

STATISTICAL ANALYSIS OF 200 YEARS OF VENUS-JUPITER CONJUNCTIONS – 1900-2100

by Jim Dodge

The purpose of this research was to determine if the appearance of the two Venus-Jupiter conjunctions in 2015, both in the Constellation Leo, might be candidates for heavenly signs that point to the Second Coming of Jesus Christ. The research is based on the premise that since Venus, Jupiter and the Constellation Leo (with the king star Regulus) comprise the foundational stellar configuration involved in the heavenly signs revealed by God in the Christmas Star for the Messiah's First Coming, it is logical to assume that God would use the same template derived from the first coming heavenly signs to point us to heavenly signs that might point to the Messiah's return at the end of the age.

The database was developed manually using the Starry Night Pro program in July 2015. None of the data has been filtered in order to determine how regular or rare conjunctions in the constellation Leo might be. One of the biggest surprises from the data was to learn how common Venus Jupiter conjunctions are. There are 205 conjunctions appearing in the 200 years between 1900 and 2100 for an average rate of occurrence of one conjunction every 1.05 years. Even so, about half (47%) of all Venus Jupiter conjunctions are not visible to the naked eye. This is important because our focus is on conjunctions that would have been visible and significant to the wise men at a time when there were no aids to view the heavens.

Below is a summary of highlights for the Venus-Jupiter conjunctions that occurred or will occur between the years 1900 and 2100 AD, as recorded in the 200 year spreadsheet (separate), based on the following parameters: Date of the Event; Separation distance between Venus and the Sun; Separation distance between Venus and Jupiter; and the Constellation in which the conjunction appears. A brief description of the significance of each of the parameters recorded for the analysis follows. Between the years 1900 and 2100 there are **210** Venus-Jupiter conjunctions with an average rate of occurrence being about one every 1.05 years:

1. Date and Frequency of the Event: The date and frequency of the event is important for two reasons. First, Venus appears to travel through the heavens at a rate of about 20 arc minutes or 1/3 of a degree per day relative to Jupiter. This rate is slow enough that a visible conjunction between the planets with separation distance of ½ degree or more can be seen around the world in pretty much the same way over a single 24 hour period. Thus, while the dates in the data table were recorded from the U.S. West Coast, a conjunction will look about the same within about 24 hours of the recorded date, regardless of where it is observed on the Earth. The exception is when the two planets merge to within about two tenths of a degree or 10-12 arc minutes of separation. When this happens, Venus moves past Jupiter fast enough that the time for conjunction to potentially appear as a single star is limited to only a few hours. When the separation is .1 degree or less, the conjunction may only be visible as a single star for an hour or less, depending on the separation between Venus and the sun. Therefore, conjunctions that merge to within less than .1 degree are only visible as a single star in one or two time zones and, on rare occasions, in three time zones. The Christmas Star was such a conjunction. Second, while the average period or interval for the appearance of Venus Jupiter conjunctions is a little more than once every 12 months, there is a significant and distinct range in the frequency or time interval between appearances.

This periodicity falls into three distinct windows of time as revealed in the Statistical Summary. Significantly, the unusual three month, three week period of time (117 days) between the 30 June and 25 October 2015 conjunctions is not just a rare occurrence, it is also uncommon for conjunctions to appear this close together in such a short period of time to each be visible to the naked eye for more than 2 hours. No other conjunction pair in the 200 year period does this. This issue is important and will be addressed further in the 9400 year data analysis because when looking at these short interval conjunctions over an extended period of time, it turns out that each pair is bracketed by two conjunctions appearing within about 10 months on either side of the short interval pair to create a rare quartet of conjunctions that all appear within a 24 month period of time. Incredibly, the Christmas Star pair is a part of one of these short interval conjunction quartets.

2. The Conjunction Constellation: As revealed in the Christmas Star, the Constellation Leo provides the backdrop for the heavenly signs for the Messiah and it is supported by scripture, so Leo is the constellation upon which the analysis will focus. The distribution of the 210 conjunctions in the constellations of the Zodiac for the period is shown in Statistical Summary (4) below. An equal distribution equates to about 17.5 conjunctions or 8.3 percent appearing in each of the 12 constellations over the 200 year period. Fifteen conjunctions appear in the constellation Leo during the 200 years. Since Jupiter takes about a year to pass through each constellation, and because Venus can potentially pass Jupiter twice in a 12 month period relative to the earth's orbit, 88 of the 210 conjunctions appear as back to back pairs of conjunctions in the same constellation. Of the 44 back to back pairs, only 2 pairs occurred in the Constellation Leo during the 200 year period. The first pair appeared in 1920 and 1921. This was before Israel's 1948 rebirth as a nation (discussed separately). The second pair appeared as the 30 June and 25 October 2015 conjunctions. No other back to back pairs of conjunctions appear in Leo for the remainder of this century.

