HUNGER FOR PLATE TECTONICS

INTRODUCTION

Maps are a guide through some of the evidence for plate tectonics. Colliding sponges compress tens of millions of years of plate motion within a few moments of time. An apple serves as a visual model of the Earth . . . and a snack.

OVERVIEW

Three activities serve as an introduction to the theory of plate tectonics. The first part goes through some of the historical evidence for plate tectonics. The second section, we recreate some landforms using two sponges. Finally we use an apple as a model of the Earth.

MATERIALS

- 1 apple (and something to slice it with. Teeth work.)
- 2 sponges
- Print out of this guide or sheets of paper
- Writing utensil
- Color pencils/markers

ACTIVITIES

Journey into Plate Tectonics

Maps and questions introduce some of the historical evidence of plate tectonics.

Continental Collisions

Hands on activity recreating plate motion and a landform using sponges.

Apple to the Core

Create a visual model of the Earth using an apple.

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JOURNEY INTO PLATE TECTONICS

Plate tectonics explains how the crust of the Earth works, and how many phenomena, like the locations of specific fossils and living organisms are found today, as well as the locations of earthquakes and volcanoes.

Map 1 – Map of Earth. Symbols on map represent general locations of fossil species.

The earliest evidence showing the Earth changes included fossils. Some fossils are included in Map 1, which illustrates something else – the puzzle-like fit of some coastlines indicate that at one point all land was united into the supercontinent Pangea.

1. What specific continents had coastlines suggesting Pangea existed?
2. How do the locations of these fossils suggest the continents were connected? To help with this, show the locations of these fossil species on the Pangea figure in Map 2. Color pencils or markers may help to differentiate each type of fossil.

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JOURNEY INTO PLATE TECTONICS *continued*

Map 2 – Stylized map of Pangea.
Adapted from Kieff, CC license.

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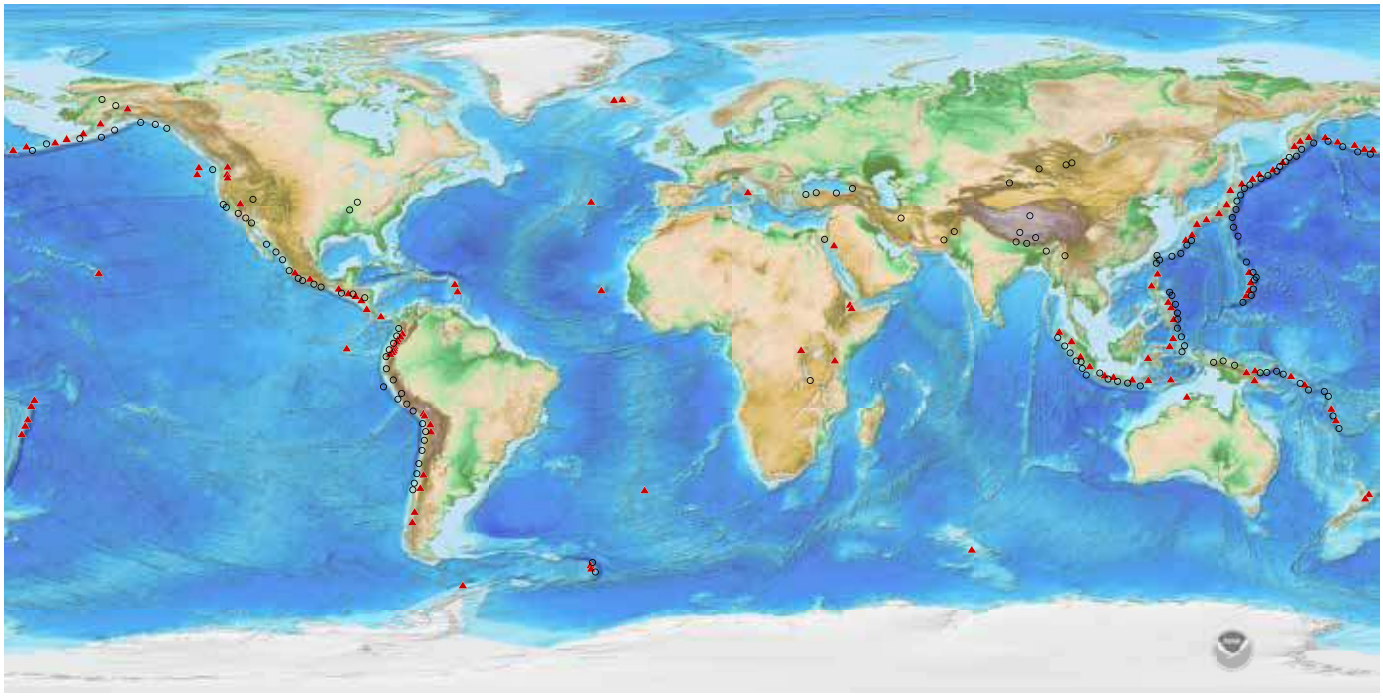
JOURNEY INTO PLATE TECTONICS *continued*



Map 3 – Relief map of the surface of the Earth. Circles and triangles represent events and a type of landform. Image from NOAA. Data from USGS.

