

Get My Drift?

Exploration

Challenge: How can you make a model to show how continents move?

Materials: one piece of thin Styrofoam water
flat pan waterproof marking pen
citric acid (solid) sodium bicarbonate (baking soda)
beaker

Watch Out! The citric acid can be caustic to the eyes, so safety goggles should be worn for this experiment.

Let's Dig In:

Continental drift is something that most people have heard about, but not seen. Since the process takes millions of years, it can't be seen. In this activity you will carry out an experiment that will essentially allow you to "speed up time" by creating a model of continental drift.

Follow the steps outlined below.

- Measure out approximately equal amounts of citric acid and baking soda (both in the solid form) in a beaker, mixing well. Try using about 1/4 of each in your beaker (between 50 mL and 75 mL, if you are measuring with a graduated cylinder). This will leave plenty of room for mixing.
- Spread the mixture evenly into the bottom of the clean and thoroughly dry flat pan.
- Use the marking pen to make a design on the piece of Styrofoam. Make certain the design is rather large, covering the surface from corner to corner. It will be used later to help you determine where and how far the pieces have moved.
- Break up the Styrofoam into 5 to 7 pieces. Don't make the pieces too small.
- Place the pieces in their original orientation in the middle of the pan.
- Sketch your arrangement in the BEFORE box below or on a separate piece of paper.
- SLOWLY, pour water in one corner of the pan until the bottom is covered with water.
- Observe the Styrofoam pieces for several minutes. Sketch the arrangement in the AFTER box below or on a separate piece of paper.

Observations:

BEFORE



AFTER



Go Figure:

1. Describe the changes that occurred when the water was first added to the solid mixture in the pan.
2. Describe what happened to the Styrofoam pieces after the water was added.
3. What is the energy source that moved the Styrofoam pieces?
4. Based on this model, develop a hypothesis of how the continents arrived in their current positions.

Teacher Notes
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GEOMES Topic: the Dynamic Earth – Earth’s Energy Sources

Lab setup:	none	<u>easy</u>	moderate	difficult
Reasoning level	easy	<u>moderate</u>	difficult	
Time required:	<u>20-40 minutes</u>	40-60 minutes	60-90 minutes	
Process skills:	<u>observing</u>	<u>collecting data</u>	<u>hypothesizing</u>	

Objectives: Students will better understand the movement of the continents over time by constructing a model designed to reenact this process.

National Science Education Standards:

Content Standards: Earth and Space Science - Energy in the earth system
Structure of the earth system
Unifying Concepts and Processes: Evidence, models, & explanation

Materials: thin Styrofoam - one per student group (approximately 10 cm x 10 cm per piece)
pan with sides – one per student group (approximately 10 x 13 inches)
citric acid (solid) – each group will need about 75 mL of the solid
sodium bicarbonate (baking soda) – each group will need about 75 mL
water
beakers – one per student group (at least 200 mL capacity)
spoons
safety goggles

Watch Out! Students should wear goggles during the experiment, as the citric acid solid is caustic.

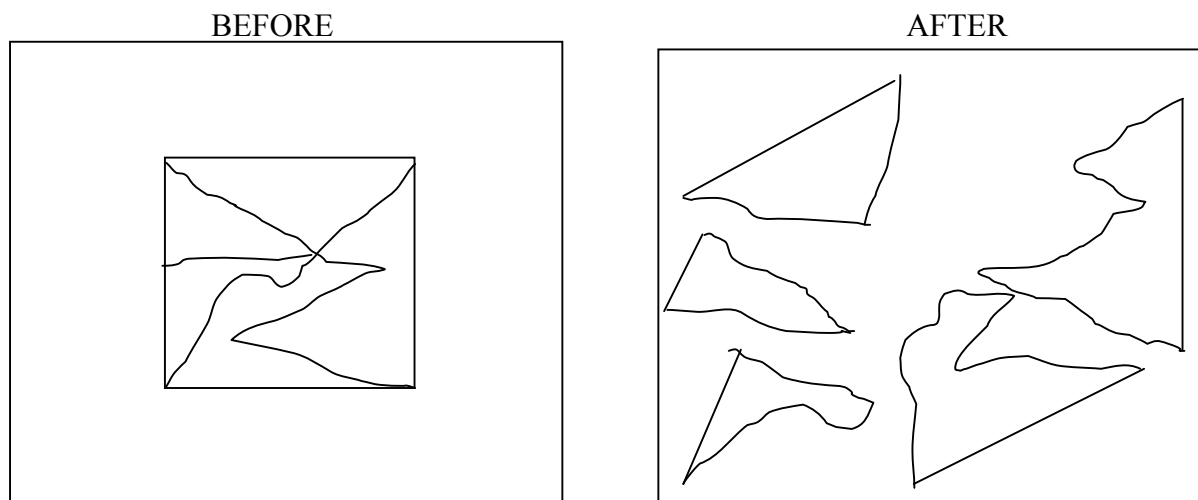
Background Information:

The surface of Earth as being divided into huge plates whose slow movements carry the continents on a slow drift around the globe. Where the plates come in contact with one another, they may cause catastrophic events, such as volcanic eruptions and earthquakes, which in turn can trigger the destructive ocean waves known as tsunamis. Plate tectonics became widely accepted by earth scientists starting only in the 1960s.

Teaching Strategies:

All materials must be dry or the chemical reaction will start before students are ready. Measuring the amounts of sodium bicarbonate and citric acid with a balance is not necessary, as long as they are in an approximate 1:1 ratio and cover the bottom of the pan. It is important to spread the mixture so that it completely covers the bottom of the pan. You should also remind students to pour the water slowly and not directly on the Styrofoam. As you circulate around the classroom, you may notice that some student’s pieces have not moved much. When this happens, suggest that the students add a bit more water in one of the other corners of the pan.

Sample Observations:



Sample Responses to Go Figure:

1. When the water mixed with the solids, a chemical reaction occurred in which it fizzed and a gas was given off.
2. The Styrofoam pieces moved. Some pieces moved apart, some bumped against each other. Some moved across the pan.
3. The energy source that moved the pieces was the chemical reaction in which a gas was given off. This reaction occurred when water mixed with the citric acid and sodium bicarbonate.
4. The continents were like the Styrofoam pieces. The continents may have all been in one landmass, like the before Styrofoam pieces before the water was added. The land mass was cracked and an energy source must have caused the continents to move around on the earth.

Internet Connection:

What is the direction each tectonic plate move?

Search Engine Key Words: "Tectonic Plates" AND move*

What do scientist theorize the breakup of Pangea looks like?

Search Engine Key Words: *Pangea AND animation