How the Moon Phases Work

Fact or fiction: The phases of the moon are caused by the shadow of the Earth falling on the moon?

Fiction! This is one of the most commonly held misconceptions in all astronomy. Here's how the moon's phases really come about:

The moon is a sphere that travels once around the Earth every 29.5 days. As it does so, it is illuminated from **different angles** by the sun. At "*new moon*," the moon is between the Earth and the Sun, so the side of the moon facing us receives no direct sunlight and is lit only by the dim sunlight reflected from the Earth. As the moon moves around the Earth, the side we can see gradually becomes more and more illuminated by direct sunlight.

When the illuminated side of the moon appears to be getting larger in size, the moon is said to be in a "*waxing phase*". When the moon is illuminated from 1 % to 49 % the moon is in a "*waxing crescent moon*" phase. Many people say this looks like a banana or the letter C.

7 days later the moon is 90 degrees away from the Sun and is half illuminated. This phase is called "*first quarter*" because it is about a quarter of the way around the Earth.

Over the next 7 days the moon continues to be in a waxing state. When the moon is illuminated from 51% to 99 %, the moon is in a "*waxing gibbous phase*", so more than half of the moon is illuminated.

After 14 days, the moon is now 180 degrees away from the Sun, with the Sun, Earth and Moon forming a straight line. The moon is now fully illuminated by the Sun, so this is called the "*full moon phase*." This is the only time during the entire month when the Earth's shadow could be close to the moon. The Earth's shadow points towards the moon at this time, but usually the moon passes **above or below** the Earth's shadow, so no eclipse occurs.

As the illuminated side of the moon appears to be getting smaller in size (after a full moon), the moon is said to be in a "*waning phase*". The moon for the next 7 days will be in a "*waning gibbous phase*".

After another week (21 days after new moon) the moon has moved another quarter of the way around the Earth to the "*third quarter phase*". The sun's light is now shining on the other half of the visible face of the moon.

For the last 7 days (21 days after new moon) the moon continues its waning phase until becoming a New Moon again. This moon is in a "*waning crescent moon*" phase and you will only see 49% – 1% of the lit moon.

After approximately 29.5 days, the moon is back to its *New Moon* starting position. Usually the moon passes above or below the sun, but occasionally it passes right in front of the Sun and we get an eclipse.

Thus the moon's phases are not caused by the shadow of the Earth falling on the moon. The shadow of the Earth falls on the moon only twice a year, when there are lunar eclipses. Phases are caused by changes in the relative positions of the Moon, Earth, and the Sun. When the sun shines on the moon, half the moon is always in sunlight. However, since the moon revolves around Earth, you see the illuminated moon from different angles. The half of the moon facing Earth is not always the part that is receiving sunlight. **The phases of the moon depends on how much of the illuminated (lit) side of the moon that you see from different angles**.

The moon is visible in daylight nearly every day except: 1) when it's close to new moon, 2) when the moon is too close to the sun to be visible, or 3) when the moon is full. The best times of the month to see the moon in daylight is close to the first and third quarter moons - when the moon is 90 degrees away from the sun in the sky. So people on Earth can see the moon in the daytime because the Earth rotates faster than the moon revolves. Earth takes only 24 hours to rotate on its axis and the moon takes 29.5 days to revolve. This means that the moon is in a position for the side of the earth that is facing the moon to see the moon for a few hours every day.