

# Eclipse Mechanics & Saros Series Meaning

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## **Mechanics of Eclipses**

Eclipses occur when the Sun, Earth and Moon align with the Moon's Nodes. The alignment with the Lunar Nodes is the factor that makes a New and Full Moon become a Solar and Lunar Eclipse. The Lunar Nodes are the points where the Moon's orbit crosses the Ecliptic Plane, which is determined by the Earth's orbit around the Sun. As a result, when the Moon conjuncts her North or South Node, it means she is on the same plane as Earth. This happens every 14 days. Also occurring every 14 days is the conjunction or opposition of the Moon & Sun. Yet, in order for an eclipse to occur, both things must be happening at the same time: the conjunction or opposition of the Sun & Moon along with the Moon's conjunction to her north or south node. These two things stacking up at 14 day intervals are why we always have a Lunar Eclipse occurring with a Solar Eclipse either before or after.

## **Eclipse Season**

Eclipse season simply means that the both conditions are present and eclipses will occur. The New & Full Moon is coinciding with the Moon conjuncting her nodes. Eclipse season lasts for 37.5 days. This time frame comes from the fact that when a New Moon occurs within 18.75 days from a nodal conjunction, a Solar Eclipse will occur. This 18.75 day period before and after the alignment adds up to the 37.5 day eclipse season window. Sometimes the conditions are such that a third eclipse occurs, either solar or lunar in one eclipse season. For instance in June of 2002 we had a solar eclipse between two lunar eclipses. In August of 2000 we had a lunar eclipse between two solar eclipses. In both cases all three eclipses occurred within the 37.5 day window of eclipse season.

## **Eclipse Years**

Every 346.62 days the Moon's North Node aligns with the Sun providing us with an eclipse year. The fact that this number is not the same as our 365.25 day solar year is the reason that eclipse season doesn't occur at the same time each year in exact 6 month intervals. Because the alignment of the Lunar Nodes with the Sun occurs 18.63 days sooner than the Earth completes a full revolution around the Sun, the Eclipse Season regresses each year. Looking at our last few solar eclipses around this time, we can see this happening. Going back to May 26, 2002, we had an Annular Solar Eclipse. The following year we had a Partial Solar Eclipse on April 19, 2004. On April 8, 2005 we had an Annular/Total Solar Eclipse. This year we have a Total Solar Eclipse on March 29, 2006.

I'll give another example with the autumn eclipses. Going back to December 4, 2002 we had a Total Solar Eclipse. Following that was the Total Solar Eclipse of November 23, 2003. The next year we had a Partial Solar Eclipse on October 14, 2004. Last year, we had an Annular Solar Eclipse October 3, 2005. Later this year we will have an Annular Eclipse on September 22, 2006.

Can you see the eclipse regression with each eclipse in its season occurring earlier than the previous year? Did you notice that each one is approximately 9 days earlier? Half of the 18.63 day difference per year goes to each season.

### Types of Solar Eclipse & What Determines Them

Solar Eclipses occur when the New Moon passes in front of the Sun and covers the sun's disk from view. There are three main types of Solar Eclipses that can occur: Total, Partial and Annular. Which one it will be is determined by the proximity of the Moon's Nodes to the Sun-Moon conjunction. The table below shows the orb in degrees and minutes between the Sun-Moon conjunction and the Moon's Nodes. Notice there are some grey areas where either a total or partial eclipse can occur and also where a partial may or may not occur at all.

Proximity to Nodes	00:00 – 09:55	09:56 – 11:15	11:16 – 15:21	15:22 – 18:31	18:32 – 29:59
Total Eclipse	XXXXXX	////////			
Partial Eclipse		\\\\\\\\\\\\	XXXXXX	\\\\\\\\\\\\\\\\	
No Eclipse				////////	XXXXX

During a Total Solar Eclipse the Sun becomes completely covered by the Moon. During a Partial Solar Eclipse, the Moon only covers part of the Sun's disk.

An Annular Eclipse is a type of Total Eclipse. The Moon does pass completely over the Sun and the degrees for this to occur are the same as for a Total Eclipse. However in an Annular Eclipse a ring of fire is left around the Moon as she passes in front of the Sun. Therefore the Sun is not completely covered even though the Moon passes entirely over the Sun from our plane of view. The reason has to do with the moon's apogee (her furthest distance from Earth). The Moon appears largest at perigee (when closest to earth) and smallest at apogee. So when the Moon is nearer her apogee point of orbit an annular eclipse can occur.

