Reviewed by Daniel Gregg

Determining the Hebrew Day of the Spring Equinox

The year 7000 in this calendar is coming next year. Terry's 7000 year paradigm will collapse when the reign of Messiah does not begin.

The author is Terry Fehr, formerly of Saskatoon Canada, living in Israel, and a citizen by marriage to an Israeli (as I have last known it).

The Creation Calendar and the Rule of the Equinox

Anywhere in Greater Israel will do.

What makes some of Yahweh's creations spiritual and others not?

The Creation Calendar at www.torahcalendar.com is a faithful restoration of the calendar used in the Hebrew Scriptures. This calendar was given by the Creator to mankind for the purpose of enabling people to properly observe and keep the Appointed Times of Elohim as found and described in **Leviticus 23:1-44**. The Creation Calendar consists of days, months and years that are determined precisely by the greater light and the lesser light seen in the sky. According to **Genesis 1:14-16**, the sun and moon were created for signs, Appointed Times, days and years. It is the wisdom of man to use the sun and moon for their intended purpose.

An average. The reality is 365 or 366 days.

A Hebrew Day on the Creation Calendar begins and ends at the moment of ***sunset***. A Hebrew Month begins at sunset on the evening on which the ***first visible crescent*** of the new moon becomes potentially visible to the naked eye at Jerusalem. A Hebrew Month is also called a lunar month and usually consists of 29 or 30 Hebrew Days. A Hebrew Spiritual Year always begins in late winter or early spring, and continues until late winter or early spring in the next tropical solar cycle. A tropical solar cycle consists of approximately 365.25 days and is divided into four seasons: spring, summer, fall and winter.

The year does not begin on Aviv 1. It begins when the sun starts a new cycle.

A Jewish traditional error since after AD 70. A Genesis day begins at sunrise or daybreak.

A typical Hebrew Year has 12 Hebrew Months. However, because the total number of Hebrew Days within 12 Hebrew Months is about 11 days short of a tropical solar cycle, a system of ***intercalation*** is necessary in order to keep the Hebrew Year aligned with the seasons that are determined by the tropical solar cycle. The Hebrew Calendar occasionally ***intercalates***, inserting a Month 13 every two or three years. A Hebrew Year commencing on Day 1 / Month 1 may ***begin*** in ***winter*** or ***spring***, but when the year is ***correctly intercalated*** by the ***rule of the equinox***, the entire Festival of Unleavened Bread which begins on Day 15 / Month 1 will occur in the season of ***spring***.

Why does spring begin at the equinox and not the year? This is a contradiction Terry.

You've been reading my book Terry! Good.

The ***rule of the equinox*** always places Day 15 / Month 1 – the first day of Unleavened Bread – on or after the Hebrew Day of the ***spring equinox***. This rule helps ensure that the festival of Unleavened Bread is always observed ***in its season from year to year*** as required by **Exodus 13:10**. Therefore, Day 1 / Month 1 may occur ***before***, ***on*** or ***after*** the Hebrew Day of the spring equinox. The logical question that arises is: How does one determine the Hebrew Day of the spring equinox?

There was no practical way to determine this in biblical times.

The Hebrew Day of the spring equinox is the Hebrew Day in which the instantaneous moment of the annual spring equinox occurs. Since Hebrew Days begin and end at ***sunset***, the decision regarding which Hebrew Day on which the spring equinox occurs is determined at ***sunset***. According to the Creation Calendar, the ***sunset ending*** Day 15 / Month 1 must always occur ***after*** the moment of the spring equinox in order that the entire Feast of Unleavened Bread will be observed ***in its season from year to year*** – the season of ***spring***.

Although modern astronomical almanacs list time and date for the spring equinox, almanacs typically show times based on the Gregorian calendar system of 24 civil hours beginning at midnight or 00:00:00 Universal Time as determined from Greenwich, England. Since the Hebrew Day of the spring equinox on the Creation Calendar is determined at sunset in Jerusalem, Israel, it may sometimes ***appear*** to be one day later than the date listed in almanacs. For example, if ***sunset*** in Israel is at 6:00 pm Israel Standard Time, and the moment of the spring equinox occurs at 6:30 pm Israel Standard Time, then a new Hebrew Day has begun whereas the Gregorian calendar will not begin a new day until ***midnight***.

