MUNCHIN' CRUNCHIN' EARTH SCIENCE

KIM CASTAGNA
CANALINO SCHOOL
CARPINTERIA

kcastagna@cusd.net

The following are some earth science ideas to supplement your curriculum to add some tastiness to your labs and activities. My students really enjoy these activities, they call them my "tasty science labs". I teach two classes of science, so ingredients are often for 2 classes worth – adjust for your class needs.

1. METAMORPHIC ROCKS IN A BAGGIE:

(No worksheet to go with this) Rocks created with heat & pressure
Materials needed for 2 classes:

- one baggie per student
- 2 12 oz. bag choc. chips
- 1 12 oz bag butterscotch chips
- 1 large bag mini marshmallows
- 2 packages of Oreos ground in blender
- 1 big container of roasted peanuts

Procedure:

Students put spoonfuls of each ingredient in their baggie at the start of the class period, making sure to mix up thoroughly and squeezing out any excess air. Now students apply Heat & Pressure by sitting on their baggies. Have them sit on them as long as possible to create metamorphic rocks that have changed through heat and pressure... now eat!

2. EDIBLE ROCKS

(worksheet provided)
Materials needed for classes: (buy Kisses when they are on sale, ie Xmas)

- Hershey kiss per student
- Almond Hershey kiss per student
- Hershey Hugs per students
- Can get some of the specialty Kisses that come out at times

Procedure:

1. Pass out a rock (Kiss) to each student. Have them unwrap it and make observations. This is Sample A. Follow directions and after they bite it in half, draw insides in oval 1/2 way down the paper.
2. Pass out 2nd rock (Hershey Almond Kiss) to each student. Unwrap and make observations. Continue through the worksheet discussing each Kiss as if it is a rock.
3. Last rock is the Hershey Hugs demonstrating a sedimentary rock with layers.
4. If you can get the caramel filled Kisses, I often pass them out last and say they are geodes... bite in and see something very different inside.

3. JELLO/PUDDING VOLCANOES

(worksheet provided)

Materials needed for classes:

- Jello cup for each student
- Pudding cup for each group of 4 students
- Syringe per group of 4
- Compass with point (math) per group to poke holes in bottom of jello cup
- Spoon for each child.

Hints for this lab:

- Purchase 25 ml syringes from a local feed store. I bought Monoject 412 which are feeding syringes. They have a long pointy tip that needs to be cut off to about 1 inch. You need ones that have the longer pointed tip/opening so it can be inserted into the jello cups.
- Once students have poked hole in bottom of jello cup, the teacher needs to come around with scissors to enlarge the hole slightly, so the syringe tip will slide in. (be sure foil cover is still on)
- Students need to cover jello opening with their thumbs... otherwise the magma will start to ooze out!
- Students inject "pudding magma" holding cup right side up and observe insides
- Once all labeling and drawing is completed, peel off the foil top (keep thumb over bottom hole) and enjoy :)
- On back of worksheet, students compare their volcano to a real one... how similar

4. CUPCAKE GEOLOGY – CORE SAMPLING

(worksheet provided)

Materials needed for class:

- One layered cupcake per student
- 5 clear plastic straws per student, cut in 1/2 (10 pieces total)
- Paper towel or napkin

Hints for this lab:

- Preparing cupcakes: the easiest is to use white cake mix and divide it into sections which you color in a variety of colors. I tried chocolate, strawberry, etc, but they each have a different baking time! Once you have several bowls of colored cake mix, layer in a variety of ways in foil lined cupcake papers (foil so they can't see the layers from the side).

Vary the layers so all cupcakes are not the same. Put on frosting so they can't see the top either. I often have a parent volunteer make the cup cakes for me.

- Students make a plan to take 10 core samples. Sample with the straws and draw the core samples in color for each of the 10
- Make predictions on what their cup cake looks like, then take a bite to eat 1/2 and draw what actual layering looks like. This is a luxury scientist don't have... being able to see the entire sample. Scientists gather core samples to make predictions as to earth layering.

5. BUILD AN OREO MOUNTAIN

(No worksheet provided) This is an easy way to show subduction and the mountain formation that results.

Materials needed for class:

- 1 Oreo per student, Double Stuff works best

Procedure:

1. One Oreo per student and twist apart.
2. One side of cookie should have the middle stuff and other just the cookie part.
3. Take the cookie part and start to slide it beneath the middle stuff on the other cookie part.
4. As the cookie part "subducts" you begin to see the mountain of "middle stuff" being formed.

6. MILKYWAY EARTH

(worksheet provided) this lab shows students how the top layers of the Earth are affected in divergent and convergent boundaries.

