A Starry Night: Shekiah, Bein Ha-shmashot, and Tzeit Ha-kochavim

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Introduction to *Bein Ha-shmashot* and *Shekiah*

The Torah begins by describing the creation of the Earth and its numerous components. On the fourth day of Creation, (Genesis 1:14) "God said, 'Let there be lights in the expanse of the sky to separate day from night; they shall serve as signs for the set times—the days and the years."' This verse describes an important aspect of Judaism, that everyday life revolves around the clock and the seasons. Halakhically, nighttime is 12 hours long. Many precepts (*mitzvot*) can be fulfilled only during this time. For example, determining when Shabbat starts and ends or calculating the time when one is required to pray at night depends on understanding when day ends and night begins. As Rabbi Joseph B. Soloveitchik eloquently describes:

> If a Jew recognizes, for example, the Sabbath laws and the precepts concerning the sanctity of the day in all their particulars, if he comprehends, via a profound study and understanding that penetrates to the very depths, the basic principles of Torah law that take on form and color within tractate Shabbat, then he will perceive the sunset of a Sabbath eve not only as a natural cosmic phenomenon but as an unsurpassably awe-inspiring, sacred, and exalted vision-an eternal sanctity that is reflected in the setting of the sun.[1]

Rabbi Soloveitchik illustrates the significance of understanding the calculation of nighttime, and the role it plays in a practicing Jew's life. Nighttime will no longer be a technical time of each 24-hour period but will be transformed into a meaningful part of a person's life. Specifically, the "changing of the guard", when the twilight zone transitions the day into night, will become an "unsurpassably awe-inspiring, sacred, and exalted vision" for those who

[1] Soloveitchik, Joseph Dov. *Halakhic Man*. 1st paperback ed., Jewish Publication Society of America, 1991, 38.

comprehend it. One will value nighttime for its own sake, rather than for the fact that it is the harbinger for the next day since the night will have inherent value in one's eyes.

Calculating *Bein Ha-shmashot* (Tractate Shabbat)

Nighttime is determined by ascertaining when sunset (*shekiah*) occurs, the length of the gloaming period (*Bein Ha-shmashot)*, and when three medium-sized stars (*Tzeit Ha-kochavim)* emerge.[2] The Mishna (Shabbat 34a) teaches that there are certain leniencies which may be employed during *Bein Ha-shmashot* on Erev Shabbat, until Shabbat actually begins at nightfall. The Talmud (Shabbat 34b-35b) has a lengthy discussion about the halakhic significance of *Bein Ha-shmashot* and whether it is considered day, night, or (more stringently) as both day and night. In the middle of its discussion, the Talmud presents a total of four opinions as to the length of *Bein Ha-shmashot* in terms of the measurement of (the time that it takes to traverse) a *mil*.[3] The first opinion is that of Rabbi Yehuda (according to the Amora Rav Yosef) who holds that *Bein Ha-shmashot* is 2/3 of a *mil*. The second opinion is that of Rabbi Yehuda (according to the Amora Rabbah) who holds that *Bein Ha-shmashot* is 3/4 of a *mil*. The third opinion is that of the Tanna Rabbi Yose, who holds that *Bein Ha-shmashot* is the length (in time) of the blink of an

[2] Rabbi Elchonon Wasserman (1874-1941) concludes (*Kovetz Shiurim Pesachim 2*) that three stars are just an indicator (Siman) that night has begun but are not the cause (Sibah) for the beginning of nighttime. Rabbi Chaim Druk (1920-1983) explains in his work *Orot Hayyim* (Chapter 2 Section 3) that the debate between Rabbeinu Tam and the Geonim about when nighttime begins (which will be discussed later in this essay) is dependent on whether nighttime is caused by darkness of the sky (automatically causing three stars to be seen, but the emphasis is on the darkness) or if nighttime is caused by seeing three stars. In other words, are the three stars a *siman* or a *sibah* for the beginning of nighttime.