About 50 years ago, technology allowed mapping the ocean floor. This revealed two-thirds of the Earth surface never known, including ridges (light blue) and trenches (dark blue lines). It may help to get oriented by labeling the continents and oceans.

Look at the locations of the events (black circles) and landforms (red triangles). What are these? Note they fall along lines, suggesting breaks that divide the solid crust of the Earth. What do these lines separate? Do the lines in Map 4 align with any features in Map 3? Drawing those lines below in Map 3 may reveal what they align with. If this is not possible, sketch these out on a piece of paper or describe what features they follow.

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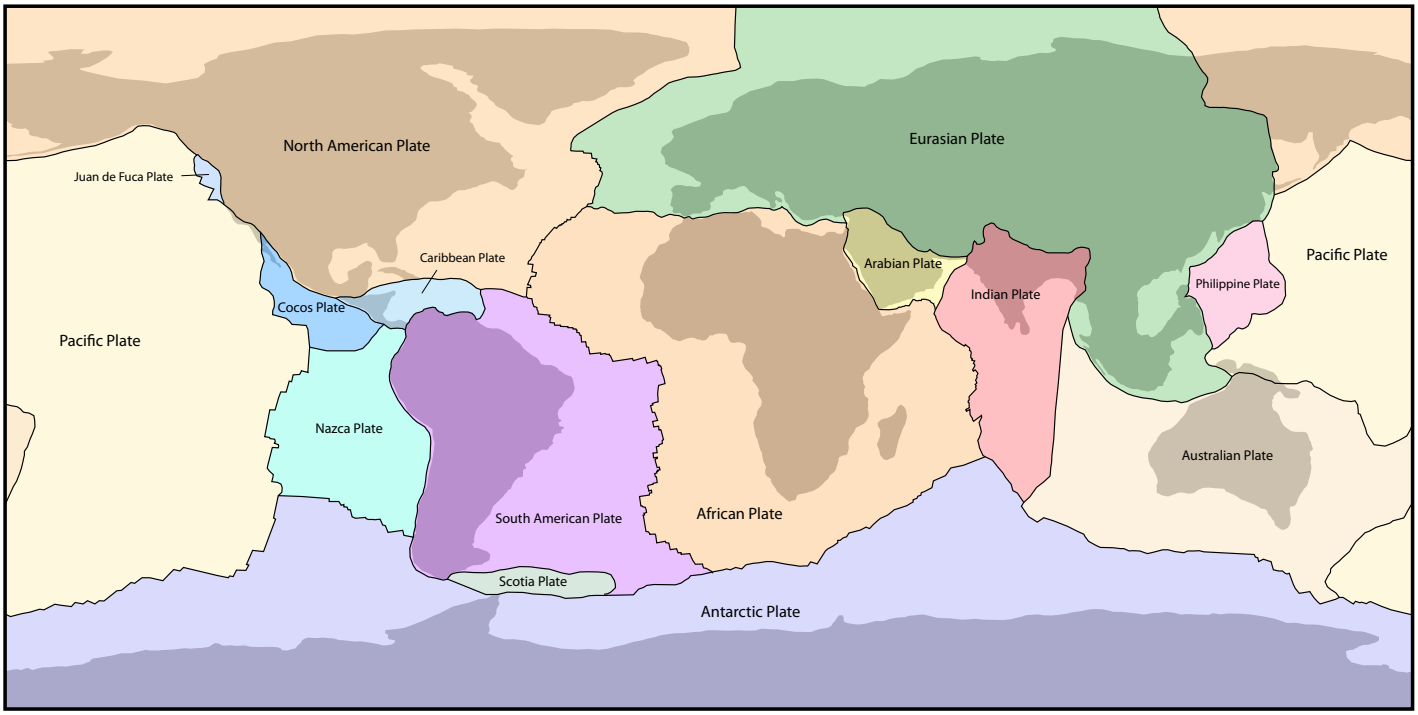
JOURNEY INTO PLATE TECTONICS *continued*



Map 4 – Relief map of the surface of the Earth. Circles and triangles represent events and a type of landform. Image from NOAA. Data from USGS.

