

Offered Title: The Moon's Same Old Face

The Moon is sort of like a coin that gets flipped and always lands with the same face showing. Well, not really but I hope you get the point...we always see the same face of our Moon. Whether it's full, gibbous, quarter, crescent, or new, the same side of the Moon faces Earth.

Why is this so, will it go on always, how does it affect us? And, what's the other side like?

Why? Our Moon is in *synchronous rotation* with the Earth. That is, its rotation rate is the same as its orbital rate around the Earth. The Moon's rotation rate is about 29.5 days, the same as its *synodic* orbit (full Moon to full Moon). Current evidence points to a phenomenon called *tidal locking* as the culprit. Tidal locking can occur when two bodies co-orbit. While the Moon orbits the Earth, it has enough mass to make the Earth wobble in its orbit around the Sun. The Moon and Earth actually orbit around a common center of mass (gravity) called the barycenter that exists between them. In the case of Moon and Earth, the barycenter is within the Earth's crust because the Earth is much larger than the Moon. Frictional (tidal) forces of Earth's gravity transferred angular momentum of the Moon to the Earth and eventually caused the Moon's rotation to slow until it became locked in step with its orbit around Earth.

Always? Sort of. This synchronous rotation will last for billions of years. Interestingly, the Moon is inching away from the Earth as I write this. Yes, it's racing away at 4 cm per year, about 1.6 inches. The same mechanism that caused the Moon's synchronous rotation is causing it to move away, except in this case it's the Earth giving up angular momentum to the Moon. It's also causing Earth's rotation to slow very slightly over time. Without the Sun's influence, in about 5 billion years Earth's day will be equal to 47 current days. The Earth and Moon will be tidally locked, with the Moon's orbit at 47 days. The Moon will be visible from only one of Earth's sides, will always be in that side's sky, and with the same face showing. Another possibility, in 5 billion years the red giant Sun's expanded atmosphere will slow the Moon's orbit, causing it to slowly head back toward the Earth. Once it gets really close, 11,470 miles (the Roche limit), the Moon will disintegrate and form a ring around Earth. That would be a sight!

Affect us? We have tides, and total solar eclipses...for now. All that will go away in time.

Far Side. It's very different, many more craters, fewer and smaller maria (flat land, called maria by ancient astronomers, Latin for seas).

What's in the Sky?

Jupiter rises before sunset and Saturn later, around 9 pm.

July 9; early evening; west: Venus and Regulus are less than a degree apart.