Materials needed for class:

- 1 mini sized Milkyway candy bar per student (I buy during Halloween when the bags are on sale)
- paper towels

Procedure:

1. Pass out 1 candy bar per student
2. Chocolate = crust, caramel = lithosphere, nougat = asthenosphere
3. Pull candy bar apart being careful to keep the caramel part attached creating a rift valley. Draw and describe.

4. Push parts together to make the chocolate crust buckle up creating a mountain. I often walk around and "help" create the mountains... needs a good push together to really buckle up and create a mountain.

7. M & M LAYERS OF THE EARTH

(no worksheet provided)
Materials needed for class:

- Large bag of Peanut M & M's

Procedure:

1. Give each student several Peanut M & M's
2. Bite one in half
3. Look at interior of M & M which is representing the earth. Candy coating = crust, chocolate = mantle, peanut = core, inside part of peanut = inner core.
4. Repeat and quiz the kids on parts.

8. ICE CREAM GLACIER

(worksheet provided along with direction sheet)
Materials needed for class

- student packet
- all other materials and directions are on Ice Cream Glacier sheet

9. MYSTERY BAG

(worksheet provided) I do this lab the first week of school. Students work in groups and use their senses to determine what is inside the bag. This gives them an idea of how scientists have determined such things as the earth layers, even though they can't physically see the actual layers.
Materials needed for class:

- Lunch sized paper bag per group
- contents to put inside: (these are suggestions, have several in each bag)
    - tootsie roll
    - apple
    - small potato
    - peanut in shell (if students have peanut allergy, substitute with something else. I have used small carrots)

Procedure:

1. Place several items in each bag (I put 2 tootsies, 2 peanuts, 1 of apple and potato) and staple the top of bag closed
2. Review objective with students, then place the bag in middle of each group. Students may not touch it! Watch, they will be tempted!
3. Have students use sense of small to determine what they think is inside the bag. Draw the items and describe their evidence… why they think those items are in their bag.
4. Pick up bag by top only and use hearing to determine what is in the bag, may shake by their ear, may place on table and listen to how different items touch down, draw and describe evidence.
5. NOW can feel the items through the outside of the bag and repeat procedure.
6. Further Tests: make predictions on other ways to determine what is in the bag. Students will now probably say to look at it. Open up and see what the actual items are.
7. On the back, describe how this is similar to how a scientist would determine the insides of something they can't actually see.

Hope your students enjoy these labs as much as mine have. Feel free to contact me is you have any questions.

Resources

Lots of these ideas were inspired by attending numerous workshops that gave me ideas that I then tinkered with… so no one source for many of them.

Eidson, Margaret Earthy Things. A Showboard, Inc. Publication 1990.

Prentice Hall Earth Science. My text book

JASON XIII – Frozen Worlds

Name
Date
Sci Period

EDIBLE ROCKS AND MINERALS

A. EXPLORATION

As is often true when working with unknown earth materials, it is important to observe the outside and the inside of a sample. Your teacher will give you an unknown rock or mineral. This will be sample A. Unwrap **Sample A.**

1. Using all of your senses except taste, write the physical properties of **Sample A.**

_____

_____

2. Carefully bite **Sample A** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

_____

_____

3. Your teacher will now give you **Sample B.** Using all of your senses except taste, write the physical properties of **Sample B**.

_____

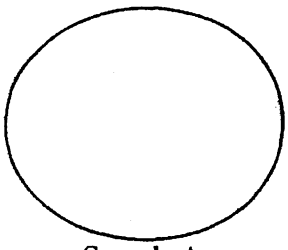
_____

4. Carefully bite **Sample B** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

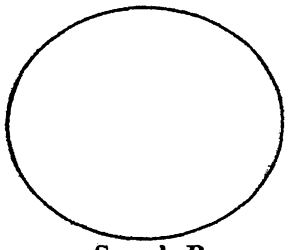
_____

_____

5. Draw your observation of the insides of **Sample A** and **Sample B** in the spaces below.



Sample A



Sample B

6. What is the same about **Sample A and B?** _____

_____

7. What is the different about **Sample A and B?** _____

_____

B. INFER

A mineral is a single, natural, solid material found in the Earth's crust. A rock is a solid made of one or more minerals.

8. Observe the samples. Which sample would you consider a mineral? _____

Why do you think so? _____

_____

9. Which sample would you consider a rock? _____

Why do you think so? _____

_____

Complete the sentences:

10. A mineral is _____

11. A rock is _____

C. EXPANSION

Rocks are classified into three groups based on how they are formed. Define each.