[3] The length of a Mil in terms of time will be discussed later in this essay. For now, a Mil is 2,000 Amot which is either 18 minutes, 22.5 minutes or 24 minutes in length.

eye. The fourth opinion is that of Rabbi Nehemiah who holds that *Bein Ha-shmashot* is (the time it takes to traverse) half a *mil*.

Additionally, the Talmud teaches another way for determining nighttime and *Bein Ha-shmashot* according to Rabbi Yehuda. Whereas the first approach in determining nighttime was based on the measurement of a *mil*, this approach holds that nighttime is determined by darkness of the sky. Rabbah explains that *Bein Ha-shmashot* occurs from the time of sunset (s*hekiah*) until both the upper and lower parts of the eastern sky are dark. Rav Yosef disagrees with Rabbah concerning the start time of *Bein Ha-shmashot*, maintaining that it is still day as long as the eastern sky is red. *Bein Ha-shmashot* begins when the lower part of the eastern sky darkens, and *Tzeit Ha-kochavim* occurs when both the upper and lower parts of the sky are dark. The Talmud (*Shabbat* 35b) teaches that the time for Rabbi Yose's *Bein Ha-shmashot* is already after Rabbi Yehuda's *Bein Ha-shmashot* has ended.[4]

Calculating *Bein Ha-shmashot* (Tractate Pesachim)

There is a second discussion in the Talmud (Pesachim 93b-94a) which calculates the length of time for *Bein Ha-shmashot*. The Mishna (93a) teaches that someone who is far away from the *Beit Ha-mikdash* on Erev Pesach is exempted from bringing the Korban Pesach. The Talmud explains that "far away" means being at least a distance of 15 *mil* away. The Talmud proves this from the distance that a person walks in a single day:

[4] There is a debate regarding how much time elapses between Rabbi Yehuda's *Bein Ha-shmashot* and Rabbi Yose's *Bein Ha-shmashot*. See, for example, Rosh (*Shabbat* 2:23) who writes that the Amoraim were unsure whether Rabbi Yose's *Bein Ha-shmashot* is immediately after Rabbi Yehuda's *Bein Ha-shmashot* or if it is (the time it takes to traverse) 49 *amot* after Rabbi Yehuda's *Bein Ha-shmashot*.

> "How much does a person walk in one day? Ten parsangs [which is equivalent to forty *mil*]. From dawn (*Alot Ha-shachar*) until sunrise (*Neitz Ha-chamah*), a person walks five *mil*, and a person also walks five *mil* from sunset (*shekiah*) until nightfall (*Tzeit Ha-kochavim*) … A person walks 15 *mil* from the morning[5] until the beginning of the afternoon, and a person walks 15 *mil* from the afternoon until nighttime…[94a] … Rabbi Yehuda argues and says … that a person walks four *mil* from *Shekiah* until *Tzeit Ha-kochavim*."

Thus, the Talmud in *Pesachim* teaches that the time between *Shekiah* and nightfall is four or five *mil* as opposed to the Talmud in Shabbat (which maintains that nightfall is ¾ *mil* after *Shekiah*).[6] This glaring contradiction attracts the attention of many of the medieval commentators, and they give several explanations for this discrepancy.[7]

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[5] There is a debate as to when this time begins. The Vilna Gaon (Shulchan Aruch Orach Chaim 459:6) teaches that it begins at *Neitz Ha-chamah* (sunrise), while the Magen Avraham (58:7) teaches that it begins at *Alot Ha-shachar* (dawn).

[6] Throughout this thesis, we will consider the Talmud in tractate *Shabbat* as siding with Rabbah's explanation of Rabbi Yehuda's position, that the time between S*hekiah* and *Bein Ha-shmashot* is ¾ *mil*.

