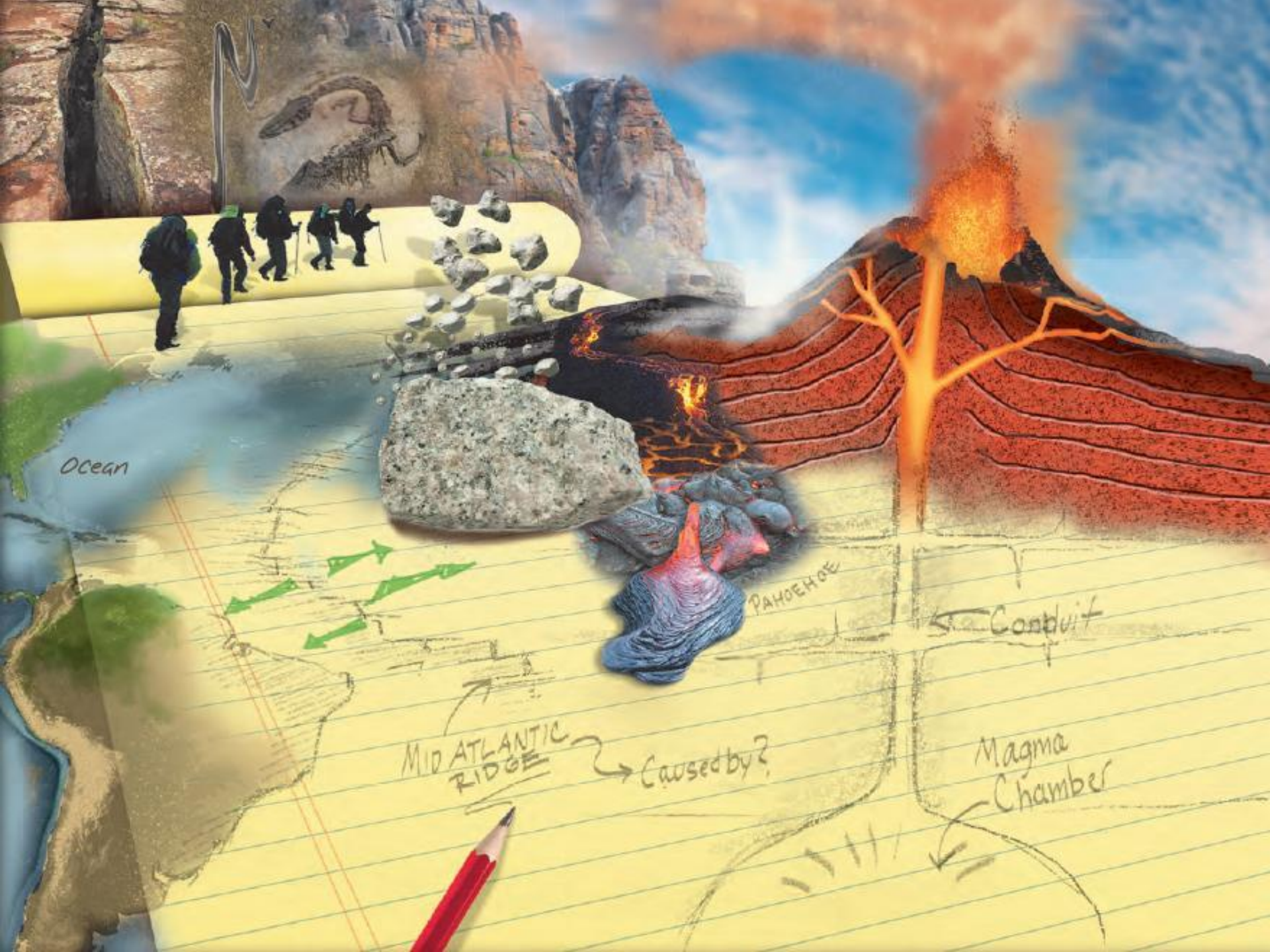
Tom Hsu, Ph.D.

 School Specialty
Science



UNIT SIX: Earth's Structure

- **Chapter 18 Earth's History and Rocks**
- **Chapter 19 Changing Earth**
- **Chapter 20 Earthquakes and Volcanoes**



Ocean

MID ATLANTIC RIDGE

Caused by?