12. IGNEOUS _____

_____

13. SEDIMENTARY _____

_____

14. METAMORPHIC._____

_____

15. Using all of your senses except taste, write the physical properties of **Sample C**.

_____

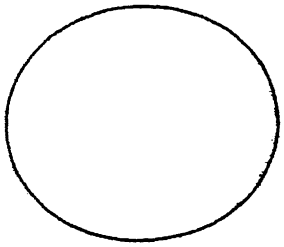
_____

16. Carefully bite **Sample C** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

_____

_____

17. Draw your observation of the insides of **Sample C** in the spaces below.



Sample C

18. What group of **ROCK** do you think **Sample C** is in and why?

_____

_____

_____

19. Compress **Sample C** with your hand. What type of rock is it now? _____

20. If you let **Sample C** melt, and then cool, what type of rock is it now? _____

Key

Name
Date
Sci Period

EDIBLE ROCKS AND MINERALS

A. EXPLORATION

As is often true when working with unknown earth materials, it is important to observe the outside and the inside of a sample. Your teacher will give you an unknown rock or mineral. This will be sample A. Unwrap **Sample A**.

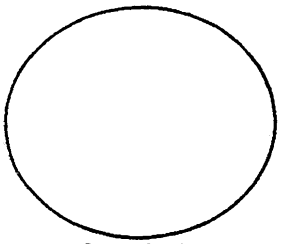
1. Using all of your senses except taste, write the physical properties of **Sample A**: Hershey kiss

2. Carefully bite **Sample A** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

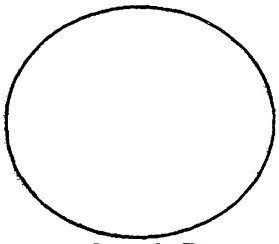
3. Your teacher will now give you **Sample B.** Using all of your senses except taste, write the physical properties of **Sample B**.

4. Carefully bite **Sample B** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

5. Draw your observation of the insides of **Sample A** and **Sample B** in the spaces below.



Sample A



Sample B

Hershey Almond kiss

6. What is the same about **Sample A and B**? _____

7. What is the different about **Sample A and B**? _____

B. INFER

A mineral is a single, natural, solid material found in the Earth's crust. A rock is a solid made of one or more minerals.

8. Observe the samples. Which sample would you consider a mineral? A - Kiss

Why do you think so? _____

_____

9. Which sample would you consider a rock? Sample B - w/almond in center

Why do you think so? _____

_____

Complete the sentences:

10. A mineral is _____

11. A rock is _____

C. EXPANSION
Rocks are classified into three groups based on how they are formed. Define each. (use textbook)

12. IGNEOUS _____

_____

13. SEDIMENTARY _____

_____

14. METAMORPHIC._____

_____

15. Using all of your senses except taste, write the physical properties of **Sample C**.

_____

_____

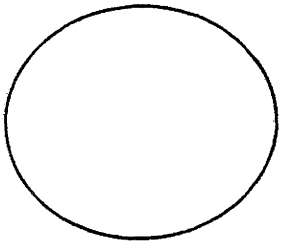
16. Carefully bite **Sample C** in half by biting off the TOP. Eat the top half and observe the bottom half. **DO NOT EAT ALL OF THE SAMPLE YET!!** Using all of your senses including taste, what did you observe on the inside?

_____

_____

17. Draw your observation of the insides of **Sample C** in the spaces below.

Hershey Hugs



Sample C

18. What group of **ROCK** do you think **Sample C** is in and why?

Sedimentary - layers

19. Compress **Sample C** with your hand. What type of rock is it now? Metamorphic

20. If you let **Sample C** melt, and then cool, what type of rock is it now? igneous

met.
igneous

Zuccarini/02
Anna_Zuccarini@ipsd.org

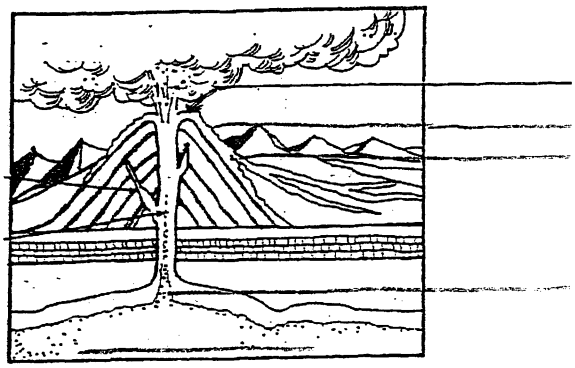
Name: _____

JELLO VOLCANOES!

A volcano is an opening in Earth's surface. Magma is forced upward to the surface and bursts out through openings called fissures. As the hot rock piles up, a mountain may be formed. A cup-shaped opening called a crater is at the top of the mountain. A pipe leads from the crater down to pools of hot magma deep in the ground. When magma shoots out of a volcano, it is said to erupt. The magma is called lava when it reaches the surface.

