Torah Times Biblical Calendar
(revision 10/2013 by Daniel Gregg, Anno 6152)

The following is rather technical. For the simplified version, and explanation of the charts, view this powerpoint:

Wall Calendar Presentation

I wrote the *Torah Calendar* using open source JPL C code for the Astronomical Almanac (provided by Steve Moshier) around AD 1995, and then in 2011 I rewrote the program drivers in C++. Some version of the program has been on the web continuously since then. In 2012 I mapped the technical looking program output to the wall calendar you now see. The precise mathematical details on how the first visible new moon in Jerusalem is determined can be found on pages 444 to 457 of the Resurrection Day Book. I will therefore simply explain the principles of the matter below, after going through the features of the calendar.

The counting of years from creation (starting from 1) appears in the upper left corner, i.e. “Anno: 6152.” On the right hand side appears the AD or BC date. I retained AD (Anno Domini) because the AD date does agree with Messiah’s age as much as is possible for the Roman calendar which is out of synch with the biblical year by four months. I explain this fully in the resurrection book, which has a chapter on the birth of Messiah.

All of the month names occur in Scripture except for Iyyar, Av, Tishri, Heshvan and Shoshanim, which means “lilies” in Hebrew and is my replacement for the month named “Tammuz” (which is avoided by Scripture, but I thought it should have an acceptable name). The pre-exilic name is placed first, i.e Aviv, Ziv, Ethanim, Bul, for the four months that are named. The fast

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1 There is a PowerPoint that also explains the features of the calendar on the website: Wall Calendar Presentation. This paper goes into more technical detail.

2 [http://www.moshier.net/](http://www.moshier.net/)

3 Link To the Resurrection Day Book
days included in the calendar are the ones mentioned in the Scripture.

New moon days are shaded grey (or bordered in grey) and are indicated by a small moon in the night they are first seen. The calculation is done according to when the first new moon may be seen by the naked eye from Jerusalem. At the bottom of the calendar are calculations to help the user appreciate whether there is to be any doubt about a particular new moon. The Q test value was developed by Bernard Yallop, which I have extended with “G” and “Z” categories. LG is the lag time between sunset and moonset in minutes. AL is the arc of light, which is the angular separation between the sun center and the moon center. AV is the arc of vision, which is the altitude difference between the sun and moon at the best time for observing the new moon. W is the width of the lunar crescent at the best time in arc minutes. QP is the Yallop test parameter for the day previous to the new moon; this generally shows the moon could not be seen a day earlier. The calculations are based on the collected observations of almost a thousand human observations of the new moon, and fit well within the parameters of antiquity. We may consider the computer program simply a way of using the experience of these observers to very accurately predict when the new moon will be. I originally called the program an “Electronic Eyewitness,” and that it is.


5 Ancient Babylonian astronomers achieved a 92% accuracy in setting the new moon day with the first sighting using a combination of observers and calculation (as compared to modern methods using observers and modern calculation). See pg. 90, Calendars in Antiquity: Empires, States, and Societies, Sacha Stern. This means they missed the right day only 1/12 of the time. If this accuracy rate were true of the Jewish astronomers, then since only 2/12 or 1/6 of the months are critical for feast days, it means that only 1/60 months or about once in five years was a critical moon incorrectly calculated. However, the Babylonian astronomer knowledge, like modern astrophysicists appears to be confined to the elite. Stern writes, “Evidence of 30-day months in administrative and economic sources was used,
The Rating messages next to the Q tests are those used in the A to F and Z, adapted from Yallop’s technical paper.6

Sabbaths are shaded light green, and annual Sabbaths are shaded light purple.

The graphical day and night cycle is accurately tied to the Roman date, from midnight to midnight, Sabbaths, sunset to sunset, and regular days, daybreak to daybreak. The user will notice that the common creation day epoch begins with the dawn and ends with the next day break as marked by the boxes in this calendar, and that shaded Sabbaths straddle two parts of these days. That is why they are shaded. These two systems worked side by side in Scripture. If you look at the calendar of Yom Kippur you can see that it begins at sunset on the 9th day and ends at sunset on the 10th day.

however, by Peter Huber to determine the accuracy of the Babylonian month in relation to the new moon. Modern astronomy enabled him to establish whether any given month should have been 30 days long had it been accurately based on first visibility of the new moon. He concluded that as much as 33% of the Babylonian months attested in the administrative and economic documents deviated from the new moon, and began either one day too early or one day too late. This considerable inaccuracy contrasted, however, with his analysis of astronomical sources, according to which only between 5% and 5.5% of Babylonian months began one day earlier or later than first visibility of the new moon.” (Stern, pg. 84). “The contrast is evident, for example, in 522 BCE when the same month is accurately given 29 days in the Astronomical Diaries, and a 30th day in an administrative text.” (pg. 85). Stern, however, concludes that the high number of 30 day months in the economic texts reflects a scribal practice due to not knowing if the new month had started yet, as they had received no news from the central authority. They therefore dated the transaction day 30, and when they received news on the 31st day that the month was only 29 days long, they dated the 2nd day of the month (skipping the 1st since it was dated 30th), but they did not go back and change the day 30 documents made the day before. Thus we must regard the Babylonian calendar as 92% to 94% accurate.

6 The values “G” and “Z” were added by myself. I retained “F” for q values below E, and introduced “G” to flag values truly below the Danjon limit by checking the Arc of Light directly rather than relying on the q-test to determine when the moon below the Danjon limit.
The year number in the seven year ‘release’ or Sabbatical cycle is indicated at the top of the charts. The Jubilee cycle is also indicated at the top of the page with years 1…49, and then the number of Jubilees since creation. The Jubilee year is called the 50th year in the same sense that an eight year is referred to in Scripture with the Sabbatical cycle. This is not meant to break up cycle based on the number seven. For this reason the 50th year is also the 1st year of the next cycle.