PANGLOSS

Conduit

Magma Chamber



Chapter Eighteen: Earth's History and Rocks

- **18.1 Geologic Time**
- **18.2 Relative Dating**
- **18.3 The Rock Cycle**



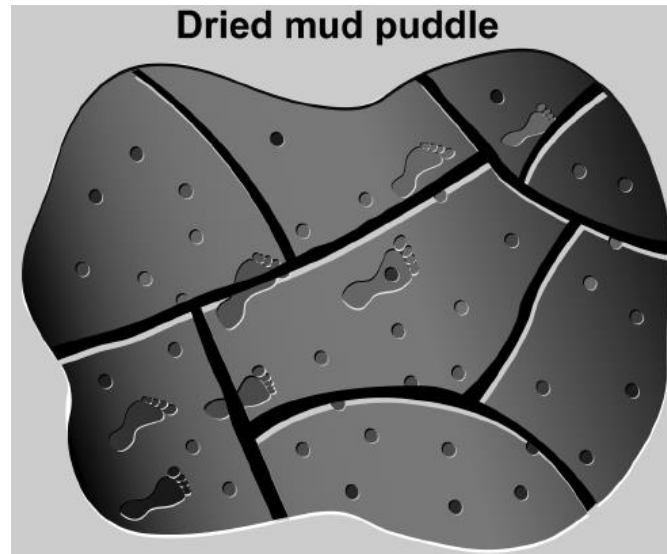
18.2 Learning Goals

- **Compare and contrast methods of relative dating.**
- **Discover the contributions of scientists whose theories help to develop modern geology.**
- **Explain the importance of fossils.**

Investigation 18B

Relative Dating

- **Key Question:**
How does relative dating tell a story?



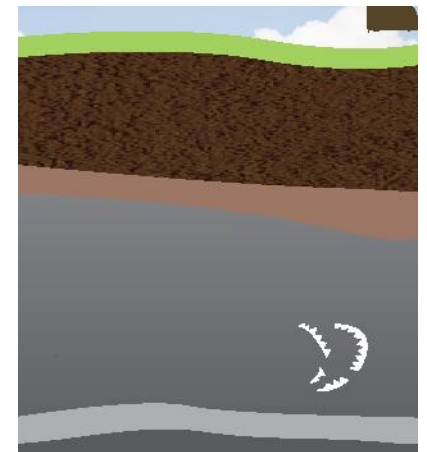
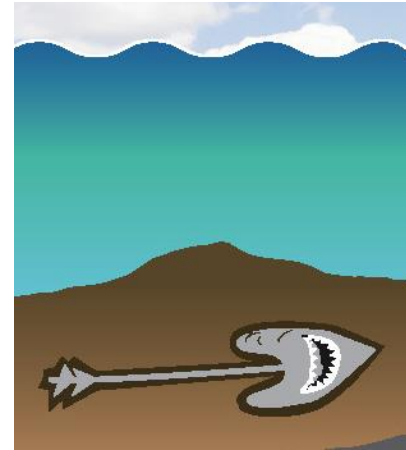
18.2 The beginnings of geology

- In 1666, Nicholas Steno, a Danish anatomist, studied a shark's head and noticed that the shark's teeth resembled mysterious stones called "tonguestones".