3. Separation Distance between Venus and the Sun: This is the most important parameter involving naked eye visibility for Venus Jupiter conjunctions (how they would have been observed by the wise men). Venus has a magnitude of brightness of minus four (-4); Jupiter averages minus two (-2 to -1) magnitude, and Regulus is plus 1.4 magnitude. This means that Venus is about six times as bright as Jupiter and more than ten times brighter than Regulus. Venus can be seen at sunset or sunrise when its separation distance from the sun is more than about 25 degrees. Jupiter is not normally visible until about 45 minutes to an hour after sunset and Regulus doesn't visibly appear until 1.5 to 2 hours after sunset. This means that Venus must be at least 20 to 30 degrees from the sun in order for Jupiter to be observed as a part of the conjunction for at least an hour after sunset or before sunrise. Venus needs to be 40 degrees or more from the sun in order for Regulus to be visible with the conjunction by about 2 hours after sunset. In (5) below, 104 or half the conjunctions during the period appear when Venus is less than 25 degrees from the sun, so Jupiter is only visible with the naked eye for a short time in a small number of these conjunctions. Regulus is only visible during 6 of the fifteen conjunctions appearing in Leo during the 200 year period. Significantly, Venus is more than 40 degrees from the sun for each of the 2015 conjunctions, so Regulus is visible during both conjunctions.

4. Separation Distance between Venus and Jupiter: For the analysis, conjunctions with a separation distance of 1 degree or less between the planets are considered to be significant. Importantly, the

separation distance between Venus and Jupiter must be less than one tenth of a degree (.1) in order for the planets to potentially appear as a single star. One hundred seven or 51% of the conjunctions during this period had a separation distance of one degree or less, although nearly half of these were not visible to the naked eye because of Venus' separation distance from the sun. Both 2015 conjunctions have a separation distance of 1 degree or less and both are visible with the naked eye, which is unusual, especially when the rare, short interval period of 117 days separating this pair of conjunctions is factored in.

One purpose of this analysis was to confirm the rarity of the record setting separation distances between Venus and Jupiter for the Christmas Star conjunctions since both conjunctions had separation distances of less than 0.1 degree. The 12 August 3 BC conjunction that formed the star the wise men saw in the East had a separation distance of about **4 arc minutes (.070 degrees)**. The Christmas Star conjunction on 17 June 2 BC had a record setting separation distance of **25 arc seconds (.007 degrees)**. As indicated earlier, only one conjunction in the 200 year period between 1900 and 2100 has a separation distance of less than 0.1 degrees and it will appear in the constellation Virgo on 27 August 2016 with a separation distance of **.069 degrees**. This conjunction is very significant because its parameters are nearly identical to the 12 August 3 BC Christmas Star conjunction except that Venus is the evening star and it does not appear in Leo. Significantly, the 2016 conjunction is part of the short interval quartet of conjunctions associated with the 2015 pair and both of these conjunctions appear in Leo. No other conjunction in the 200 year period comes close to this separation distance. The next closest conjunction during this period was on August 17, 1933 in the Constellation Virgo with a separation distance of 7.5 arc minutes (.125 degrees), nearly twice the August 03 BC and August 2016 separation distances. Of the five next closest conjunctions having a separation distance of about 10 arc minutes (.166 degrees), the closest of these will occur on November 22, 2065 in the Constellation Libra, but it will not be visible because Venus is only 7 degrees from the sun. These data support the rarity of the Christmas Star pair of conjunctions in Leo and the Christmas Star itself as the heavenly sign marking Jesus Christ's incarnate birth on 17 June 02 BC.