The weekdays are numbered 1 to 7 according to creation, and note that the numbers always go with the day portion of the chart (not the night). Depending on whether the day is a creation day or a Sabbath one can associate either the night before a day with the day, or the night after the day with a day to make a calendar day. The Biblical year works on the same principle. All years have in common months 1 to 6, but the creation year is from spring equinox to spring equinox while the sacred (or some call civil) year is from Tishri 1 to either Elul 29 or 30. Consider the spring and summer months the “day” of a year, and the fall and winter the “night” of a year, and you will begin to grasp the distinction between the common created cycle of time and the sacred set apart cycle of time.

In the month of Adar or Aviv (Nisan) one will notice that the equinox date is marked. The method of calculating the equinox is now an ancient method that is cited in Jewish traditional literature. The equinox day is the same day on which the middle of the apparent sun is passed due west at sunset. This is calculated with refraction in effect, according to what an actual observer would see. This observational method often causes the equinox to fall a day earlier than the geometrical methods of the Greeks, or a day earlier than those who might use an equinox ring or measure the sun’s height at noon and then use latitude to calculate the equinox. (See PDF Rambam and the Seasons or direct link to this page).

Also in the month of Aviv the counting of the omer (or wave sheaf) is indicted from 1 to 50. This continues into the second and third months ending at Shavuot (Pentecost). Also counted are the seven Sabbaths between the Great Passover Sabbath and The Great Sabbath marking Shavuot.
The Roman planetary week, of course, must be reckoned at the top to make the calendar usable in the exilic circumstances we find ourselves. Like the Roman month names, they are spelled with three letters to avoid undue offense.

The small chart at the bottom of the page numbers each day of the month according to the days of the solar year 1 to 365, or in the case of a leap year 1 to 366. Take a look at the month for Adar or Aviv and you will see that “1” marks the day of the spring equinox. This is defined so that the equinox (called Tequfah in Hebrew) must come before Aviv 15.7

That covers the basic features of the calendar. The user can use the sunset calculation link at the bottom of the page to determine when the Sabbaths begin and end at their locations. Also there is a link to my website www.torahtimes.org.

Principles of a Scriptural Calendar

The new moon is calculated according to its first visible appearance. When the width of the lighted portion of a new

7 The modern equinox definition is adequate for determining the 13th month in a great number of years, say 28 out of 30, however the modern definition (δ = 0) when the sun crosses the equator is not the definition used by ancient Israel. δ = 0 is very hard to measure, and the Greeks did it using a ring situated in the equinoctial plane. The trouble with this was that the ring could not be positioned perfectly, and that it gave wrong answers near sunrise and sunset due to refraction. Claudius Ptolemy complained about it in the Almagest without knowing the reasons for the inaccuracies. He preferred to measure the sun’s altitude at midday using a primitive sextant. For close cases, ancient Israel used east and west (this is also confirmed by the Talmud). When the sun rose in the east 90° and set in the west 270°, then this was the day of the equinox. Due to refraction, this day is usually one day before the δ = 0 method used by modern astronomers. Refraction raises the sun, and causes the apparent sun to move further north thus achieving 90° or less or 270° or more before the theoretical position of the sun in which refraction is not taken into account. The ancients generally did not know about refraction, and certainly not how to calculate it, so the method used is pure observation of the apparent sun. The ancient method has been recently integrated into the software, so some already published charts may reflect the modern definition.
The moon is sufficient, then observers on earth can see the new moon. This definition agrees with Genesis 1:14, where the moon is supposed to be the light that gives the timing for the months of the year. The key words are the word “lights” and “signs.” A sign that is not seen is no sign at all, and an astronomical body that gives no light cannot be seen. Therefore, the moon is the sign for the beginning of the month when it can be first seen again after becoming dark. This is the definition that also agrees with the prophetic fulfillments tied to the Biblical holy days. And by these two things, we can be sure that the Almighty intended the month to begin when the light of the new moon can be first seen.  

If a tree falls in a forest and there is no one to see it then does that mean the tree did not fall? Or if a bird sings and no human hears it, does that mean there is no sound? Accordingly, if the new moon can be seen, and no one is there to see it, does that mean it is not new? If one has knowledge of the timing of the lunar clock, then one can say it is new even if he or she is not there to see it. The new moon does not require human eye witness to be new. Indeed, the Almighty always knows whether the moon is new or not even if humans cannot see it or agree if it can be seen.

8 Not only this, but the ancients could not at first calculate the conjunction, whereas they could immediately observe the renewed light of the moon. It took centuries of observations to calculate the dark moon plus the discovery of numerical recipes and interpolation to do it accurately, not to mention measuring the size of the earth, and only the Babylonians achieved this. Their advances remained their own until the Greeks got hold of them. In any case, the first method was observing the new moon by sight; it therefore became the accepted and traditional method. Similarly, the beginning point of the year became the equinox on account of the difficulty of observing or calculating the exact day of the solstices. The sun rises and sets in the same places at the solstices for several days making it hard to figure out which day is actually the solstice, whereas at the equinox it moves a whole sun diameter along the horizon each day making it easy to pinpoint when it cross the east-west line. It is for this reason that the ancients settled on the spring equinox for the beginning of the year, as spring is the time for beginnings.
Thus I establish an important principle. The calendar is not determined by the authority of men. It is determined by Yahweh in heaven who created the rules that govern when the moon will be lighted enough so that his biological rules would allow a human eye to see it. It is the task of men to discover when the moon will be new by careful observations and calculations based on past observations, and then to confirm what heaven has already ordained. Thus our task here is to discover when the moon is new, and not to say when it is new by some arbitrary human standard.

If the new moon is not seen on the 29\textsuperscript{th} day of the old month then tradition says to add a 30\textsuperscript{th} day to the month. If the new moon is not seen on the 30\textsuperscript{th} day of the month, then tradition says the next day is the 1\textsuperscript{st} of the new month. Since in neither case did anyone see the moon why did the ancients not wait until it was witnessed by human beings? The answer is that by the 30\textsuperscript{th} day they knew by calculation that the moon was already new even though no person had seen it. And it is the simplest calculation in the world based on past observation. We know that a month always has at least 29 days, and never more than 30 days.

