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May the studying of the Daf Notes be a zechus for his neshamah and may his soul find peace in Gan Eden and be bound up in the Bond of life

### **FAVOR TO THE BABYLONIANS**

➤ Ulla came to Bavel from Eretz Yisroel and informed the people that they had made Elul thirty days and that this is a great benefit for the Babylonian community. Ula explained that if they would have kept Elul at twenty-nine days, Shabbos and Yom Tov would have occurred one immediately following the other. This would cause the vegetables that were picked before the first day to wither. Rav Acha stated that they wanted a weekday between Shabbos and Yom Tov in order that they would be able to bury the dead without postponement and the corpse will not decompose. The Gemora explains that this benefit applies to Bavel where there is a hot climate and therefore there is a legitimate concern that the vegetables will wither and the corpses will decompose; however regarding Eretz Yisroel which is hilly and therefore not so hot, there are no such concerns. (20a)

### **COERCING THE WITNESSES**

➤ Rava states that if there is a public necessity for changing a month from thirty days to twenty-nine, Beis Din can do that; however to

change a month from twenty-nine to thirty is not allowed even if there is a public need to do so.

The Gemora cites proof to this from a ruling of Reb Yehoshua ben Levi who stated that Beis Din can intimidate witnesses to make a twenty-nine day month into a thirty day month but they may not coerce the witnesses to testify that the month should contain twenty-nine days when in truth it should have thirty.

This distinction is questioned based on Reb Yehudah Nesiah's report to Rebbe Ami regarding Rabbi Yochanan's rulings. Rabbi Yochanan taught that it is permitted to intimidate the witnesses regarding a new moon that was not seen in the proper time in order to establish Rosh Chodesh on the thirtieth and tell them to testify that they saw the new moon even though in fact they did not see it.

The Gemora answers that Rabbi Yochanan is specifically referring to Nissan and Tishrei whereas Reb Yehoshua ben Levi is discussing all the other months.

Rav Dimi learns the opposite of Reb Yehoshua ben Levi. He rules that Beis Din can intimidate witnesses to make a thirty day month into a twenty-nine day month but they may not coerce the witnesses to testify that the month should contain thirty days when in truth it should have twenty-nine. The reason given for this is because when the moon was visible and Beis Din chooses to delay and sanctify the next day, that appears like a lie; however sanctifying the month early does not have the appearance of a falsehood. (20a)

## LUNAR ASTRONOMY

### From Kollel Iyun HaDaf

➤ Reb Zeira makes two important statements about the new moon. First, he teaches that when the Beraisa of "Sod ha'Ibur" (the secret wisdom of lunar astronomy) says cryptically, "The Molad occurs before Chatzos, or the Molad occurs after Chatzos," it means that there is a difference between the Molad when it occurs before Chatzos and when it occurs after Chatzos (midday). Rabbi Zeira explains that when the Molad occurs before Chatzos, the new moon can be seen immediately after sunset of the same day. When the Molad occurs after Chatzos, it is not possible to see the moon after sunset of that day.

Rebbi Zeira also says in the name of Rav Nachman that the moon fully disappears from view for a

total of 24 hours at the time of the Molad: for people "here" (in Bavel) the moon is not visible for 6 hours before the Molad and for 18 hours after the Molad, and for people "there" (in Eretz Yisrael) the moon is not visible for 18 hours before the Molad and for 6 hours after the Molad.

**RASHI** explains the statements of Rebbi Zeira in considerable detail, attributing his explanation to Rav Sa'adyah Ga'on. Although Rashi explains these statements at length, the astronomical aspects of his explanations are unclear.

(a) Rashi says (DH 24 Sha'os) that the people who stand in the east can see the moon better when it is in the east, and the people who stand in the west can see the moon better when it is in the west. What does Rashi mean? The moon moves across the sky, and people in both the east and the west are able to see it in both the eastern and western parts of the sky! Moreover, living further east or west cannot possibly bring a person "closer" to the moon. No place on earth is significantly closer to the moon than any other due to the great distance between the earth and the moon (approximately 384,400 kilometers, or 238,857 miles).

