Clash of Ideas, Episode 2
Pluto vs Neptune and the Origin of Rocks

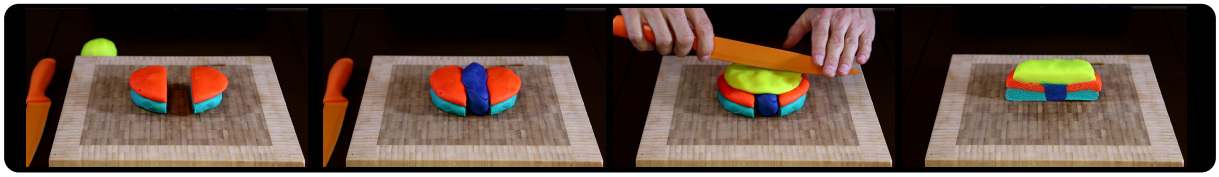
Engage

- Does it surprise you that one outcrop could have such a major impact on the history of geology? Why, or why not?
- Which fits better with the biblical worldview, seeing history as an eternal cycle, or seeing history as a linear progression of events?
- Why do you think that James Hutton wanted to believe that in the rock record, "We find no vestige of a beginning, no prospect of an end"?
- When the outcrop near Predazzo was studied carefully, it was shown that the granite rocks were definitely on top of the limestone. Does that mean that Hutton was right about the endless cycles?
- Even though all modern geologists recognize that the earth had a beginning, and that distinct trends can be seen in the rock record, many people are still "scoffers…following their own evil desires," and saying "Where is this 'coming' he promised? Ever since our ancestors died, everything goes on as it has since the beginning of creation" (2 Peter 3:3-4). Have you heard people say anything like this? If so, in what way?

Discover

- Play-Doh exercise on superposition:

  Make two or more layers of Play-Doh and cut them in half as shown
  Add another color of Play-Doh in between the two halves
  Add another layer on top, and cut the Play-Doh cake as shown



For more information, see: https://www.youtube.com/watch?v=a7vnyTYiXaE

- In the Play-Doh cake, look at the way the layers are positioned, and think about the order in which they were laid down or inserted. This type of thinking is a common exercise in geology, and is what the geologists who studied the outcrop at Predazzo were doing to determine that the granites were younger than the limestones.

Explain

- The big picture in the debate between Neptunism and Plutonism has more to do with Earth's beginning than it does with the origin of granite. Abraham Werner believed that granite was a primary rock, one of the first rocks that precipitated out of a primordial ocean, and so he believed that Earth had a beginning. James Hutton, on the other hand, believed that granite was formed from magma, and that the rocks were cycled endlessly, and that Earth did not have a beginning. In Predazzo, Italy, a small town in the Alps, granites were found that intruded into limestone. These granites eventually convinced many geologists that the Plutonists were right. It turns out, however, that the formation of granite from magma is part of a distinct trend in rock formation, and fits with the idea that Earth did have a beginning.

Half Dome is a granitic dome in Yosemite National Park in California

Extend

- 2 Peter 3:3-4 summarizes the creation account in Genesis, and reminds us that the antediluvian world was destroyed by the Flood. Then Peter tells us something interesting—just like the antediluvian world was destroyed by a flood, this world will be destroyed by fire. When Noah preached on the coming judgement, scoffers said such a flood would be impossible. After all, it had never rained on the earth. These people didn't enter the ark, and in the end, only Noah and his family were saved. Similarly, many people today mock the idea that a flood destroyed the ancient world, and also mock the idea that this world will be destroyed by fire.

Assess/Reflect

- Graphic Organizer

If granite was precipitated out of a primordial ocean:	If granite is formed by cooling magma:
We should be able to reproduce the process in a laboratory	If we can reproduce the temperatures and pressures present down in the earth, as well as the time scales necessary, we should be able to create granite in a laboratory
Granite should mostly be below sedimentary rocks in the rock record, and it should not be found in veins that cut through other rocks	We might find granite intruded into other rocks

Teacher's Resource

Vocabulary

Superposition: in geology, the law of superposition states that in a sequence of deposited in layers, the youngest layer is on top and the oldest on bottom, each layer being younger than the one beneath it and older than the one above it

Magma: hot fluid or semifluid material below or within the earth's crust from which igneous rocks are formed

Granite: a granular rock formed from magma deep in the earth

Limestone: a sedimentary rock often composed of skeletal fragments of marine organisms

Precipitate: to form a solid out of a solution

Antediluvian: before Noah's Flood

Video for exercise available at:
https://www.grisda.org/audio-visual-media?album=5469010&video=206448504