Determining the New Moon and Holy Days in Leviticus 23

by

Anthony V. Gaudiano

Israelites reckoned days, months, years, seasons, etc., using Genesis 1:15-19. Every twenty-nine to thirty days (sunset-to-sunset) they looked for a new moon crescent on the western horizon a little above where the sun had disappeared. During the temple era the sky over Jerusalem might be obscured, so witnesses were also placed on distant mountains to relay a sighting by signal fire.

The Jewish high court (Sanhedrin) would declare the start of a new year *after* the Spring Equinox (mow'ed = fixed appointment) evidenced by the sun setting in the constellation Tleh (Aries), when the first new moon crescent was seen by two independently examined witnesses.

The first scriptural month named Abib refers to 'green sprouting/growth' of vegetation. After the Babylonian captivity the prophet Ezra adapted Babylonian month names for the Jewish calendar. The first month, Nisanu, became Nisan, etc. Both calendars were luni-solar, had a nineteen year cycle with intercalary months, and started in the Spring.

Today, the probable visibility of the new moon crescent in Jerusalem can be known without observation if its elongation exceeds a certain minimum value. Elongation is based upon: (a) determining the moon's altitude in degrees, and (b) the azimuth difference in degrees between the moon and the setting point of the Sun, both referenced to the western horizon.

The scriptural new year,1 Nisan, and the Holy Days in Leviticus 23 for any Gregorian year, can be determined using data from United States Naval Observatory (USNO)'s web site:

1. **Obtain the date and local time (LT) of the Equinoxes for the year of interest**. Go to: http://www. usno.navy/mil, to the USNO home page. On the left side under Departments, click on: *Astro Applications, Data Services, Dates, and Earth's Seasons, Equinoxes, Solstices, Perihelion, and Aphelion 1992-2020.* Select the table for the year of interest.

The data is given in Universal Time (UT) which is the original Greenwich Mean Time (GMT) referenced to a 24 hour clock, midnight-to-midnight reckoning (h = hour, m = minute). For 2005, the USNO shows the Spring Equinox to occur on March 20, at 12h 33m UT, and the Autumnal Equinox to occur on September 22, at 22h 28m UT. Convert these times to Local Time (LT) Jerusalem, two time zones East of Greenwich, by adding two hours to each.

In LT Jerusalem, the **Spring Equinox** will occur on **Sunday, March 20,** at **14h 33m** and the **Autumnal Equinox** will occur on **September 23,** at **0h 28m**. The latter will be use for determining dates in the seventh Hebrew month.

2. **Obtain the date and time of the astronomical new moon (conjunction)**. Backup to *Data Services, Phases of the moon, Dates of Primary Phases of the Moon*, then click on:

Phases of the Moon (UT). Enter the year of interest and press: GET DATA, or choose a table with that year.

Each table has columns titled: NEW MOON, FIRST QUARTER, FULL MOON, LAST QUARTER. Under each column is the month, day, hour, and minute in UT. The column titled NEW MOON is the astronomers' term for the calculated Astronomical Conjunction (AC) of the invisible moon. It is not visible to the unaided eye because of the glare of the sun.

On the table for year *2005*, look under the column of months for the date of first NEW MOON (AC) after the Spring Equinox. It will occur on Friday, April 8, at 20h and 32m UT. Convert to LT Jerusalem by adding two hours: i.e., **Friday, April 8, at 22h and 32m**.

An AC before this time can be used if not more than about 24 hours earlier, otherwise the visible new moon crescent could occur on or before the Spring Equinox, which is a day of Winter. The Sadducee priesthood only began the New Year in the Spring.

3. **Determine the LT of sunset in Jerusalem for a year.** Backup to *Data Services.* Select: *Sunrise, Sunset, Moonrise, Moonset, and Twilight*, then click on: *Sun or Moon Rise/Set Table for One Year, Form B - Locations Worldwide*, to obtain Jerusalem sunset time for the days in each month for one year.

Insert the information shown in italics: Year: *2005*, Type of table: *sunrise/sunset*, Place name: *Jerusalem*, Longitude: *East 35* degrees *13* minutes, Latitude: *North 31* degrees *47* minutes, Time Zone: *2* hours *east* of Greenwich. Press: COMPUTE TABLE.