(b) What does Rashi mean when he repeatedly mentions (DH Nolad, DH Kaf-Dalet, DH Mechasya, and on 24a, DH Kan) that at the time of the new moon, the moon *always* rises in the south-east and sets in the south-west? This

statement is inaccurate. The locations of moonrise and moonset depend on the season of the year. The sun and the new moon are always in close proximity. In the summer (in the northern hemisphere) the sun and new moon rise *north* of the midpoint of the eastern horizon and travel in a curve across the sky, first towards the south and then following the path of an arc (at midday) towards the north again, finally setting north of the midpoint of the western horizon. In the winter, the sun and new moon rise *south* of the midpoint of the eastern horizon and travel across the sky, as in the summer, toward the south, curving northward and setting to the south of the midpoint of the western horizon. Why, then, does Rashi say that the moon *always* rises in the south-east and *always* sets in the south-west? (See also Rashi to Yoma 62b, DH Al Taba'as, and **RASHASH** there who asks a similar question.)

(c) Rashi writes that some people are able to see the moon 6 hours before or after the Molad. (People in the east can see the old, waning moon 6 hours before the Molad occurs, and people in the west can see the new, waxing moon 6 hours after the Molad occurs.) The Rishonim ask that this is astronomically impossible: the moon cannot be seen for at least 18 hours after the time of the Molad. (See Rambam, Hilchos Kidush ha'Chodesh 17:3. The impossibility of the 6-hour limit of visibility that Rashi describes has been confirmed by modern astronomers.)

#### ANSWERS:

(a) The **HAGAHOS BEN ARYEH**, as well as **HA'GA'ON RAV YOSEF ELIYAHU HENKIN** zt'l in **LEV IVRA** (pp. 44-45), propose an ingenious solution that offers a simple and astronomically correct rationale to differentiate between what the people in the west and what the people in the east are able to observe in the sky. (The Hagahos Ben Aryeh was written by Rav Zev Lipkin, Rosh Beis Din of Telz and the father of ha'Ga'on Rav Yisrael Salanter. The explanation cited here actually appears as a bracketed insertion in the Ben Aryeh. It is not clear who added it.)

The Ben Aryeh's explanation is explained in greater detail with additional clarifications in **MAGID HA'RAKI'A** (Rav Hasgal of Kiryat Sefer, Israel) and **KUNTRUS KAF-DALET SHA'OS** (Professor Nisim Vidal, former chief astronomer at the Royal Greenwich Observatory, professor of Astronomy at the Australia National University, and visiting professor at the Harvard University Center for Astrophysics), who explain at length the astronomical principles behind this explanation. Below is a summation of their explanation, with three introductory remarks.

1. Although according to the perspective of man on earth, the sun and moon both travel in an east-west trajectory (this perspective is caused by the rotation of the earth on its orbit), rising daily in the east and setting in the west, they also have a motion relative to each other. The moon travels slightly slower than the sun, constantly

falling behind it more and more to the east. As the month progresses, the moon gets progressively farther away from the sun in the sky until it passes the midway point, after which it begins to approach the sun from the other side, the west. Eventually it "catches up" with the sun (or, from the sun's perspective, the sun "catches up" with it) as it travels west to east relative to the sun and passes the sun in an easterly direction. This is what causes the changes in the way the moon appears in the sky, as follows:

At the moment the Molad occurs at the beginning of the month, the moon is directly between the earth and the sun; from man's perspective on earth, the moon and sun are at the same point in the sky. (Actually, the "Molad" refers to the point immediately after conjunction, or "Kibutz." Conjunction is the moment at which the moon passes directly between the earth and the sun.) At that moment, the moon cannot be seen at all (it is between the earth and the sun, and thus all of the light of the sun that it reflects is on the side of the moon that faces *away* from the earth). As the days progress, the moon's orbit lags behind the sun's so that more of the moon becomes visible.