[7] The continuation of the Talmud in Pesachim (94b) discusses a debate between the sages of Israel and the Gentile sages about the path the sun takes to return to its starting point for the next morning. Some of the medieval commentators explain that this debate underlies the opinions of the Geonim and Rabbeinu Tam as will be described in the continuation of this essay. The sages of Israel say that the sun travels beneath the *rakia* during the day and above the *rakia* during the night, while the Gentile sages say that the sun travels beneath the *rakia* during the day and beneath the ground at night. Rabbi Yehuda HaNassi concludes that the Gentile sages are correct. In order to understand this debate, it is necessary to provide some background. Namely, the Talmud assumes "that the *rakia* is a dome over the Earth, and the sun passes through it every morning and evening. According to this [sages of Israel] view, the sun begins to faintly illuminate the sky, which is the inside surface of the dome, at the beginning of each day when it enters a "window" at the extreme east and progressively illuminates the sky as it gets closer to the inside of the *rakia*. *Alos ha'shachar* occurs when the sun enters the "window" of the *rakia*, and twilight extends until the sun passes through the *rakia* and rises above the horizon. Evening twilight [*Shekiah*] lasts until the sun reaches the end of the "window" and rises above the opening; at this point, twilight is over and the sky is completely dark because the sun is on the other side of the opaque *rakia*; this is called *tzeis ha'kochavim*…[the opinion of the Gentile sages] is the idea that the heavens are not in the shape of a dome but rather in the shape of a sphere. The sun revolves around the earth every day. When the sun is above the earth, it illuminates the blue sky above us. After sunset, the sun moves below the earth, and the entire sky falls into a shadow and cannot be seen" (The Great Z'manim Debate, Notis, 2022 p. 46). Modern astronomy has proven both of these opinions incorrect, and they have

Opinion of the Geonim (and later rabbinic interpreters)

The first explanation for the discrepancy in the Talmud is that of Rav Sherira Gaon (d. 1005) and his son Rav Hai Gaon (d. 1038),[8] and their opinion is conveniently cited in the Responsa of Moses ben Isaac Alashkar (d. 1542, section 96).[9] This opinion served as the basis for the practice of the Jews over many centuries in Europe, the Middle East, and Africa. Most later authorities understand the opinion of these Geonim is that *Shekiah* occurs when the sun appears to be entirely below the western horizon (even from higher elevations), but the rays of the sun can still be seen on the western sky. At this point, *Bein Ha-shmashot* commences and lasts for ¾ *mil*, at which point *Tzeit Ha-kochavim* occurs. [According to this view, the Talmud in tractate *Pesachim* is referring to a time called *Tzeit Kol Ha-kochavim*, when all the stars emerge, even the small ones. Nevertheless, *Tzeit Kol Ha-kochavim* does not have any halakhic significance, since nighttime already began over three *mil* earlier].

Moses ben Isaac Alashkar explains that the Geonim understand that the astronomic reality follows like the Gentile sages that the sun goes beneath the earth at night. Therefore, the sun does not need to travel the entire four *mil* width of the *rakia*, since the sun is "absorbed" by the ground. *Shekiah* occurs after the sun is completely "absorbed" by the horizon and is immediately followed by *Bein Ha-shmashot* for ¾ *mil* until *Tzeit Ha-kochavim*.

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been replaced by the heliocentric theory. Nevertheless, the fact that this understanding of the firmament has been disproven by modern science does not affect the times for *Shekiah, Bein Ha-shmashot,* and *Tzeit Ha-kochavim*.

[8] In recent years, a copy of the original Responsa of Rav Sherira Gaon was discovered in the Cairo Genizah and is located in the University of Cambridge's library (manuscript T.S. G 2 103).

[9] Moses ben Isaac Alashkar, also known as the Maharam Alashkar, lived in Egypt and Jerusalem from approximately 1466-1542. *Teshuvot Maharam Al Ashakar Zichron Aharon pages 308-312*.

This explanation was also suggested by Rabbi Elijah b. Solomon of Vilna (the Vilna Gaon, 1720-1797), who explains that *Shekiah* occurs immediately after the entire sun dips beneath the horizon.[10] R. Elijah also reasons that *Tzeit Kol Ha-kochavim* does not occur until four *mil* after *Shekiah,* because that is when all of the sun's light disappears. At that point, there is no more sunlight, and three small stars appear in the sky.[11] The Vilna Gaon explains that the reason the Talmud in *Shabbat* gave two indicators that night has begun, namely, the appearance of three medium-sized stars and that both the top and bottom of the sky appear to be dark, is because of the difficulty in ascertaining what is considered a medium-sized star. Additionally, the Vilna Gaon says the Talmud in both *Shabbat* and *Pesachim* is discussing the time of *Shekiah* and *Tzeit Ha-kochavim* during the autumnal and vernal equinoxes, when the day is at its average length and in both Israel and Babylonia, which are approximately 31-33° North of the equator. However, in Lithuania (and other countries farther north of Israel), there is a greater length of time between *Shekiah* and *Tzeit Ha-kochavim*.[12]

