Eclipse Mechanics and the Saros Series

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 or Full Moon become a solar or lunar eclipse, respectively. The lunar nodes are the points where the Moon's orbit crosses the ecliptic, the plane of the Earth's orbit around the Sun. As a result, when the Moon conjoins her North or South Node, it means that she is on the same plane as the Earth. This happens every 14 days. Also occurring every 14 days is the conjunction or opposition of the Moon and Sun. Yet, for an eclipse to occur, both events must be happening at the same time: the conjunction or opposition of the Sun and Moon, along with the Moon's conjunction to her North or South Node. Since these two conditions stack up at 14-day intervals, a lunar eclipse will always occur two weeks before or after a solar eclipse.

The term "eclipse season" simply means that both conditions are present — the New Moon and the Full Moon coincide with the Moon conjoining one of her nodes — and eclipses will take place. Eclipse season lasts for 37.5 days. This time frame arises from the fact that when there is a New Moon within 18.75 days of a nodal conjunction, a solar eclipse will occur. This 18.75-day period before and after the alignment adds up to a 37.5-day eclipse season window. Sometimes the conditions are such that a third eclipse, either solar or lunar, occurs in one eclipse season. For instance, in May–June 2002, we had a solar eclipse between two lunar eclipses. In July 2000, there was a lunar eclipse between two solar eclipses. In both cases, all three eclipses occurred within the 37.5-day window of an eclipse season.

Eclipse Years

Every 346.62 days, the Moon's North Node aligns with the Sun, providing us with an eclipse year. Because this number is not the same as our 365.25-day solar year, an eclipse season doesn't occur at the same time each year in exact six-month intervals. The lunar nodes align with the Sun 18.63 days sooner than the Earth completes a full revolution around the Sun, so the eclipse season regresses each year. Looking at our last few solar eclipses in the spring/summer season, we can see this happening. On April 19, 2004, there was a partial solar eclipse (see "Types of Solar Eclipses" below) and then an annular-total solar eclipse on April 8, 2005. Last year, we had a total solar eclipse on March 29, 2006. This year's spring partial solar eclipse occurred on March 19, 2007.

I'll give another example with the autumn/winter eclipses: Going back to October 14, 2004, we had a partial solar eclipse; following that was an annular solar eclipse on October 3, 2005. Last year, there was an annular solar eclipse on September 22, 2006. This year's autumn partial solar eclipse occurs on September 11, 2007. By looking back through the ephemeris,1 we can see both the spring/summer and autumn/winter eclipse seasons regressing several days each year.

Types of Solar Eclipses

Solar Eclipse Solar eclipses take place when the New Moon passes in front of the Sun and covers (or partly covers) the Sun's disk, from our point of view. There are three main types of solar eclipses: total,

partial, and annular. The type is determined by the proximity of the Moon's nodes to the Sun–Moon conjunction. Table 1 (below) shows the orb in degrees and minutes between the New Moon and the closest lunar node.2 Notice there are some areas where either a total or partial eclipse can occur and also where either a partial eclipse or none at all may happen. Outside an orb of 18°31', no solar eclipse can take place.

Table 1: Solar Eclipse Types

Proximity to Node	Solar Eclipse
00°00' – 09°55'	Total
09°55' – 11°15'	Total or Partial
11°11' – 15°21'	Partial
15°21' – 18°31'	Partial or None
18°31' – 29°59'	None

During a total solar eclipse, the Sun appears to be completely covered by the Moon. During a partial solar eclipse, the Moon covers only a 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 degree orbs for this phenomenon 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 for this has to do with the Moon's apogee (the point in her orbit where she is farthest from Earth). The Moon appears largest at perigee (when closest to Earth) and smallest at apogee. So, when the Moon is nearer her apogee and thus appears smaller in respect to the Sun, an annular eclipse can occur.

Lastly, we can have an annular-total eclipse. This means that the eclipse will be total over some parts of the world; and annular, over other areas. Such an eclipse begins as one type and ends as the other as it makes its path across the globe. This last happened on April 8, 2005. We won't see another annular-total solar eclipse until November 2013.

Types of Lunar Eclipses

Lunar eclipses occur at the Full Moon when the Earth is between the Sun and Moon and blocks the light of the Sun, thus casting a shadow on the Moon. There are three types of lunar eclipses: total, partial, and appulse. Table 2 (below) shows the orb in degrees and minutes between the Full Moon and the Moon's nodes. Again, we have the same gray areas where two types of eclipses can occur, but the orbs are much smaller. Outside an orb of 12°15', a lunar eclipse cannot take place.

Table 2: Lunar Eclipse Types

Proximity to Nodes Lunar Eclipse

00°00’ – 03°45’ Total

03°45’ – 06°00’ Total or Partial

06°00’ – 09°30’ Partial

09°30’ – 12°15’ Partial or None

12°15’ – 29°59’ None

To understand lunar eclipses, we have to examine the shadow that the Earth casts on the Moon. The Earth’s shadow falls into two categories: umbra and penumbra. The umbra is the direct shadow cast by the Earth completely blocking the Sun. The penumbra is the angular and indirect portion of the shadow that is cast due to the curvature of the Earth. Here, a picture is definitely worth a thousand words! (See the Diagram)

Diagram eclipse mechanics A total lunar eclipse occurs when the Moon moves completely into the umbra shadow (as shown in the diagram). The Moon appears to vanish from view because no sunlight reaches her surface to be reflected.

