



IMPACT CRATERS

BIG IDEAS:

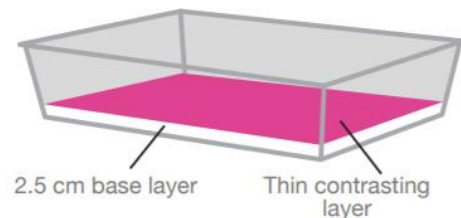
- The Moon's craters were formed when meteorites or other celestial objects smashed into the Moon's surface.
- Studying these craters helps us understand the Moon's history and geology.
- Astronauts in the Artemis project will test and study craters to look for water, ice, and other resources.

AUDIENCE:

- Families
- Students, Kindergarten and older

WHAT YOU NEED:

- Large, high-walled pans or boxes, at least 10" x 12" x 3", made of aluminum, plastic, or cardboard (not glass).
- A variety of spherical objects of different sizes and weights, such as marbles, golf balls, wooden balls, or ball bearings
- Materials for modeling the Moon's surface. Choose at least one light colored and one dark colored material to create contrasting layers:
 - All-purpose flour
 - Baking soda
 - Table salt
 - Cornmeal
 - Sand
 - Cornstarch
 - Cocoa powder
 - Powdered drink mix
 - Instant coffee
 - Dry tempera paint
 - Glitter
- Ruler, yardstick, or measuring tape
- Newspaper or other covering to protect floor or table



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- Printed [crater images](#)
- (Optional) flour sifter or fine sieve
- (Optional) [Learning about Moon Craters](#) sheet

SET-UP:

- **Safety considerations:** Flour, cornmeal, and cornstarch can pose an allergy risk for some participants. If you are using these materials, you may want to include a sign stating that they are present, and/or provide disposable gloves for participants who need them.
- Watch the [Activity Demonstration](#) video to familiarize yourself with the activity.
- Create your lunar surfaces. You may want to make two or three pans to allow multiple visitors to explore at the same time, or so that you can trade them out between visitors and save time resetting them. Fill each pan to about 1 inch (2.5 cm) with your light colored material(s). Sprinkle a fine layer of the dark or contrasting material over the top until it completely covers the surface. You may want to use a flour sifter or sieve to create a thin, even layer.
- Put down the newspaper or other covering around the area where the pans will be placed to catch spills.

WHAT TO DO:

1. Ask participants to look at the photos of lunar craters.
 - What do you notice about these pictures of the Moon's surface?
 - What do you think caused those craters to form?
 - What other features do you see in these pictures?
2. Invite participants to make an impact crater by dropping one of the objects from a height of about 2–3 feet above the pan. Encourage them to gently remove the object and observe the crater. Ask them to compare their crater to the lunar surface photos.
 - What do you notice about your crater?
 - Which picture looks most like the crater you made?
3. Encourage participants to explore different ways of creating the craters and notice how it affects the results. Some changes to suggest:
 - Dropping different sized objects from the same height
 - Dropping the same object from different heights
 - Dropping smaller objects close to (or on top of) an existing crater
4. For older participants, you could use the Learning about Moon Craters sheet to point out and name different features of the craters they create, such as ejecta or rays.

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5. After 3–4 impacts, the lunar surfaces will probably need to be reset (or traded out for fresh pans). To reset them, remove all objects and shake the pan gently until the surface is smooth. Add a fresh layer of your darker surface material to the top.
6. Explain that we can use craters to tell us about what the Moon’s surface is like, and what has happened to it in the past. Invite participants to look again at the lunar crater photos and use what they learned in their experiments to learn more about the lunar craters.
 - What can you tell about how these craters formed?
 - Which ones were made by bigger or smaller objects?
 - Which ones happened first, and which ones came later? How can you tell?
7. Point out that craters uncover layers of the Moon’s surface that might otherwise be hidden. Explain that the Artemis program will be sending Astronauts to areas of the Moon with lots of craters, so they can study them and look for signs of water or other resources.

TIPS & TRICKS:

- *If you do this activity in an out-of-school-time program:*
 - Make one pan for every 3 – 4 students.
 - For older students (5th grade and up) you could include some data collection: ask them to measure different drop heights and the widths of the resulting craters, and graph the results. See the [source activity](#) for a suggested procedure.
- Try varying the materials in your lunar surface pan:
 - Layer multiple different materials, instead of just two
 - Make a uniform mixture of two different materials for the base layer, such as sand and cornstarch, or baking soda and table salt
 - Make three or four pans with different material mixtures or layers, and ask participants to compare how the craters form in each kind of surface
- This activity exists in many forms. For a more permanently reusable version that doesn’t use food products, see NISENet’s [Craters](#) activity; for a similar activity using water balloons, see [Kid Moon: Splat!](#)
- See the Mission2Mars [Additional Resources](#) document for related videos, printable resources, and other activities.

CLEAN-UP:

- Flour and other lunar surface materials can be reused for this activity if stored in an airtight container between uses. They should not be used for cooking or eating purposes!

WHAT TO KNOW:

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- The circular features we see on the Moon are impact craters caused by large pieces of rock from space striking the Moon's surface. The objects were travelling so fast that they exploded on impact, leaving behind a crater and often throwing out rays of material from below.
- Most of the craters formed in the early days of the Solar System, when there were a lot more asteroids and impacts happened frequently. Because the Moon has no atmosphere or flowing water, the surface doesn't erode, so these craters are preserved for millions of years.
- The Artemis 3 mission will land the first woman and next man on the southern pole of the Moon. Our orbiting platform, Gateway, will give us the opportunity to land in almost any location we choose using an ascent/descent vehicle that will be docked with the station. The location on the "bottom" of the Moon, along with the high rims of the craters, make it possible for there to be permanently shadowed regions that contain water and ice. Traveling to this region will help us identify areas rich in water and other resources, and how to best use those materials available to us on the lunar surface.

SOURCE: NASA, [Impact Craters](#); Astronomical Society of the Pacific, [Creating Craters](#)

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