A day or two after the Molad, one can see the moon "behind" (to the east of) the sun. Fifteen days after the Molad, the moon has lagged so far behind in the sky that it is seen on the opposite side of the sky from the sun (that is, the earth is between the moon and the sun; this is called

opposition), and thus at night the entire lit face of the moon is visible (a full moon).

As more days pass (in the second half of the month), the moon's lag causes it to appear to get *nearer* to the sun from the *other* direction (the direction in which the sun is traveling), so that when one looks into the sky he sees the moon ahead (to the west of) the sun. Finally, at the end of the month, the moon's lag causes it to be equal again with the sun (conjunction), and the next Molad occurs.

The moment before the moon passes the point of the sun (before the Molad), it is immediately to the west of the sun. The moment after it passes through the sun (after the Molad), it is immediately to the east of the sun.

2. There are a number of ways to express the changing distance between the sun and the moon. Mathematically, it can be expressed in terms of degrees around a circle (since the sun and moon travel around the earth in a circle, from man's perspective on earth). When the moon is on the opposite side of the sky from the sun (at opposition, at the middle of the month when the moon sets in the west at the time the sun rises in the east), it is 180 degrees away from the sun. When the moon is one-quarter of a circuit away from the sun, it is 90 degrees from the sun, and so on.

This distance can also be expressed in terms of the number of days or hours that have passed from the time of the Molad. This amount of time expresses how many hours or days it has taken for the moon to reach the distance that it lags behind the sun. For example, to say that the moon and sun are fifteen days (half a month) apart means that the distance between the moon and sun is the specific distance the moon lags in fifteen days. (As mentioned above, in terms of degrees this means that the moon is 180 degrees away from the sun).

Since the moon travels 360 degrees from the sun in approximately 30 days (that is, it meets the sun again after completing an entire circuit), it travels 12 degrees in one day, or half a degree in one hour. When we say that the moon is one day (24 hours) away from the sun, that means it is 12 degrees away (because in one day the distance between the moon and the sun increases by 12 degrees).

(It is important to remember that the distance *between the sun and the moon* over the period of an hour should not be confused with the distance that the sun and moon *travel around the earth* over the period of an hour. Since the moon travels around the entire earth (that is, the earth rotates on its axis 360 degrees) once a day, the moon travels 15 degrees every hour relative to any point on earth. However, the sun also travels approximately the same number of degrees around the earth in an hour, so the moon does

not distance itself 15 degrees from the *sun* in an hour. Rather, it only lags one-half of a degree behind the sun in one hour.)

3. The moon is not always visible. When it is near the sun on its orbit, it cannot be seen because of the great luminosity of the sun. How far away from the sun must the moon be in order to be visible? (In other words, what is the earliest time after the Molad at which the moon can be seen under the most favorable conditions?)

Rashi asserts that when the moon has lagged behind the sun for *6 hours* after the Molad and thus is *3 degrees* away from the sun, the moon can be seen because the light of the sun is not strong enough to obstruct its visibility at that distance. This means that both 6 hours before and 6 hours after the Molad the moon may be visible, while the moon is never visible during the interim 12 hours.

However, another factor may obstruct visibility of the moon: the rotation of the earth. Around the time of the Molad, since the moon is so close to the sun it rises and sets only shortly before or after the sun does. Throughout most of the night it is on the other side of the earth (like the sun itself) and therefore it is hidden from the view of man on earth.

With these words of introduction, the Gemara may be understood as follows.

