

THE SKY THIS MONTH

JULY 2009

THE EARTH'S APHELION AND THE MOON'S APOGEE

To most, the two terms “aphelion” and “apogee” might seem to be very technical terms but they describe a very simple phenomena that every orbit in our solar system exhibits.

Many believe that the Earth's orbit is perfectly circular and that the Sun lies at the very center of the Earth's orbit. The reality is that the Earth (and every other planet in our Solar System) has an elliptical orbit, with the Sun at one of the ellipses' two foci. The heliocentric (sun-centered) elliptical orbit is illustrated in Figure 1.

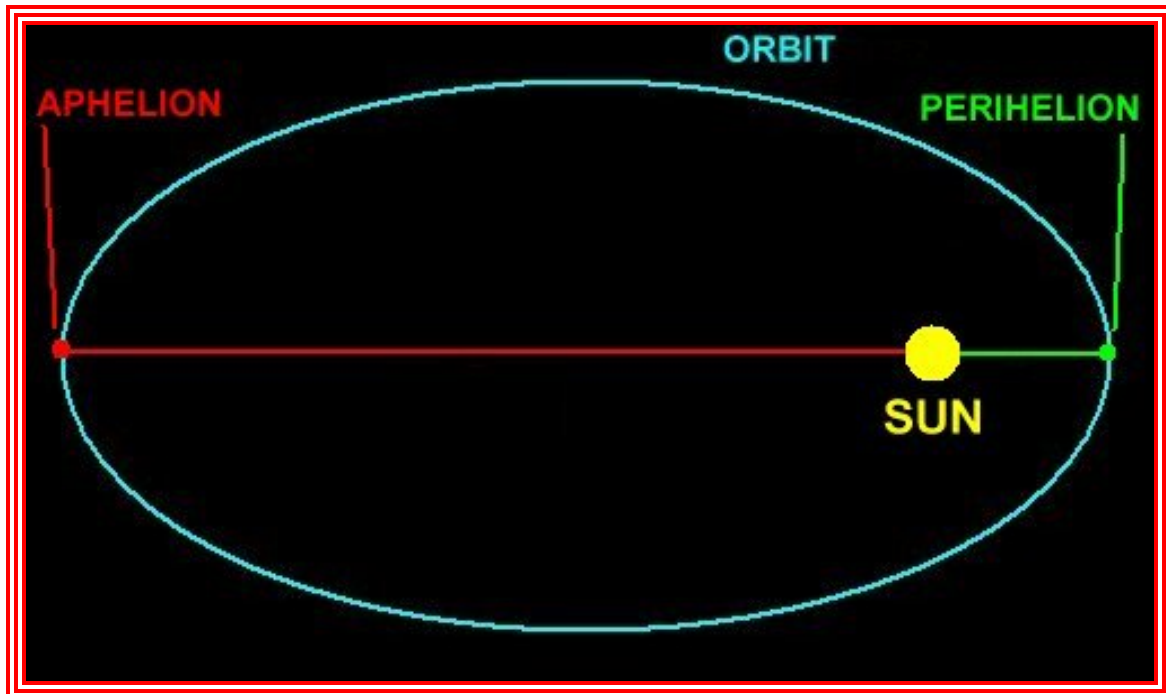


Figure 1: The “heliocentric” (Sun-centered) elliptical orbit. The Earth (and the other 7 planets) orbits the Sun in this manner. The orbit's eccentricity is exaggerated here to better illustrate the aphelion and perihelion distances.

Looking at Figure 1, it is obvious that there is a point at which the Earth is closest to the Sun (perihelion) and another point at which the Earth is furthest from the Sun (aphelion).

What about the Earth's Moon? It does not seem to have an "aphelion". The title of this article clearly says "Moon's Apogee". What does "apogee" mean?

The terms "perihelion" and aphelion" refer to the closest and furthest points the orbiting body has from the Sun (helion = Sun). However, the Moon is orbiting the Earth.