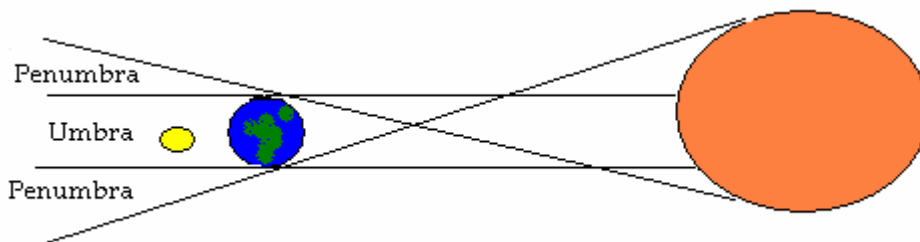
Lastly, we can have an Annular-Total Eclipse which means that over parts of the world a Total Eclipse will occur and an Annular will occur over others. This type of eclipse begins as one and ends as the other as it makes its eclipse path across the globe. This happened on April 8, 2005.

## Types of Lunar Eclipses & What Determines Them

Lunar Eclipses occur when the Full Moon passes through the Earth's shadow (cast by the sun) on the opposite side of the Sun. The Earth is between the Sun and Moon. There are three types of Lunar Eclipses that can occur: Total, Partial and Annular. The table below shows the orb in degrees and minutes between the Full Moon and the Moon's Nodes. Again we have the same grey areas, but this time the orbs are much smaller.

Proximity to Nodes	00:00 – 03:45	03:46 – 06:00	06:01 – 09:30	9:30 – 12:15	12:16 – 29:59
Total Eclipse	XXXXXX	//////////			
Partial Eclipse		\\\\\\\\\\\\\\	XXXXXX	\\\\\\\\\\\\\\\\	
No Eclipse				//////////	XXXXX

To understand Lunar Eclipses, we have to examine the shadow Earth casts on the side that is away from the Sun. The Earth's shadow is broken down into two categories: umbra and penumbra. The umbra is the direct portion shadow cast from head on. The penumbra is the angular portion of the shadow cast due to the curvature of Earth. A picture is worth 1,000 words in this case for sure!



A Total Eclipse occurs when the Moon moves completely into the umbra shadow (as in the picture above). The Moon disappears from view because no sun light is getting to her surface to reflect.

A Partial Eclipse occurs when the moon is partially in the umbra shadow and partially in the penumbra shadow. (The Moon would be on one of the horizontal lines in the above picture.) In this case only part of the moon disappears and we get those cases where it looks like someone took a bite out of the moon. The part of the moon that does not disappear becomes sort of strange in color because some shadow is cast and some light can still get through. It reminds me of how a dimmer switch can let only some of the wattage illuminate a light bulb.

Our current eclipse is an Annular, also known as a penumbral eclipse. During an annular the Moon moves into the penumbra shadow but never goes into the umbra portion. Hence we have the dimmer switch affect visually when we look at the moon.

### **The Saros Series – Mechanics**

If you have Bernadette Brady's book entitled *The Eagle and the Lark*, you'll notice the eclipses I mentioned above during the spring/summer eclipse season are all labeled "North" (pp 348 – 349). This means the Moon's North Node is involved in the aforementioned solar eclipses. The autumn/winter eclipses of those years involved the Moon's South Node and are labeled "South". Run a chart in your software for the eclipses and see for yourself.

Notice also how the numbers of North and South in the Saros Series appendix table range from 1 – 19 (pp 337 – 351). This number 19 is significant. If you take an eclipse year of 346.62 days and multiply that by 19 you get a total of 6585.78 days. The synodic cycle of the Sun & Moon is 29.53 days. After 223 synodic months, this cycle also reaches that number of days. 223 synodic months of 29.53 days equals 6585.19 days. The two factors do not coincide at any time before that. This is the greater eclipse cycle that Babylonian astronomers noticed. Saros means 'repeats' and after 19 eclipse year cycles, the Saros Series starts over at 1 again. This equates to 18 calendar years and 10 or 11 days.

### **The Saros Series – Meaning**

The meaning of each saros series is determined by the aspects that were present at the first solar eclipse of the series. If we look at our current solar eclipse of March 29, 2006 in *The Eagle and the Lark*, we see it is labeled 8 North. Turning to page 318 we see that the Saros Series of 8 North began on May 17, 1501 at 03:39:06 GMT. We also see the planetary positions of the original eclipse chart. Plug this data into your software and see for yourself. You'll see it is as Bernadette Brady says "The New Moon squares Uranus and is also on the midpoint of Mercury/Venus." Other planetary pictures she refers to in the chart are PL=VE/SA=MO/NO and MA=ME=MO/NE. It is from these aspects that the following interpretation of this saros series is derived. (Each saros series gets its meaning from the aspects present in the original eclipse chart.)

Inventiveness and flashes of genius are hallmark of this Saros Series. The individual will have intuitive leaps, insights, good ideas, visions or vivid dreams. The new found inspiration will pull the person away from his or her social life or relationship, thereby causing strain in the private life. This is a time when the person needs to be free, if only for a few weeks. [Brady, p318]

### **Eclipse Degrees for March 2006**

Lunar Eclipse: March 14, 2006 at 24Virgo15

Solar Eclipse: March 29, 2006 at 08Aries35

Where do these fall in your chart? Bring your chart to the Lecture Hall on Saturday March 18, 2006 at 1:00 p.m. EST and we'll discuss it.