When the Gemara discusses the 24 hours during which the moon cannot be seen, it refers back to the first statement of Rebbi Zeira, "Nolad Kodem Chatzos...." Rebbi Zeira means that if the Molad occurs immediately before midday, the new moon can be seen right after sunset the same evening, since 6 hours have passed and the moon has distanced itself from the sun enough to be seen before it sets (a few minutes after the sun sets). If the Molad occurs *after* midday (by more than approximately 12 minutes), the new moon cannot be seen that evening after sunset, since less than 6 hours have passed from the time of the Molad until the moon sets. The Gemara discusses a 12-hour day (the length of the day at the time of the equinox, when the length of the day and night are equal).

Since the Molad depends on the position of the moon relative to the sun (and not to a particular spot on earth), it occurs at the same instant in time regardless of where the observer is located. For some places on earth, that instant occurs in the middle of the day (i.e., when the sun is directly overhead), while for others it occurs in the middle of the night, and yet for others it occurs at the beginning of the day or the night. The specific case the Gemara discusses (in Rebbi Zeira's second statement) is one in which the Molad occurs just before midday in Eretz Yisrael. For one who lives farther east (such as in Bavel), the time of day at which the Molad occurs is not before midday but shortly after midday (since the

sun already passed overhead earlier in his more easterly time zone), or about 12:30 **PM**.

(When we refer to different times, such as 11:59 in Eretz Yisrael which is 12:30 in Bavel, we do not refer to the time according to the standard time zones used today, but to the actual sun time for each place. That is, if it is a 12-hour day, the sun will set in 6 hours from now in Eretz Yisrael and 5 1/2 hours from now in Bavel.)

Since in Bavel the Molad is half an hour after Chatzos, the moon will not be visible that evening (6 hours will not have passed from the Molad before moonset, which is approximately 6:12 that evening, about twelve minutes after sunset). However, the Molad *did* occur more than 6 hours from *sunrise* that morning. Therefore, that morning the old moon was visible in the east, right before sunrise (i.e., to the immediate east of the sun) when the moon was three degrees away from the sun. The first time the people in Bavel will be able to see the new moon *after* the Molad is approximately 18 hours after the Molad -- that is, when it rises again the morning after the Molad. This is what the Gemara means when it says that "for us [in Bavel], the old moon is covered for 6 hours and the new moon is covered for 18 hours."

In contrast, in Eretz Yisrael -- since the Molad occurred immediately *before* noon -- the new moon *will* be visible just before sunset, 6 hours later (and it will remain visible until it sets a few

minutes after the sun sets). However, the *old* moon was not visible in the morning, since it was within 6 hours of (before) the Molad. The old moon will be visible only before sunset the evening before the Molad, when it is approximately 18 hours (9 degrees) away from the Molad. (The old moon will set *before* the sun, approximately 36 minutes before the sun sets.) This is what the Gemara means when it says that "for them [in Eretz Yisrael], the old moon is covered for 18 hours and the new moon is covered for 6 hours."

All of the words of Rashi throughout the Sugya are easily understood based on this explanation.

(b) Why does Rashi write that the new moon is first visible after the Molad "in the south-west corner of the sky" and the old moon is last visible before the Molad in the "south-east corner"? It is true that if the Molad is close to midday, then the new moon first appears in the west (i.e., at the time that it sets), and the old moon last appears in the east (i.e., at the time that it rises). Why, though, does Rashi say that it is in the *southern* side of the western and eastern horizons?

Rashi explains in a number of places (see 24a, DH Kan) that the sun does not always rise and set at the same place along the horizon. It moves along the horizon, rising and setting more to the south each day in the winter and more to the north each day in the summer. (The discussion here, as well as every discussion in the Sugyas which deal

with topics of astronomy, refers specifically to the northern hemisphere.) Since the moon orbits the earth on the same path as the sun orbits the earth (i.e., on the ecliptic plane, according to man's perspective), shortly before or after the Molad -- when the moon is very near to the sun -- it should be seen setting approximately in the same place the sun sets. Consequently, its inclination to the north or south of the horizon should also vary according to the season just as the sun's inclination varies. It should rise and set on the northern side of the horizon in the summer and the southern side in winter. Why does Rashi write that it is always in the south?