[10] Shulchan Aruch Orach Chaim Siman 261 Paragraph 11. Rabbi Meir Posen, a contemporary rabbinic authority in London, disagrees with this linkage (*Sefer Ohr Meir Chapter 3 Siman 2 page 80*) and holds that the Vilna Gaon argues with the position of the Geonim. If R. Elijah of Vilna agreed to the Geonim, he should have cited their opinion in support of his view. R. Posen therefore explains that the Vilna Gaon understands *Shekiah* to be when the entire body of the sun disappears beneath the horizon. Rav Sherira and Rav Hai, on the other hand, hold that *Shekiah* occurs after the sun's rays disappear beneath the horizon, which occurs a few minutes after the Vilna Gaon's interpretation of *Shekiah*. Nevertheless, this claim seems to be slightly unfounded, as there is a strong likelihood that R. Elijah of Vilna was unaware of the opinion of the Geonim.

[11] To be clear, the stars are always there, but there is too much sunlight for them to be seen during the day. The three stars can only be seen after the sun sets and there is no longer any (significant) sunlight.

[12] The simplest way to explain this is that at the circumference of the Earth (i.e., the equator), where the globe moves more quickly than at the more Northern points, the length of time between *Shekiah* and *Tzeit Ha-kochavim* will be less. This is just as the middle of any spinning ball moves quicker than the poles of the ball.

Opinion of Rabbeinu Tam

The second explanation for the discrepancies in the Talmud is provided by R. Jacob ben Meir (Rabbeinu Tam, 1100-1171, in northern France).[13] Rabbeinu Tam, whose view was also adopted by many subsequent rabbinic authorities in medieval France and Spain,[14] teaches that the Talmud in Pesachim is talking about the length of time from the beginning of *Shekiah* until *Tzeit Ha-kochavim*, while the Talmud in Shabbat is talking about the length of time from the end of *Shekiah* until *Tzeit Ha-kochavim*. Essentially, Rabbeinu Tam holds that the first 3 ¼ *mil* period after *Shekiah* is still considered day, while *Bein Ha-shmashot* begins for the next ¾ *mil* period. At that point, *Tzeit Ha-kochavim* occurs, and nighttime has then begun.[15]

Moses ben Isaac Alashkar (section 96) explains that Rabbeinu Tam is scientifically inaccurate as he understands the astronomic reality to be in accordance with the sages of Israel. The reason for this is because he understands that the width of the *rakia* is four *mil* (as suggested by Rabbi Yehuda in the Talmud), and the sun needs to travel through the entire *rakia* in order for nightfall to occur. As the sun moved westward through the *rakia*, the stars moved eastward

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[13] See *Tosafot* Shabbat 35a (s.v. *trei tiltei mil*), Pesachim 94a (s.v. *rabbi yehuda omer*), Zevachim 56a (s.v. *minain la-dam*), Menachot 20b (s.v. *nifsal be-shekiat ha-chamah*). See also *Sefer Hayashar le-Rabbenu Tam* Chapter 221 in Deblitzki edition.

[14] See Ramban in his *Torat HaAdam (Aveilut Yeshanah page 252 in Mossad HaRav Kook edition*), Rashba (Shabbat 35a s.v. *amar rabbah bar bar chanah*), Raah (Berachot 27b s.v. *shemitchilat*), Ritva (Shabbat 35a s.v. *vehikshah*), Maggid Mishneh (Shabbat 5:4). See also *Sefer Mitzvot Gadol* by Moses b. Jacob of Coucy (d. c. 1250) who was one of the Tosafists and agrees with Rabbeinu Tam. This is also how R. Yosef Karo codifies the halakhah in his Shulkhan Arukh (Orach Chaim 261:2).