The Moon's orbit is not perfectly circular either. In fact, its orbit around the Earth is more elliptical than the Earth's orbit around the Sun. The closest point the Moon can get to the Earth is called the "perigee". The furthest point is called the "apogee" (gee = Earth).

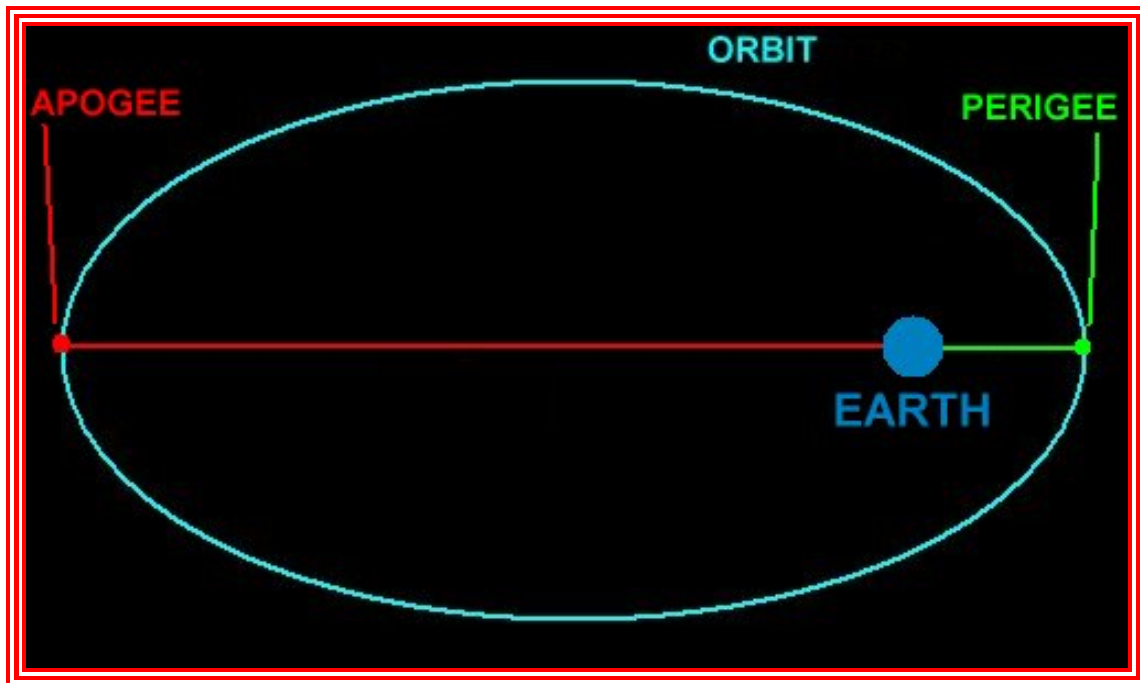


Figure 2: The "geocentric" (Earth-centered) elliptical orbit. The Moon orbits the Earth in this manner every 27.322 days. The orbit eccentricity is exaggerated here to better illustrate the apogee and perigee distances.

This year, Earth's aphelion (152,091,221 km from the Sun) occurs at 10 p.m. on July 3rd. The Earth's perihelion (147,095,260 km from the Sun) occurred at 11 a.m. last January 4th, and will again at 7 p.m. on January 2nd.

Many might wonder why the weather is warmer when the Earth is at apogee (July) and colder when the Earth is at perigee (January). This seems counter-intuitive. However, the seasons are not caused by the Earth's changing distance from the Sun, but the tilt of the Earth's axis. The Sun is only 1.07 times brighter when the Earth is at perihelion than when it is at aphelion.

The Moon hits its apogee every 27.322 days (nearly one month). In July, its apogee will occur at 6 p.m. on the 7th. The next apogee will occur at 9 p.m. August 3rd, etc.

July's apogee will be the furthest for the entire year (406,232 km), meaning the moon will appear the smallest at that time.

Many do not know that the Moon can also change its apparent size over the month, thanks to its non-circular orbit. If we could see the Moon at perigee and then suddenly see it at apogee, it would look very much like Figure 3.