Further the ancients knew that if the past four months had 30 days, and that if the new moon was not seen on the 29\textsuperscript{th} of the 5\textsuperscript{th} month in a row, then the next day should be the new moon day. Why is this? Because there are never more than four 30 day months in a row. This fact was gained from past observation. Furthermore, if the sky should be cloudy on the 29\textsuperscript{th} and 30\textsuperscript{th} days of several months in a row, the ancients simply alternated 29 and 30 day months until they could see the moon again, and the theory that a 29 day month more often than not followed by a 30 day month.

Even the Karaites are compelled to use astronomical knowledge. If on the 30\textsuperscript{th} day of a month they declare a new moon without observing it, then they are using the fact that the moon is always new after 30 days. They are calculating by counting the days and by using the fact that the calculated path of the moon can never be less than 29 days nor more than 30. One would not know this about the moon without keeping
careful track of actual observations and then using mathematics to divide the total number of days by the number of observed lunar cycles to fit into the days. Thus it is known that a lunation is 29.531 days on average and never less than 29 and never more than 30.

Thus anyone who says the moon is new on the 30th day after sunset without seeing it is using astronomical calculation. This is to say that the new moon is considered new IF it CAN BE seen even if no one has actually seen it. And this IF is determined by astronomical calculation. There are of course a host of reasons why a new moon may not be seen. One may not simply bother to look. One may stay indoors at the moment. The sky may be clouded. The horizon may be dusty. Or one may try to look, and these conditions will prevent a successful sighting. This still does not prevent everyone from saying the moon is new after 30 days, because we know it could be seen without those conditions.

So why did the ancients add a day to the old month if they did not see the moon on the 29th day under inclement conditions? They added the day because they thought that there was the possibility that the moon might not really be new at the end of the 29th day. And they were right, because they lacked sufficient knowledge of the moon’s motion to know which was the case.

But now we know with a much higher precision which is the case. That is, modern astronomers can tell you if the moon is visible or not on the 29th day if the clouds and haze are removed. In principle, this is no different than saying the moon is new at the end of the 30th day when no one sees it. It is just a deeper application of astronomical knowledge that can tell us which 29th days will be followed by a visible new moon. If the tree falls in the forest and no one sees it because there are other trees in the way, but one hears it falling, one can definitely say the tree fell.

Thus we do not need to automatically prolong a month if astronomical knowledge tells us there is a visible new moon at the end of a 29th day. The rule the ancients used was because of their ignorance. In ancient times, the uncertainty of a day was
not a big issue, however in these modern times with all of our other timings and technology, and the need for schedules for economic cooperation and employment, it is very inconvenient not to apply the same knowledge to more easily discover the regularity of times and seasons set up by Yahweh.

We still have some ignorance so that witnesses are still needed. It could be that on the 29th day it is uncertain whether the new moon could be seen or not, even after applying all of the modern methods of determining whether it could be seen or not. These are borderline cases. On the Yallop rating system they are identified by the letter “B. visible under perfect conditions” as opposed to “A. Easily visible.” If the end of the 29th day gives an “A” rating, and the moon is not seen due to clouds, then the next day is the new moon day. For the moon would be easily visible without the clouds.

So only in the cases where the Yallop rating is “B” at the end of a 29th day should an extra day be added. How many “B” ratings are there in the years 2000-2012?

2000 1 13
2001 2 12
2002 1 13
2003 3 12
2004 1 12 “C” on Tishri for Previous day (An Exception is Confirmed by observation.)
2005 1 13
2006 2 12
2007 1 12
2008 2 13 “B” on Aviv confirmed by observation
2009 1 12
2010 0 12
2011 3 13
2012 3 12 “B” on Aviv confirmed by observation

In 21 out of 161 months we have a “B” rating. Only two of these “B” months were feast day months. In this case two of them were Aviv. Only in these two cases should it have been proper to consider adding a 30th day to the month if the moon
were not seen. However, in both cases (2008 and 2012), the “B” rated new moon was actually seen by observers. To simplify matters, we would prefer the “B” cases be confirmed by fresh observations, but they usually come out on target. In the years to come, Aviv 2014, Tishri 2018, and Aviv 2023 will need witnesses to confirm these “B” cases.

Also a “C” rating suggests a small possibility that the moon could be seen on the day before the one listed, “C. Unlikely without optical aid.” Thus, an exception was confirmed by witnesses for Tishri 2004.

Let us look at a table of ratings for 2013:

<table>
<thead>
<tr>
<th>AL</th>
<th>AV</th>
<th>Q-TEST</th>
<th>R</th>
<th>Q-1</th>
<th>P</th>
<th>LAG</th>
<th>Chance +/- 1 day</th>
</tr>
</thead>
<tbody>
<tr>
<td>I AVIV</td>
<td>21.9</td>
<td>21.9</td>
<td>1.624</td>
<td>A</td>
<td>-0.054</td>
<td>C</td>
<td>107m</td>
</tr>
<tr>
<td>II ZIV</td>
<td>14.0</td>
<td>13.9</td>
<td>0.467</td>
<td>A</td>
<td>-0.914</td>
<td>F</td>
<td>69m</td>
</tr>
<tr>
<td>III SIVAN</td>
<td>18.0</td>
<td>15.6</td>
<td>0.794</td>
<td>A</td>
<td>-0.543</td>
<td>F</td>
<td>81m</td>
</tr>
<tr>
<td>IV SHOSHANNA</td>
<td>22.2</td>
<td>15.0</td>
<td>0.922</td>
<td>A</td>
<td>-0.337</td>
<td>F</td>
<td>79m</td>
</tr>
<tr>
<td>V AV</td>
<td>26.7</td>
<td>13.9</td>
<td>1.056</td>
<td>A</td>
<td>-0.395</td>
<td>D</td>
<td>71m</td>
</tr>
<tr>
<td>VI ELUL</td>
<td>20.5</td>
<td>7.9</td>
<td>0.146</td>
<td>B</td>
<td>9.967</td>
<td>F</td>
<td>40m</td>
</tr>
<tr>
<td>VII ETHANIM</td>
<td>26.0</td>
<td>12.0</td>
<td>0.861</td>
<td>A</td>
<td>-0.470</td>
<td>F</td>
<td>59m</td>
</tr>
<tr>
<td>VIII BUL</td>
<td>20.0</td>
<td>10.8</td>
<td>0.437</td>
<td>A</td>
<td>-0.843</td>
<td>F</td>
<td>53m</td>
</tr>
<tr>
<td>IX KISLEV</td>
<td>14.0</td>
<td>9.9</td>
<td>0.084</td>
<td>B</td>
<td>-1.180</td>
<td>F</td>
<td>51m</td>
</tr>
<tr>
<td>X TEBETH</td>
<td>22.2</td>
<td>19.7</td>
<td>1.468</td>
<td>A</td>
<td>-0.318</td>
<td>F</td>
<td>105m</td>
</tr>
<tr>
<td>XI SHEBAT</td>
<td>16.5</td>
<td>16.3</td>
<td>0.841</td>
<td>A</td>
<td>-0.542</td>
<td>F</td>
<td>85m</td>
</tr>
<tr>
<td>XII ADAR</td>
<td>10.6</td>
<td>10.5</td>
<td>0.034</td>
<td>B</td>
<td>-2.000</td>
<td>Z</td>
<td>53m</td>
</tr>
<tr>
<td>XIII ADAR_II</td>
<td>17.5</td>
<td>17.5</td>
<td>1.001</td>
<td>A</td>
<td>-0.752</td>
<td>F</td>
<td>86m</td>
</tr>
</tbody>
</table>

AL: angle of sun center to moon center, no refraction
AV: arcus visionis (difference between sun and moon altitude)
Q-TEST: Yallop's test value (HM Nautical Almanac Office, B.D Yallop 1998)
R: Visibility Rating, Q-1: Previous Day's q-test, P: Previous Day's Rating
LAG: Time between sunset and moonset

Visibility/Non Visibility Ratings:
A: Easily visible
B: Visible under perfect conditions
C: Unlikely without optical aid
D: Will need optical aid
E: Not visible with a telescope, AL <= 8.5 deg
F: Not visible, below Danjon limit, AL <= 8 deg
Z: The moon set before sunset.

The “B” cases should be checked by observation. The “C” cases should be checked by a negative observation. The “C” case for Aviv has a 7% chance of coming to pass. This is based
on how many times in the past the moon was seen with a “C” q-test.

What will happen is this. For the most part the pre-published calendar will be accurate. However, there are notes at the bottom of the page indicating whether the month needs verification by eyewitnesses or not. If it so happens that the eyewitnesses see the moon at a different time than calculated I will try to issue a corrected calendar as soon as possible.⁹

Inter calculating the Year

The sun determines the start and ending of the year according to Genesis 1:14. The start of the year is determined in the way in which the sun lights the earth, which according to long standing convention is when the day length is everywhere equal (except at the poles). Similarly, the night length is everywhere equal (except at the poles). The Hebrew term for this is the Aviv Tequfah, or in English the Spring Equinox. (This does not mean that the day length is equal to the night.) Another term is used for this called Equilux.¹⁰ At the beginning of the year, the sun rises exactly in the west and sets exactly in the east. Also, at the equinox, the sun rises and sets exactly between the winter and summer solstice points of the horizon.

The Scripture says in Exodus 13:10 that the annual Passover memorial for the Exodus should be kept “from days to days.” Often this is translated “from year to year,” however something

⁹ An analysis of the observations Yallop used (295) shows that the error rate in the B and C categories is 23 observations. Thus 23/295 = 0.078, or 8%. This statistically the same as the Babylonian error rate, i.e. the success rate of observation and prediction is 92%. We accept B calculations and reject C calculations, but have to confirm them by observation. By doing so the success rate will be 92%.

¹⁰ Equilux varies with geographical location, and it is very hard to determine due to refraction. Also in ancient times clocks were not precise enough to determine it. Therefore, the ancient world used the equinox which can be determined by geometrical methods without the use of clocks. The Shadow of a tall building or object will trace a straight line at the equinoxes. At all other times of the year it will be a curve.
is lost in that translation. What is lost is that the definition of a year can be stated as so many days. The number of days is 365 or 366. Like the month varies from 29 to 30 days, so also the year length varies between 365 and 366 days. Observing the moment of the Spring Tequfah is similar to observing the new moon, except in that case what one watches for is when the sun rises in the exact east and sets in the exact west. The day that this first happens is the first day of the year.

The rule followed is to keep the sunset of ending the Great Sabbath of Passover on or after the equinox. Thus sunset on Aviv 15 must fall after the equinox. This ensures that the feast (marked by the second Seder) memorializing the Exodus falls “from days to days,” i.e. that it never falls twice in any one year, and always falls in the new year. In theory the Rabbis follow the same rule with their rabbinical calendar, however they state it that Nisan 16 must fall in the new year. My way of stating simply agrees better with the biblical language in Exodus 13:10. And of course the Rabbis are using calculations for the equinox that are outdated by 1500 years. Since they have not taken fresh observations of the equinox their calculations are off by 7 or more days. The Tequfah is mentioned in other passages, but it would take too long a paper to treat the whole subject here.

Ancient Societies Sighting the New Moon

“In principle, all Greek calendars were lunar, and so they were generally perceived. According to later writers such as Gemius (first century BCE), the Greek month began when the new moon crescent was first sighted.”

Stern includes a note, “First visibility of the new moon crescent always occurs in the evening, shortly after sunset, and only for a relatively short period (see Stern 2001:99-103). If this marked the beginning of the month, the first day of the month would have been reckoned from that evening or from the following morning. The beginning of the day in the Greek calendar remains a matter of controversy.”
noumenia (‘new month’), the first of the next month. Conjunction is when the moon, along its orbit, passes between the sun and the earth; it is then at minimal illumination, and completely invisible to the naked eye.” (ibid. pg. 27).