[15] Avraham Reiner (*Rabbeinu Tam: Parshanut, Halakhah, Polmos* (Ramat Gan, 2021), 331 (n.78) notes that the view of the Geonim at least initially held sway in northern Europe since Rabbeinu Tam's leading student (and nephew), R. Isaac (Ri) b. Samuel of Dampierre (d. c. 1190) adopts the Geonic view rather than that of his teacher. Another noteworthy student of Rabbeinu Tam, R. Eliezer of Metz, also did not adopt the view of his teacher (although R. Eliezer also did not follow the view of the Geonim; see the next section). At the same time, however, R. Moses of Coucy does adopt Rabbeinu Tam's view in his *Sefer Mitzvot Gadol (mitzvat aseh 32)*. R. Moses (d. c. 1250) was a student of the Tosafist R. Judah Sirelon of Paris (who was himself a direct student of Ri), although R. Moses may also have supported this view because of his journeys to Spain to teach the precepts of Judaism there as well.

through the *rakia* and the night sky. This view of Rabbeinu Tam conforms to the sages of Israel's perspective that the *rakia* is a dome.[16]

Opinion of Rabbi Eliezer of Metz[17]

Rabbi Eliezer of Metz [*Sefer Yereim Amud 7 Siman 274 page 300-303*] argues with both the Geonim and his major teacher, Rabbeinu Tam. He maintains that halakhic night begins five *mil* before *Tzeit Ha-kochavim*, namely at the time when the sun begins to set which is what the Talmud in Pesachim calls *Shekiah*. At this time, the stars begin to emerge, and nighttime commences once three medium-sized stars can be seen. According to Rabbi Eliezer of Metz, *Bein Ha-shmashot* begins ¾ *mil* before *Shekiah*. Essentially, Rabbi Eliezer of Metz holds that the emergence of the stars at *Shekiah* determines when nighttime begins, unlike the other Rishonim who maintain that *Shekiah* is when *Bein Ha-shmashot* begins.

Avraham Reiner suggests that Rabbeinu Tam and Rabbi Eliezer of Metz held almost opposite views. Whereas Rabbeinu Tam believes that there are two times for *Shekiah* (the beginning and the end of *Shekiah*), Rabbi Eliezer of Metz (and the Geonim) maintained that

[16] However, as noted in footnote 7, Rebbi decides the halakha in accordance with the opinion of the Gentile sages, making Rabbeinu Tam's opinion difficult to understand. However, the *Shitah Mekubetzet* (Ketubot 13b *s.v. v"l Harosh)* quotes Rabbeinu Tam as saying that Rebbi was only stating that the Gentile sages were correct with their arguments, but the sages of Israel are factually correct. In a different vein, R. Isaiah di Trani ben Mali (c. 1180-c. 1250) explains (Shabbat 34b s.v. *venire li*) Rabbeinu Tam's opinion in light of the Gentile sages, and that the sun's light still shines in the world until the sun is entirely underneath the earth. This takes the amount of time it takes to traverse five *mil* (while Rabbeinu Tam holds there are only four *mil* between *Shekiah* and *Tzeit Ha-kochavim*).

[17] Rabbi Eliezer b. Samuel of Metz (d. 1198) was a student of the *Rashbam* (Rabbi Shmuel ben Meir) and of Rabbeinu Tam in Ramerupt (northern France). Eventually, R. Eliezer seems to have made his way or returned to Mainz in the German Rhineland, where he taught (note that Metz itself is on the border with Germany). R. Eliezer was in correspondence with Rabbeinu Tam on many issues and was not afraid to disagree with his positions, as recorded in R. Eliezer's compilation *mitzvot*, *Sefer Yerei'm*. On R. Eliezer of Metz's life and works, see E. E. Urbach, *Ba'alei ha-Tosafot* (Jerusalem, 1980), 154-164.

