**Target Moon**

60 Minute Space Science Lesson Planetarium Program

Grades: 7-8

**TEACHER GUIDE**

**Target Moon**

**Description**

What’s up with the Man in the Moon? Can you see a faint outline of a face, or maybe a rabbit or a lobster? Let’s explore the Moon’s light and dark markings, see how it changes shape as it orbits the Earth, and discover where all of those craters come from. We’ll witness a visualization of a planet colliding with our own – the “whack that made the Moon!” Hey, got cheese?

**Objectives**

* Recount how the Moon formed from the impact of another planet with the Earth billions of years ago.
* Explain the difference between the light and dark regions of the Moon's surface.
* Name some geologic processes that result in a variety of lunar surface features.
* Name the phases of the Moon and identify them in order of appearance.
* Explain why the Earth’s oceans have tides.
* Describe the reasons for solar and lunar eclipses.

**Ohio’s Learning Standards**

**Grade 7:** Earth and Space Science – Cycles and Patterns of Earth and the Moon

* The relative pattern of motion and positions of the Earth, Moon and Sun cause solar and lunar eclipses, tides and phases of the Moon

**Grade 8:** Earth and Space Science - Physical Earth

* A combination of constructive and destructive geologic processes formed the Earth’s surface
* Evidence of the dynamic changes of Earth’s surface through time is found in the geologic record

**Grade 8:** Earth and Space Science - Forces and Motion

* Forces between objects act when the objects are in direct contact or when they are not touching
* Forces have magnitude and direction

# If this will be your first trip to the Museum for your students you may want to review the following:

**Before Your Museum Visit**

# What is a Museum?

# What is our purpose for visiting The Cleveland Museum of Natural History?

# How should we handle objects at the Museum?

# Introduce the vocabulary and additional resources provided below

**Vocabulary**

 **anorthosite** - a light (color *and* weight) lunar rock that is the major rock type on the Moon's surface (highlands). When the Moon was originally molten, this material rose up to the lunar surface to form its crust.

**basalt** - a dark and dense lunar rock that forms the maria. A type of lava, lunar basalt is very similar to the dark and dense basalt that forms the ocean floors on Earth.

**basins** - huge excavated depressions on the Moon's surface carved out by the impact of large asteroids early in the Moon's history (4.5 to 3.8 billion years ago). Many basins later filled with lava to form the maria.

**breccia** (brech-ee-uh)- a rock formed of coarse rock fragments welded together during an asteroid or large meteorite impact. Breccias are very common on the lunar surface.

**crescent** - the shape of the Moon between New Moon and First Quarter, and between Last Quarter and New Moon, when less than half of the lunar disk is visible.

**eclipse** - the partial or complete obscuring of one celestial body by another. A solar eclipse occurs when the Moon comes between the Earth and Sun. A lunar eclipse occurs when the Earth’s shadow is cast upon the Moon.

**gibbous** - the shape of the Moon between First Quarter and Last Quarter, when the Sun is illuminating more than half of the lunar side facing the Earth.

**highlands** - the brighter regions of the Moon's crust. Highlands are composed of relatively light rock (primarily anorthosite), and are extremely old and heavily cratered.

**impact crater** - the bowl shaped depression formed by the impact of an asteroid or meteorite on the lunar surface. It is the most common lunar landform. The majority of lunar craters are billions of years old.

**lunar** - pertaining to the Earth's Moon. In Roman mythology "Luna" was the goddess presiding over the Moon and months.

**maria** ("mah-ree-uh"; singular mare, "mah-ray") - the dark areas of the Moon's surface. Maria are low basins that filled with lava billions of years ago. They are now solid, very flat and have relatively few craters.

**neap tide** – a high tide with the Moon at First or Third Quarter, with the Sun, Earth and Moon angle at 90°. At neap tide the gravitational forces of the Sun and the Moon partially cancel each other. At these points in the monthly cycle, the tide's range (the difference between high and low tides) is at its minimum. The neap tide is the *lowest* of the month’s high tides, and the *highest* of the month’s low tides.

