

By the Light of the Moon

To the human species, the Moon has been a constant companion in our sky, and its beauty has elicited inspirational music and poetry. Other than the Sun, our Moon has, from time immemorial, been the most impressive celestial object in the sky.

Amongst the eight planets orbiting our Sun, all but two, Mercury and Venus, have satellites. Of those planets our Earth is unique in being blessed with but one satellite, the Moon. Our Moon is unique because it is much larger in proportion to its primary planet than any other body in the solar system, It is $\frac{1}{4}$ the width of Earth, and exerts $\frac{1}{6}$ th of its gravity. If Earth were a basketball, the Moon would be a tennis ball orbiting about 25 feet away. A human weighing 180 pounds on Earth would weight just 30 pounds on the Moon.

The Moon was born more than 4 billion years ago, when a Mars-size planet collided with Earth, sending millions of particles into Earth orbit. These particles eventually coalesced into the Moon we see today. But that isn't the end of the story. Its present battered surface is testimony to a period of intense bombardment of asteroids and comets that began about 3.9 billion years ago and continued for about 100 million years.

These impacts, known as the Late Heavy Bombardment, created large basins that eventually filled with dark lava welling up from deep within the still molten lunar interior. Many of these basins are hundreds of miles in diameter, and were easily seen by humans here on Earth. Early observers thought the dark areas were oceans and lakes, and gave them names such as Mare Crisium (Sea of Crisis) and Mare Tranquillitatis (Sea of Tranquility).

Since its fiery birth, the Moon has been slowly moving away from Earth. As its gravity interacts with that of its parent planet, the Moons distance from Earth and its rate of rotation have been changing. Due to a condition referred to as Tidal Lock, the rotation rate of the Moon is now the same as its orbital period of 27.3 days, so we always see the same side of the Moon. However, we actually see more than half of the Moon surface due to its elliptical orbit that carries the Moon from a perigee of 224,000 miles to an apogee of 252,000 miles. Due to this difference the Moon is seen to exhibit a slight wobble, known as Lunar Libration, that exposes about 59% of its surface to observers. During its closest approach at perigee, the Moon appears 11% larger than at apogee.

The Moon produces two spectacular periodic events sure to bring observers outside for a look. Since the Moon's orbital plane is inclined about 5 degrees to Earth's plane around the Sun, the Moon does not always pass between the Sun and Earth. When it does align we are treated to eclipses of the Sun as a narrow band of darkness passes across the Earth. In a total solar eclipse, as the Moon slides in front of the solar disk, an eerie quiet settles onto the land. Birds fly to secure areas to pass the night and

the sounds of nocturnal insects are heard. Most total solar eclipses last but a few minutes, but to experience one is a memory of a lifetime.

Conversely, when the Earth is aligned between the Sun and the Moon, we experience lunar eclipses. Lunar eclipses only occur when the Moon is at full phase, and are always seen at night. If we are fortunate to be on the night side of Earth when one of these alignments occurs, we can spend hours watching the Moon being engulfed by the Earth's shadow, and then being reborn as the shadow moves on its way. Depending on the clarity of our upper atmosphere, lunar eclipses can be quite colorful. If our atmosphere is carrying large amounts of volcanic material, the Moon may take on a memorable dark blood-red coloration.

To learn more about the Moon, you are invited to attend the 2nd annual "International Observe The Moon Night" at the Cameron Park Rotary Community Observatory on Saturday, October 8th, from 7:30 to 10:30pm. For directions to the observatory you are invited to go to www.communityobservatory.com