

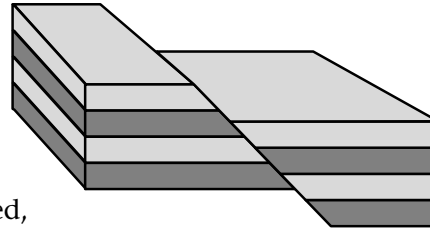
LABS YOU CAN EAT

STUDENT WORKSHEET



Dough Fault of Your Own

Different types of rocks respond differently when under intense heat and pressure. Rocks heated deep in the Earth become plastic and bend to form *folds*, while those near the surface tend to break and slip against one another to form *faults*. In this lab you will use cookie dough to model different types of folds and faults. When you're finished, your lab material can be baked into cookies!



MATERIALS

- large mixing bowl
- 225 mL (1 cup) of margarine or butter, softened
- 450 mL (2 cups) of sugar
- electric mixer
- 15 mL (3 tsp) of baking powder
- 10 mL (2 tsp) of vanilla extract
- 3 mL ($\frac{1}{2}$ tsp) of salt
- 2 large eggs
- 675 mL (3 cups) of all-purpose flour
- heavy mixing spoon
- medium-sized mixing bowl
- 120 mL ($\frac{1}{2}$ cup) of unsweetened cocoa
- large mixing bowl
- 3 sheets of wax paper or coated freezer paper, 30 × 50 cm
- rolling pin
- metric ruler
- knife
- permanent marker
- freezer
- watch or clock

Optional

- cookie sheet
- oven
- oven mitts

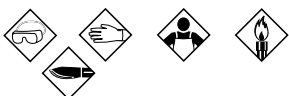
Objective

To demonstrate how the processes of folding and faulting shape rock formations

Rolling in Dough

You will first make three models of a slab of rock. The rocks are made up of four rock layers whose color alternates between light and dark.

1. In the large bowl, beat the butter and the sugar together until they are blended. Continue to beat rapidly until the mixture is light and fluffy. Mix in the baking powder, vanilla extract, salt, egg, and 560 mL ($2\frac{1}{2}$ cups) of the flour. Blend well.
2. To create the dough for the light-colored layers in your models, place half of the dough in a medium bowl. Stir in the rest of the flour and mix well.
3. To create the dough for the dark-colored layers in your models, stir the cocoa into the dough in the large bowl. Mix well.
4. Use your hands to form the dark-colored dough into a ball.
5. Place the ball of dough on a piece of wax paper. Flatten the ball slightly with the base of your palm.
6. Grip both ends of the rolling pin. Place the pin in the center of the dough, and roll the pin steadily over the dough. Continue to roll the dough until you have an even layer that is about 1 cm thick.
7. Using the ruler and the knife, cut the rolled dough into six 5 × 10 cm strips. If there are not enough strips, gather the remaining dough scraps and reroll them. Discard excess dough.
8. Clean and dry the rolling pin. Repeat steps 4–7 for the light-colored dough.

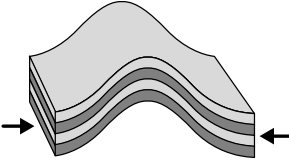


Dough Fault of Your Own, continued

USEFUL TERMS

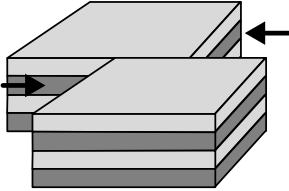
shortening
the process of moving two spots on the Earth's crust closer together

folding
bending of rock layers made flexible by heat and pressure during shortening

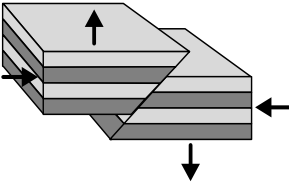


fault
a break between pieces of rock that move relative to one another

transverse or strike-slip fault
a nearly vertical fault in which rock moves both horizontal and parallel to the fault line



reverse fault
an angled fault in which one side of rock is pushed above the other during shortening



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9. Stack a light strip on top of a dark strip. Add another dark strip, then add another light strip. You should now have a stack alternating dark and light layers of dough. Set this stack aside.
10. Repeat step 9 twice to make two more stacks.
11. Wrap one stack in a piece of waxed paper, and label it "Stack A." Place Stack A in the freezer for at least 20 minutes.
12. Place another stack on its side so that the alternating colors face upward. Cut the stack in two pieces at a 45° angle to the layers. Wrap each piece in a separate piece of wax paper. Label both pieces "Stack B," and place them in the freezer for at least 20 minutes.

Dough Shortening

13. Place the third stack on a desk or table that touches a wall with one of the short ends flush against the wall. With the base of your palm, compress the dough by pushing the opposite end of the stack toward the wall. What happens to the layers of dough?

14. What geologic process is represented in this model?

15. Where would such a process occur? Explain your answer.

Breaking Even?

16. Remove Stack A from the freezer, and unwrap it.
17. Without allowing the dough to warm, crack the dough against the edge of a table or desk to make two roughly equal pieces. Place both pieces on the wax paper.

▲ EARTH SCIENCE ▲

Dough Fault of Your Own, continued

- 18.** Holding one piece in place, press and slide the other piece on the tabletop along the direction of the crack. Does the dough slide smoothly as you push or does it stick?

- 19.** How is the rock motion along a transverse fault during an earthquake similar to the motion you modeled in step 18?

Rocks on the Slide

- 20.** Remove both parts of Stack B from the freezer. Unwrap the two pieces and place them flat on the table so that the cut ends touch one another. Without allowing the dough to warm, push the two pieces together. The pieces slide against one another. Describe the placement of the two pieces.

- 21.** How is the movement of rocks along a reverse or thrust fault similar to this movement?

Dough Fault of Your Own, continued

Critical Thinking

22. If the dough in Stack B were warmed to room temperature, would the pieces of your reverse-fault model be more likely to slide over one another or to bend and fold? Explain your answer.

23. Compare the behavior of the dough as it warms with the behavior of rocks as they are heated.

Now that you are done with your lab, slice your stacks into cookies! Place the cookies on an ungreased cookie sheet in an oven set at 400°F. Cook for 8–10 minutes.