there are two times for *Tzeit Ha-kochavim*. Rabbeinu Tam's position is that only the second *Shekiah* has halakhic significance, while Rabbi Eliezer of Metz (and the Geonim) believed that only the first *Tzeit Ha-kochavim* has halakhic significance. The difference between the opinion of Rabbi Eliezer of Metz and that of the Geonim is evident regarding the timing of *Bein Ha-shmashot*. For Rabbi Eliezer of Metz, *Bein Ha-shmashot* is before *Shekiah* (and serves as his first *Tzeit Ha-kochavim*), while the Geonim felt that *Bein Ha-shmashot* is after *Shekiah* but before *Tzeit Ha-kochavim*. Reiner suggests that the difference between the positions of Rabbeinu Tam and Rabbi Eliezer of Metz is whether to focus on the stars emerging (Rabbeinu Tam), or on the path of the sun (Rabbi Eliezer of Metz). [18]

Opinion of Rabbi Eliezer Ben Nathan (Ra'avan) of Mainz (d. c. 1160)[19]

Ra'avan[20] was asked to explain a seeming contradiction in the Talmud. On one hand, the Talmud (Yoma 81b) teaches that one is required to begin Shabbat early before it is dark, but on the other hand, the Talmud (Shabbat 34a) teaches that only the candles need to be lit before *Shekiah*, implying that it is not necessary to start Shabbat early. Ra'avan answers that the Talmud in tractate Shabbat teaches that while one needs to light candles before *Shekiah*,[21] the

[18] See A. Reiner, *Rabbenu Tam: Parshanut, Halakhah, Polmos* (Ramat Gan, 2020), 334.

[19] Rabbi Eliezer ben Nathan (Ra'avan) of Mainz (c. 1090-1160) was a slightly older contemporary of Rabbeinu Tam, and one of the earliest German Tosafists. His major work of responsa, talmudic commentary and halakhic rulings and discussion is known as *Even ha-'Ezer* or *Sefer Ra'avan*. See Urbach, *Ba'a'lei ha-Tosafot,* 173-184.

[20] The opinion of Ra'avan is somewhat unclear, and there is a dispute among the modern authorities as to how to understand his position. The explanation which follows is the approach presented by Rabbi David Deblitzky in his newly edited and annotated edition of the Ra'avan (Bene Beraq, 2012) Volume II pages 340-343. Others understand that Ra'avan's view is similar to that of Rabbi Eliezer of Metz, while some understand that Ra'avan's view accords with that of the Geonim.

[21] The requirement to light before *Shekiah* is only according to the handwritten manuscript version (Herzog August Wolfenbüttel 5.7) of the text of the Ra'avan, which was copied right around the time that Ra'avan completed his work. The first printed version of the Ra'avan was printed in Prague and is also considered an authoritative version.

Sabbath does not actually begin until *Tzeit Ha-kochavim*. The time between *Shekiah* and *Tzeit Ha-kochavim* is when one is bidden to extend the Sabbath[22] (*Tosefet Shabbat*), thus fulfilling the Talmudic dictum of the Talmud in Yoma. Ra'avan explains that the opinion that *Bein Ha-shmashot* is ¾ *mil* after *Shekiah*, beyond which it is night is only according to the position of the Tanna Rabbi Yehuda (who asserts that nighttime begins when the top and bottom parts of the sky are both dark). Ra'avan, however, maintains that nighttime really begins after five *mil*, as the Talmud in Pesachim asserts. He proves this from Berachot (2b) which maintains that it is still considered daytime until *Tzeit Ha-kochavim*. One who lights candles before *Shekiah* fulfills the requirement of *Tosefet Shabbat* from *Shekiah* until *Tzeit Ha-kochavim* (which according to Ra'avan is 5 *mil* after *Shekiah*),[23] at which point nighttime starts and there is no contradiction between the various Talmudic passages. Rabbi Deblitzky concludes that the Ra'avan's opinion for *Bein Ha-shmashot* is thus the most stringent, since he holds that it lasts for five *mil* from *Shekiah* to *Tzeit Ha-kochavim*.