Look vertically down the left side of the table to the date of the AC, and the two days afterward. The new moon crescent will occur toward the end of that period. Then look horizontally to the right, under the month of interest to obtain the times of sunset for the three days. For April 8, 9, and 10, sunset is:*18h 03m, 04m, and 05m*, respectively.

4. **Determine the altitude for a visible new moon crescent in Jerusalem at sunset.** Backup to Data Services. Select: *Sunrise, Sunset, Moon rise, Moon set, and Twilight,* then click on: *Positions of the Sun and Moon, then Altitude/Azimuth Table for Sun or Moon for One Day, Form B - Locations Worldwide.*

Insert the information shown in italics: Object: *Moon*, Year: *2005*, Month: *April*, Day: *8*, Tabular interval: *10* minutes, Place name: *Jerusalem*, Longitude: *East 35* degrees *13* minutes, Latitude: *North 31* degrees *47* minutes, Time Zone: *2* hours *east* of Greenwich, *North* of equator. Press: COMPUTE TABLE.

A new moon crescent occurs about 20 minutes after sunset but will not be visible to the unaided eye unless it meets the altitude criteria: i.e., the moon must be $\geq 10^{\circ}$ above the western horizon.

Look down the computed table for the sunset closest to the time determined in 3. above. For April *8*, at *18h 03m*, the table shows the altitude will be -3.6.° This does not meet the criteria, so the moon will not be visible. Backup, enter April *9,* and press: COMPUTE TABLE. Look for

the sunset closest to *18h 04m*. The computed table shows the altitude will be 9.3˚ to 7.3.˚
Backup again, enter April *10*, and press: COMPUTE TABLE.
Look for the sunset closest to *18h 05m*. The computed table shows the altitude will be 21.8˚ to19.8˚, which meets the criteria.

The new moon crescent will be visible in Jerusalem after the sunset of Saturday, April 10, (midnight-to-midnight reckoning). But, the scriptural 'day' will have already begun at sunset, so it is the first day, of the first month, of the scriptural New Year, *1 Nisan, Sunday, April 11.*

When visibility of a new moon crescent is probable in Jerusalem, its probability is greater for most locations westward which are approximately ± 60˚ of Jerusalem's latitude, at their local time.

5. **Determining the Holy Days in 2005**

Passover, Sunday, April 24. Starting above with 1 Nisan (April 11), count fourteen days inclusively to 14 Nisan, Passover (Sunday, April 24), which begins at the sunset of the April 23rd.

Days of Unleavened Bread, **Monday, April 25 - Sunday, May 1**. - The day beginning at the sunset of Passover is 15 Nisan (Monday, April 25). It is referred to in the New Testament as 'an High Day' (John 19:31). It is the first day of the seven day Feast of Unleavened Bread, ending at the sunset of 21 Nisan (May 1). The first day, last day, and a weekly Sabbath within the seven days inclusively, is a holy convocation.

Day of the Elevated (Wave) Offering, Sunday, May 1. The Elevated (Wave) Offering is made within the seven inclusive Days of Unleavened Bread, on the day after the weekly Sabbath therein. It can be any date, but only on the first day of the week. In 2005 it is Sunday, May 1.

Day of Sabbaths (Weeks, Pentecost), Sunday, June 19. **-** The Day of Sabbaths (Weeks, Pentecost) is a variable which must: (a) be determined by counting (b) begin within the Days of Unleavened Bread, on the day after the first weekly Sabbath from Passover, (c) contain seven complete Sabbath weeks, (d) include the morrow after, (e) total fifty days, and (f) end on the first day of the week (Sunday). In 2005 the count will begin on Sunday, May 1, and end on Sunday, June 19.

Day of Trumpets, Thursday, October 6. The Day of Trumpets is 1 Tishri, the first day of the seventh scriptural month. It starts with the visible new moon crescent first after the Autumnal Equinox.

(a) Determine the first AC after the Autumnal Equinox: Backup to: *Data Services, Phases of the Moon, Dates of Primary Phases of the Moon*, *Phases of the Moon (UT)*.

