



Inside Mars - Recipe for a Planet

http://www.lpi.usra.edu/education/explore/mars/inside_mars/recipe_planet.shtml

Overview

Recipe for a Planet is a 45 minute activity in which children ages 8 to 13 build edible models of Earth and Mars to compare their sizes and illustrate their internal layers. An optional investigation, Differentiation Demonstration, enhances this activity.

What's the Point?

- Mars is about half the size of Earth.
- Mars and Earth have internal layers, including cores, mantles, and crust.
- Earth has a solid inner core and molten outer core; Mars most likely has a molten core.
- Surface features on a planet provide clues to their internal processes.
- Volcanos on a planet's surface suggest that the interior of the planet is – or was recently – sufficiently hot to create magma, molten rock.
- Models are tools for understanding the natural world.
- Models — such as the children are using here — can be tools for understanding the natural world.
- Geologists use comparisons between features on Earth and other planets, like Mars, to help them identify differences in how the features may have formed or changed.

Materials

For each team of 3 to 4 children (or for each individual child if you prefer that they make their own planets):

- 10-12 *mini* chocolate chips and 3-4 *regular* size chocolate chips
- 2 teaspoons of green sprinkles or "jimmies"
- 4 teaspoons of blue sprinkles or "jimmies"
- 3 teaspoons of red sprinkles or "jimmies"
- 4 tablespoons of red icing
- 1 small paper cup
- 1 donut hole, preferably chocolate
- 6 pre-packaged Rice Krispies Treats
- 3 zip lock baggies
- 2 cardboard plates
- 1 ruler
- 1 pair of scissors
- 1 sturdy plastic knife
- Several wet wipes or damp paper towels
- *Recipes for Earth and Mars* handout (attached)

For each child:

- (optional) One *GSI Journal Part 2: Inside Mars* handout (attached)
- (optional) One pencil

For the group:

- Butcher paper, newspapers, or disposable table cloths for the activity area

For the Facilitator:

- Background information: <http://www.lpi.usra.edu/education/explore/mars/background/>
- Shopping list: http://www.lpi.usra.edu/education/explore/mars/mars_materials_list_final.pdf

Preparation

You may need to modify this activity for children with dietary restrictions.

- Make copies of the global images of Earth and Mars.
- Place the different colors of sprinkles in separate baggies. Place both sizes of chocolate chips in a baggie. Place the red icing in the small paper cup.
- This is a fun, but messy activity! If possible, tell the children ahead of time to wear an old shirt or apron, or you may wish to provide trash bags for them to wear.

Activity

1. Introduce the activity by dividing the children into teams of 3 to 4 and explaining that each team will create edible models of Earth and Mars. Invite them to share what they know about Mars:

- Are Earth and Mars the same size? Which is bigger?
- What color is Mars from space? What about Earth?
- Does Mars have several land masses — or continents — like Earth?
- Does Mars have oceans like Earth?
- Do Earth and Mars have volcanos? What differences in the volcanos can they recall from earlier activities?
- Does Earth have layers inside? Can they name some of those layers?
- What is the inside of Earth like? *Children may say there is a molten layer under the surface; this is an important misconception that will be examined in the activity.*
- Does Mars have layers inside? What might they be like
- Do you think Earth and Mars look similar on the *inside*?

2. Before you begin, explain to the children that this is a fun and tasty — but messy — activity! Have them **wash their hands before they start and remind them to not lick their fingers while they are working on their models.** For now, they will just make the model — they will be invited to eat it at the end of the activity!

3. Create a model of Earth! Provide the materials to the teams and invite them to create a model of Earth.

Earth's inner metallic core: a donut hole

Earth's molten outer core: red icing

Earth's mantle: 3 1/2 Rice Krispies Treats

Earth's oceanic crust: blue sprinkles or "jimmies"

Earth's continental crust: 1/2 of a Rice Krispies treat covered in green sprinkles or "jimmies"

Have each team tear one of their Rice Krispies treats in half and set one half aside. Mash the other half together with 3 more Rice Krispies Treats so they make one "mega treat." Have them form the treat into a flat rectangle, about 4 inches by 6 inches. Starting in the center of the flattened "mega treat," smooth a thin sheet of the red icing to within one inch of each edge; they should use about half of the icing and save the rest for later. Place the donut hole in the middle. Gently wrap the Rice Krispies Treats around the donut hole — with the icing side against the donut hole — to form a ball. Roll it around and squeeze it to make it firm. Invite the children to add continental and oceanic crusts to their Earth. Have them place their Earth sphere in the baggie with the blue sprinkles. Roll it around until it is thoroughly covered in blue. Remove and set it aside.

- Ask the children what they think the blue represents. *Many of the children may say "the ocean." Clarify that in this model we are using blue to represent the thin crust under the ocean (oceanic crust).*

Now invite them to make the continental crust — the land on Earth. Ask them to take the Rice Krispies Treat half they set aside earlier and flatten it into a thin layer. Have the children create four or five continent shapes, then gently press one *side* of each continent into the green sprinkles until covered. Have them gently press each continent onto the Earth sphere with the sprinkle side up. In reality, the thicker continental crust does not "sit" on top of the oceanic crust; both sit above the Earth's mantle.

