Average Length of the Lunar Month According to Genesis and Jewish Tradition

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Comments:

* This article is based on Ch. 18 in my book: *Coincidences in the Bible and in Biblical Hebrew* (2007, 2008; 2nd Edition Dec., 2012; iUniverse, Bloomington, IN 47403, USA). A PDF version of this book may be downloaded free from Shore's personal blog.

* This article is a somewhat shortened version of an article in Hebrew that appears as a separate entry at my blog.

1. Introduction

The average duration of the lunar month (the number of days between successive moon renewals, which fluctuates somewhat between months) is 29.53059 days. This value may be found in different available sources, for example: http://en.wikipedia.org/wiki/Lunar_month

NASA site cites a more precise value of 29.530589 days
(http://eclipse.gsfc.nasa.gov/SEsaros/SEsaros.html).

Surprisingly, this average is already quoted in the Talmud (by Raban Gamilel;
Rosh Hashanah 25:71) and by Maimonides (Mishne Torah, Sefer Zmanim,
Hilchot Kidush Hachodesh, Chs. 6 and 11).

The question is:

How was the average lunar month duration known to such a high precision in
ancient times? Furthermore, do we have to accept the quoted value by Raban
Gamliel as given (mysteriously known to Jewish sages in ancient times), or is
there a way to calculate this value from known sources, relying only on text in the
Hebrew Torah and how Jewish tradition complemented this text by oral
commentary?

In this article I show that average lunar month duration may be calculated,
accurate to five decimal digits, using only two basic numerical values. These
values are derived from the timeline described in the Hebrew Genesis creation
story and from Jewish traditional commentary on the text that complements this
timeline. I refer to the following basic constructs of Jewish tradition, part and
parcel of the current Hebrew calendar:

* *Baharad* (in Hebrew: בהר"ד);

* *Ve-Yad* (in Hebrew: וי"ד).

According to Jewish tradition, the first lunar renewal started with the completion
of the "creation" of Adam on Friday. This event marked the completion of the
Divine act of creation, and with that the moon, hidden since its creation on the
fourth day (Genesis 1:16), now revealed itself and the first Hebrew year had
started, on the first day of Tishrei, the first month of the Hebrew calendar. This
timeline is related to *Ve-Yad*, as will be explained soon in more detail.

However, if first moon renewal occurred on the sixth day of creation, how do we account for the five "days" of creation that preceded it? Which year in the calendar do they belong to? To account for these days, an imaginary year is defined, denoted in Hebrew *Shnat Toho* (year of *Tohu*, where *Tohu* is taken from Genesis description of Earth as being initially *Tohu va-Vohu* ("without from and void"; Genesis 1:2). This year of *Tohu* is created figuratively by rolling back a whole lunar year, to the first day of *Tishrei* in the year of *Tohu* (also denoted *Shnat Yetzirah*, Year of Creation, the first year in the **current** Hebrew calendar). *Baharad* and *ve-Yad* specify the exact times **in the week** that the imaginary year started and ended, respectively:

Baharad - The second day (accounting for the first Hebrew letter in *Baharad*, *Bet,* with numerical value of *2*); at the fifth hour of the day (accounting for the second Hebrew letter in *Baharad*, *Hei*) and additionally (204/1080) of the sixth hour (accounting for the Hebrew *Resh* and *Daleth* in *Baharad*). Note, that these two letters combined indicate 204 parts of the 1080 parts that an hour was divided into in ancient times;

Ve-Yad – The sixth day (accounting for the Hebrew *Vav*) at the end of the fourteenth hour (accounting for the Hebrew *Yod* and *Dalet*). Since the Jewish day starts at 6.00PM on the previous day, this implies that the first lunar renewal in the Jewish calendar (and the end of the imaginary year that preceded this event) started at 8.00AM on the sixth day of creation.

Baharad, according to Jewish tradition, may be read directly from the Hebrew Genesis thus: Start with the first letter in Genesis 1:1, *Bet*; Then skip 42 letters to get the next letter in *Baharad* (*Hei*); Continue so until you get to the last Hebrew *Dalet* in the Hebrew word *Va-Yavdel* (Verse 4). In Jewish tradition, *Baharad* is associated with one of the sacred names of God, a 42-letter-long name.

Ve-Yad is based on a long held Jewish oral tradition that is often quoted in the Talmud and in other ancient Jewish sources. Those sources tell us that creation of Adam was completed at the end of the fourteenth hour of the sixth day of

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creation and with that the Divine act of creation had been completed and the moon, hidden since the fourth day of creation, now revealed itself to Adam to start the first lunar renewal in the Jewish calendar (Jewish sources for this description from the Talmud can easily be found from a Google search, either in English or in Hebrew).

Surprisingly enough, those two time points of the week, *Baharad* and *Ve-Yad*, incredibly beyond the confines of our present scientific world view, are sufficient to calculate average lunar month duration to accuracy of five decimal digits. In this article, I show how these two concepts alone inevitably lead to an average lunar month duration of 25.530594 days (deviation of 0.000005 days from NASA figure).

3. Calculating Average Lunar Month Duration with *Baharad* and *Ve-Yad*

To start the calculation, we first define an equation in three variables:

A – A value that may be directly calculated from *Baharad* and *Ve-Yad*;

X – Average lunar month duration (in days); this is the value we seek by solving the equation developed below; it is known that the solution for X (the value that maintains the equality of the two sides of the equation) has to be between 29 and 30, the alternating number of days in a normal Hebrew month;

K – An integer value that represents the number of whole weeks contained in the difference between the true average duration of the lunar year (12X) and the length of the lunar year based on an assumption of four weeks (28 days) per month. We denote this difference by Δ.

Given these variables, the following equation for Δ is easily obtained (expressed in days):

$\Delta = (12X) - 12*28 = 12(X - 28) = (7K) + A$

While both X and K are unknown, the parameter A in the equation can easily be calculated from *Baharad* and *Ve-Yad*:

From Monday, on the 5.1888 hour (5 plus 204/1080), to the exact same time point on Friday: Four days.

From the 5.1888 hour on Friday to the end of the fourteenth hour (indicated by the *Yad* in *Ve-Yad*):

14 – 5.188889 = 8.81111 hours

Therefore the total difference (expressed in days):

A = 4 + 8.81111 / 24 = 4.36713 days

Since a Hebrew month can be either 29 or 30 days, we assume: 29 < X < 30.

We now calculate values of X in the above equation, with the calculated A, while introducing for the **integer** K various values that result in X maintaining the above constraint (inequality). We obtain:

For K=1: X=28.947261

For K=2 : X=29.530594

For K=3: X=30.113927

Obviously only K=2 results in X maintaining the above constraint!

We conclude therefore that the average lunar month duration, from ancient Hebrew tradition and based on Genesis creation timeline, is 29.530594 days.

This is a deviation of five part in a million (namely, 0.000005 days) relative to the value specified by NASA.