More well known is the fact that the Assyrians, Babylonians, and Persians all used the first appearance of the lighted moon to start their months.

Testimony Concerning Second Temple Calendar

Note: the Rabbis and Rabbinical Calendar experts of Judaism readily admit that the calendar in current use by Judaism is not the same as the Second Temple Calendar. They specify that the original calendar was based on the sighted new moon, when the first crescent appears shortly after sunset from one to three days after the conjunction, and that the actual apparent equinox was used to determine the beginning of the year, and that the equinox cannot fall after Nisan 16. The Rabbinical sages, including Maimonides testify that the moon was visibly sighted, and that the new moon day followed as the first day of the month. Additionally, the Karaite Jews, testify that the new moon was visibly sighted in the Second Temple period, and in biblical times before that. The Rabbis say that they must wait for a new Sanhedrin to restore the calendar to its Second Temple methods of observation and calculation, but the Karaites were unwilling to wait or submit to rabbinical authority. The Rabbinic unwillingness to fix a problem they themselves freely admit, however, has led many to pervert history, or to stumble into anachronistically redacting the modern Rabbinic Calendar back into the Second Temple period. Roy Hoffman, of the Israeli New Moon Society reflects the Orthodox Jewish consensus:

“For over a thousand years, the Hebrew calendar has been fixed by calculation. Today, the Hebrew calendar does not match that fixed by observing the Moon…. While sanctification of the month according to observation is not practiced today, it is important to carry out calculations and practice observing the New Moon in order to be ready for when the Sanhedrin is
reestablished.” (Roy Hoffman, Israeli New Moon Society, Feb 2011, ver. 3/26/2012. Roy also has some informative PowerPoints on the calendar in Hebrew.) His words reflect the consensus of Orthodox Judaism on the calendar, i.e. that the calculated calendar in current use is technically incorrect. Orthodox Jews also often add the proviso that the calendar change compromise was made to unify Judaism in the face of persecution. This is true enough, but a curious side effect is that the modern Rabbinic calendar does not bear witness to Messiah’s prophetic fulfillments during Passion week.

Jewish calendar expert Arthur Spier says, “In the early times of our history the solution was found by the following practical procedure: The beginning of the months were determined by direct observation of the new moon. Then those beginning of months (Rosh Hodesh) were sanctified and announced by the Sanhedrin, the Supreme Court in Jerusalem, after witnesses testified that they had seen the new crescent and after their testimony had been thoroughly examined, confirmed by calculation and duly accepted. The Jewish communities were notified of the beginning of the months (Rosh Hodesh) in earlier time by kindling of night fires on the mountains, and later on by messengers.” (Arthur Spier, The Comprehensive Hebrew Calendar, p.1, section: “Historical Remarks on the Jewish Calendar,” pg. 1)

Despite overwhelming historical testimony as to the nature of the original calendar, that the new moon was sighted, certain groups insist on denying it. The Jewish leaders know that they follow a calendar that is incorrect according to their own historical records, and freely admit it, simply preferring the tradition over biblical correctness, and justifying the difference as a necessary compromise to unify Judaism, and saying we must wait for the Sanhedrin to fix repair the problem.

However, these other groups insist that the conjunction was used in the Second Temple Period, and by doing so pervert History. Some even claim that the conjunction method is the only way to make the Wednesday crucifixion of Messiah work
correctly as described in the New Testament. There is no truth in claim. Sir Isaac Newton and the Orthodox Jewish scholar Solomon Zeitlin both concluded that the crucifixion of Yeshua was in AD 34 based on the starting point of Messiah’s ministry, and the length of his ministry. It so happens that in this year the 14th of Aviv fell after the spring equinox on a Wednesday. This year works exactly with a Sabbatical year solution to Daniel 9 that takes Persian history at face value starting with the rebuilding of the city. Other interpretations dismiss the literal sense of what it means to rebuild the city, or they introduce calendars that were never in actual use.

It now appears that the current Rabbinic Calendar does not even go all the way back to AD 359 when it was proposed in principle by Rabbi Hillel II, “There is…unimpeachable evidence from the works of writers with expert knowledge of the calendar that the present *ordo intercalationis* [sequence of intercalations—the 19 year cycle] and *epochal molad* were not intrinsic parts of the calendar of Hillel II, these being seen still side by side with other styles of the *ordo intercalationis* and the

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12 Specifically, 119 ministries makes this claim. But clearly when they applied the Wednesday test using the conjunction to AD 30 they forgot to have a scientific control to their experiment. This would involve doing the same test on all other possible crucifixion years to see if the sighted moon method would not work in those years (AD 29-34). Science that makes claims without controlled experiments (in this case astronomical calculations) is simply bad science. A control would have shown that AD 34 works with the sighted moon, and would have disproved the hypothesis that only the conjunction works. The parsimonious choice then is to accept the historical record as delivered to us that the moon was sighted.

13 Don’t hold your breath though. Newton managed to eek a Friday date out of AD 34 by postponing Nisan by a whole month. Improved astronomical calculations have since shown that a Friday date is impossible in AD 34, and that only a Thursday is possible by making the first month fall too late. If the month is not improperly postponed, 15 Aviv comes right after the equinox and 14 Aviv falls on Wednesday, March 24th (which is when Yeshua was crucified). The Jewish Scholar Zeitlin seems not to have considered that only a Wednesday date was available in AD 34, but he was sympathetic to the idea that the preparation of the Passover was the day before the Annual Sabbath, and stated so in the *Journal of Biblical Literature*. 
molad as late as the 11th century. Also the four dehiyyot [postponement rules] developed gradually. …By the tenth century the Jewish calendar was exactly the same as today.” (Cecil Roth, editor, Encyclopaedia Judaica, Vol. 5, p.50, article: Calendar.)