Look on the table for 2005 under the column of months for the date of first AC after the Autumnal Equinox (*September 23*, at *0h 28m LT Jerusalem*). It occurs on Monday, October 3, at

10h and 28m UT. Convert to LT Jerusalem by adding two hours: i.e., September 23, at 0h 28m.

(b) Determine the LT of sunset in Jerusalem for the days in each month for a year: Backup to: *Data Services, Sunrise, Sunset, Moon rise, Moon set, and Twilight*, and click on: *Sun or Moon Rise/Set Table for One Year, Form B - Locations Worldwide.*

Insert the information shown in italics: Year: *2005*, Type of table: *sunrise/sunset*, Place name: *Jerusalem*, Longitude: *East 35* degrees *13* minutes, Latitude: *North 31* degrees *47* minutes, Time Zone: *2* hours *east* of Greenwich. Press: COMPUTE TABLE.

Look vertically down the table to the date of interest; read horizontally to the right for the time of sunset of a specific month. For October 3, 4, and 5, sunset is: *17h 22, 20, and 19m* respectively.

(c) Back up to: Data Services, *Positions of the Sun and Moon*, click on: *Altitude/Azimuth Table for Sun or Moon for One Day*, *Form B - Locations Worldwide.*

Insert the information shown in italics: Object: *Moon*, Year: *2005*, Month: *October*, Day: *3*, Tabular interval: *10* minutes, Place name: *Jerusalem*, Longitude: *East 35* degrees *13* minutes, Latitude: *North 31* degrees *47* minutes, Time Zone: *2* hours *east* of Greenwich. Press: COMPUTE TABLE.

A new moon crescent occurs about 20 minutes after sunset but is not visible to the unaided eye unless it meets the altitude criteria: i.e., the moon must be $\geq 10^{\circ}$ above the western horizon.

Look down the list for the sunset closest to17h 22m. For October *3*, the computed table shows the altitude will be -0.5˚ to –2.1˚. This does not meet the criteria, so the moon will not be visible. Backup, enter October *4,* and press: COMPUTE TABLE. Look for the sunset closest to17h 20m. The computed table shows the altitude will be 5.5˚. This also does not meet the criteria. Backup again, enter October *5*, and press: COMPUTE TABLE. Look for the sunset closest to 17h 19m. The computed table shows the altitude will be 12.6˚ to 10.8˚, which meets the criteria.

It is probable the new moon crescent will be visible on Wednesday, October 5, midnight-to-midnight reckoning. However, since it occurs after sunset, the next scriptural day will have begun. That day is 1 Tishri (Thursday, October 6), the Day of Trumpets.

Day of Atonement, **Saturday, October 15**. Count ten days inclusively to 10 Tishri (Saturday, October 15), the Day of Atonement.

Feast of Tabernacles, Thursday, October 20, **- Wednesday, October 26**. Count five more days to 15 Tishri (Thursday, October 20) which is the first of seven days of the Feast of Tabernacles. Then count seven inclusive days to 21 Tishri (Wednesday, October 26), the last day of the Feast. The first and last day and a weekly Sabbath therein, are a holy convocation.

Eighth Day Holy Convocation, **Thursday, October 27**.
The eighth Day Holy Convocation is the next day, 22 Tishri (Thursday, October 27).

Date of Holy Days in 2005

Scriptural New Year day, 1 Nisan, Sunday, April 11 (begins at the sunset of April 10)
Day of Passover: Sunday, April 24. (Memorial begins after the sunset of April 23).
Days of Unleavened Bread: Monday, April 25 through Sunday May 1.
Elevated (Wave) Offering; start the count to Day of Sabbaths on May 1.
Day of Sabbaths: (Weeks, Pentecost), Sunday, June 19.
Day of Trumpets: Thursday, October 6.
Day of Atonement: Saturday, October 15.
Feast of Tabernacles: Thursday, October 20, **- Wednesday, October 26**.
Eighth Day Holy Convocation: Thursday, October 27.

04/25/05

Conundrum - Anything that arouses curiosity or perplexes because it is unexplained, inexplicable or secret also Mystery, Puzzle, enigma, riddle, puzzlement, puzzler