Wrong reasoning. The right reason is since Deut. 16 says the annual Pesach offering (the Chag offering) on the 15th is at the going down of the sun, and that they went out of Egypt in the night that followed. This night is to be in the new year. Either way, we agree on the time cutoff, which is sunset ending Nisan 15.

Using Israel Standard Time can surely mess one up. The actual time difference between Jerusalem and Greenwich is 2 hours and 20 minutes.

How did the Ancients Determine the Day of the Equinox?

Modern computers can quickly, accurately and precisely calculate the timing of an equinox or a solstice using complex mathematical formulas and equations created and validated by scientists and engineers. But such advanced technology was not available to those in ancient times. So, how did ancient people determine the spring equinox? And more specifically, how did they determine the Hebrew Day of the spring equinox?

Several theories exist as to how the spring equinox was determined by those living in ancient times. Some claim that people in the ancient world used shadows cast by the sun onto a flat surface to determine the day of the equinox. Others claim they observed sunrises or sunsets. However, all ancient methods for determining the spring equinox had one thing in common – they were all based on ***empirical observation***. And several of these methods could have successfully determined the Hebrew Day of the spring equinox.

Elohim provided the sun and the moon first and foremost for ***signs***. A ***sign*** is something visible that can be seen and witnessed through the outward senses by an observer here on earth. So, from an astronomical perspective, the determination of the spring equinox in ancient times must have been based on a visual sighting or observation. Today astronomers use formulas that predict the ***apparent*** astronomical coordinates for the positions of the sun and moon. The ***apparent*** position of an object seen in the heavens differs slightly from the ***actual*** position when motion is involved. Due to the speed of light, the ***apparent*** position of an object is the position seen by an observer after the light from that object has reached the observer's eye.

In astronomy, the term ***geocentric*** refers to a theoretical point located in the ***center*** of the earth and is a coordinate typically used for calculations for determining the orbital position of the earth around the sun. In contrast, the term ***topocentric*** refers to a particular location on the ***surface*** of the earth usually designated in latitude and longitude and is distanced from the ***geocentric*** position by the earth's radius at that location. In order for the Creation Calendar to simulate the observation of the sun or moon from Jerusalem, it requires the use of ***apparent*** coordinate positioning while calculating observance from a ***topocentric*** perspective.

The four seasons exist due to the tilt of the earth's axis of approximately 23.5 degrees from a perpendicular line with respect to the ecliptic plane that contains the nearly circular orbital path of the earth around the sun. Two equinoxes and two solstices comprise the four seasonal demarcation points. These demarcations are instantaneous since the earth is constantly in motion. In the northern hemisphere, the mid-day sun gets to its highest topocentric altitude around June 21 at the summer solstice, and to its lowest topocentric altitude around December 21 at the winter solstice. In summer, the days are longest in the northern hemisphere and shortest in winter.

Ancient cultures were agricultural in nature. Ancient peoples were keenly aware of the seasons. They carefully observed the motion of the sun in order to determine when to plant and harvest crops. Today, we refer to the directions of due east as 90 degrees from true north, and due west as 270 degrees from true north as seen on a compass. The angle in degrees from true north is called the ***azimuth*** angle. Over the course of a tropical solar cycle, observers in Israel would notice that in summer, the sun would both rise and set well north of due east and due west respectively. Likewise, in winter, these same observers would notice that the sun both rose and set well south of due east and due west respectively.

As the days of the year passed, these same observers would notice the position of each setting sun appear to travel back and forth from the most southern setting position seen at the winter solstice to the most northern setting position seen at the summer solstice. In particular, they would notice that the change of the sunset position on the horizon each day would appear to decelerate down to a standstill, changing little from day to day when near the time of a solstice extreme, then would appear to accelerate from day to day approaching

the time of either the spring equinox or the fall equinox. Mathematically, when plotted onto graph paper, we can see that this cyclical pattern of sunset position changes resembles the shape of a sin wave. (See Figure 2)

Ancient astronomers created simple observatories having an unobstructed view of the western horizon in order to observe sunset positions. By noting the sun setting positions from a single common reference point, these astronomers were able to aim pointing devices: one device pointed to the most southern setting point at the winter solstice, and another device pointed to the most northern setting point at the summer solstice. The two pointing devices formed a V-shaped angle that could be geometrically bisected.

