



## This chart astronomically confirms the 6000-year expiry of the Hebrew calendar.

The dashed line at Hebrew year 4119 indicates when the Hebrew calendar was fixed under the authority of Hillel II. The dashed line at Hebrew year 5766 indicates the approaching Hebrew year (at the time of preparing this report).

The *Torah* (*D'Varim: Re'eh*, 16:1) instructed Israel to observe Passover in the "month of spring" (*chodesh ha-aviv*). Although it seems unclear what this phrase means, this chart shows that Hillel II originally set up the fixed calendar such that the earliest Passover would occur was at the vernal equinox, and the latest was one lunar cycle after the equinox.

Slope of diagonal line indicates average drift of Hebrew calendar =	6.5 minutes <u>too long</u> per year.
Years to accumulate an average of one day falling further behind Sun =	222.1 years per day behind (later <190 years).
Average length of Hebrew calendar year = ( 235 x <i>molad</i> ) / 19 =	365.24682221 days per year.
Average length of the vernal equinoctial year (from this calculation) =	365.24229734 days per year.

Thus Passover drifts an average of about one additional day later than the vernal equinox every 222 years. Within 6000 years of Hillel II the earliest Passover will occur near the *chodesh ha-aviv* limit, the latest near twice that limit. This proves that the fixed Hebrew calendar expires in 6000 years. This need not imply that the World will end at that time, nor that the calendar must not be adjusted before then. Rather it could simply be the "last chance" to correct the calendar drift, otherwise thereafter Passover will always be observed too late in the year.

In classical times Passover (*Nisan 15*) was allowed to occur on or after the date of the equinox, but sunset *Erev Nisan 16* had to be after the equinox (Maimonides *Mishneh Torah: Sefer Zemanim -- Kiddush haChodesh*, chapter 4, number 2). That rule, easy to compute now, would restore the earliest Passover dates back to the equinox and keep them there.

Dots below the "equinox limit" are Hebrew years in which *Erev Nisan 16* occurred before the vernal equinox. That happened four times: early by 5/4 day in 4120, 4/5 day in 4139, 1/2 day in 4215, and 1/2 day in 4253.

The average vernal equinoctial year length is approximately constant over the years shown, but it will vary in the future.

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Calendar and astronomy calculations as per "Calendrical Calculations: The Millennium Edition", by Ed Reingold & Nachum Dershowitz, 2001.