Statistical Summary and Analysis of Venus-Jupiter Conjunctions from 1900-2100

1. Total Conjunctions for the period = 210
2. Average period between conjunctions = 1.05 years
3. Frequency of Conjunction Appearance: For the 210 conjunctions between 1900-2100:
 - a. 111 or 52.8%, had an interval between appearances of 12-14 months
 - b. 79 or 37.6%, had an interval between appearances of 10-12 months
 - c. 22 or 10.4%, had an interval between appearances of 3.5 to 4.5 months

Of the eleven pairs of short interval conjunctions that appear within about 4 months of each other (c. above), at least one conjunction in each pair had either significant separation distance between Venus and Jupiter or, Venus approached but did not actually pass by Jupiter relative to the earth to form a conjunction, as follows:

- a. One or both conjunctions occurred in the Sun = 2

- b. For one or both conjunctions, the V-J separation distance is more than 5 degrees = 14
- c. For one or both conjunctions, the V-J separation distance is between 2 & 5 degrees = 5
- d. For both conjunctions, the V-J separation distance was 1 degree or less = 1

This is significant because the only year in the two centuries where two visible conjunctions occur within 4 months of each other, each having a separation distance between the planets of 1 degree or less is 2015: **the 30 June and 25 October 2015 conjunctions, both in the Constellation Leo.**

4. Constellation in which the conjunction appears (uniform distribution = 8.3%):

<u>Constellation</u>	<u># Conjunctions</u>	<u>44 pairs of Conjunctions in the same Constellation (41%)</u>
a. Virgo	= 30 - 14.2%	13 - 12.3%
b. Libra	= 26 - 12.3%	7 - 6.6%
c. Scorpio	= 9 - 4.2%	0 - 0%
d. Sagittarius	= 19 - 9%	3 - 2.8%
e. Capricorn	= 11 - 5.2%	2 - 1.9%
f. Aquarius	= 20 - 9.5%	5 - 4.7%
g. Pisces	= 17 - 8%	3 - 2.8%
h. Taurus	= 18 - 8.5%	3 - 2.8%
i. Aries	= 13 - 6.1%	1 - 0.9%
j. Gemini	= 16 - 7.6%	3 - 2.8%
k. Cancer	= 15 - 7.1%	2 - 1.9%
l. Leo	= 15 - 7.1%	2 - 1.9%

5. Separation distance between Venus and the Sun

a. # Less than 10 degrees	= 49 - 23.3%	Venus not visible
b. 11-25 degrees	= 55 - 26.1%	Conjunction not visible
c. 26-30 degrees	= 16 - 7.6%	Conjunction visible 30-45 min.
d. 31-40 degrees	= 39 - 18.5%	Conjunction visible 1-2 hours
e. # Greater than 41 degrees	= 51 - 24.2%	Conjunction visible 2 -3 hours

6. Separation distance between Venus and Jupiter

a. # Greater than 5 degrees	= 30 - 14.2%
b. 2 to 5 degrees	= 34 - 16.2%
c. 1 to 2 degrees	= 39 - 18.6%
d. .5 to 1 degree	= 58 - 27.6%
e. .1 to .5 degrees	= 49 - 23.4%
f. # Less than .1 degree.	= 1 - 0.005% (27 August 2016)

7. Notes on the above data:

- i. None of the conjunctions where Venus is less than about 20 degrees from the sun are visible with the naked eye, especially when Venus is the evening star. When Venus is 10-20 degrees ahead of the sun as the morning star, conjunctions with Jupiter can be visible for a short time from the moment the planets rise in the eastern sky until about

30 minutes before sunrise when Jupiter begins to fade in the early morning light. Thus, based on the separation distances between Venus and the Sun in 5 (a) and (b) above, about 104 or 49.5% of all Venus-Jupiter conjunctions between the years 1900-2100 were not visible with the naked eye from anywhere on earth.

8. Analysis of the Conjunctions in the Constellation Leo for the 200 year period:

We want to focus on Venus-Jupiter conjunctions in the Constellation Leo because these planets and this constellation make up the template from which the Christmas Star for Christ's first coming appeared. The fifteen Venus - Jupiter conjunctions that appear in Leo during the 200 year period are as follows:

- a. 14 Oct 1908: Venus was the morning star with 44 degrees separation from the sun and about 1 degree of separation from Jupiter. Star rise was 4 AM and sunrise was 7:15 AM so the conjunction was visible for 3+ hours. The parameters are nearly identical to the **25 Oct 2015** conjunction except that Mars appears as the third planet in the 2015 conjunction.
- b. **Double or back to back Conjunctions in Leo:** 9 Aug 1920 and 25 Oct 1921. For the August 1920 conjunction, Venus was the evening star and only 11 degrees from the sun so the **conjunction was not visible from anywhere on earth.** For the October 1921 conjunction, Venus was the morning star and the planets were separated by $\frac{1}{2}$ degree. Star rise was 5:45 AM and sunrise was 7:15 AM so the conjunction was visible for about an hour.
- c. 20 Oct 1932: Venus was the morning star, 41 degrees from the sun, with 25 arc min separation from Jupiter. These parameters are similar those of the **30 June 2015** conjunction. Star rise was 4 AM and sunrise was 7:10 AM so the conjunction was visible for about 3 hours.
- d. 13 Aug 1944: Venus was the evening star and the planets were only 13 degrees from the sun. The **conjunction was not visible from anywhere on earth.**
- e. 25 Oct 1956: Venus was the morning star, 39 degrees from the sun. Planet separation distance was 14 arc minutes, making this the closest separation between the planets for a conjunction in Leo during the 200 year period. Star rise was 4:30 AM and sunrise was 7:15 AM so the conjunction was visible for about 2 and a half hours.
- f. 18 Aug 1968: Venus was the evening star, 16 degrees from the sun. Planet separation distance was 25 arc min. Sunset was 7:38 PM and star set was 8 PM. **The conjunction was not visible anywhere on earth.**
- g. 15 Oct 1991: Venus was the morning star, 45 degrees from the sun. Planet separation distance was 2.5 degrees, for the widest V-J separation distance in Leo in the 200 year period. Star rise was 3:50 AM and sunrise was 7:15 so the planets were visible for nearly 3 and a half hours.
- h. 19 August 2003: Venus was the morning star and in the sun so the **conjunction was not visible from anywhere on earth.**
- i. **Double conjunction in Leo:** 30 June 2015 and 25 October 2015. For the 30 June conjunction, Venus was the evening star. The parameters of this conjunction nearly match

those for the October 1932 conjunction when Venus was the morning star. For the 25 October conjunction, Venus was the morning star and the parameters closely match those of the October 1908 conjunction when Venus was also the morning star. **Significantly, this is the only pair of back to back conjunctions during the 200 year period separated by four months where each conjunction is visible for 3+ hours.**

- j. 31 Aug 2051: Venus is the evening star and only 7 degrees from the sun. The **conjunction will not be visible from anywhere on earth.**
- k. 28 Aug 2062: Venus is the evening star and only 11 degrees from the sun. The **conjunction will not be visible from anywhere on earth.**
- l. 1 Sep 2086: Venus is the evening star and only 8 degrees from the sun. The **conjunction will not be visible from anywhere on earth.**
- m. 28 June 2098: Venus is the evening star and separated from the sun by 44 degrees. The planet separation is 1 degree. Sunset is 7:55 PM and star set is 10:20 PM so the conjunction is visible for about 2 and a half hours.

9. Chronological frequency of Venus - Jupiter conjunctions in Leo for the 200 year period:

- a. 14 Oct 1908 (similar to 10/25/2015)
 - i. 11 yrs 10 mos
- b. 9 Aug 1920 **Not visible**
 - i. 14 months 10 days (**back to back conjunctions in Leo**)
- c. 25 Oct 1921
 - i. 11 yrs
- d. 20 October 1932 (similar to 6/30/2015)
 - i. 11 yrs 10 mos
- e. 13 Aug 1944 **Not visible**
 - i. 12 yrs 2 mos
- f. 25 October 1956
 - i. 11 yrs 10 mos
- g. 18 August 1968 **Not visible**
 - i. 22 yrs 10 mos
- h. 15 October 1991
 - i. 11 yrs 10 mos
- i. 19 August 2003 **Not visible**
 - i. 11 yrs 10 mos
- j. **30 June 2015**
 - i. **3 months 3 weeks (back to back conjunctions in Leo)**
- k. **25 October 2015**
 - i. 35 yrs 10 mos
- l. 31 August 2051 **Not visible**
 - i. 11 yrs
- m. 28 August 2062 **Not visible**
 - i. 14 yrs

- n. 1 September 2086 **Not visible**
 - i. 11 yrs 10 mos
- o. 28 June 2098

Significantly, the shortest period between conjunctions in Leo (3 months, 3 weeks for the 2015 conjunctions) is followed by the longest period, almost 36 years, until the next conjunction appears in Leo. It should also be clear that there is nothing remarkable about the remaining conjunctions in the Constellation Leo for the rest of this century.