It was then a simple matter of geometry to bisect the resulting angle in order to fashion a mid-position pointer aimed toward the point of the horizon for the equinox (see Figure 1). The point on the horizon for the spring equinox would therefore be exactly ***halfway*** between the two extreme solstice sunset positions. For the sake of illustration, we will refer to the midway point on the horizon as the ***equinox point***.

This method is only good for approximation in most cases. It is not good for precision. Precision requires true west to be figured from the sunrise and sunset points, not from two setting points.

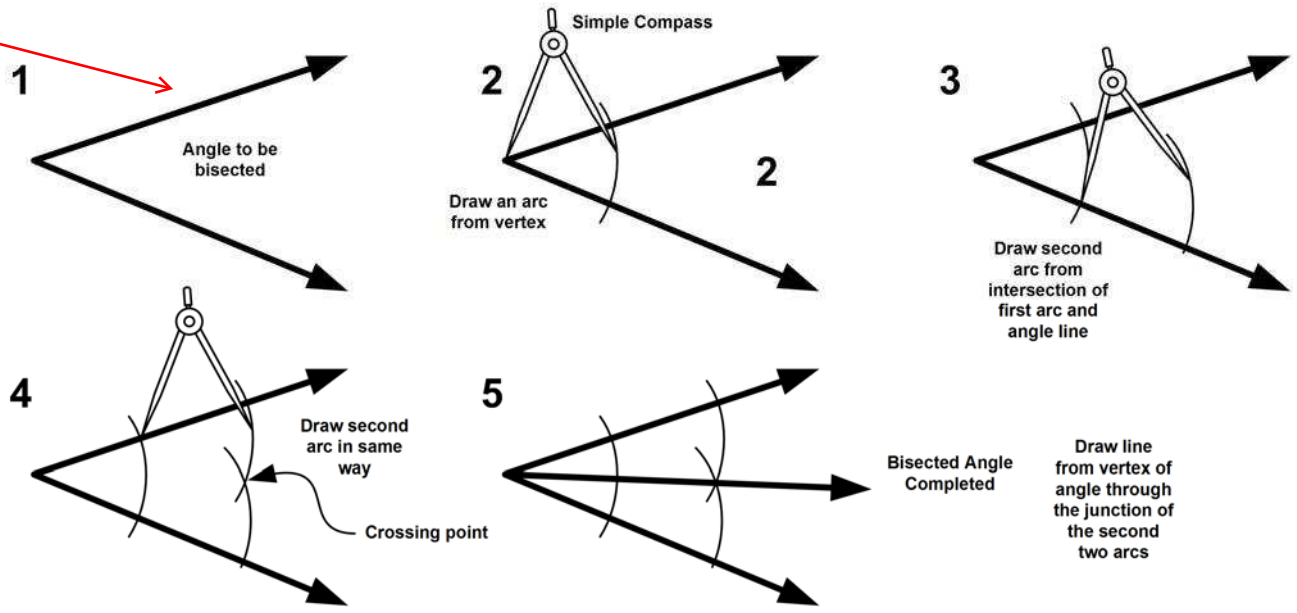


Figure 1 – Illustration of how to geometrically bisect an angle in order to determine the equinox point. Notice that no numerical methods are required, just the use of a simple compass to draw arcs and a straight edge to draw lines.

During the time of the spring equinox, the ancients looked for the first sunset ***north*** of the ***equinox point*** to determine the Hebrew Day of the spring equinox. So if the sunset beginning a Hebrew Day was to the ***left*** of the equinox point (***south*** of equinox point), and the sunset ending that same day was to the ***right*** of the equinox point (***north*** of equinox point), that day would have been the Hebrew Day of the spring equinox.

At the location of the temple mount in Jerusalem at latitude N31d, 46m, 43.8s and longitude E35d, 14m, 5.1s, the most northern sunset position has a topocentric azimuth of about **North 298.804** degrees at the time of the summer solstice. At the same location, the most southern sunset position has a topocentric azimuth of about **North 242.367** degrees at the time of the winter solstice (see Table 2). Therefore, the resulting difference angle measures about **56.437** degrees in azimuth. When this difference angle is bisected, the resulting midpoint angle rests at a topocentric azimuth of about **North 270.5855** degrees.