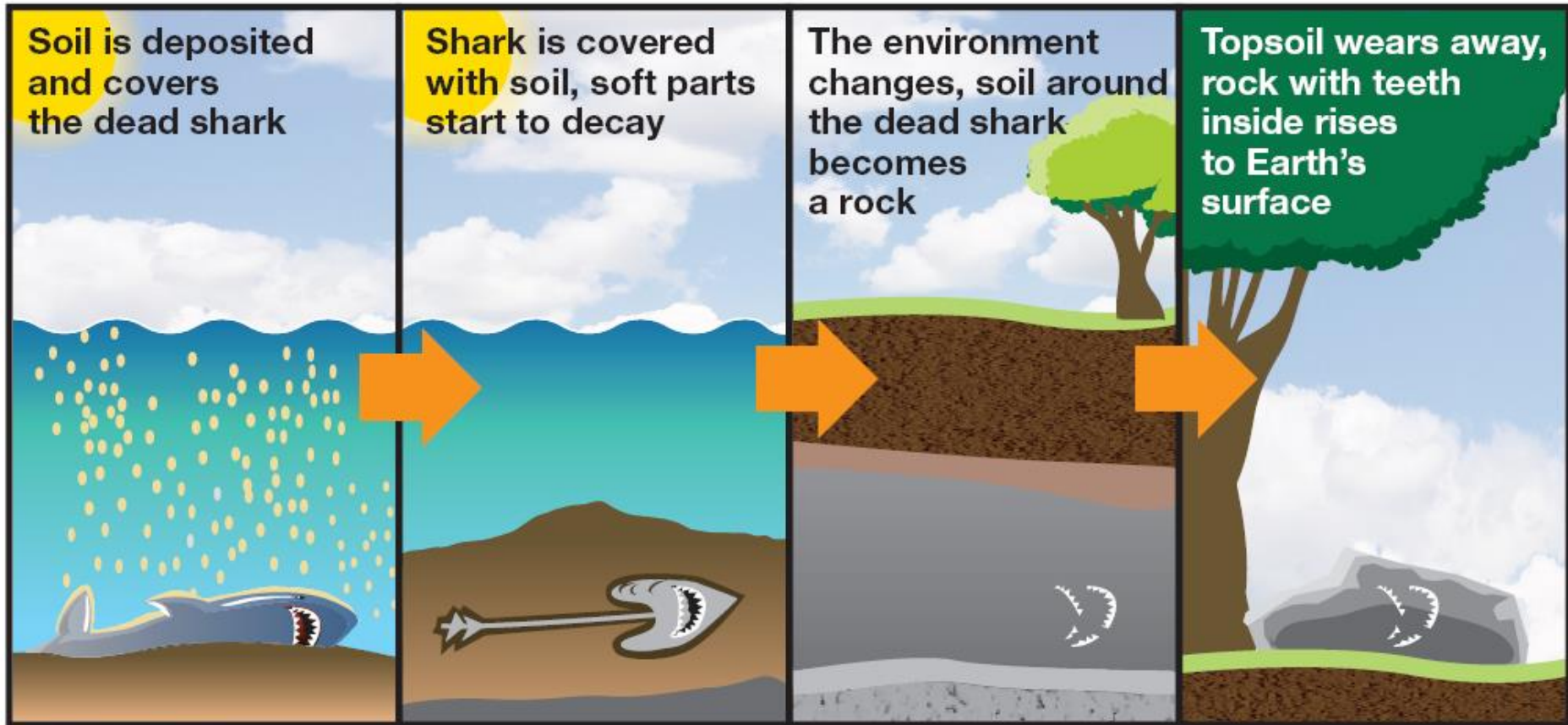


18.2 The beginnings of geology

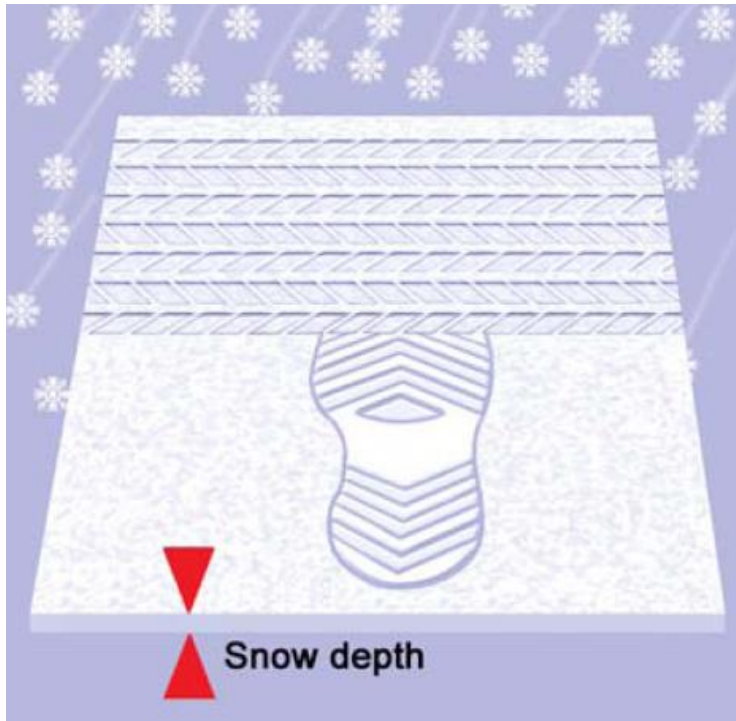
- **Steno theorized that tonguestones looked like shark's teeth because they actually *were* shark's teeth that had been buried and became fossils.**



Fossil Formation



18.2 Relative dating



* Which event happened first?

- Steno's principles are used by geologists to determine the age of fossils and rocks in a process called relative dating.
- * *Relative dating* is a method of sequencing events in the order they happened.



18.2 Relative dating



- **James Hutton (1726–1797) showed how processes today might explain what happened a long time ago.**
- **For example, grooves left behind by flowing rainwater helped explain the formation of the Grand Canyon from the Colorado River.**