- What do the green sprinkles represent? *The crust, or land, that is above the ocean (the thicker continental crust).*

4. Create a model of Mars. Provide the materials to the teams and invite them to create a model of Mars.

Mars' inner core: 2 tablespoons of red icing

Mars' mantle: 2 Rice Krispies Treats

Mars' crust: red sprinkles

Have the teams shape their Rice Krispies Treats into a rectangle about four inches by two inches. Place the red icing in the center and *gently* wrap the Rice Krispies Treat around it, shaping it into a ball.

- What color is the surface of Mars from space? *Mostly red.*

Have the children place their Mars sphere in the baggie with the red sprinkles and roll it around until it is thoroughly covered in red. Remove and set aside.

5. Invite the children to examine and discuss their models.

- Which is larger? *Earth.*
- What features did they see on Earth and Mars in their earlier investigations? *Channels, volcanos, and impact craters.*
- How might they make their Earth and Mars more realistic? *Their answers may include adding these features.*

6. Revisit their crater ideas.

- Which has more craters? *Mars.*
- Which has bigger craters? *Mars.*
- How might the children add craters to their Earth and Mars? *They can use their fingers to make impressions in the surface to represent giant impact craters.!*

7. Revisit their volcano ideas and their findings from earlier activities.

- Which has more volcanos? *Earth.*
- Which has bigger volcanos? *Mars.*
- Is there a pattern to where the volcanos on Earth are? *They are mostly in a line or chain. Sometimes they are in chains along continents or in the middle of oceans.*

Invite the teams to add chocolate chip volcanos to their Earth and Mars models, based on their observations and what they learned in other activities. They may want to use the left-over red icing to help the chocolate chips stick.

- Where should small chocolate chip volcanos go? *Earth. Facilitator Note: at the model Earth scale, these chocolate chips are really much too large!*
- Where should the large chocolate chips go? *Mars.*
- Which will have more chocolate chip volcanos? *Earth.*
- Which planet has volcanos in chains? *Earth.*

8. Ask the children what volcanos tell us about a planet.

- What makes volcanos? *Molten rock or magma coming from inside the planet.*
- If the rock is melted, what does this mean about the temperature of the planet? *It is hot enough to melt the rock!*
- Earth has lots of active volcanos — like Hawaii, Mount St. Helens, Mount Erebus in Antarctica, and Mount Etna in Italy. What does that mean about its inside? *Earth is very hot.*
- On Mars, we have the volcanos, but there are fewer than on Earth — and we have never observed one erupting. What might this tell us about Mars? *Mars has been hot enough to make volcanos, perhaps not very long ago, but it is not as hot as Earth.*

Planetary scientists hypothesize that some of Mars' volcanos were active not very long ago, between 10 million years ago and a hundred million years ago. They suggest this because the volcanic rock around many of the volcanos is not heavily cratered; the surface appears fresh.

- What does the red icing represent? *Melted or molten rock, or magma under the volcano.*
- Is there a layer of melted rock under the Earth's crust in their model? *No, just little pockets.* This is an important point to make, as children often think there is a melted layer under Earth's crust that feeds magma to volcanos. If there were a molten layer everywhere, we might expect to see volcanos everywhere!
- Is there a melted layer anywhere in Earth — did they use the red icing for any layer? *Yes, the red icing was used for the outer core. Earth's outer core is molten.*

9. Have the children spend a few minutes talking in their groups about what the inside of their Earth and Mars model planets will look like if they cut them open. Invite them to draw their predictions if they wish.

10. Return to their models and have the teams carefully cut both Earth and Mars in half. Small children may need help cutting, and they may need to reshape the planets after cutting.

11. Invite the teams to examine the cross sections of their planets.

- Were their predictions correct about the interiors of Earth and Mars? Do the insides of the planets look like the children thought they would?
- What do the different layers represent? *Refer to steps 3 and 4.*
- In what ways are the interiors of Mars and Earth similar? *They both have layers, with a central core, a middle mantle, and an outer crust. They both have magma chambers under the volcanos.*
- In what ways are they different?

- *Earth has a layer of iron that represents the liquid molten outer core. Earth has a solid inner core.*

Share with older children that Earth's molten layer of material — iron and nickel - is very important. Convection (flow) of material in Earth's outer core creates Earth's magnetic field. The magnetic field protects us from dangerous particles from the Sun called solar wind. Without the magnetic field, these particles would wear away our atmosphere and dangerous radiation from the Sun would reach Earth's surface.

- *Mars also has a molten core — but no solid inner core.*
Share with older children that because there is not convection within the liquid core, Mars does not have a magnetic field like Earth's. Without this protective magnetic field, solar wind has worn away the atmosphere of Mars, and dangerous radiation reaches its surface.
- *In general, Earth has two different types of crust — thick crust where there is land (continental crust) and thin crust under the oceans (oceanic crust). On Mars, the crust is relatively thick everywhere.*

Conclusion

Ask the children if they think the differences in the interiors of Mars and Earth are somehow related to the differences in their surface features. Give them a few minutes to discuss the possible relationship. You may wish to have them share some of their ideas and record them in their *GSI Journals*.