In this version, the text of the Sefer Ra'avan says that one must light Shabbat candles from *Shekiah* onward, and this is how the Pri Chadash (*Kuntres Dvei Shimshi* page 297 Nachalat Israel edition) quotes him.

[22] Interestingly, the Ramban (*Torat HaAdam Aveilut Yeshanah page 252 in Mossad HaRav Kook edition*) explains the contradiction of Rabbeinu Tam the same way as Rabbeinu Tam does, but he requires the Tosefet Shabbat to occur before Bein Hashmashot, and adds in the point made by Ra'avan (without mentioning him by name). Specifically, the Ramban explains that Bein Hashmashot begins after the second Shekiah, ¾ Mil before Tzeit Hakochavim (and 3 ¼ Mil after the first Shekiah). This is the same way that Rabbeinu Tam explains the contradiction. However, he adds that one is required to add onto Shabbat and is permitted to do so from the first Shekiah, just like the way that the Ra'avan explains in the Prague manuscript. However, although Ramban permits one to extend Shabbat from (the first) Shekiah, the minimum requirement to extend Shabbat is only a few minutes, so one does not need to light at Shekiah (unlike the Ra'avan in the handwritten manuscript). Rabbeinu Tam does not mention the requirement to extend Shabbat, and the requirement to extend Shabbat is a dispute amongst the Rishonim which is beyond the scope of this essay.

[23] According to the majority of the rabbinic authorities who require Tosefet Shabbat, one is only required to add a few minutes to the Sabbath. The *Arugat Ha-Bosem*, whose author, Abraham b. Azri'el of Bohemia was a student of R. Eleazar of Worms (d. c. 1230, and the leading student of R. Yehuda *he-Hasid*), notes that the *Hassidei Ashkenaz* wanted to extend Shabbat by an hour, which would adhere to the opinion of Ra'avan. On the possible connections of Ra'avan to the thought of the German Pietists, see Ephraim Kanarfogel, *Peering through the Lattices: Mystical, Magical, and Pietistic Dimensions in the Tosafist Period* (Detroit, 2000), 161-165.

Further Reflections: The Significance of the Talmudic Pericope in tractate *Berachot*

The law is that only a *kohen* or his family are permitted to partake of *terumah*, 1/50th of all produce grown in Israel. This produce is sanctified, and the *kohen* (or his family) can only consume *terumah* if they are ritually pure. In order to attain ritually purity, a *kohen* is required to immerse in a ritual bath (*mikveh*) during the day, and when nightfall occurs, he is permitted to eat from the *terumah*.

The Talmud in tractate *Berachot* (2a-2b) has a discussion concerning when it is considered nighttime with respect to the *kohen* being permitted to eat *terumah*. In its explanation of when *Tzeit Hakochavim* occurs, the Talmud quotes the verse (Leviticus 22:7) which says, "and the sun shall come, and he will be *tahor* (ritually pure)". The *Baal Ha-maor*[24] quotes in the name of the Geonim that the Talmud's question is:

> "From where do we know that the phrase: "And the sun sets" refers to the setting of the sun's light (beginning of *Shekiah*), and therefore, "and it is purified" means that the person will become purified, [2b] Perhaps the expression: "And the sun sets" refers to the complete setting of the sun (end of *Shekiah*), "and it is purified" refers to the fact that the day is pure."

[24] Rashi has a different presentation of the text wherein he flips the question of the Talmud, although this does not seem to have a major impact on one's understanding of the Talmud (i.e. "From where do we know that the phrase: "And the sun sets" refers to the complete setting of the sun (end of *Shekiah*), and therefore, "and it is purified" refers to the fact that the day is pure, [2b] Perhaps the expression: "And the sun sets" refers to the setting of the sun's light (beginning of *Shekiah*), "and it is purified" means that the person will become purified"), since the conclusion of the Talmud remains the same.