10. Probability Analysis for the above data: From the above data it should be possible to determine how rare the 2015 Venus –Jupiter conjunction pair might be. So this is the question: **What are the odds of back to back, or a pair of Venus- Jupiter conjunctions appearing in the Constellation Leo, less than four months apart, where both conjunctions are visible for at least 2 hours with the naked eye, and the separation distance between the planets is one degree or less in each conjunction?**
11. The following factors are considered based on conjunctions for the 200 years between 1900 and 2100 (those used for the basic calculation are highlighted in yellow):
 - a. There were a total of 210 conjunctions during the period
 - b. 15 of the 210 appeared in Leo: 7.1% (.071) or 1 every 14 years, yet only 8 of the 15 conjunctions was visible with the naked eye. Seven or 47% were not visible.
 - c. 88 of the 210 conjunctions formed back to back pairs that appeared in same constellation = 44 of 105 possible combinations or 41.9% (.419)
 - d. 2 of the 44 back to back pairs appeared in Leo - 4.5% (.045)
 - e. 11 of the 105 pairs occurred between 3.5-4.5 months apart = 11.4% (.104)
 - f. Only one pair of visible back to back Venus Jupiter conjunctions appeared less than 4 months apart and it happened in the Constellation Leo = 1/105 = .009% (.009)
 - g. For 51 of 210 conjunctions, Venus was greater than 40 degrees from the sun = 24.3% (.243)
 - h. In 141 of 210 conjunctions, the planets were separated by 1 degree or less = 67.1% (.671)
 - i. In 49 of 210 conjunctions, the planets were separated by .3 degrees or less = 23.3% (.233)

12. The Calculation:

What are the odds of back to back Venus- Jupiter conjunctions appearing in the Constellation Leo,

$$\frac{(6/30/15)(10/25/15)}{(.071) (.071)} = \frac{(2015)}{(.045)}$$

less than four months apart, where both conjunctions are visible for at least 2 hours with the

$$\frac{(6/30 \& 10/25/2015)}{(.104)} = \frac{(6/30/2015)(10/25/2015)}{(.243) (.243)}$$

naked eye, and the separation distance between the planets is one degree or less for each conjunction?

$$\frac{(6/30/2015) (10/25/2015)}{(.233) (.671)}$$

Calculation: $.045 \times .104 \times .243 \times .671 = .000763$ $1/.000763 =$ once every **1,311 years**

In the above calculation, only four of the critical parameters in the question were used to come up with a fairly conservative estimate for the uniquely rare appearance of the 2015 visible back to back conjunctions in Leo. Had (f) above (.009) been used as the four month separation factor to more accurately reflect the significance of the unique visibility aspect of the 2015 conjunctions instead of the value in (e) (.104) that was used in the equation, the odds increase to once every **15,150 years**.

13. Highlights and conclusions:

While the highlights of this analysis listed below are valuable, particularly as we look for heavenly signs pointing to Christ's return, it is difficult to draw significant conclusions from a limited 200 year snapshot of Venus Jupiter conjunctions, especially when the template for the heavenly sign for the Messiah is based on 2000 year old, naked eye observations. That said, the data from the 200 year spreadsheet becomes very significant and relevant when considered in the context of the 9400 year database presented in the next part of the analysis. For the 200 years between 1900 and 2100:

- a. Only about half of the 205 Venus Jupiter conjunctions in the 200 year period were visible with the naked eye
- b. In terms of separation distance, only one conjunction in the 200 year period has a separation distance between the planets of less than 0.1 degree, making it possible for the planets to appear as a single star: the **27 Aug 2016** conjunction with .069 degrees of separation (about the same as the 12 August 3 BC "star the wise men saw in the east"). It appears in the constellation Virgo as a part of the 2014-2016 conjunction Quartet. This is significant and is addressed further in the 9400 year analysis.
- c. Only two back to back conjunction pairs occurred in the constellation Leo during the 200 years: 8/9/1920 & 10/25/1921 and 6/30/2015 & 10/25/2015. The 1920 conjunction was only 11 degrees from the sun so it was not visible, but both the 2015 conjunctions were visible for 3+ hours.

From the above it should be clear that God can use ordinary stellar configurations to reveal extraordinary and timely heavenly signs for His purposes and glory. What makes the 2014-16 Quartet unique is how its timing coincides with the abundance of fulfilled and currently being fulfilled prophetic signs that point to the soon return of Jesus Christ. From a prophetic perspective, the critical timeframe for a heavenly sign pointing to Christ's return could not be before Israel became a nation again in 1948, nor would a sign for the Messiah appear after the Rapture since no one living on earth after that event will be looking for a heavenly sign for the Messiah's return. If we consider the Venus-Jupiter conjunction history for the 150 year period between 1950 and 2100, the most remarkable conjunctions appearing in any constellation or stellar configuration during this period appear in the 2014-16 Quartet. While a final conclusion is being developed separately, it appears at this point that the June and October 2015 Venus Jupiter conjunctions as a part of the 2014-16 conjunction quartet are the most likely candidates to be significant heavenly signs that point to the Messiah' second coming if such signs truly exist.

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