“The Talmudic Rabbis [ca. first half of the third century C.E. (i.e., prior to 250 C.E.) to the end of the fifth century C.E.] recognized the variation in length of the synodic month…and hence they determined the beginning of every month separately by observation of the new moon as well as by calculation.” (W.M. Feldman, Rabbinical Mathematics and Astronomy, Hermon Press, 1965, p.123)

“Further, [Solomon] Ganz points out, that it is hardly likely that R. Gamaliel would speak of a mean [i.e. average] synodic month, as in his time the ‘fixed’ calendar was not yet in use.” (W.M. Feldman, Ibid, p.124).

14 It also appears now that the testimony about Rabbi Hillel II is based on the testimony of just one Jewish source. The source may well be accurate, but now they are saying that he did not implement the full system as Orthodox Judaism knows it at present.

15 I checked this book out from the University of California and photocopied it many years ago. Using it I wrote my first computer programs using the arc of vision and elongation values to determine the sighted new moon. This was sometime in 1990-1992. I also used Peter Duffett-Smith’s book Practical Astronomy with your Calculator to write a gw-basic program on a 8086 Zenith Data Systems 10Meg computer to calculate the new moon. Later I ended up getting a new computer, and tossing the motherboard into the fire at Passover one year to watch it burn pretty colors. Like most, I was misled by the Rabbinic calendar into anachronistically redacting the conjunction (minus the postponements) method into the first century. It did not take long, however to become aware that the historical testimony was unanimously against this. There was no non-Jewish Messianic consensus at that time about the incorrectness of the Rabbinic Calendar to inform me. But reading the University copies of the Mishnah and Talmud sections Rosh Hashanah convinced me otherwise. I had done enough chronology work at that time to know that AD 29-32 were impossible dates. I had settled on AD 33 (as other evangelicals had). However, the new information scuttled the Wednesday date for that year. Realizing this one day, I knew that there was only one other possible year and that was AD 34, but I did not know yet what the calculations would be (I did not have Finegan’s Handbook of
“But unless all indications are deceitful, they did not in the time of Jesus Christ possess as yet any fixed calendar, but on the basis of a purely empirical observation, on each occasion they began a new month with the appearing of the new moon…” (Emil Schürer, *The History of the Jewish People in the Age of Jesus Christ*, p.366).

The testimony of Philo of Alexandria, a near contemporary of Josephus, and prolific writer of the times bears witness to the use of the sighted new moon:

“Now there are ten festivals in number, as the law sets them down….The third [festival] is that which comes after the conjunction, which [festival] happens on the day of the new moon in each month. …(140) Following the order which we have adopted, we proceed to speak of the third festival, that of the new moon. First of all, because it is the beginning of the month, and the beginning, whether of number or of time, is honourable. Secondly, because at this time there is nothing in the whole of heaven destitute of light. (141) Thirdly, because at that period the more powerful and important body gives a portion of necessary assistance to the less important and weaker body; for, at the time of the new moon, the sun begins to illuminate the moon with a light which is visible to the outward senses, and then she displays her own beauty to the beholders.” [6] [first century Jew, Philo Judaeus, *The Special Laws*, II, XI. (41), XXVI. (140) & (141), as translated by C.D. Yonge in *The Works of Philo: New Updated Edition, Complete and Unabridged in One Volume*, Hendickson Publishers, 1993, pp.572, 581]

C.D. Yonge did not translate all of Philo here. I deal with this in one of my PowerPoints, and show that Philo clearly believes the new moon is sighted. It is one thing to be misled

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*Biblical Chronology* to simply look up Nisan 14 for that year). So with much suspense I prayed, knowing of course that the answer was completely deterministic, whether AD 34 would work out or not. I knew that if it did not that a harmonious chronology of the New Testament and Daniel 9 was doomed. I plugged in the year and it did. I went over the calculations by hand, and it did. I also spent a good deal of time finding other sources that calculated the same results.
into thinking the conjunction was used in the Second Temple Period for a brief time until one becomes familiar with the historical sources. It is quite another to continue to teach it after being shown all the sources. Yet there are at many teachers calling themselves Messianic or claiming to teach the laws of the calendar who are incorrect on this. They go to great lengths to reinterpret Philo to agree with them. I don’t know why they do this, but it takes a certain intellectual humility to overcome errors one is taught or has assumed. It takes a willingness to submit to fair scientific principle. Yet some of these same people are experts at the religious pretense of a false humility they put on so that they can support their religious traditions. True humility can only be determined by knowing who has submitted themselves to the truth. Yet in this age of doubt, those who would show boldness in stating the truth are called arrogant by foolish shepherds who are experts in religious pretense. True humility requires one to sacrifice the perks and rewards of religiosity, and to realize that humility with the facts leads to certainty of truth, and certainty of truth leads to the deceived making charges of arrogance.

"Jews calculated the month according to the phase of the moon, each month consisting of either twenty nine or thirty days, and beginning with the appearance of the new moon. But this opened a fresh field of uncertainty. It is quite true that every one might observe for himself the appearance of a new moon. But this would again partly depend on the state of the weather. Besides, it left an authoritative declaration of the commencement of a month unsupplied. And yet not only was the first of every month to be observed as ‘New Moon’s Day,’ but the feasts took place on the 10th, 15th, or other day of the month, which could not be accurately determined without a certain knowledge of its beginning. To supply this want the Sanhedrin sat in the ‘Hall of Polished Stones’ to receive the testimony of credible witnesses that they had seen the new moon. To encourage as many as possible to come forward on so

