

Creating Craters

Activity Rundown:

How would you describe our Moon? Take a look at the picture below and write down some defining characteristics of Earth's very own rocky satellite.



Moon observations!

Colour: Shape: Size: Texture: Other observations:



Great job! Let's talk a bit more about the Moon's texture (the appearance of the Moon's surface). As you probably noticed, there seems to be a bunch of different sized indents (also called craters) all across the surface. What caused those bowl-shaped dents? Why are they all different sizes? Hopefully by the end of this experiment, you will be able to answer all those questions. Now let's make some craters!

You will need:

- + Flour (baby powder also works!)
- + Cocoa powder (Hot chocolate mix works too!)
- + Shallow pan/container
- + Measuring tape
- + Pencil and paper
- + Assortment of ball-shaped (or close to spherical) items, you will ideally want at least one large, medium, and small item. Below are some suggestions if you should need them.
 - + Large items: Tennis ball, large bouncy ball, or a hockey puck.
 - + Medium items: Golf ball, medium sized rock, or a tea candle.
 - + Small items: Marble, frozen pea, or a pebble.
- + Optional: Scale to measure the weights

Let's do it!

- 1. Gather your large, medium, and small sized items. You can use as many as you would like, but remember to not use anything that might break if dropped from a height.
- 2. On a piece of paper, record the items you'll be using. Using a measuring tape or a ruler, measure the **diameter** of the object. The diameter is how long a circular object is from end to end while passing through its center:





- 3. If you have a scale handy, you can also record the weights of each object.
- 4. Now it's time to make some hypotheses (predictions)! On the same piece of paper, note which items you think will cause the biggest craters. Which ones will cause the deepest craters?
- 5. In a shallow pan, pour a 2 cm deep layer of flour. On top of this white layer, sprinkle a thin layer cocoa powder across the whole surface. The flour is to represent the bottom layers of soil while the brown cocoa powder represents the layer right on top of the Earth's surface.
- 6. Time to make some craters! Choose a drop height that you can replicate each time you drop an object. An easy one to keep constant is simply your arm outstretched while standing up. If you decide to drop from a higher height (from a chair or step-stool) just make sure you're safe and that your aim is good enough for the objects to land in the pan!
- 7. Start with your smallest item and drop it from your chosen height.
 - a. Using a ruler or measuring tape, measure the diameter of the crater created from the object.
 - b. Make a note of how deep the crater is as well! (If you can, take a measurement of how deep your crater is. Be careful not to poke a hole in your crater!)
 - c. Is the colouring of the crater what you expected?
- 8. Repeat step 7 with the rest of your objects. If you run out of room in your flour pan, you can dump your current one and make a new one, but we recommend that you use the same flour-setup for all your objects so you can compare the craters at the very end!
- 9. Check to see if your hypotheses (predictions) are true. Why or why weren't they correct?

Background:

<u>The Moon:</u>

- The Moon is Earth's only natural **satellite**, otherwise known as an object that orbits a planet.
- The surface of the Moon features a huge number of impact craters from **comets** and **asteroids** that have collided with the surface over time.
- Because the Moon lacks an atmosphere (a shield or gases surrounding the object) and therefore weather, these craters are very well preserved. Below is a picture of



the Earth's atmosphere, which acts like a big blanket to maintain a livable temperature!



Layers of the Atmosphere

Want to learn more about the Earth's atmosphere? This NASA site has some great information about it and more: <u>https://climatekids.nasa.gov/menu/atmosphere/</u>

Craters:

- There are millions of Moon craters (also known as **Lunar craters**) scattered across the Moon's surface. Some are even hundreds of kilometers in size!
- The larger in size the falling object, the larger in diameter the crater. The denser and heavier the falling object, it will be able to build up more speed as it falls towards the planet's surface and can cause deeper craters!
- Most formed a long time ago when **comets**, **asteroids** and **meteorites** crashed into the moon's surface.
 - <u>Comet</u>: A body of **ice**, **rock and dust** that can be several kilometers in diameter and orbits the sun.
 - <u>Asteroid</u>: A large **rocky** object that orbits the Sun. They are smaller than a planet, but they are larger than the pebble-size objects we call meteoroids.



Most asteroids in our solar system are found in the main **asteroid belt**, a region between Mars and Jupiter.

- Meteoroids: Much smaller rocks or particles in orbit around the Sun.
- <u>Meteor</u>: If a meteoroid enters the Earth's atmosphere and vaporizes, it becomes a meteor, which is often called a shooting star!
- <u>Meteorite</u>: If a small asteroid or large meteoroid survives its fiery passage through the Earth's atmosphere and lands on Earth's surface, it is then called a meteorite.





Such crashes have also happened on Earth! A great example is the "Barringer Crater" located in the state of Arizona in the United States. The crater is 1,200 m in diameter and 170 m deep. The impact created a rim that is 45 m above the surrounding area. The meteorite that caused this crater hit the Earth about 50,000 years ago, back when mammoths and giant sloths roamed the area!



Barringer Crater in Arizona, USA.

Thought-provoking question: "Since the Moon is only ¼ of the size of the Earth, why does it look like it's been hit by more objects than the Earth?"

Answer: This is because any "scars" left on the Moon by comets, asteroids, and meteorites are preserved on its surface! Unlike the Earth, the Moon has no atmosphere or weather to protect and cover up the craters caused by these strong collisions. Thanks to the Earth's weather and the fact that we have water, **erosion** (gradual destruction) helps to smooth out the Earth's surface after a crater has been formed.



Resources:

https://sservi.nasa.gov/articles/how-are-craters-formed/

https://spaceplace.nasa.gov/craters/en/

https://www.jpl.nasa.gov/edu/teach/activity/make-a-crater/

Reach out!

We would love to hear from you about all the amazing STEM projects you are doing at home! Show us your finished products on any of the following social media platforms by tagging us or by using the following hashtags. We hope these projects have brought some excitement to your day during these difficult times.

Let us know how we did! Please <u>click here</u> to fill out a short survey on how well we did and what you would like to see more of in the future. Thank you!

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