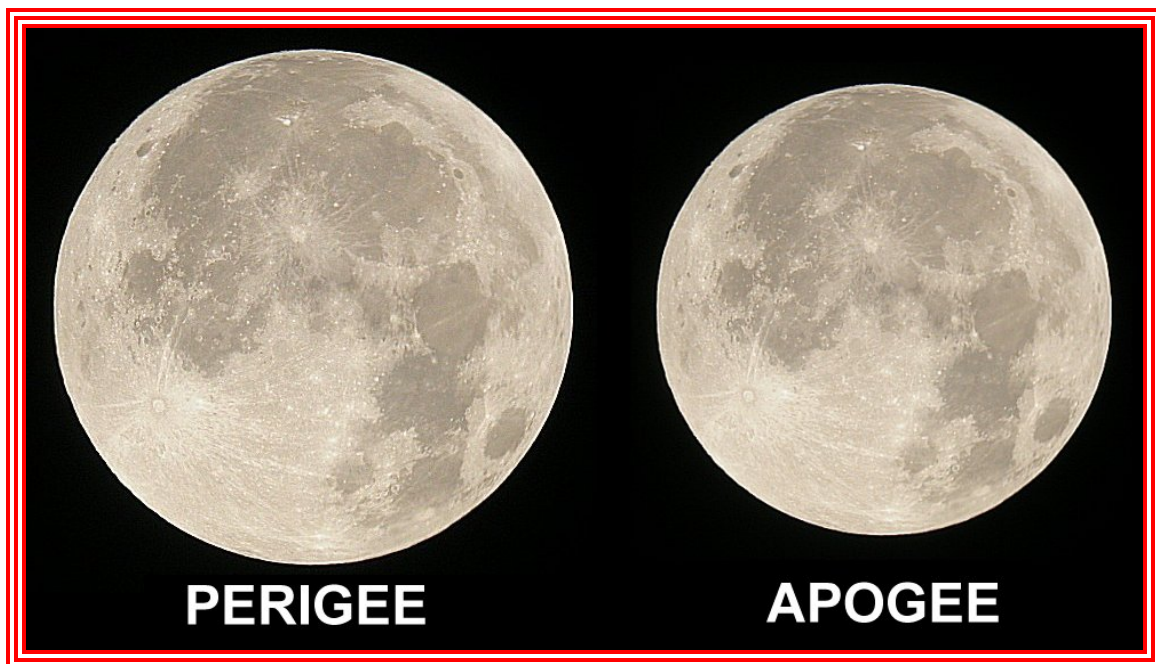


Figure 3: The Moon's relative apparent sizes at perigee and apogee. Image by the author.

Before 1957, only the Moon experienced apogee and perigee. After 1957, we began launching man-made Earth satellites, each having an apogee and a perigee of its own. "Apogee" and "perigee" are also called "orbit elements": one of several used to determine where a satellite will be in its orbit at a specific time.

No orbit in our solar system is perfectly circular. Some come very close. For example, Venus' orbit is actually more circular than the Earth's.

So, on July 3rd, bask in the knowledge that you will be the furthest from the Sun you will be all year. On July 7th, look at the full Moon and know that it is the furthest it will get from you all year. However, don't worry! Both the Sun and the Moon will get closer again! They always do.

SUMMER ASTRONOMY AT THE MILL OF KINTAIL

Help us celebrate the **International Year of Astronomy** by attending our summer star parties! Both will be held at the Mill of Kintail gatehouse and are free for the general public to attend.

The first Night Sky Conservation Sky Tour will begin at **8 p.m. Friday, August 21, 2009** (weather permitting).

The second Night Sky Conservation Sky Tour will begin at **7 p.m. Friday, September 18, 2009** (weather permitting).

For more information about the NSC Sky Tours, please visit www.castor2.ca/nsc/04_Tours.

THE SKY NEXT MONTH – AUGUST 2009

JUPITER RULES AGAIN!

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