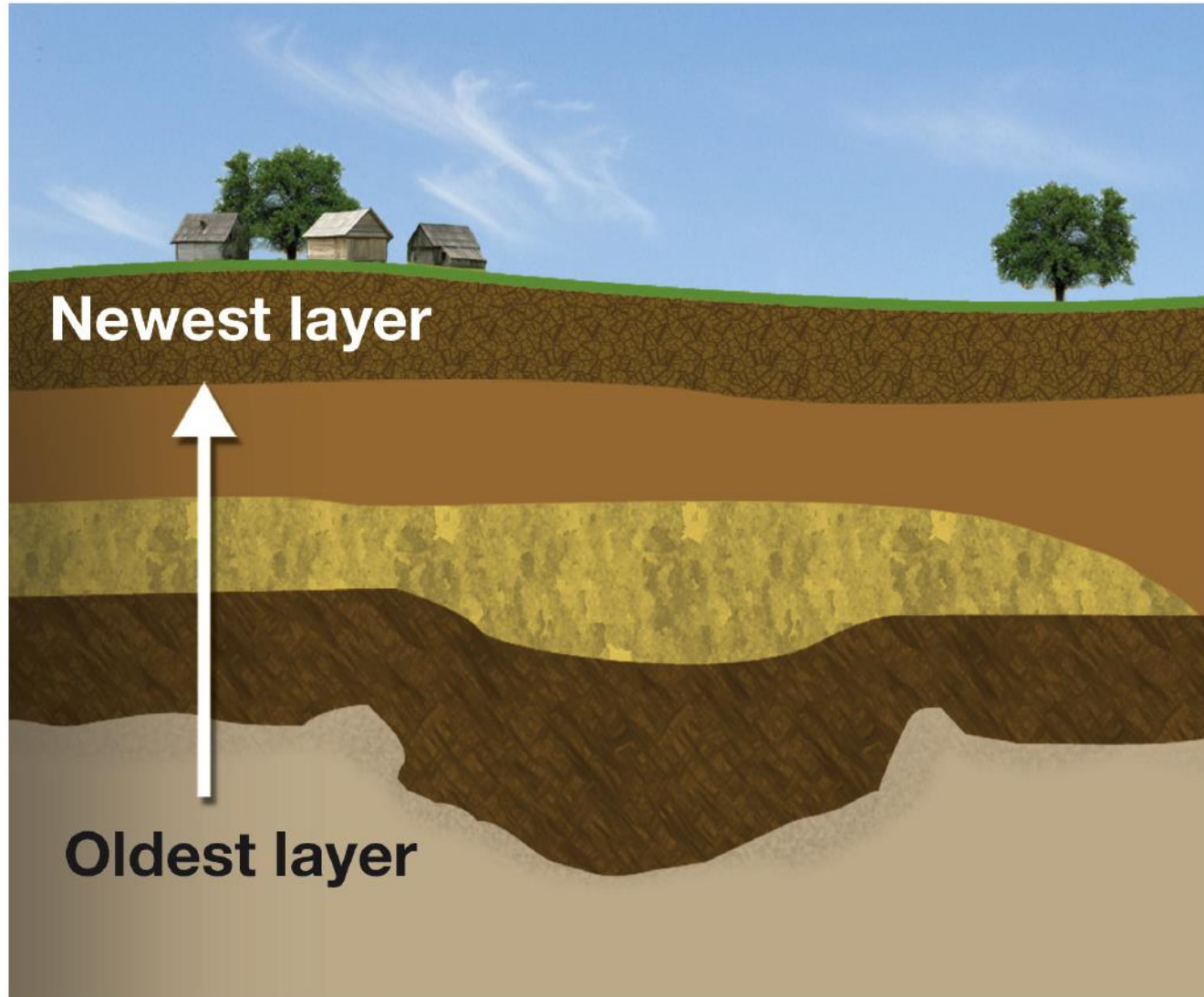
18.2 Law of superposition

- * Steno's ideas for relative dating include superposition, original horizontality, and lateral continuity.
- * Steno identified the *law of superposition*, which states that the bottom layer of a rock formation is older than the layer on top.