We will simulate the magma pushing up through the pipe by using pudding magma and jello land.

Label the drawing on the right.



Steps to Jello Volcanoes:

1. Each student gets a jello land mold
2. Table groups will share pudding magma
3. Poke a hole in the bottom of the jello cup
4. Leave the foil on the jello top
5. Using the syringe, suck up10ml of pudding magma. You will need to take turns because 1 syringe/group
6. Inject magma into land
7. Pass syringe to next person
8. Draw the inside of your volcano in the box. Label as many parts as you can.
9. If there is time, inject more lava and draw.
10. Use your spoon, and lap up a bit of lava!

Volcano after one injection

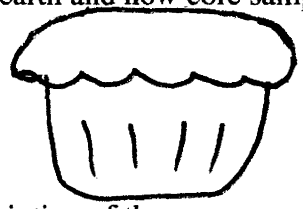
Volcano after 2nd injection (or hypothesis of what would be like)

on back Compare your jello volcano to a real volcano

Cupcake Geology – Core Sampling

When geologist want to know more about earth formations, they try to figure out what is beneath the surface. One way is to take core samples to interpret what a cross section probably looks like based on the information obtained from the sample.

Objectives: To investigate how scientists study the interior of the earth and how core samples are made.



Materials: cupcake, paper towel, 5 plastic straws cut in 1/2

Procedure:

1. Examine your cupcake without touching it and write a description of the appearance.

1. Predict what you think the inside of the cupcake looks like. Draw it

Draw the top view of your cupcake. Mark on the location of each of the 10 core samples.

1. Draw each core sample in color showing each layer:

Sample #1 Sample #2 Sample #3 Sample #4 Sample #5

Sample #6 Sample #7 Sample #8 Sample #9 Sample #10

1. What did you learn from your samples?

1. Make a new prediction (drawing) of what the interior of your cupcake looks like.

6. Bit into your cupcake and draw actual

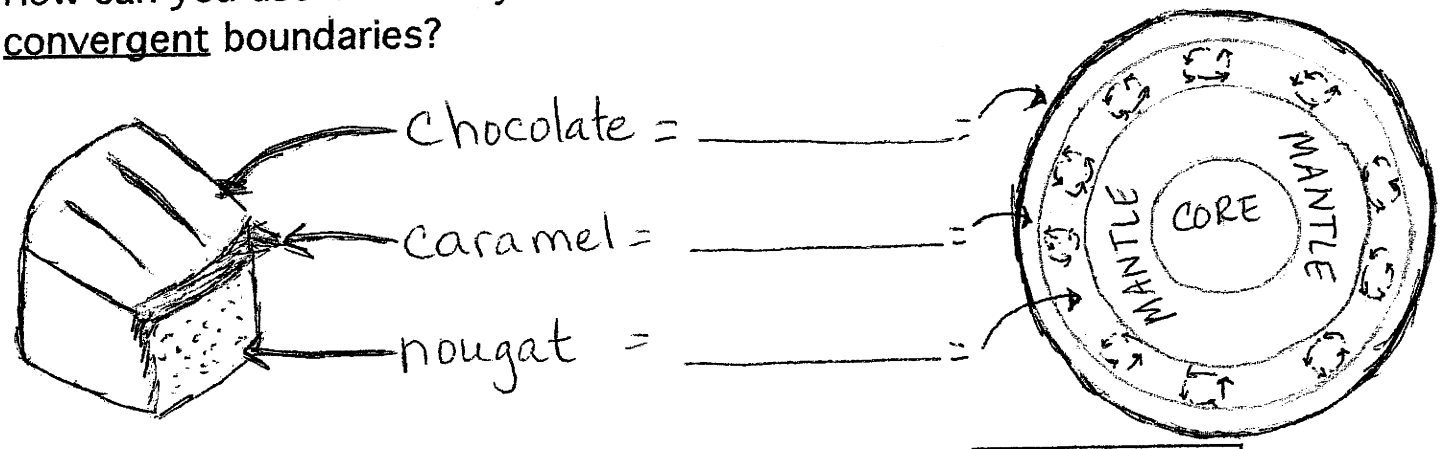
7. Compare your prediction to the actual appearance.

8. How is this similar to scientists discovering the inside of the Earth?

MILKYWAY EARTH

NAME: _____#_____

How can you use this candy bar to model what happens at <u>divergent</u> & <u>convergent</u> boundaries?