There are two possible ways to understand the words of Rashi.

1. Professor Vidal explains as follows. As mentioned earlier, when the Gemara says that "if the Molad occurs before Chatzos, the new moon will be seen before sunset," it must be referring to a 12-hour day in which the sun sets exactly 6 hours after midday. Such a day occurs twice a year -- on the vernal equinox and on the autumnal equinox (September 21 and March 21). On the equinox, the sun sets exactly at the midpoint of the western horizon, approaching the horizon at an angle from south to north. In such a situation, the new moon -- which is visible right before it sets -- will always be visible when it is slightly *south* of the midpoint. This is what Rashi means when he says that the new moon is in the "south-west" corner when it is first seen.



The same is true for moonrise before the Molad; the moon will be seen rising slightly south of center of the eastern horizon.

However, it is not clear according to this explanation why Rashi writes that it is in the south-west corner "l'Olam" -- "always." Second, why is this called the south-west "corner" ("Keren")? The term "corner" implies, as Rashi himself says later (24a), the *farthest* point to the south at which the sun sets, and not just slightly south of center. Third, Rashi cites the Gemara later (24a) as a source for his statement that the moon is always in the south-west. Rashi there (DH Kan) repeats his assertion that the new moon is always in the south-west, and he clearly states that this applies both in the summer and in the winter months.

2. A second possible interpretation of Rashi's words may be that "the south-west corner" does not refer to the south-west of the world, but rather it is a term which describes the moon's location relative to the sun's location. Whenever the new moon is seen in the west (close to sunset) it is to the south of the sun. Since the sun travels from south to north as it sets in the west, the new moon -- which is farther to the east on the same orbit and sets after the sun -- is always to the south of the sun. Similarly, the old moon -- when seen over the eastern horizon -- is always to the south of the sun because it rises before the sun and is thus ahead of the sun as it travels towards the south.

According to this interpretation, Rashi uses the term "south-west" with regard to the moon (both here and on 24a) differently from the way he uses the term "south-west corner" with regard to the sun (on 24a), because there the term clearly means that the sun is south of the *horizon*. (See Insights to Rosh Hashanah 24a.)

(c) Why does Rashi write that some people are able to see the moon 6 hours before or after the Molad? Astronomically, it is impossible to see the new moon less than 18 hours after the Molad (Rambam, Hilchos Kidush ha'Chodesh 17:3; see also Ba'al ha'Me'or here who says that the same applies to seeing the old moon 6 hours before the Molad).

1. Professor Vidal suggests that although it is true that under normal circumstances the new moon cannot be seen before 18 hours have passed from the Molad, nevertheless under perfect viewing and atmospheric conditions it is possible for one who knows exactly where and when to look to see the new moon earlier.

Professor Vidal points out (Kuntrus Kaf-Dalet Sha'os, p. 9) that almost every year the record is broken for the earliest time at which the moon is seen after the Molad. In Teves of 5757, the new moon was seen by the naked eye only 14 hours after the Molad (and, with a telescope, 12 hours after the Molad). Rashi means that the Chachamim had a tradition as a Halachah l'Moshe mi'Sinai that the earliest possible

moment that the new moon could be seen is 6 hours after the Molad, even under the most ideal conditions. That is how Rashi understands Rebbi Zeira's statement in the name of Rav Nachman. It is not a statement of the average time of visibility of the new moon, but rather it is a statement of the extreme limit of how early the new moon can be seen. This limit enables Beis Din to reject witnesses if they claim to have seen the moon earlier.

