ASTRONOMY from the GROUND UP
An Educational Collaboration of ASP, NOAO & ASTC
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Exploring Lunar Phases with a Daytime Moon

Activity Guide

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Type of Activity:	Outside demonstration
Set up Time:	minimal
Time to Do:	10 minutes
Audience age:	10 years and older
Group size:	up to 20

What's This Activity About?

Many people hold preconceptions about the reasons behind the phases of the Moon. Many think the phases are caused by the shadow of the Earth on the Moon or by shadows passing in front of the Moon. This activity creates a model with the real Moon and Sun in the sky to help participants discover the real reason for the lunar phases.

Materials

For each participant:

- One Moon ball *
- One pencil or other handle to insert into the Moon ball

**indicates that this material is included in the AFGU toolkit. You may need to replenish these supplies. See the list of sources on page 3.*

Setting Up the Activity

You may want to glue the sticks into the balls so that they are permanently fixed. Otherwise, there is no set-up. You will simply need to hand out the Moon balls to the participants.

Be sure to choose a time for this activity when both the Moon and the Sun are visible in the sky. This will be the case in the morning a few days after full to a few days after last quarter and in the afternoon a few days before first quarter to a couple days before full.

Suggestions for Introducing the Activity

Stand in an open, outdoor space with participants and ask who can find the Moon. Have everyone look at the Moon. Why does the Moon look like it does right now? Why does the Moon appear to change shape? Why does the Moon have phases? Hand out the Moon balls and give participants a couple of minutes to see if they can figure out why the Moon has phases.

Doing the Activity

Tell participants that the ball they are holding will represent the Moon and their heads will represent the Earth. And where is the Sun? Where is the real Earth? The real Moon? Explain that just like the Earth has day and night, so does the Moon. Ask them to point to where it is night on their Moons. Why is it night there? Where is it daytime? Why?

Now have them try to hold their Moon ball so that it seems to have the same phase as the real Moon in the sky. They should discover that they need to hold it just under the real Moon in the sky.

Now demonstrate how to put the Moon balls in orbit. Move the ball around your head in a counterclockwise direction. Have the participants try it, watching how the phase of the Moon ball changes. They should bring it all the way around to line up with the real Moon again.

After participants have had time to explore, ask why the Moon has phases. Why is only a portion of their Moon balls illuminated? So why is only a portion of the Moon illuminated? Why do we see it in its current phase? The dark area is the nighttime side of the Moon – where the Sun is not shining. The lit side of the Moon will always be pointing in the direction of the Sun!

Now, if you like, you can go further by helping participants find out the location and phase of the Moon for some day in the future. This works best with more advanced audiences. Ask how long the Moon takes to orbit the Earth once. Allow various answers and use the similarity of the words moon-moonth-month to bring out the answer of about one month. We can estimate that at about 30 days, to make the calculations easier. How many degrees are in a circle? If we divide those 360 degrees by 30 days, we discover that the Moon moves about 12 degrees each day.

So, where will the Moon be in the sky at this time tomorrow? It will be twelve degrees away. How far is twelve degrees? Well, to measure ten degrees, you can hold your fist out at arm's length. Now, if you stick your thumb out a little bit, you will cover about twelve degrees of the sky. So, where in the sky will the Moon be tomorrow? How about in three days or one week?

What phase will it have? Be sure participants are rotating counterclockwise to find the position of the Moon on some day in the future. What phase will the Moon have on that day? Participants can hold up their Moon balls at the new position in the sky to find the phase for that day. How many days until we have a full Moon or a new Moon (i.e. a Moon that we do not see at all because the illuminated side is away from us)?

Wrap-up

Have participants explain the phases of the Moon, using their Moon balls as props. Check their understanding and clarify any misunderstandings.

You may want to go further and ask this question: If we lived on the Moon, would the Earth have phases? To find out, have one participant stand in the center, holding an Earth ball above his or her head. The other participants should form a circle around the Earth while still holding their Moon balls. They circle around and observe he Earth. So, does the Earth have phases? The answer is yes.

Complimentary Activities:

- Moon Clock
- Making Craters

Materials Sources:

The 2" polystyrene "moon" balls with a hole in them are available for $0.24 each (as of this writing) from Molecular Model Co., 116 Swift St., P.O. Box 250, Edgerton, WI 53534. They can be reached via telephone at (608) 884-9877.