Add into notes

Rock Layering



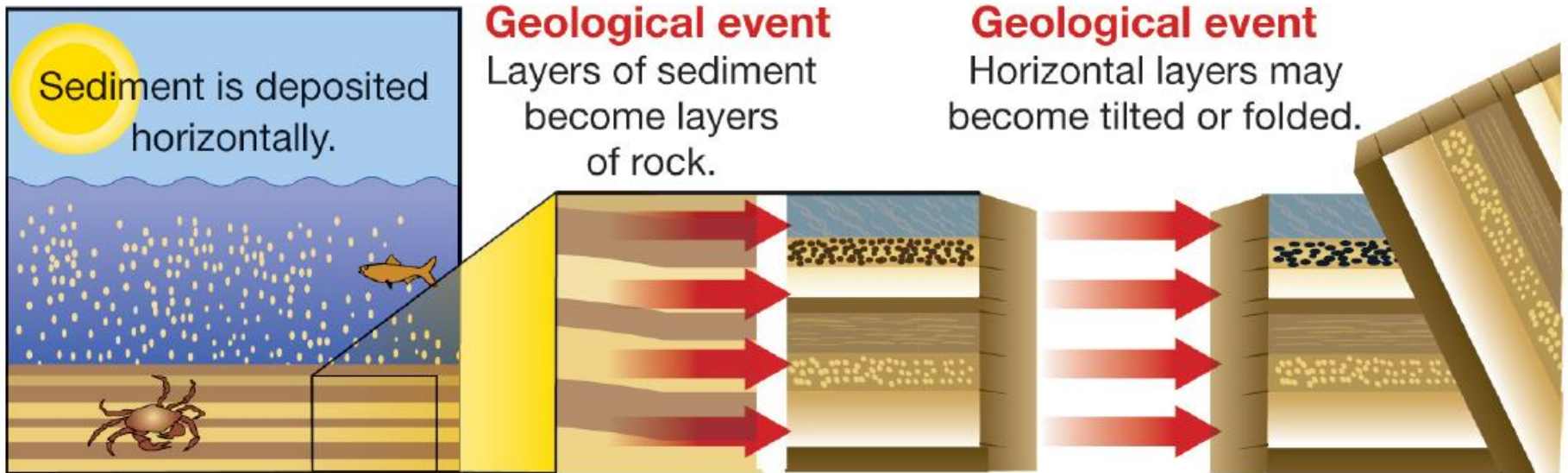


18.2 Law of horizontality

- * **Steno also identified the *law of original horizontality* which refers to how sediment particles settle to the bottom of a body of water in response to gravity.**
- * **Horizontal layers of rock might become tilted or folded by a geological event.**



18.2 Original horizontality

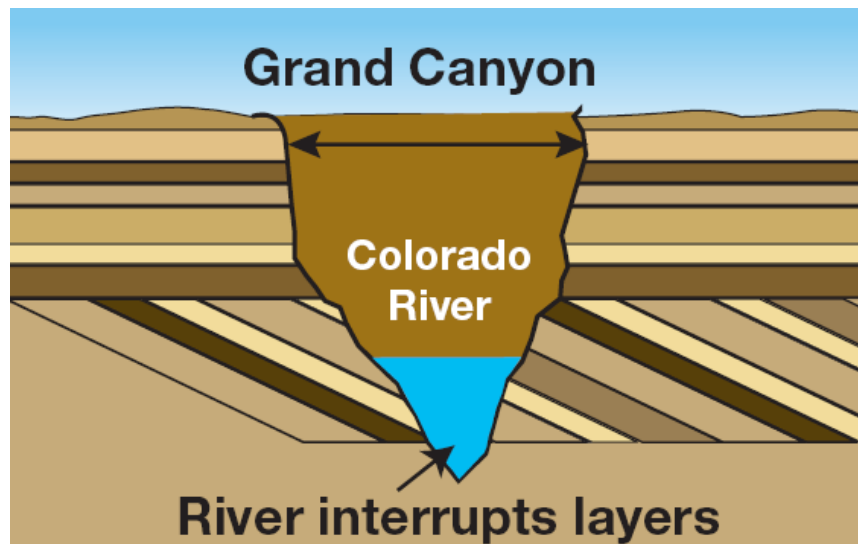


Layers might be tilted at any angle and can even be upside down.