2. Alternatively, perhaps according to Rashi the Molad which the Gemara here discusses is not the pure astronomical Molad. Rather, it is the "average Molad" which the Rambam describes in the beginning of Hilchos Kidush ha'Chodesh, which is determined according to the average length of a lunar circuit of 29.5 days and 793 parts of an hour. This Molad does not take into account inconsistencies in the speeds of the earth and moon at different times in the month or in the year. Although these inconsistencies balance out over the course of the year, depending on the month they can cause the true Molad to occur from 6 to 14 hours before or after the average Molad.

When Beis Din scrutinizes the testimony of witnesses, they cannot ignore the possibility that our calculation of the average Molad is not the same as the true Molad, and the true Molad may have occurred 14 hours earlier than our calculation. Therefore, the witnesses are believed as long as they claim to have seen the

new moon at least 6 hours after the Molad (which could actually be 20 hours after the Molad, taking into account the variations in orbital speeds). It is entirely reasonable for the new moon to be seen that long after the true Molad. (M. Kornfeld)

## INSIGHTS TO THE DAF

### INTIMIDATING THE WITNESSES

➤ Rabbi Yochanan taught that on certain months, it is permitted to intimidate the witnesses regarding a new moon that was not seen in the proper time in order to establish Rosh Chodesh on the thirtieth and tell them to testify that they saw the new moon even though in fact they did not see it. The commentators ask that it would seem that we are coercing witnesses to lie outright. Is this permitted?

Pnei Yehoshua writes that we are referring to a case where according to the calculation, the moon should have been seen and in order to establish the new month in the proper time the witnesses can testify that they saw the moon even though they didn't. It is not considered a lie because the knowledge that the moon should have been visible is regarded as if it was actually seen.

He offers an alternative explanation that the witnesses are reconsidering their original testimony and perhaps they saw a sliver of a



cloud in the sky that resembled the moon; Beis Din allows the witnesses to testify that they saw the moon and they are not interrogated extensively on this. Rabbeinu Chananel also seems to understand the Gemora in a similar manner.

The commentators ask that this explanation is still not completely satisfactory since there is a halacha that Beis Din cannot make a “din merumeh” -a judgment based on deceiving evidence. How can Beis Din rule on the new month based on false testimony.

The Steipler Gaon (19) states that perhaps this is a proof to the viewpoint of some of the Acharonim who maintain that the witnesses required for testimony on the new month are distinctively different from other witnesses. Normally witnesses are needed in order to clarify to Beis Din regarding the particular issue being judged at the time. Sanctifying the new month does not require witnesses that will clarify to Beis Din anything since through the calculations of the lunar cycle, Beis Din already knows when the new month should begin. Witnesses are needed only because the Torah requires Beis Din to rule on the new month through witnesses. Perhaps it can be said that Beis Din after listening to witnesses testifying that they saw the moon can rule on the new month even though they know that the witnesses did not actually see the moon. (He does conclude that this explanation will only be sufficient if it is not clear that the witnesses are

lying because otherwise they are not considered witnesses at all.)

Tosfos HaRosh in Kesuvos (32) seems to indicate that witnesses for sanctifying the new month are valid even if they are false witnesses outright. He sites the Scriptural verse “These are Hashem’s appointed [holy days] that you shall designate them as holy occasions,” and it is learned from there that Beis Din’s declaration of the new month is valid even if they choose the incorrect day through a mistake or even deliberately.

The Chasam Sofer writes that these witnesses are not transgressing the prohibition of the Torah of bearing false testimony since it is being done with the knowledge of Beis Din and they are not deceiving anyone.

Rav Yosef Engel explains that these witnesses are not transgressing the prohibition of the Torah of bearing false testimony because the Torah explicitly states “Do not bear false testimony against your neighbor” and by testifying in regards to the moon, one is not testifying against his neighbor and therefore will not be included in the transgression.

Rav Elyashiv Shlita says something very similar to the Chasam Sofer. He states that there cannot be a transgression of bearing false testimony when Beis Din is aware that the witnesses are lying. They are not deceiving anyone and Beis Din is even intimidating them to do so. This is not a lie or false testimony at all.