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Amaze Your Brain *at Home!*

ACTIVITIES

BEST FOR Grades 7–12

CONTINENTAL COLLISIONS

In this exercise, we will demonstrate what happens when two pieces of continental crust collide, and make observations.

PROCEDURE

1. Place two sponges down next to each other on a flat surface. Sponge with a scouring pad is not required, but if it has a side, try it scouring side down and scouring side up.

Two sponges. All alone.

2. Gently push the sponges together.

Hey, hands! Draw arrows showing the force being applied

3. Continue to push until the sponges are deformed. Use the space below to quickly sketch, or describe what happened.

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CONTINENTAL COLLISIONS *continued*

4. After making your observations, let's translate this to the real world. If these were two pieces of continental crust colliding, what landform was the result?

   What was the tempo of this change? Did it happen slowly as you pushed the sponges together, or did it happen suddenly? If suddenly, how might we experience this event on the Earth's surface?

5. Geologists and paleontologists often make observations today and use that evidence to look backward in time. Based on the landform you created with the sponges, identify that type of landform on Map 3. How do you think that landform formed? What continents or chunks of continents were involved?

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Amaze Your Brain *at Home!*

ACTIVITIES

BEST FOR Grades 7–12

APPLE TO THE CORE

In this exercise, we will create a visual representation of the Earth using an apple. We have focused mostly on the crust, and we will examine strengths and weaknesses of this model pertaining to the crust. This activity may be expanded to include not only the chemical structure of the Earth (inner core, outer core, mantle, and crust) but the mechanical structure (inner core, outer core, mesosphere (mantle), asthenosphere, and lithosphere). Materials: apple, knife/teeth, metric ruler, and lunch if desired.

PROCEDURE

1. Grab an apple and a knife (optional). Thoroughly wash your hands.

Cripps Pink apple deliciousness.

2. On a suitable surface, slice the apple with a knife – or use your teeth.

3. Observe the thickness / or thinness of an apple skin. This is the "crust" of this model Earth. Briefly and quickly describe the apple's skin, how it feels, how thick is it?

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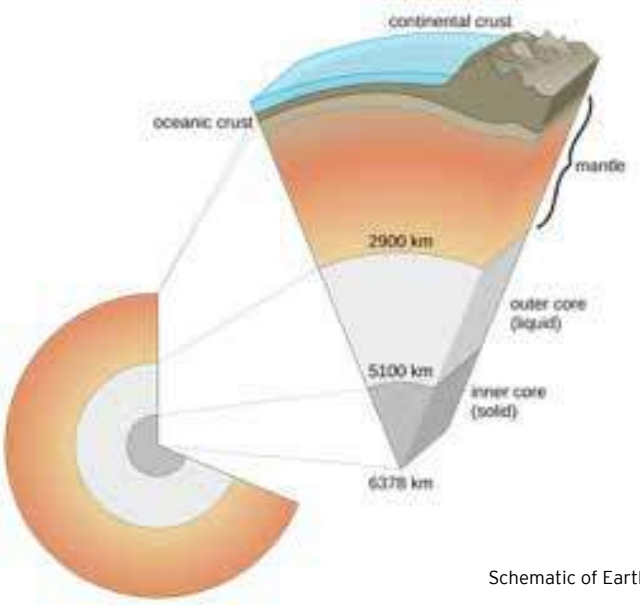
APPLE TO THE CORE *continued*

4. Measure as best you can the radius of the apple in millimeters.

Close-up of an apple.

5. A typical apple skin is about 60 microns (μm) thick. Divide the thickness of the apple skin by the radius you measured. This number is the percent of the apple's radius that is the skin.

6. Now we will do the same for the Earth's crust. The Earth's crust ranges from 5 km thick (oceanic crust) to an average of about 25 km thick (continental crust). The radius of the Earth is approximately 6378 km. Divide the thickness of the oceanic crust by the Earth's radius and do the same for the continental crust. How do these numbers compare with that for the skin of an apple?



Schematic of Earth's interior. Public domain.

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APPLE TO THE CORE *continued*

7. Based on this comparison, does the thickness of the apple's skin relative to the apple approximate the crust of the Earth?

8. After that work, it is a good time to enjoy part of the apple before exploring more.

Lunch. Ham and cheese sandwich, with plantain chips and apple slices.

GOING FURTHER

1. We have examined how the thickness of the apple skin relates, but how does the apple core relate?
2. How do other properties of the skin compare with what is known about the crust?
3. We compared the skin to the crust's thickness, but how does it compare with the lithosphere?
4. We used a knife or our teeth to see the interior of the apple. How could we know what the Earth's deep interior is like?