16 The 10th day refers to Yom Kippur, but this is a fast, and not a feast as Edersheim implies.
important a testimony, these witnesses were handsomely entertained at the public expense. If the new moon had appeared at the commencement of the 30th day — which would correspond to our evening of the 29th, as the Jews reckoned the day from evening to evening — the Sanhedrin declared the previous month to have been one of twenty-nine days, or ‘imperfect.’ Immediately thereon men were sent to a signal-station on the Mount of Olives, where beacon-fires were lit and torches waved, till a kindling flame on a hill in the distance indicated that the signal had been perceived. Thus the tidings, that this was the new moon, would be carried from hill to hill, far beyond the boundaries of Palestine, to those of the dispersion, ‘beyond the river.’ Again, if credible witnesses had not appeared to testify to the appearance of the new moon on the evening of the 29th, the next evening, or that of the 30th, according to our reckoning, was taken as the commencement of the new month, in which case the previous month was declared to have been one of thirty days, or ‘full.’ It was ruled [much later in history, and by the so-called “rabbis,” not God] that a year should neither have less than four nor more than eight such full months of thirty days” (Alfred Edersheim, The Temple: Its Ministry and Services, pp.156-157)

“It is generally accepted that the Jewish festivals were, in Biblical times, fixed by observation of both the sun and the moon. Gradually, certain astronomical rules were also brought into requisition, primarily as a test, corroborating or refuting the testimony of observation….It has been authoritatively proved that in spite of a more advanced knowledge of astronomy the practice of fixing the new moon and the festivals by observation was in force as late as the latter part of the fifth century [AD]….It was only after the close of the Babylonian Talmud, in the sixth or perhaps later, in the seventh century, that the observation of the moon was entirely given up, and a complete and final system of calendation introduced [in the tenth century].” (Henry Malter, Saadia Gaon: His Life and Works, Chapter IV, Saadia’s Controversy with Ben Meir, pp.70-88,
The next quotation needs to be introduced with some explanations. Saadia Gaon was a huge anti Karaite, to the point of claiming that calculation was used to determine a conjunction based calendar since the time of Moses, and that sighting of the new moon was only added sometime in the 3rd century BC as a measure to show that the calculations were accurate. However, his epic claims were rejected both by his own Rabbinic party and by the Karaites. Sadly, though, some modern teachers have followed his example of redacting the Rabbinic calendar back to Moses.

“…Rejecting the fixed calendar as a heretic innovation, the Karaites held that by law of Scripture the beginning of the months must be determined by the appearance of the new crescent and no other means, and that this had been the practice of ancient Israel at all times. Rabbanite refutation of this extreme assertion found its most outspoken exponent in Saadia Gaon who went to the opposite extreme in ‘demonstrating’ that the fixed calendar, computation of molad and tekufah, has the force of a Mosaic-Sinaitic law that had been followed at all ages of the past [like some in the CoGs proclaim], while observation of the new crescent was merely a

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17 Most of these quotes were compiled by Joseph Dumond. I don’t agree with his chronological teachings or research and prophetic philosophies, but credit is due for the neat summary. Some of the [ ] notes are likely Dumonds remarks, and I have left them where I agree with them.

18 Maimonides calls it an “extreme assertion,” and perhaps it is, because calculation was used in cases where the moon could not be seen. The Karaite contention that the new moon should begin when the lighted new moon first appears, however, is not the extreme part. Only a Karaite assertion that no calculation was used to help determine when this was would be extreme.

19 Here we can add others who have taken a page out of Saadia’s polemical battle plan: the appendix of Andrew Roth’s Aramaic English New Testament (who called me a sun worshipper for teaching the moon is new when lighted, and suggests the same about others); the teachings of 119 ministries; and Moshe Koniuchowsky of Your Arms to Israel who proclaims the lunar Sabbath heresy.
passing episode in the history of the Jews, introduced at the
time of the Sadducees to show that it confirmed the correctness
of the prescribed calendric regulation by calculation. Although
this contention could easily be refuted by the Karaites as fanciful to the point of ridicule, Saadia’s prestige was so great
that his theory was accepted even by leading scholars…..Maimonides [12th century A.D] is one of the few
medieval Rabbanite authorities known to have taken issue with Saadia’s and his followers’ contention, and his refutation
amounts to unmitigated reproach, indeed to expression of
intellectual as well as religious indignation. [Maimonides commented:] ‘I am truly astonished over a personage who
rejects clear evidence, asserting that the religion of Israel was
based, not on observation of the new moon, but on calculation
alone—and yet he [Saadia] affirms the authority of all these (just
mentioned) Talmudic passages!²⁰ I think indeed that he did not
believe his own assertions, but he merely wished to repel his
[Karaite] adversary by any notion that just occurred to him, be it
ture or false, when he had found himself unable to escape the
force of (his adversary’s) argument.’” (The Code of
Maimonides, book II, treatise 8, translated by Solomon Gandz,
Yale Judaica Series, Volume XI, pp.lii-liii)

“….the Gregorian calendar is solar, the Jewish one is
lunar. The latter evolved over a period of many centuries, going
through a number of formulations, much experimentation, and a
great deal of controversy….Despite the fact that the Jewish
calendar finally became fixed in 358 C.E. [i.e., it may have been
around this time that the formulation of the set calendar was
initialized], there was no end to the criticisms and disputes
leveled at its inaccuracies for centuries thereafter.” (Nathan
Ausubel, The Book of Jewish Knowledge, An Encyclopedia of
Judiasm and the Jewish People, pp.70-71, 1964.)

“It is uncertain what the calendar of Hillel originally
contained, and when it was generally adopted. In the Talmud

²⁰ Which is to say that Saadia as a believer in Rabbinic tradition and the
Talmud rejected the testimony of his own tradition concerning the sighting
of the new moon in the Second Temple period. It is no wonder that
Maimonides is stunned.
there is no trace of it.” (The Jewish Encyclopedia, “Calendar, History of”, pp. 502-503, Funk and Wagnalls, 1903)

“The name Rosh Ha-Shanah as it is used in the Bible (Ezek. 40:1) simply means the beginning of the year, and does not designate the festival. The months of the year were counted from the spring month (Ex. 12:2), later called by the Babylonian name Nisan. The month known by the Babylonian name Tishri is, therefore, called the “seventh month” in the Pentateuch. When the festival on the first of this month is recorded, it is referred to as the festival of the seventh month and a day of “memorial proclaimed with the blast of horns,” or “a day of blowing the horn” (Lev. 23:23-25; Num. 29:1-6). In the Bible, the festival lasts one day only; the two-day festival arose out of the difficulty of determining when the new moon actually appeared.” (Encyclopedia Judaica, volume 14, article: Rosh Hashanah, pp.305,306)