If the same calculation is done for solstice sunrises, the the result is 89.5 degrees. Even the ancients would know that the line from the vertex to 89.5 and 270.5 was not straight. The arc of the sun would be 181 degrees, clearly past the equinox. Therefore, they would have used a dailly sunrise and a daily sunset to do the geometry on where the west point was. It is at 270.00 degrees.

This definition is arbitrary. Why not define it as I do, when the center of the sun crosses the western point? Hebrew principles agree with inclusive counting, as does allowing part of the 15th day to be before the equinox and part of it to be after the equinox, and part of the first month to lie in winter, and part of it to lie in the spring season, and part of the first month to be in the old year, and part of it to be in the new year. Therefore, it is only necessary for the greater part of the sun to be north of the west point.

The daily motion of the sun was more often used to determine the cardinal points.

I believe Terry picked this definition to foil my 2 BC date. His definition is arbitrary. First establish that 2 BC is the correct year, and then pick you equinox method. The chronology takes priority, not the equinox method.

This is .5855 degrees too far. The proper way to determine west is to bisect the angle of sunrise and sunset. In rough figures, the sun rises on the summer solstice day at Jer at 61.5 degrees, and sets at 298.5 degrees. The difference is 237 degrees. Divide this by 2 and you have 118.5 degrees. Now 298.5 - 118.5 = 180, and 61.5 + 118.5 = 180. This defines the north south line a 0 degrees to 180 degrees. or 360 to 180. Bisection of 360 to 180 yields 360-180 = 180. 180/2 = 90. 180 + 90 = 270.00 degrees.

It is when the point is determined by bisecting the sunrise and sunset points. There were 365 days to do this on, whereas any ancient would defer to a figure determined that way vs. a figure determined by bisecting the solstices that resulted in a bent line from 89.5 to 270.5!

The conclusion is wrong because the assumptions that went into the calculation are wrong.

So when the ancient Hebrews sought to determine the Hebrew Day of the spring equinox, they looked to see if the sun set left or right of the ***equinox point*** which for Jerusalem calculates to **North 270.5855** degrees. The topocentric azimuth of **North 270.5855** degrees is also expressed as **North 270 degrees**, **35 arcminutes**, **7.8 arcseconds**.

At first glance, it is easy to assume that the ***equinox point*** at Jerusalem is **North 270.0000** degrees. However, the ***equinox point*** is ***only*** **North 270.0000** in azimuth for observers at the ***equator***. For observers at Jerusalem the ***equinox point*** is actually **North 270.5855** degrees in azimuth. The **0.5855** of a degree difference in azimuth makes all the difference in correctly determining the Hebrew Day of the spring equinox. For latitudes further away from the equator the azimuth difference angle increases. More importantly, the midpoint angle and the resulting ***equinox point*** between the solstices is seen to be ***northward*** from the azimuth of **North 270.0000** degrees for observers in the northern hemisphere.

The error of assuming that two setting solstices should be bisected rather than a setting solstice and a rising solstice is also an assumption.

Again this is all based on the arbitrary assumption that two setting solstices should be used. A proper determination of the cardinal point bisects the sunrise and the sunset on the summer or winter solstice day.

The error of ***assuming*** that the ***equinox point*** is the topocentric azimuth of **North 270.0000** degrees for the latitude of Jerusalem can lead to ***incorrect intercalation*** of the Hebrew Year. This becomes an issue in years where determining the Hebrew Day of the spring equinox is a close call, such as in the spring of 2 B.C.E. Some have ***speculated*** that the ancient Hebrews ***did not intercalate*** in this year arguing that they would have observed the sun cross the ***equinox point*** on March 22, 2 B.C.E. Though we will probably never know how the Hebrews intercalated in 2 B.C.E., the fact of the matter is ***they should have intercalated***, as they would have been ***unable*** to observe the sun cross the ***equinox point*** on March 22, 2 B.C.E