A partial lunar eclipse occurs when the Moon is partly in the umbra shadow and partly in the penumbra shadow. (The Moon would be on one of the horizontal lines in the diagram.) In this case, only a portion of the Moon disappears, and it looks as though something has taken a bite out of the Moon. The part of the Moon that does not disappear turns a rather strange color, because some shadow is cast but some light can still get through. It reminds me of how a dimmer switch allows only some of the wattage to illuminate a light bulb.

The third type of lunar eclipse is an appulse, also known as a penumbral eclipse. During an appulse, the Moon moves into the penumbra shadow but never goes into the umbra portion. Hence, we see the dimmer-switch effect when we look at the Moon. The Moon, rather than disappearing, becomes gray in color.

The Saros Series: Mechanics

In Bernadette Brady’s book, The Eagle and the Lark, the eclipses I mentioned above that take place in the spring/summer eclipse season are all labeled “North” in the Saros Series appendix.3 This means that the Moon’s North Node is involved in those solar eclipses. The autumn/winter eclipses of those years involve the Moon’s South Node and are thus labeled “South.” Run a chart for the eclipses and see for yourself.

Notice also that the numbers of North and South in the Saros Series appendix table range from 1 through 19.4 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 6,585.78 days. The synodic cycle of the Sun and Moon is 29.53 days — that is, there are 29.53 days between one Sun–Moon conjunction and the next. After 223 synodic months, this

cycle also reaches that number of days: 223 synodic months of 29.53 days equals 6,585.19 days. The two factors — the eclipse year and the Sun–Moon synodic cycle — do not coincide at any time before that. This is the greater eclipse cycle that Babylonian astronomers observed. The word saros means "repeats," and after 19 eclipse-year cycles, the Saros Series starts over at 1 again. This equates to 18 calendar years and 10–11 days, an amount of time that of course also coincides with our nodal return, when the transiting lunar nodes return to the same zodiacal positions they occupy in our natal chart.

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. This is because a Saros Series begins when an eclipse occurs at either the North or South Pole of the Earth. This indicates the static chart of the eclipse Saros cycle. Thus, over the life span of each particular Saros Series, the planetary meaning inherent at its beginning is carried through each eclipse in that series — just as we carry our static natal chart through life. (The lunar eclipse that occurs on either side of the solar eclipse belongs to the same Saros Series.)

Let's look at the solar eclipse of March 19, 2007. According to The Eagle and the Lark, it is labeled 9 New North. The Saros Series of 9 New North began on August 21, 1664 at 09:12:03 GMT at the North Pole. Consider the planetary positions of the original eclipse chart (see Chart 1). Bernadette Brady writes: “A Venus–Mercury conjunction is on the Mars/Pluto midpoint, and Mars is on the Uranus/Pluto midpoint.” For these aspects in the birth chart of the 9 New North Saros Series, Brady gives the following interpretation:

This is a very physically expressive Saros Series. Accidents, great physical effort, violence or any sudden physical events. These can be experienced positively as, for example, the first time snow-skiing, or it can be felt negatively in terms of accidents and so on. The approach to take when this Series is affecting a chart is not to hide away but to undertake some physical activity, with an ever-watchful eye to safety.5

The March 19, 2007 eclipse was at 28°07’ Pisces. Late winter storms in March provided an outlet for physical activity by extending the skiing season in the United States. Tornadoes in Georgia, Alabama, and Iowa warranted Federal Disaster Assistance. There was an earthquake in Kansas and brush fires in Griffith Park in Los Angeles. The eclipse path began in the Bay of Bengal, passed over India, Pakistan, Afghanistan, along the Ural Mountains in Russia, over the North Pole, and ended just above Alaska. Directly below the eclipse path, there was a mudslide in Indonesia, a plane crash on the island of Java, and an eruption of Mount Batutara. Other areas of volcanic activity included Kamchatka in Russia and the Stromboli volcano in Italy.

Here are the dates of past eclipses in the 9 New South Saros Series: August 31, 1989; August 20, 1971; August 9, 1953; July 30, 1935; July 19, 1917. The best way to understand an eclipse cycle is to search the news around the month of the eclipse and see how it has manifested in the past.. I think you'll be amazed by what you find. Remember that things will not always play out the same way, because each new eclipse chart is different; nonetheless, the original theme is inherent in all eclipses of the series to follow.

References and Notes:

1. Neil F. Michelsen, The American Ephemeris for the 21st Century 2000 to 2050 at Midnight, ACS Publications, 1997.

2. Bernadette Brady, The Eagle and the Lark: A Textbook of Predictive Astrology, Samuel Weiser, Inc., 1992, p. 215.

3. Ibid., pp. 346–347.

4. Ibid., pp. 337–351.

5. Ibid., p. 320.

6. Ibid., p. 321.

Charts use Whole-Sign houses and the True Node.

Chart 1: Saros Series 9 New North

Chart 2: Saros Series 9 New South

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