“…One of the Gaons [probably Saadia is meant] asserted that the existing calendar system was of great antiquity and the new moons and festivals had always been established by calculation. His view was that the observation of the moon had not been put to use until the third century BC, its purpose to demonstrate the accuracy of calculation, this, in order to refute dissenters. His view was that calculation and observation had always agreed. His arguments were soundly repudiated by both Karaites and Talmudists on the basis of Talmudic records (ibid).” (The Hebrew Calendar: Is It Reliable?, Bethel Church of GOD 1999; slightly reworded from: Church of God, The Eternal’s article of the same title from 1994)

Scripture Texts

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21 Indeed, Rosh Hashanah means “head of the year,” but in Ezekiel it is applied to the Day of Atonement. Evidently it means the beginning part of the year (which included Yom Kippur) and not just one day. We might speak loosely in English saying that American Presidents are inaugurated at the start of the year every four years on Jan 15, even though we know the year begins on Jan 1.
The promoters of conjunction methods try to make scriptural arguments for the use of the conjunction. Orthodox Jewish scholars, of course, make no such arguments, having already admitted how the new moon was determined. Since the historical record is clear, for those who bother to study it, and since the testimony of Messiah may be shown to agree with it, it logically follows that every attempt to prove a conjunction method from Scripture is simply scripture twisting. It is sad that scripture twisting is the means by which so many people are deceived, so it will be necessary to go through the actual cases.

Amos 1:5, “When will the new moon be over?” Conjunction teachers suggest that the complaint Amos reports means that they truly did not know when the new moon day ended, and then draw the conclusion that the new moon day must have been determined by the calculated conjunction. There could be, of course, any number of reasons why someone might be ignorant of when the new moon day ended. Chief among these would be that messengers had not arrived from a central authority to inform them of which day was actually determined. Even living next door to the calendar council might occasion ignorance of when the new moon feast ended, because the days in question might be clouded over. But in all probability, Amos is quoting a simple complainer, and the complainer knows when the day will end, but is expressing impatience by the question, such as when someone says, “When will this long hot day end?”

For the conjunction teachers, their interpretation implies that they believe more than one day should be officially observed for the new moon. For they say that the new moon begins at the conjunction and ends with the observed crescent, a time which takes from one to three days. There often are as many as three complete days (sunset to sunset) between the conjunction and the sighting of the new moon. This implication has several problems. 1. We usually don’t see the conjunction teachers teaching that one must observe more than one day, but their argument would make it a legal imperative. For the complainer in Amos could simply observe the day of the conjunction, or dark moon, and then go about their work after that knowing full well when the day would end for them. But the interpretation of
the complaint suggests legal force to a multi day observance of the new moon. 2. The historical record shows that more than one day of observance was due to doubt of the correct day, and not because there was more than one correct day.

Thus it is perfectly possible that the new moon feast was started right after the end of the 29th day when the skies were cloudy, or due to living some distance from the calendar council, or that witnesses had to travel from afar more than one day to reach the calendar council or due to the faintness of the moon and that only a very few witnesses had seen it in another town. Our complainer then, could simply be in ignorance because no testimony for the new moon has yet been given, and that it might be given making the old month either 29 or 30 days. Thus until such testimony was given, it would remain in doubt during the first day of the new moon whether a second day would have to be observed.

What I am saying is that the Amos text does not favor a conjunction method at all. It fits perfectly well with starting the month with the first appearance of a lighted moon.

In 2Sam. 20:5 it says, “Behold a new moon is tomorrow.” Conjunction teachers like to say that the only way to know when a new moon is in advance is to calculate it. This is true, but the argument for the conjunction has a fatal flaw, and that is that it is equally as possible to calculate the first appearance of the new moon as the conjunction. To show this, we need a little education in lunar astronomy. The ancients by observing that the moon sometimes traveled up to −5° below the sun’s path (called ecliptic) and sometimes +5° above it. This easy to determine by plotting the sun’s daily motion with a sextant or fixed structure for measuring the altitude of the sun and moon. By doing this ancient astronomers found the “nodes” of the moon, which are the points at which the moons orbit passes in front of the sun’s orbit. The moon passes through the nodes twice a month, and the times of these passages became the time of potential solar and lunar eclipses. Only when the node lines up with a conjunction or a full moon can there be an eclipse. Ancient astronomers timed the passages of the moon’s nodes in front of the sun or through the earth’s shadow to find the dates
of eclipses in advance. The upshot of all of this is that ancient astronomers knew what the declination of the moon was, i.e. \(-5^\circ \leq \text{DEC} \leq +5^\circ\) as accurately as they knew the orbital position of the moon.

Let us assume then that they could calculate the conjunction time of the moon. (More on this later.) Then since we already know they could forecast eclipses by using periodicities of the nodes, it follows that both the moon’s declination and elongation with respect to the sun are known. Also the inclination of the sun’s path to the western horizon was known. Using these value’s is how ancient astronomers arrived at the value known as the arc of vision, which is the number of degrees between sunset and moonset, i.e. the altitude difference. By the same values one estimates the arc of light, or size of the lighted portion of the moon. To make an accurate model of the conjunction requires a knowledge of lunar parallax, and the same is true for an accurate model of sighting the new moon. So the bottom line is that if an astronomer knows how to do one, he knows how to do the other. The hardest part of all of this is equal to both the conjunction and the sighted moon, and that is accurately modeling the changing speed of the moon on an elliptical orbit. The rest is relatively easy. The Babylonians had some very accurate numerical recipes for doing this, but it was not perfected until Sir Isaac Newton invented Calculus.

So if the assumption is granted that Israel could calculate the conjunction in advance, then so also it must be granted that they could calculate when the moon was first seen.