1. Carefully begin to pull the candy bar apart:

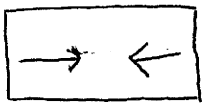
Draw what happens

A valley begins to form, this is called a _____.

This is an example of a _____boundary.

Describe your results:

2. Now push the parts together:



Draw what happens

The chocolate buckles and forms _____.

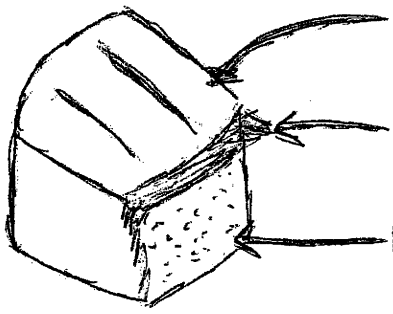
This is an example of a _____boundary.

Describe your results:

MILKY WAY EARTH

NAME: Key #_____

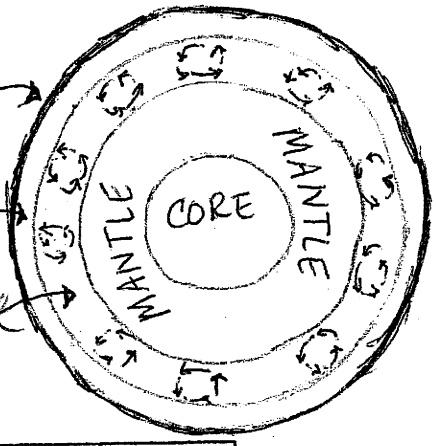
How can you use this candy bar to model what happens at <u>divergent</u> & <u>convergent</u> boundaries?



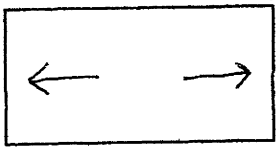
chocolate = Crust

caramel = lithosphere

nougat = asthenosphere



1. Carefully begin to pull the candy bar apart:



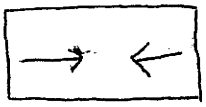
Draw what happens

A valley begins to form, this is called a Rift Valley.

This is an example of a divergent boundary.

Describe your results:

2. Now push the parts together:



Draw what happens

The chocolate buckles and forms mountains.

This is an example of a Convergent boundary.

Describe your results:

ICE CREAM GLACIER

Materials for 2 classes:

2 gallons soft vanilla ice cream
12 oz bag chocolate chips
2 jars of sprinkles
1 jar dry roasted peanuts
4 packages of Oreos crushed
Graph paper on back of clipboards
Metal roasting pans to catch the glacier
Plastic wrap
Spoons

PREPARATION:

1. Tape graph paper to back of clip boards (1 per group)
2. Cover clip board with plastic wrap
3. Cover roasting pans with wrap
4. Crush Oreos in a food processor

CLASS PRESENTATION:

1. Show any video clips of glaciers (I have JASON XIII update video)
2. Read information on handout
3. Discuss the questions on the back that need to be answered in groups
4. Show how to set up the mountain and basin (clip board and pan) using books to support
5. Show materials to collect (dirt oreos in baggies, eratics - peanuts and chips - also in own baggies)
6. Have runner from each group collect materials
7. Put dirt on incline, pack with spoons
8. Add peanuts and chips
9. Draw outline on individual graph of dirt area
10. Teacher will give a generous amount of ice cream as the glacier
11. Students apply sprinkles to glacier (tree pieces and debris)
12. As they watch the glacier move down the mountain, be filling in questions. Notice the morain on the sides and eratics being picked up by glacier. (may need to increase incline if glacier is stuck and class time is running out!)
13. Once glacier is in basin, draw on graph what their glacier did - label and identify parts
14. A city below is in danger from the advancing glacier. City workers must use scoop bulldozers (spoons) to remove the glacier to dump trucks (stomachs)... students may eat!
15. Clean up: with clip board in pan, take off plastic wrap and put with rest in pan. Fold up wrap in pan and throw away. If pan is messy, wash and dry it.

Glaciers-Natures Bulldozers

JASON XIII-Frozen Worlds

Name_____

Period/Class_____

Date_____

Directions:
In this investigation you will explore hold they shape the earth.

Background Information-
Glaciers are huge, slow moving "rivers" of ice and snow. They flow down from the mountain peaks and spread across the land, some glaciers make it to the sea, just like rivers of water. Others begin to melt in the warmth of lower elevations, becoming lakes and streams of meltwater. Glaciers are found on every continent except Australia. Some glaciers are so big that they spread over entire mountains and plains. Huge glaciers called *ice caps* are so thick that they almost bury mountains. Larger still, are ice sheet, which blanket vast areas of continents. Ice sheets cover much of Greenland and Antarctica. Try to imagine an ice sheet that is about the size of the United States and Mexico combined, that's Antarctica. Worldwide glaciers are extremely important because the glaciers generate some of the planets weather and they hold or store 75% of our fresh water.

