



Folded Mountains: Group Activity

By Carolyn Estell

Time: One 50-minute class period

Grade level: 6–12

Purpose:

- Create a model of a folded mountain.
- Identify three different types of folding.

Materials Needed for Each Group:

- Paper plates
- One slice of wheat bread
- Two slices of white bread
- 3 heaping tablespoons of jelly
- 4–5 heaping tablespoons of nut butter (peanut or other)
- Paper (students can use their own)
- Colored pencils (optional)
- Spoons or knives for spreading toppings
- Paper towels or wet-wipes



Teacher Comments: This activity can be done as a small group activity, a student-assisted demonstration, or a teacher-led demonstration, depending on the class. Small-group activity should be done with classes that are very good at following directions. If you are interested in the student-assisted demonstration or the teacher-led demonstration please see *Folded Mountains: Demonstration* included on this CD-ROM.

This is a great activity for reviewing models, the Law of Superposition, depositional environments, original horizontality of sedimentary layers, faulting, and convergent boundaries. You can make this as simple or as complex as you like.

As any teacher knows, food is a great way to capture a student's attention and this activity takes a minimum amount of money and prep time. It can be messy, so be sure to have materials for cleaning peanut butter and jelly off hands and desks. Students will ask to eat the extra materials, but they usually will stop asking if you tell them they can make a sandwich if they come back at the end of the day.

Note: The colored pencils are used for coloring in sketches. One paper plate will be used to hold the sandwich. The other can be used on which to place their utensils to keep the desks a little less messy. You may even try substituting some of the bread with a piece of toast to encourage more discussion.

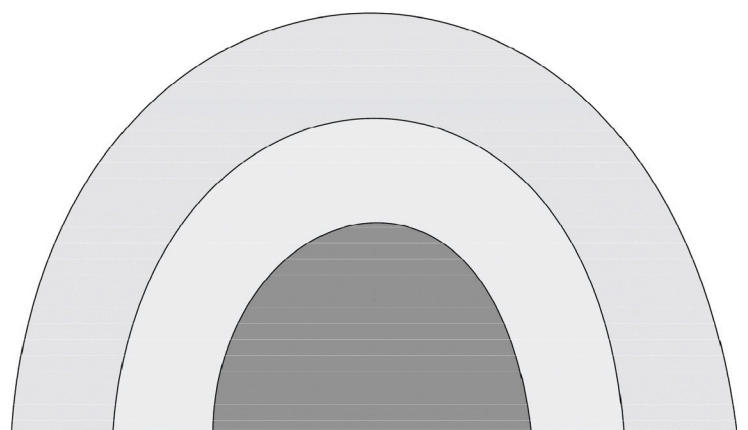
It is important to be aware of any allergies that students have. Read other nut butter ingredients carefully because many of them contain peanuts.

Procedure:

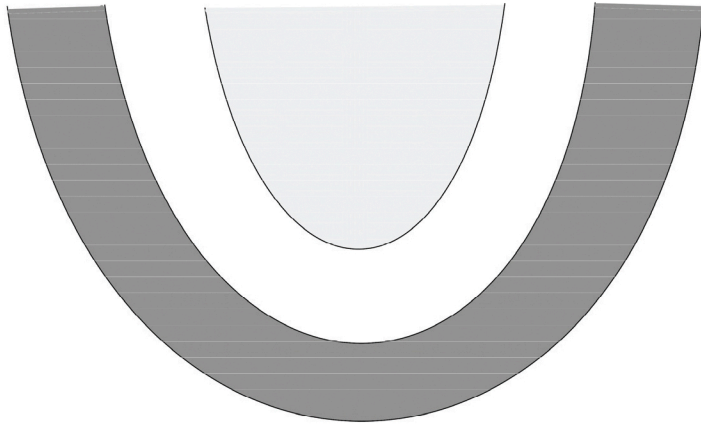
1. Tell the students that we are going to construct a model of a mountain. Have the students take out a piece of paper to record the information and their sketches during the activity. Reveal the materials and have them make a list of the materials. You will want a centralized location to distribute the materials.
2. It is a good idea to ask for a one or two students to help with the demonstration. It is very important to explain to the students how important it is to follow directions and to not eat anything yet. They can eat it after the entire activity is complete.

3. Have the students get into groups of 2-4 students. Have them assign tasks (i.e. materials person, recorder, leader, etc). The materials person will be doing lots of moving.
4. Have the materials person come to the front table and pick up a plate and one slice of white bread. Ask the students what position it is in. Discuss until you get the answer “flat” or “horizontal.”
5. Place slice of white bread on the plate. The white bread represents sandstone. Prompt for discussion of a model. Refer to the white bread as “sandstone” for the remainder of the lesson.
6. Ask “what do you need to make sandstone?” Students will give you a variety of answers, but look for the answer “sand.” After you receive this answer, ask them where we find sand (beach environment).
7. Have the materials person bring their sandstone and plate to place layer of peanut butter on bread. Note that the layer is not perfectly flat.
8. Peanut butter represents mudstone. While students are building sandwiches they can be sketching and labeling the “before” pictures of their model.
9. Ask what position the peanut butter is in. Ask which layer is the oldest and which layer is the youngest. Review the Law of Superposition. Discuss the peanut butter not being perfectly flat. Ask students if they think this happens in nature. This relates to layers of rocks in road cuts, while some are basically flat, there may be slight variations. You can discuss or introduce original horizontality. Again discuss the depositional environments.
10. Have the materials person bring the model back up to the front table to add the rest of the materials. Explain what each layer represents as you go.
11. Place wheat bread on the peanut butter. The wheat bread represents limestone.
12. Add the jelly; it represents a layer of ash.
13. Finally add the last layer, white bread (aka sandstone).
14. Have the students finish their sketches. Be sure they label the youngest and oldest layers. If your students are more advanced, you can discuss preservation of layers and why no mudstone was preserved before the other layer of sandstone was deposited.
15. Have the groups get ready to smash their sandwiches.
The sandwich should be sitting horizontally (it may help to turn the plate upside down and place the sandwich on the bottom of the plate so that it is sitting slightly above the desk and not down in the curve of the plate). Be sure that the sandwiches are visible to the rest of the group.
16. Ask the students what they think is going to happen to their rock layers when they smash the sandwich (namely, what do they think it will look like). Do they think it will break or bend? Lead them in a discussion to identify breaking rocks as faults and bending rocks as folds. Have them record their predictions.

Anticline



Syncline



17. Review types of faults (normal and reverse); on the board sketch the three types of folds they may see. (Note: this can be done before or after smashing has occurred.) The most common ones you'll see from sandwich smashing are the synclines and anticlines, but S-folds (recumbent) are fairly common.

18. Place both hands palms facing each other on either side of our model. Have them very quickly smash their model; you may want to demonstrate first.

19. Walk around the class showing each group's results so all students can see the different folds that were created.

20. Have the students make a labeled sketch of their smashed models and identify what type of fold (you may have some faults depending on the amount of smashing). Have students add force arrows to their sketches.

21. Some students will need assistance identifying with structures especially if they have both faulting and folding. After everyone has completed labeling their sketch, eat sandwiches.

22. Have the students complete sketches of the other two folds.

23. Discuss where you may see structures like this and the events that cause them to happen (namely colliding plates). Some students may have driven through the Appalachian Mountains and will have seen some of these features.

24. Have the students turn in their labeled sketches.

For bell work the next day, have students identify the different types of folds and faults from sketches or pictures.

S Fold

