Target: Moon (Grades 5-12)

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 and the geologic processes that result in a variety of lunar surface features
- Name the phases of the Moon and identify them in order of appearance
- Describe the reasons for solar and lunar eclipses and explain why the Earth's ocean have tides

OHIO'S LEARNING STANDARDS

GRADE 5

Science: Earth and Space Science – Cycles and Patterns in the Solar System

- **5.ESS.1**: The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics.
- **5.ESS.2**: The sun is one of many stars that exist in the Universe.
- **5.ESS.3**: Most of the cycles and patterns of motion between the Earth and sun are predictable.

GRADE 6

Science: Physical Science – Matter and Motion

- **6.PS.3**: There are two categories of energy: kinetic and potential.
- **6.PS.4**: An object's motion can be described by its speed and the direction in which it is moving.

GRADE 7

Science: Earth and Space Science – Cycles and Patterns of the Earth and the Moon

- **7.ESS.4**: The relative patterns of motion and positions of Earth, moon, and sun cause solar and lunar eclipses, tides and phases of the moon.

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GRADE 8

Science: Earth and Space Science – Physical Earth

- **8.ESS.3**: A combination of constructive and destructive geologic processes formed Earth's surface

Science: Physical Science – Forces and Motion

- **8.PS.1**: Objects can experience a force due to an external field such as magnetic, electrostatic or gravitational fields.
- **8.PS.2**: Forces can act to change the motion of objects.

GRADE 9-12

Science: Physical Science – Forces and Motion

- **PS.FM.2**: Forces
    - Types of forces (gravity, friction, normal, tension)
    - Field model for forces at a distance

Before your Program

At the museum (in house) programs:

If this will be your first trip to the Museum for some of your students, you may want to discuss the following questions:

- What is a Museum? Why are we going to the Cleveland Museum of Natural History?
- How should we handle objects at the Museum?
- Use the vocabulary and additional resources provided in this Teacher Guide to preview or review program content with your class.

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

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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 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

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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

ONLINE RESOURCES FOR TEACHERS AND STUDENTS

Click the link below to find additional online resources for teachers and students. These websites are recommended by our Museum Educators and provide additional content information and some fun, interactive activities to share with your class.

CMNH Educators regularly review these links for quality. Web addresses often change so please notify us if any links have issues.

Shafran Planetarium & Mueller Observatory

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