**Mantle Plumes Inquiry Lab**

by Skipper Coates

**Purpose:** To show students the geologic affect that a mantle plume has on the surface of the earth.

**Time Needed:** About 15-20 minutes

**Background Knowledge Required**: Students should know that volcanoes are formed when magma escapes from inner earth and exits on the surface. They should also understand that the surface of the earth is called the crust, and that it is very thin, and that the middle of the earth is called the mantle.

**Materials Included**:

* Teacher instructions
* Student lab instructions and worksheet

**Materials Needed:**

* Latex balloons (one per student group). These can be reused for each class period
* Plastic table cloths (one per student group). These WILL be reused each period
* Post-It Notes (six single sheets for each student group). These WILL NOT be reused, so plan to use many of these
* Markers or Pens
* Masking Tape

**Teacher Prep Time**: About 10 minutes, or the time it takes for you to print worksheets and gather materials, but plan on more time if you need to shop for materials.

**Teacher To-Do List:**

* Print all items in this file
* Gather or shop for the materials needed (listed above). I usually purchase Dollar Store table cloths and use about 8 of them for my classes of 40 students. But if you choose this cheaper option you will want to buy extras because they can easily be ruined by students who do not follow directions.
* Copy the student worksheet (1 copy per student)
* Decide where you want the students to work. I have tables in my classroom, and they work perfectly for this inquiry lab. If you have desks I would suggest moving them into “tables” of six so that students have a large and long surface to work on. This lab may also work on the ground, but only if you are able to secure the balloons to the carpet/tile.
* Decide how you want to deliver materials to your students. I usually place all materials at the front of the room and ask for one student from each group to pick the items up and take them back to the group.
* Distribute the student worksheet
* Read the procedures with the students
* Show students where they can pick up materials and monitor their work

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_\_

**Modeling Mantle Plumes and Island Chains**

Materials:

* One Balloon
* One Table Cloth
* 6 Post-It Notes
* Piece of Masking Tape
* Marker or Pen

Procedure:

1. Clear your table of all items.
2. Inflate the balloon so that it is only 1/8th full of air.
3. Put the inflated balloon somewhere near the middle of your table (or work station) and tape it in place.
4. Gently unfold and place table cloth over the table so that it covers the balloon (the table cloths will be reused each period, so please be careful).
5. Draw a triangle or volcano on each Post-It Note.
6. Place the first Post-It note on the table cloth right over top of the balloon.
7. Carefully pull the table cloth about 3-inches toward the front of the classroom, or the direction your teacher has indicated.
8. Place another Post-It note volcano on the table cloth, right over the top of the balloon.
9. Repeat steps 7-8 four more times (so that you have 6 volcanoes total).

Data: Draw and LABEL a picture that shows all six of your volcanoes.

Analysis:

1. What did the balloon represent in this model?
2. What did the table cloth represent in this model?
3. Which item was moved, the balloon or the table cloth? How does this explain the way that island chains (like Hawaii) are formed?
4. Based on this model, why are the Hawaiian Islands sinking?
5. Based on this model, how does the formation of island chains support the theory of plate tectonics?

Name \_\_\_\_\_**SUGGESTED ANSWER KEY**\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_\_\_

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Data: Draw and LABEL a picture that shows all six of your volcanoes.

Analysis:

1. What did the balloon represent in this model? **THE BALLOON REPRESENTS MAGMA THAT IS CLOSE TO THE SURFACE OF THE EARTH. THESE ARE CALLED MANTLE PLUMES OR HOT SPOTS.**
2. What did the table cloth represent in this model? **THE CLOTH REPRESENTS EARTH’S THIN, FLEXIBLE CRUST OR LITHOSPHERE.**
3. Which item was moved, the balloon or the table cloth? How does this explain the way that island chains (like Hawaii) are formed? **THE TABLE CLOTH WAS THE ITEM MOVED. AS EARTH’S CRUST IS MOVED OVER TOP OF A STATIONARY MANTLE PLUME, ISLAND CHAINS ARE FORMED ON THE SURFACE.**
4. Based on this model, why are the Hawaiian Islands sinking? **THE MANTLE PLUMES RAISE THE ELEVATION OF THE CRUST. AS AN ISLAND IS MOVED AWAY FROM THE PLUME ITS ELEVATION IS CHANGED, CAUSING SINKING.**
5. Based on this model, how does the formation of island chains support the theory of plate tectonics? **ISLAND CHAINS INDICATE THAT THE CRUST MOVES WHILE THE MANTLE DOES NOT. AN ISLAND CHAIN ALSO INDICATES THE DIRECTION AND SPEED OF A SINGLE TECTONIC PLATE.**