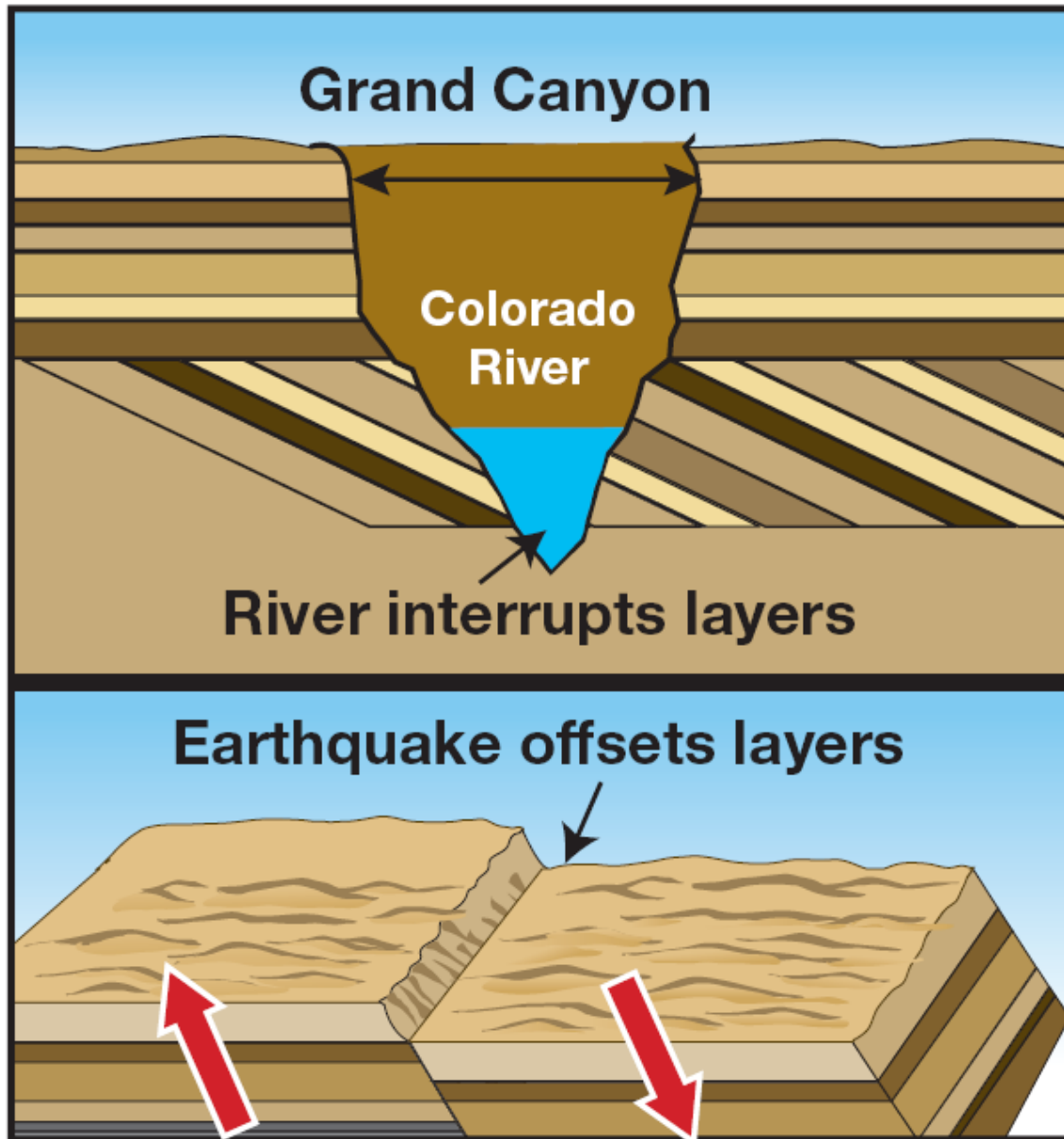


18.2 Law of lateral continuity

- * **The *law of lateral continuity* refers to how layers of sediment extend in all directions horizontally unless a river erodes them or an earthquake moves them.**

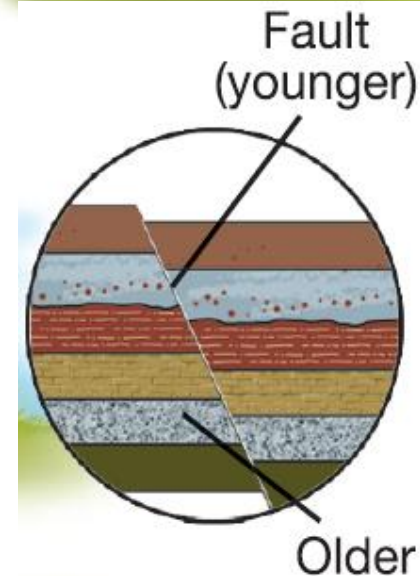


Lateral Continuity



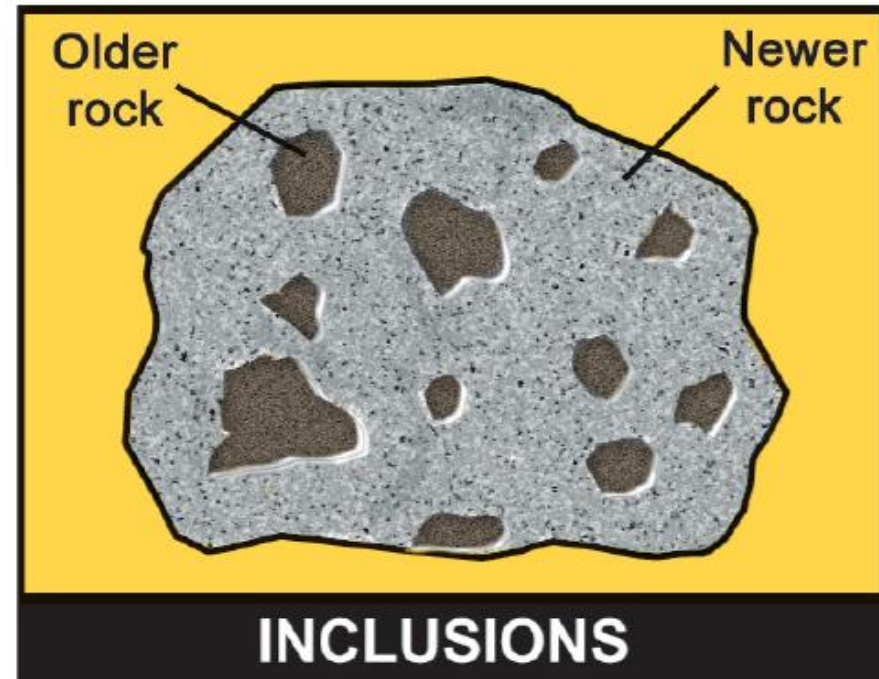
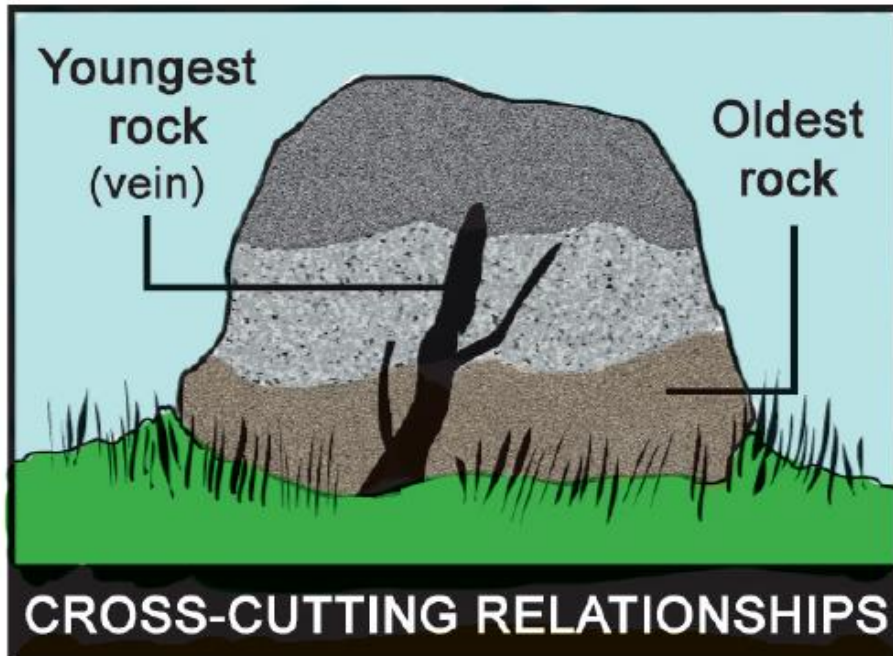
18.2 The relative age of a rock