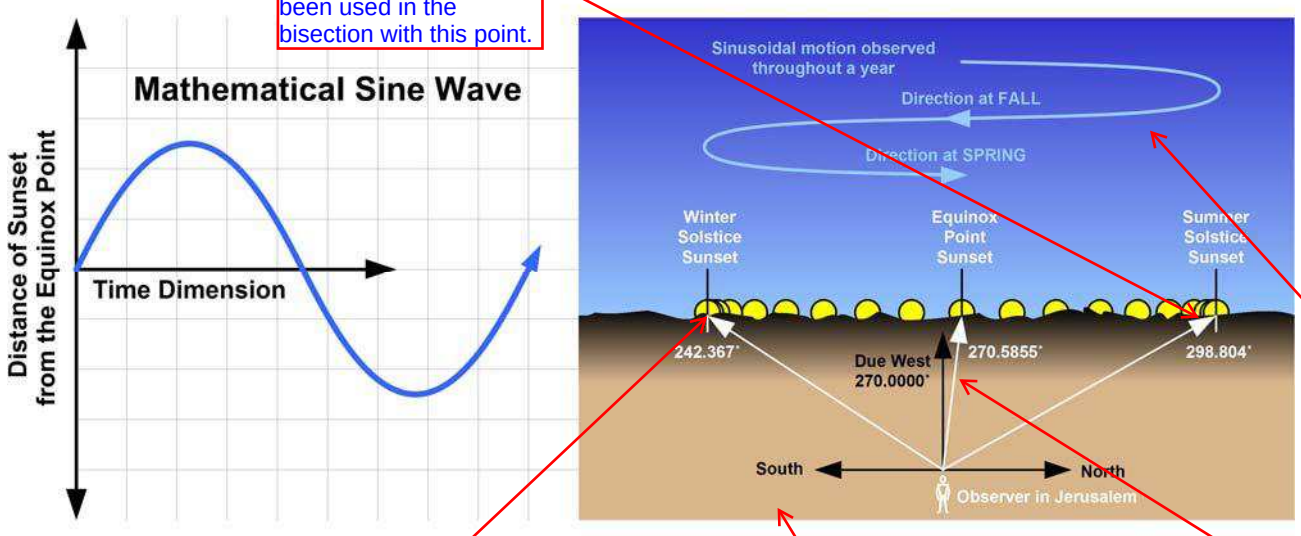
Terry, you have departed from the counsels of Elohim on the overall chronology of Scripture. Where is your published chronology of the whole bible?

The reason for advancing the concept that the ancient Hebrews ***did not intercalate*** in the spring of 2 B.C.E. is to promote the idea that the Messiah was born on the evening of August 31, 2 B.C.E. which is ***mistakenly*** equated with Yom Teruah on Day 1 / Month 7. However as the Creation Calendar mathematically executes the rule of the equinox, August 31, 2 B.C.E. ***truthfully*** corresponds to Day 1 / Month 6.

The basis of the 2 BC date is established on independent chronological grounds that REQUIRE NO ASSUMPTIONS about the equinox. Once the 2 BC date is known, only then can we decide WHICH equinox method agrees with it.

In order to correctly execute the counsels of Elohim and to properly observe His Appointed Times and Festivals, it is necessary to correctly implement the rule of the equinox. This must be done in order not to trespass against the instruction in Exodus 13:10 which prohibits Unleavened Bread from occurring in winter.

The summer solstice sunrise should have been used in the bisection with this point.



Just so readers are clear, the sine wave is only a plot of horizon location against a time axis. It has no geometric expression. So this little squiggle in the air is misleading.

Figure 2 – Sun setting positions seen by an observer at Jerusalem, Israel change throughout the year in a sinusoidal motion, coming to a standstill and changing directions at the solstices. Note the difference between the azimuth of due west and that of the Equinox point on the horizon as seen from Jerusalem.

Notice the bent line.

I think the back drop was inspired by a similar diagram in my book.

The winter sunrise should have been used in the bisection with this point.

Now Terry you will have to revise your whole calculation scheme for torahcalendar to make sure that west is 270.5 degrees in your program, as I am pretty sure you are using code that uses the modern definition of the equinox time.

Again, the assumption was made by bisecting two sunset points at the solstice rather than a sunrise and a sunset point. The decision to do so is arbitrary, and is not based on a correct chronology. The 3 BC date is incorrect based on Luke 3.