How glaciers form-Glaciers form when snow falls, it collects in hollow and deep valleys. In some places in the world, the snow never melts entirely. The new snow falls on top of the old snow. Year after year, sometimes thousands of years the snow piles up deeper and deeper. The weight of the snow squeezes the air out of the layers below. The lower layers become packed turning into ice and becoming very heavy. The ice starts to flow down hill and the glacier is born.

Guide Questions-
A. Why are glaciers sometimes called, "nature bulldozers"?
B. How do glaciers help shape the earth?

Word Power-
1. till -glacier deposits mixture of sediment called till, examples of till are sand, clay, gravel, boulders
2. erratic -a rock or boulder that has been carried a long distance by the glacier. - peanuts
3. moraine-a ridge formed at the edges or at the end of a glacier
4. plucking-a process where a glacier picks up the rocks as it flows over the land.
5. abrasions-when rocks are dragged along the bottom of a glacier. This process gauges and scratches the bedrock.

Procer

Construct your model of a glacier. Materials, vanilla ice cream, Oreo cookies, sprinkles and crushed peanuts . Plastic food wrap, graph paper, cafeteria tray or cooking sheet.

Step 1- Place your graph paper on top of your cafeteria tray. Wrap the plastic food wrap around the tray so as to cover the graph paper.

Step 2- Place 1-2 scoops of ice cream on one end of the tray. Spread some sprinkles (on top of ice cream), crushed peanuts, crushed Cookies underneath the ice cream.

Step 3- Place one end of the tray on a stack of books. (Make an incline plane)

Directions-Closely study your glacier model and answer the following question.

1. Why does the ice cream (glacier) move down the slope?_____

2. When a glacier moves across the land, we say the glacier is advancing. Is your glacier advancing? Yes or No

3. If the glacier is advancing, what materials does the frozen river carry?_____

4. In your model, what do the sprinkles represent?_____

5. In your model, what do the crushed cookies or peanuts represent?_____

6. What materials move faster down the slope? Circle your choices: sprinkle cookie peanuts

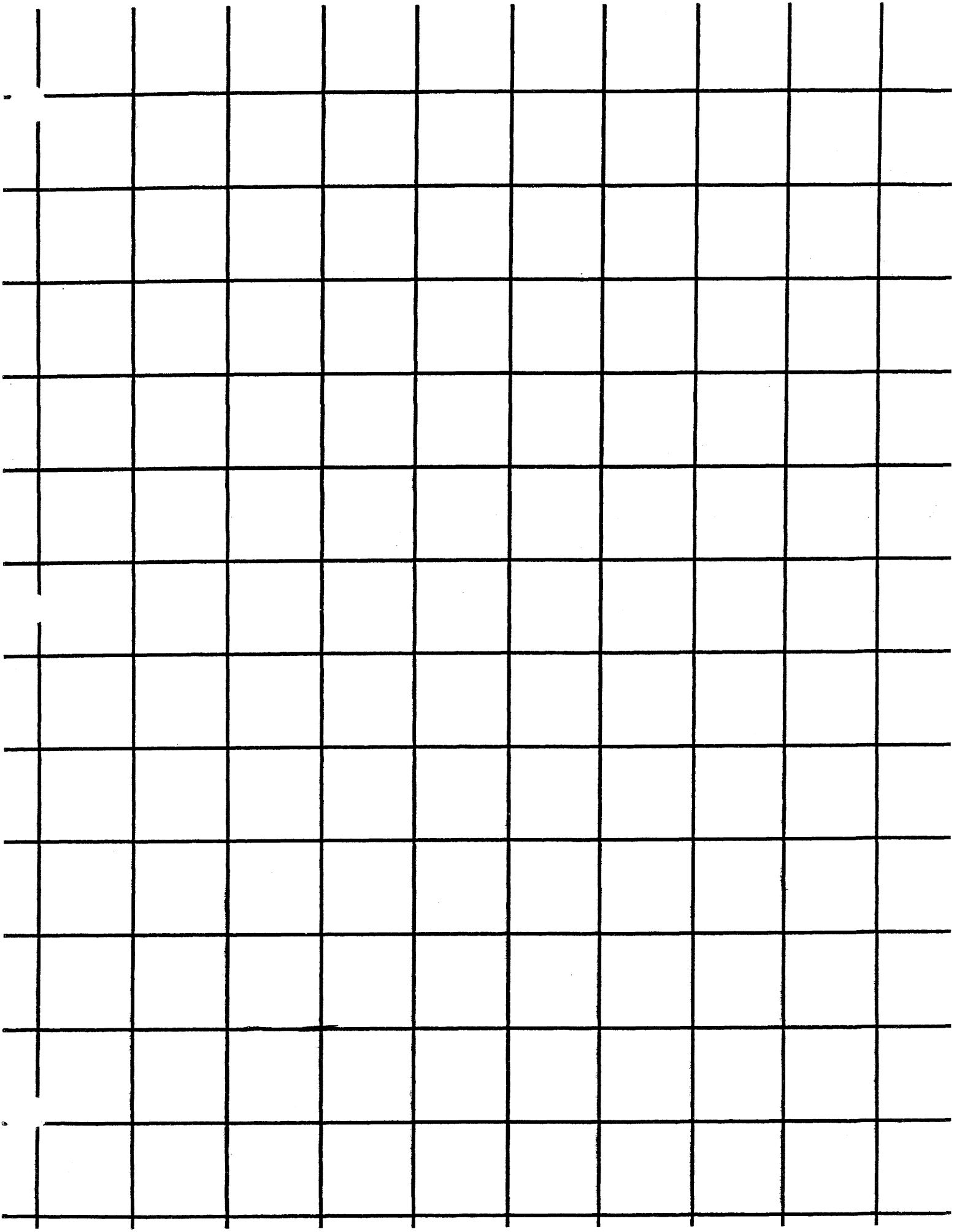
7. There are two basic kinds of glaciers, valley glaciers and continental glaciers. A valley glacier forms when snow and Ice build up high in a mountain valley. A Continental glacier is a glacier that covers much of a continent. What type of glacier is your model?_____