- * **The principle of cross-cutting relationships** states that a vein of rock or a fault that cuts across a rock's layers is younger (more recent) than the layers.
- * The middle and top layers formed after the bottom layer but before the vein.



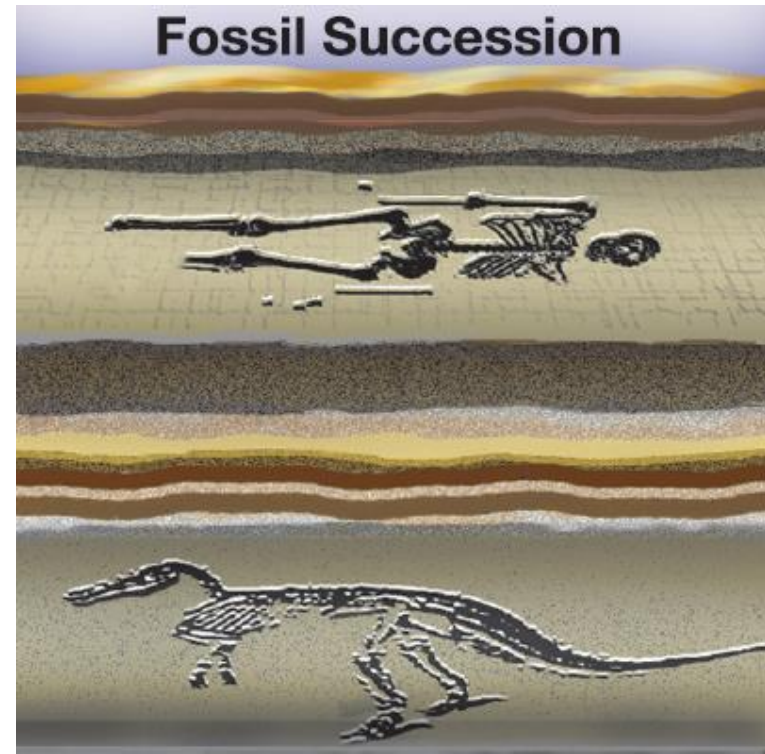


Cross-Cutting Relations and Inclusions



18.2 Fossil succession

- * The *principle of fossil succession* means that fossils can be used to identify the relative age of the layers of a rock formation.
- * The organisms found in the top layers appeared after the organisms found in the layers below them.