Date at Jerusalem	Hebrew Day	Sunset Time (UT)	Sun's Apparent Longitude	Sun's Topocentric Azimuth
March 20, 2 B.C.E.	13	15h 49m 7.571s	357.290°	269.235°
March 21, 2 B.C.E.	14	15h 49m 43.436s	358.265°	269.696°
March 22, 2 B.C.E.	15	15h 50m 19.144s	359.239°	270.156°
March 23, 2 B.C.E.	**16**	15h 50m 54.712s	**0.213°**	**270.617°**
March 24, 2 B.C.E.	17	15h 51m 30.159s	1.186°	271.077°

Table 1 – This table shows the position of the sun at the time of sunset as seen from Jerusalem for various dates near the spring of the year 2 B.C.E. Although on March 22 (Hebrew Day 15), the sun set at azimuth 270.156° having crossed the due west cardinal coordinate of azimuth 270.0000°, it was still to the left and south of the required **270.5855°** equinox point. The sun's apparent longitude had not yet crossed 360° in longitude at sunset on March 22. The precise moment of the spring equinox occurs when the sun's apparent longitude crosses 360° which is also 0.0°. Only on March 23 (Hebrew Day 16) can it be seen that the sun set at 270.617° which is right of the equinox point of 270.5855° making Hebrew Day 16, the Hebrew Day of the spring equinox in 2 B.C.E.

Date at Jerusalem	Time of Solstice	Sunset Time (UT)	Sun's Apparent Longitude	Sun's Topocentric Azimuth
Dec 22,3 B.C.E.	Winter	14h 43m 12.636 s	269.294°	242.369°
Dec 23, 3 B.C.E.	Winter	14h 43m 42.657s	**270.313°**	**242.367°**
Dec 24, 3 B.C.E.	Winter	14h 44m 14.056s	271.331°	242.375°
June 24,2 B.C.E.	Summer	16h 43m 49.364s	89.328°	298.803°
June 25, 2 B.C.E.	Summer	16h 44m 3.177s	**90.282°**	**298.804°**
June 26, 2 B.C.E.	Summer	16h 44m 15.748s	91.237°	298.797°

Table 2 – This table shows the position of the sun at the time of sunset as seen from Jerusalem for various dates around the time of solstices nearest to the spring of the year 2 B.C.E. The first three lines correspond to the timing of the winter solstice in 3 B.C.E. The last three lines correspond to the summer solstice in year 2 B.C.E. Note that the most extreme angles for topocentric azimuth measurements are seen to occur on December 23 in 3 B.C.E. and on June 25 in 2 B.C.E. The sun's apparent longitude crosses 270° at the moment of the summer solstice, and crosses 90° at the moment of the winter solstice. The time of equinox occurs at the azimuth that is halfway between the azimuths of **242.367°** at the winter solstice, and **298.804°** at the summer solstice. The exact moment of the winter solstice occurs at 7:00 (UT) on December 23, 3 B.C.E. The exact moment of the summer solstice occurs at 9:17 (UT) on June 25, 2 B.C.E. Both of these solstices are shown on their corresponding Hebrew Days on the Creation Calendar at www.torahcalendar.com

And sunrise, and they would have noticed a bent angle resulted if they had tried to bisect in the way Terry describes. They would have quickly learned to bisect a sunrise and a sunset, and not two sunsets.

The Creation Calendar Calculates the Rule of the Equinox Correctly

Observers in ancient times watched the sun's setting positions, and they determined the ***equinox point*** on the horizon by noting the most northern and southern sunset positions of both the summer solstice and winter solstice respectively. They then determined the ***midpoint*** on the horizon for the ***equinox point*** by ***bisecting*** the resulting angle formed between the two solstice extremes. In the spring of 2 B.C.E. the determination of the spring equinox was a close call. The critical sunset in question is the one that occurred on Sabbath, March 22, 2 B.C.E. on the proleptic Julian calendar.

At sunset on Sabbath, March 22, 2 B.C.E. the topocentric azimuth of the sun was **North 270.156** degrees (see Table 1). And although the topocentric azimuth of the sun ***was*** greater than **270 degrees** at this moment in 2 B.C.E., it ***was not*** greater than **North 270.5855** degrees which is the ***bisected midpoint*** or the ***equinox point*** for determining the Hebrew Day of the spring equinox in Jerusalem. This ***equinox point*** would have been ***established over time*** by ***visual observation*** by the ancient Hebrews using their simple observatories with an unobstructed view of the western horizon.

Try bisecting the the sunrise and sunset on the same day. You will get 270.00 degrees EVERY TIME.