**observatory** - a building equipped with a telescope for viewing the real sky.

**orbit** - the path of a planet around the Sun or a moon around a planet. The Moon orbits the Earth about once a month and also spins, or rotates, at the same rate. Thus, the Moon always presents the same hemisphere, or side, to observers on Earth.

**regolith** - a layer of loose, rubbly material covering solid rock on the lunar surface. Regolith includes dust, soil, and broken rock.

**spring tide** - a high tide with the Moon at New or Full Moon, with the Sun, Earth and Moon angle at 180°, or in a straight line. This configuration is known as *syzygy*. At spring tide the gravitational forces of the Sun and the Moon combine and reinforce each other. At these points in the monthly cycle, the tide's range (the difference between high and low tides) is at its maximum. The spring tide is the *highest* of the month’s high tides, and the *lowest* of the month’s low tides.

**tides** - the regular upward and downward movement of the level of the ocean that is caused by the gravitational pull of the Sun and the Moon on the Earth.

**Extension Activities**

1. Have students observe the Moon both during the night and in daylight. Are the light and dark markings more pronounced at night, during the day, or at twilight? (twilight). Markings are visible any time but are faint in the bright daylight, and diminished by the Moon's glare in the nighttime.
2. Encourage students to make sketches of the Moon as it appears to their unaided eye. Can they make out any outlines such as the "Man in the Moon," a rabbit or a big bug? Have them use their imagination.
3. Observe the Moon over a period of days - how does its shape change? Explain that the dark, or missing part of the Moon is its nighttime side and NOT the shadow of the Earth.
4. Demonstrate phases of the Moon. Place a lamp with a bare light bulb at the center of a room to represent the Sun. Students will represent the planet Earth. Place a foam ball on a pencil to represent the Moon. A student holding the pencil with the foam ball out at arm’s length and facing the lamp will see a New Moon. Walking counterclockwise around the “Sun”, the student will observe successive phases of the Moon.
5. Using the same materials as above, demonstrate how solar and lunar eclipses occur. Note that the Moon orbits the Earth in a counterclockwise direction as seen from above (north).
6. Students might notice a bright star or planet near the Moon. Each evening the Moon will be seen in a different position relative to that star or planet. Why? (the Moon is orbiting the Earth). In what direction has the Moon moved? (eastward). As the Moon orbits the Earth, it moves its own diameter against the background sky every hour. If the Moon happens to be very close to a star or planet, its orbital motion can be easily observed in a very short period of time.
7. Research information about the many robotic and six manned lunar landings - when they occurred and what was discovered.
8. Obtain books, atlases and close-up pictures of the Moon from the library and Internet and discuss the various features of the Moon's surface.

**Online Resources for Teachers and Students**

Click the link below to find additional online resources. These websites are recommended by our Museum Educators and provide additional content information.

CMNH Educators regularly review these links for quality. Web addresses often change so please notify us if any links have issues. Please note that aside from our own Museum website, the Museum is not affiliated with and does not endorse these online resources.

Cleveland Museum of Natural History https://[www.cmnh.org](http://www.cmnh.org/)/edlinks

**Materials for Loan**

If you’re interested in additional resources be sure to check out the following ERC materials or browse ERC materials online at [CMNH.hosting.L4U.com](http://cmnh.hosting.l4u.com/4dcgi/gen_2002/Lang%3DDef)

Related ERC kits for this topic include:

**All About the Earth, Sun and Moon:** Start a revolution for students with hands-on activities including globes, models, of Moon phases, eclipse models, and more.

**Sculpt a Lunar Surface Kit:** Sculpt the lunar surface using clay, photos, maps, and posters.

The Educator Resource Center offers educator workshops, thematic teaching kits, animal dioramas, and more for loan to area teachers.

Contact the ERC at 216-231-2075 for information on individual or school membership.

Visit the Museum’s ERC website for more information on workshops https://[www.cmnh.org/ERC](http://www.cmnh.org/ERC)

**Hours**

* Monday through Friday, 1 to 5 PM
* Wednesday, 1 to 6 PM
* Saturday, 9 AM to 2 PM

**Educator Resource Center (ERC)**