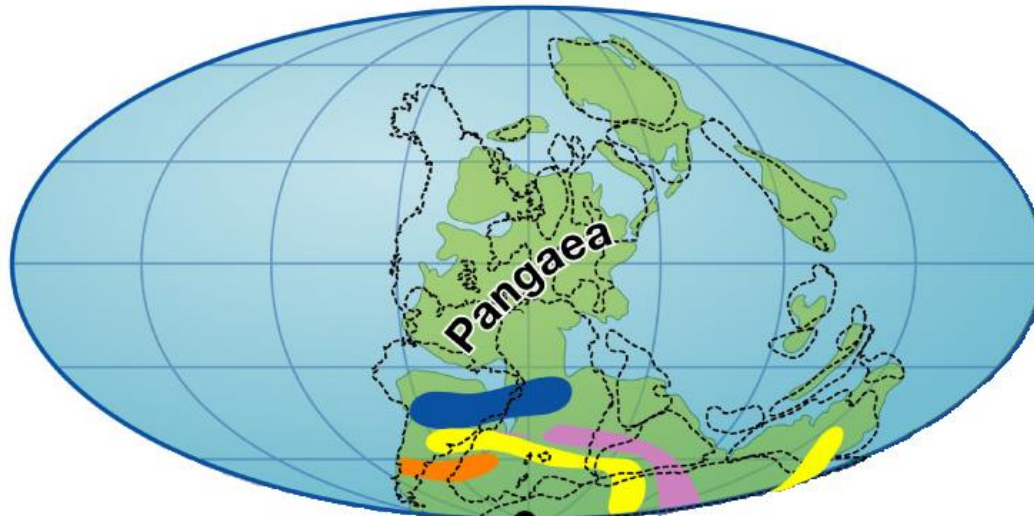




18.2 Fossils and Earth's changing surface

- * Most of the land on Earth was part of a large landmass called Pangaea about 250 millions of years ago.

Where organisms lived on Pangaea



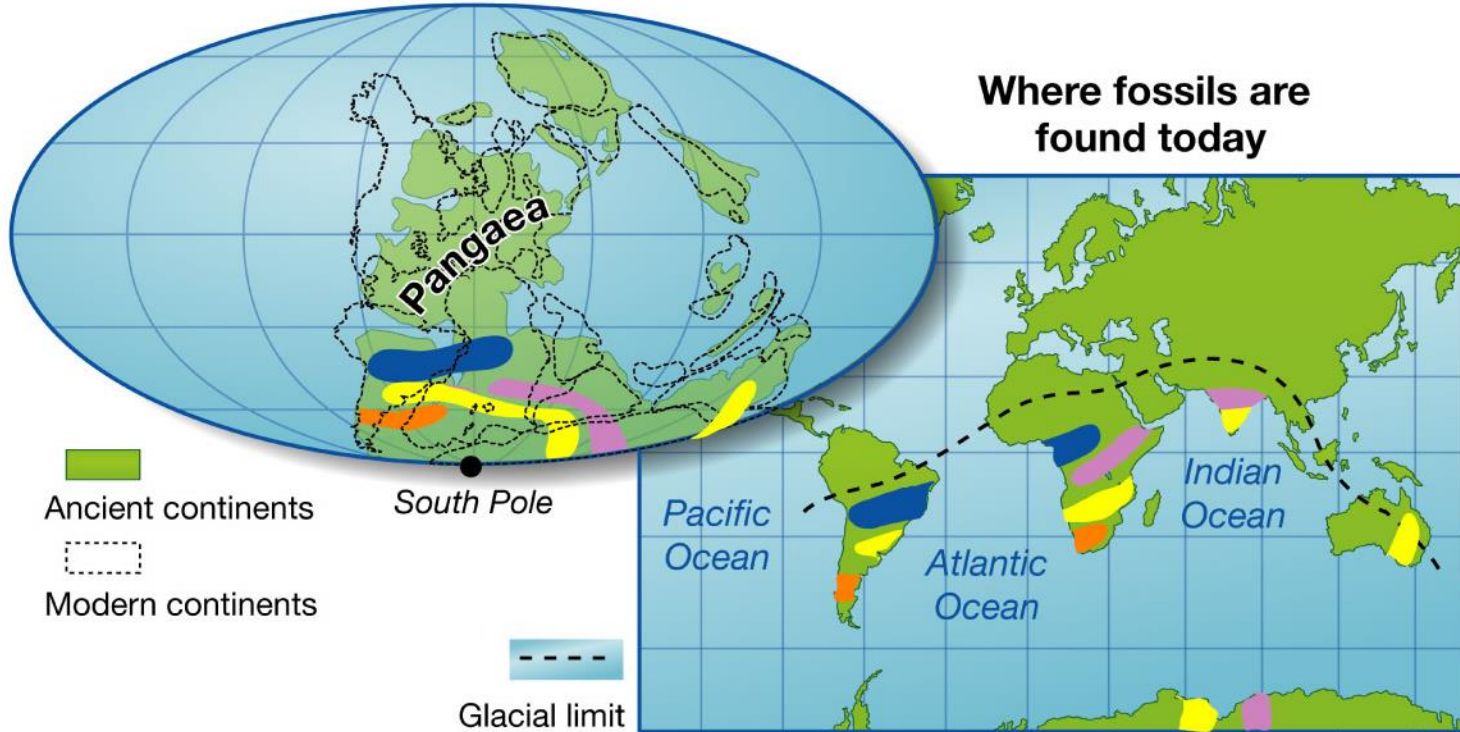
18.2 Fossils and Earth's changing surface

- * Fossils provide evidence for how Earth's surface has changed over time.
- * Scientists map fossil locations.
- * Understanding Earth's past helps explain how similar plants and animals ended up in different locations.



Fossil Locations

Where organisms lived on Pangaea



Range of organisms

