

Total eclipse of moon coming on Nov. 29



RAYMOND E. BULLOCK

SKY WATCH
November's best celestial delights will occur during the second half of the month: Mercury is very well-placed for spotting, there will be a second meteor shower and a total eclipse of the moon will occur.

Mercury will be located three degrees directly above the planet Venus on the morning of Nov. 16. Face the east-southeast horizon around 6:40 a.m. Above and to the right of Mercury will be Jupiter (with Spica farther above and to the right of Jupiter). With Mercury located between these two bright planetary beacons, this is an excellent opportunity to track that elusive planet.

The second meteor shower of the month, the Leonids (LEE-oh-nids), will be at its peak on the morning of the 18th. This shower is named for the constellation of Leo, which will be high in the southeast by sunrise.

Like the Taurid shower, the Leonids are not one of the year's best; expect an average of 15 meteors to be visible each hour. On the other hand, we may be building up toward a very good display of Leonids. The Leonids have set the sky ablaze with meteors in the past. In 1833 and again in 1866 an observer would have seen as many as 200,000 meteors in the span of a few hours!

The Leonids, like most meteor showers, are caused by the remains of a comet that disintegrated long ago. This comet had a pe-

riod (completed an orbit) every 33.3 years. Although the earth passes through the Leonid stream every year, the display would be incredible every 33.3 years because we would pass through the greatest concentration of debris. The displays of 1899 and 1933 did not live up to expectations, but in 1966 observers in some areas saw as many as 140 meteors per second. The closer we get to 1999, the better the Leonids may become!

Even if the Leonids just turn out to be average, there won't be a moon in the sky to scatter light, as was in the case of the Taurids earlier this month.

Mercury will be located nearly midway between Venus and Jupiter on the morning of Nov. 18. If you keep track of these three planets each morning, you will notice Jupiter climbing higher, Venus slipping lower and Mercury nearly holding its own.

On the evening of the 18th, the moon will be found within the constellation of Capricornus the goat. The star above the moon is named Al Giedi (Arabic for the goat). While it is not one of the brighter stars in the sky, it is the brightest in Capricornus, so it is distinguished by the first letter of the Greek alphabet and is known as Alpha Capricorni. The second brightest star in Capricornus, Dabih or Beta Capricorni, will be to the left of the moon. Dabih, whose name means "lucky one of the slaughterers" or the "slayer's lucky star," probably bode no good luck as far as a sacrificial goat was concerned.

The moon will be at first quarter phase at 8:03 a.m. on Nov. 20. The moon will have completed the first quarter of its orbit

around the earth. Still located in the constellation of Capricornus, the bright star below the moon will be the planet Saturn. Below Saturn will be Deneb Algedi (the "tail of the goat"), the fourth brightest star in this constellation, hence also called Delta Capricorni.

About four degrees to the northeast of Delta Capricorni is the location in which Johann Galle discovered Neptune in September 1846. This planet moves extremely slow, taking 166 years to complete a single orbit around the sun. Since 1846 was "only" 147 years ago, Neptune has not yet completed a single orbit since its discovery. Neptune, and coincidentally Uranus, are currently within Sagittarius.

Mercury will be at its maximum elongation (greatest apparent distance from the sun) on the morning of the 22nd and will be nearly at its brightest. Mercury will be 20 degrees to the west (right) of the sun and nine degrees above the east-southeast horizon. Can you still see Venus below Mercury? It will be seven degrees below Mercury all week. Bright Jupiter, between Mercury and Spica, will be very easy to identify.

The moon will be approaching the Pleiades star cluster on the evening of the 27th, and the 28th it will be located midway between the Pleiades and Aldebaran (below the Pleiades and above Aldebaran). The following night the Full Moon (November's full moon is also known as the Frosty Moon or Beaver Moon) will put on a very spectacular show.

Full moon will be at 1:31 a.m. on Nov. 29. The moon will be opposite the sun, as seen from the

earth, and will be fully lighted. In fact, the moon will be EXACTLY opposite the sun, and it will be totally eclipsed as it passes through the earth's shadow. This will be a lunar eclipse, an eclipse (covering) of the moon.

The earth always casts a shadow, and it always points away from the sun into space. When the moon is opposite the sun, as the moon is during its full phase, it usually passes above or below our shadow and remains lighted. But should things line up precisely, the moon will pass through the shadow and the light of the sun, streaming past the earth, will be blocked.

Many eclipses are partial; the alignment is close, but not exact. The moon will pass through a part of the shadow and only a portion of the moon will darken. This month, however, the alignment happens to be quite precise. This will produce a total eclipse; the moon will be totally covered and should darken considerably.

The eclipse will officially begin at 10:27 p.m. when the moon will enter the penumbra (pen UM-bruh), the faint outer shadow of the earth. Because this part of the shadow is very faint, no change in the moon will be noticed to the casual observer.

At 11:40 p.m. the moon will be-

gin to enter the umbra, the darker part of the shadow. As the moon continues to move into the shadow, it will darken from left to right.

Totality will begin at 1:02 a.m. The moon will be totally within our shadow for the next 48 minutes. The darkest "phase" of the eclipse will be at 1:25 a.m. The top part of the moon will be nearest the central part of the shadow and should appear slightly darker than the rest of the moon.

During totality, the moon probably will not disappear from view, as the sun does during a total solar eclipse. Enough sunlight streaming past the earth will be refracted (bent) by our atmosphere and will illuminate the moon, but with an eerie red glow. (Sunrises and sunsets are red because our atmosphere refracts the sunlight. This same effect colors the moon red.)

It is not possible to predict how "dark," or how red, the moon will be. Each lunar eclipse appears differently. The more dust and pollutants we have in our atmosphere, the redder the moon. In December 1963, volcanic eruptions on the earth caused more light than usual to be blocked by our atmosphere, and the moon disappeared from view during totality! The 1991 eruption of Mt.

Pinatubo in the Philippines could cause a portion of the moon to appear dark red or even brown.

Total phase will end at 1:50 a.m. as the orbit of the moon begins to carry it out of our shadow. The moon will be partially eclipsed again, getting light from left to right.

The moon will still be eclipsed by the fainter penumbra until 4:25 a.m., but for all intents and purposes the show will be over at 3:12 a.m.

An eclipse of the moon is TOTALLY SAFE to observe. Best views of the eclipse will be through binoculars or with a telescope at low power, although there will be plenty to enjoy if you just go out and watch with the naked eye. And enjoy it you should; the next lunar eclipse, in May 1994, will be a partial one. The best viewing of the next total eclipse of the moon, in April 1996, will be limited to the eastern part of the country. (The moon will rise invisibly, already totally eclipsed, as seen from Michigan.)

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