8. Like a bulldozer, the glacier piles up the rocks and sediment. The end of the glacier is the point where the glaciers Stopped. What materials, if any were deposit at the end of the glacier?

9. The glacier produced a wall or ridge of rocks. What is this ridge called?_____

Begin to clean your station by eating your glacier model, erratic till and all. Yummy

Draw your glacier movement on the graph paper

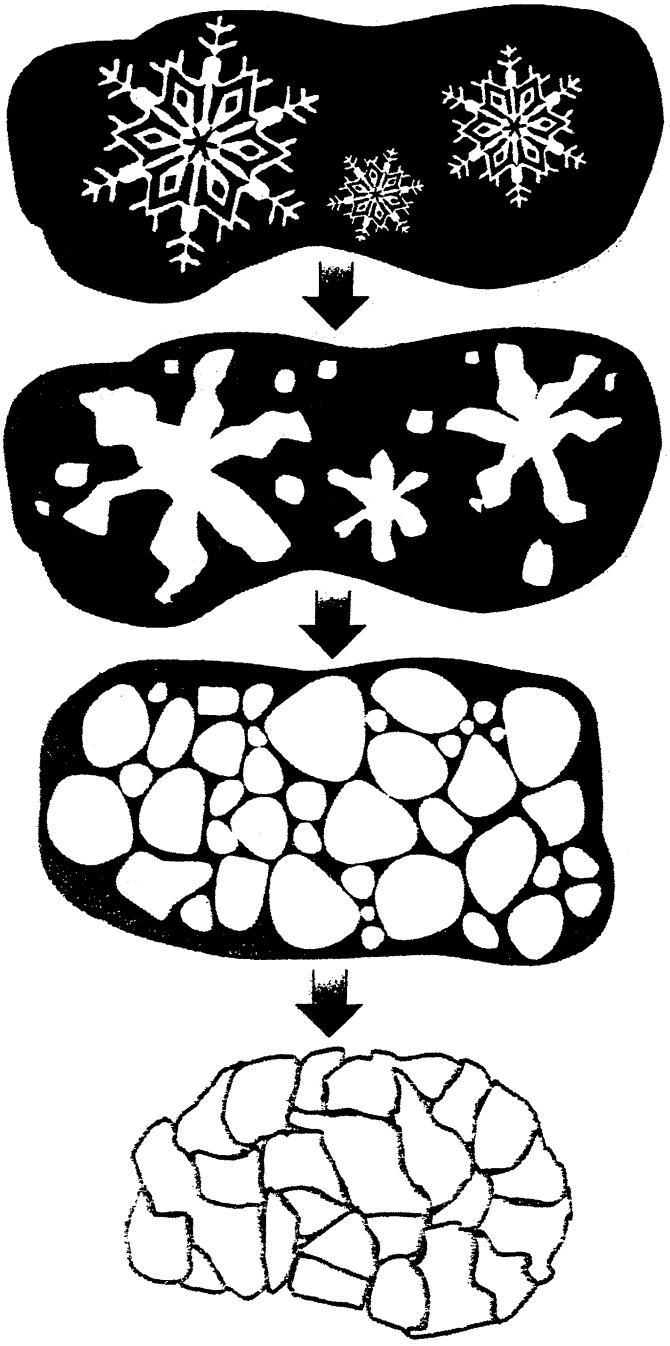


Ice Info

A single snowflake hardly weighs anything. However, a fresh snowfall 25 centimeters (10 inches) deep over an acre of land can have a mass of almost 100,000 kilograms (110 tons)! About 90% of that volume of snow is air trapped in the open spaces of snowflakes and between layers of snowflakes. In other words, fresh snow's average density is quite low—0.1 grams per cubic centimeter, to be precise.

As snow falls, newly fallen snowflakes crush the flakes beneath with their weight. The crushed snowflakes' "arms" break off and start to evaporate. The snow's density increases. At the end of winter, compression and the summer's warmth cause snowflakes to change in shape, size, and texture in a process called recrystallization. Typically, the snow crystals turn into icy grains (called firn) in about a year. With further compression and time, the firn becomes glacial ice. This process takes anywhere from 3 years to thousands of years depending on the amount and moisture content of the snow. Individual crystals of glacial ice contain bubbles of trapped air and are clear. The crystals are much larger than snowflakes, measuring 3 to 5 centimeters across. Some can be even larger.

Ice also forms through the direct freezing of water—even sea water can freeze. When the water is cold enough (0°C, or 32°F, for fresh water; -1.91°C, or 28.6°F, for sea water) ice crystals form at the surface. When sea water begins to freeze, crystals of freshwater ice form in the salty water. As the ice crystals increase in size, the salt water is pushed aside and becomes trapped in the ice. With time, the denser salt water sinks out of the sea ice. Sea ice's salt content can drop to only one part per thousand in about 2 years—leaving firmer ice with no noticeable salty taste. In fact, Inuit seal hunters look for this "multi-year" sea ice to melt for drinking water!



Compaction of snowflakes into glacial ice.