Terry's choice of 3 BC over 2 BC is therefore founded on a ARBITRARY assumption on how the equinox was determined.

If I were to found the choice only on the equinox method I use, then I would be arbitrary also. But I don't. The 2 BC date is established based on 1. Luke 3, AND a better alignment of Rev. 12:1-3 in 2 BC than 3 BC. It is simply impossible to have Yeshua "almost 30" at his baptism in the fall of AD 29 at the end of the 15th year of Tiberius, and have John ordained in the Spring of AD 29 being the same 15th year of Tiberius. Terry has produced no overall biblical chronology to examine, therefore, I conclude that he has not earned the right to say he knows when it was.

Wrong assumptions yield wrong conclusions.

This did not happen because Messiah was born in 2 BC, based on biblical chronology.

Therefore, at sunset ending Sabbath, March 22, 2 B.C.E., the moment of the spring equinox would ***not*** have appeared to have occurred by the ***ancient observational methods*** used by the Hebrews. If the skies were not cloudy that night and they had a clear view of the horizon, they would have seen that the sun set ***south*** or ***left*** of the ***equinox point*** and this would have indicated to them that they were still in the season of ***winter***.

If the Hebrews had been able to witness the New Moon 15 days earlier at sunset on March 7, 2 B.C.E., they would have known that they had just completed the 15th day of that month in ***winter***. If the ***Nasi***, who was the president of the Sanhedrin, ***had intercalated*** a Month 13 after the New Moon on March 7, 2 B.C.E., then his decision to ***intercalate*** at that time would have been ***validated*** at sunset ending Sabbath, March 22, 2 B.C.E. as the moment of the spring equinox and therefore ***spring*** had not begun at that time in Jerusalem.

More of you super sanctimonious remarks Terry.

If the Nasi ***had not intercalated*** a Month 13 after the New Moon on March 7, 2 B.C.E., he would have known at sunset ending Sabbath, March 22, 2 B.C.E. that the first day of the Festival of Unleavened Bread had just been kept in the season of ***winter*** as ***spring*** had not yet begun. This would have been a concern for him as it was his responsibility to ensure that Israel kept the Festival of Unleavened Bread in the season of ***spring*** from year to year in order to fulfill the requirements of **Exodus 13:10**.

On Sabbath, March 22, 2 B.C.E. in Jerusalem, Israel the sun set at a point ***south*** or ***left*** of the ***equinox point*** of **North 270.5855** degrees azimuth ***before*** the ***equinox point*** had been crossed. The Creation Calendar correctly calculated and validated the position of the sun at the moment of sunset on this day and it correctly implemented the rule of the equinox which always places Day 15 / Month 1 on or after the Hebrew Day of the spring equinox.

The ***sunset ending*** the Hebrew Day of the spring equinox always occurs ***after*** the ***equinox point*** has been crossed – on the ***right side of the line*** in an ancient observatory. At ***sunset ending*** the Hebrew Day of the spring equinox the righteous always want to be on the ***right*** side of the line. This is easy to remember if you associate it with the parable of the sheep and the goats.

The Creation Calendar at www.torahcalendar.com accurately ***simulates*** the ***observational methods*** that were used by the ancient Hebrews for determining the Hebrew Day of the spring equinox. Although the Creation Calendar uses ***21st century methods*** to calculate the rule of the equinox, it ***simulates*** the ***observational methods*** used by the ancient Hebrews and ***accurately*** determines the ***apparent position*** of the sun from a ***topocentric perspective***. The ***equinox point*** on the western horizon as seen from Jerusalem, Israel is at the topocentric azimuth of about **North 270.5855** degrees.

Ancient observations can be mathematically ***simulated*** and ***verified*** today thanks to the accurate and precise retro-calculated computations of the Creation Calendar. It is a useful tool that will assist a person in finding the ***narrow way*** which leads to life by ***verifying*** when all of the dates past, present and future occur in the 7000 Year Plan of Elohim.

Deuteronomy 32:4 *He is the Rock, His work is perfect;* ***For all His ways are judgment****, an Elohim of truth and without injustice; Righteous and upright is He.*

I doubt this since Terry probably did not implement his new method when he first put up the calendar.

True enough, but in my estimation, your ways are not his ways.

That's an ugly definition of west I should say, and it will engender a lot of criticism from those who know better.