10250 MOON PHASE DEMONSTRATOR

Purpose:

To graphically demonstrate the relative position of the Sun and Moon in the lunar cycle.

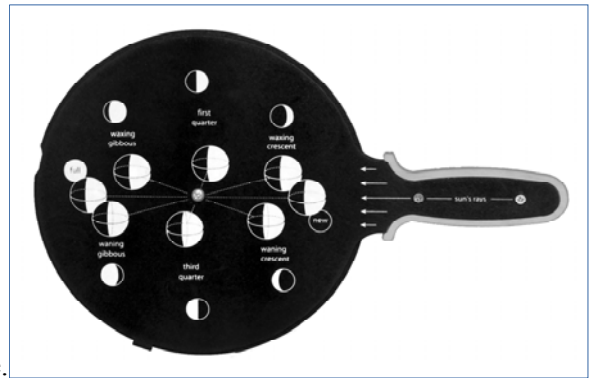
Introduction to Moon Phases

This device shows you how the Moon's appearance changes over a period of one month. The Moon is a sphere whose diameter is roughly one-quarter that of Earth, which appears as a circular disk in the sky. As the days go by, the shape of the illuminated part of this disk changes. The disk is at first not visible at all, because it is completely dark (a "new moon"). Then a very thin crescent appears, gradually growing until after about a week, one half of the disk is lit (the "first quarter Moon", since this occurs one quarter of the way through the cycle). The lit portion continues to increase until after about two weeks, the entire disk is lit, giving us a "full Moon". This occurs halfway through the cycle. Gradually, this decreases in size until after about three weeks, the opposite half from the first quarter is seen. This is a "third quarter Moon". The reason for this sequence of phases is the changing angle between the direction of our lines of sight to the Sun and Moon, as the Moon revolves around Earth in its orbit each month. When the Sun and Moon are aligned in our sky (at the new Moon), the face of the Moon opposite the one we are looking at is being illuminated; we can see no Moon . When this angle is very small (the Moon appears to us to be almost in the same direction as the Sun), we see a thin crescent. The first quarter Moon is seen when this angle is 90 degrees. Although we are looking at the sphere of the moon, we only perceive the half being illuminated by the sun. At first quarter, if you point with your right arm at the Sun and left at the Moon, your arms will be perpendicular to each other. Full Moon corresponds to an angle of 180 degrees. The Sun and Moon are opposite each other in the sky. The third quarter is then at 270 degrees, the mirror image of first quarter.

So where and when does the Moon appear in the sky when it has a particular phase? To help make this clear, remember that the definition of the celestial meridian at your location on Earth is a line drawn on the sky starting at the zenith (the point directly overhead), straight down to meet the horizon at a right angle to a point that is due south on the horizon. Noon is the time when the Sun crosses the meridian. (The abbreviation AM stands for "ante meridiem", and means "before the meridian", while PM stands for "post meridiem" and means "after the meridian".) Just after the new Moon, the thin crescent rises just after sunrise, crosses the meridian just after noon and sets just after sunset. About one week later, the first quarter Moon rises at noon, crosses the meridian at sunset, and sets at midnight. About two weeks after the new Moon, the full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise. Three weeks into the cycle, the third quarter Moon rises at midnight, crosses the meridian at sunrise, and set at noon. A week later, the cycle repeats with a new Moon. Many people are not aware that the Moon is often visible in the daytime. Read through this paragraph again and figure out for each phase for what period during the day the moon will be visible. The Moon Phase Demonstrator will show you all of this.

Using the Device

Hold the demonstrator by the handle so that the yellow disk representing the Sun faces you. This disk is attached to a plate which you will rotate to simulate the motion of the Sun across the sky, from sunrise to sunset. Imagine that you are facing south. The Sun rises to your left, on the eastern horizon, and moves higher in the sky until it crosses your meridian at noon, then moves lower in the sky to set on the western horizon to your right. During the night, the Sun appears to move around behind the Earth until again rises the next morning. Move the disk through a coplete rotation and be sure that you understand how it represents the Sun's location in the sky throughout one day.



A second circular piece with a single circular hole in it is mounted on top of the plate carrying the Sun. By rotating this piece you can move the hole so that a particular phase of the moon is visible. Which phase you see depends on the angle between the Sun and the Moon, as illustrated on the demonstrator's back plate:

To use the device, select a particular phase of the Moon by holding the phase plate stationary (the finger notch aids this) and rotate the Sun plate. The two plates will then rotate together when turned by the outer edge of the phase plate. Make the Sun rise, travel across the sky, set, and move around behind the Earth until it rises again. Try to visualize the angle between the Sun and Moon that is producing the visible portion of the Moon. Use the back plate illustration to help you form a mental image. Is the Moon visible during the day for this Moon phase? Is is visible during the night? When does the Moon rise and set in relation to sunrise and sunset? How do your answers differ for another Moon phase?

Time Allocation:

No prior assembly is required for this product. Individual experiment times will vary depending on student needs and methods of instruction, but normally will not exceed one class period.

Feedback:

If you have a question, a comment, or a suggestion that would improve this product, you may call our toll free number.