- Presently, 10% of land area is covered with glaciers.
- Glaciers store about 75% of the world's freshwater.
- Glacierized areas cover over 15,000,000 square kilometers.
- Antarctic ice is over 4,200 meters thick in some areas.
- In the United States, glaciers cover over 75,000 square kilometers, with most of the glaciers located in Alaska.
- During the last Ice Age, glaciers covered 32% of the total land area.
- If all land ice melted, sea level would rise approximately 70 meters worldwide.
- Glacier ice crystals can grow to be as large as baseballs.
- The land underneath parts of the West Antarctic Ice Sheet may be up to 2.5 kilometers below sea level, due to the weight of the ice.
- North America's longest glacier is the Bering Glacier in Alaska, measuring 204 kilometers long.
- The Malaspina Glacier in Alaska is the world's largest piedmont glacier, covering over 8,000 square kilometers and measuring over 193 kilometers across at its widest point.
- Glacial ice often appears blue because ice absorbs all other colors and reflects blue.
- The Kutiah Glacier in Pakistan holds the record for the fastest glacial surge. In 1953, it raced more than 12 kilometers in three months, averaging about 112 meters per day.
- In Washington state alone, glaciers provide 470 billion gallons of water each summer.
- Antarctic ice shelves may calve icebergs that are over 80 kilometers long.
- Almost 90% of an iceberg is below water--only about 10% shows above water.
- The Antarctic ice sheet has been in existence for at least 40 million years.
- From the 17th century to the late 19th century, the world experienced a "Little Ice Age," when temperatures were consistently cool enough for significant glacier advances.

Name_____ Date_____

Mystery Bag Activity

What can you SMELL?

MODEL:

EVIDENCE:

What can you HEAR?

MODEL:

EVIDENCE:

What can you FEEL?

MODEL:

EVIDENCE:

FURTHER TESTS

Actual

Name_____ Date Key

Mystery Bag Activity

ask how many ea time

What can you SMELL?

MODEL: drawn

Chocolate

apple

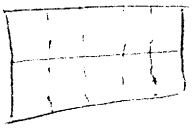
EVIDENCE: describe

Smells like

What can you HEAR?

MODEL:

Solid sound



EVIDENCE:

Solid sound

big + little

What can you FEEL?

MODEL:

EVIDENCE:

peanut cracked when squeezed

softer than rock, gives

~~Tootsie~~ Squeezes

apple - feel Storm

FURTHER TESTS

Light test

Actual

Tootsie - (2)

Apple (1)

peanut (2)

Small potato (1)