This passage of the Talmud clearly differentiates between the beginning and end of *Shekiah*. The Geonim understand that the Talmud's question is rhetorical, and that "and the sun sets" refers to the beginning of *Shekiah*, and this is the determinant of nighttime (which is ¾ *mil* later). Similarly, Rabbeinu Tam understands that the Talmud's question is rhetorical, but he has Rashi's version of the Talmud in which "and the sun sets" refers to the end of *Shekiah* when the day is purified from all sunlight. Rabbi Soloveitchik[25] derives from here that there are two distinct sections of the Torah which determine day/night: 1) "and the sun sets, and he will be *tahor*", and 2) "and God made the big luminary (i.e. the sun) to rule during the day, and the small luminary (i.e. the moon) to rule at night".[26] Rabbi Soloveitchik explains that the first section teaches that day/night is a function of sunset/sunrise, whereas the second section teaches that day/night is a function of light/dark. He further explains that this is the underlying dispute between the position of Rabbeinu Tam and the position of the Geonim. Rabbeinu Tam understands that day/night is determined by the presence/absence of light, and nighttime is not until the time it takes to traverse 4 *mil* after Shekiah, since this is when all of the light has disappeared. On the other hand, the Geonim understand that day/night is determined by sunrise/sunset. Therefore, *Bein Ha-shmashot* occurs immediately after *Shekiah*, and this is followed by *Tzeit Hakochavim* which is the beginning of nighttime.

[25] *Shiurim le-Zecher Abba Mari pages 119-121*
[26] Genesis 1:16

Understanding the *mil* in terms of time, and calculating *shaot ze-maniyot*

As noted earlier, the Talmud in *Pesachim* (94a) introduces the notion of the day in terms of *mil*:

> "How much does a person walk in one day? Ten parsangs [which is equivalent to forty *mil*]. Ulla says that from dawn (*Alot Ha-shachar*) until sunrise (*Neitz Ha-chamah*), a person walks five *mil*, and a person also walks five *mil* from sunset (*shekiah*) until nightfall (*Tzeit Ha-kochavim*) … A person walks 15 *mil* from the morning until the beginning of the afternoon, and a person walks 15 *mil* from the afternoon until nighttime…[95a] … Rabbi Yehuda argues and says … that a person walks four *mil* from *Shekiah* until *Tzeit Ha-kochavim*."

Rashi[27] [28] explains that a *mil* is 2,000 *amot.* Therefore, the length of time of the *mil* is dependent on when the day has begun. This is subject to a dispute as follows: the *Terumat Ha-deshen*[29] (1:1) understands that daytime begins with dawn (*Alot Ha-shachar*) and ends with nightfall

[27] *Yoma 67a s.v. shivah*

[28] Nearly all Rishonim and Acharonim concur with this opinion although some want to claim that R. Elazar Ha-Kalir (c. 570-640) understands that a *mil* is only 1,425 *amot* long, but its diagonal (when making a *mil*-by-*mil* square) is approximately 2,000 *amot*. See *Yerushateinu (Machon Moreshet Ashkenaz) Volume 1 Year 5777* (p. 59-64) and *Yarchon HaOtzar Gilyon 42* p. 237-263) for more information. Interestingly, Prof. Leo Levi (*Halakhic Times for Home and Travel: World-Wide Times-of-Day Tables with Halakhic and Scientific Foundations and Permanent Calendar*. 3rd expanded ed., R. Mass, 2000, p. 25.) quotes R. Yosef Eliyahu Henkin (1881-1973) as suggesting a possible resolution to the contradiction between the Talmud in Shabbat and the Talmud in Pesachim by declaring that the Talmud in Shabbat is referring to a different type of *mil* where 2/3 of it are equivalent to 4 *mil.* While this is not the same as a Roman *mil*, it is in intriguing example of utilizing other versions of the *mil* to resolve Talmudic discrepancies.

[29] R. Zev Wolf b. Samuel Ulskar (1700-1778) in his *Hiddushei Ha-Razah* (page 98 Kominer edition) explains that Rabbeinu Tam subscribes to this opinion, and that the calculation for the day begins at *Alot Ha-shachar* and ends with *Tzeit Ha-kochavim*. However, not all later authorities agree to this interpretation of the *Hiddushei Ha-razah*. Additionally, the *Terumat Ha-deshen* (R. Israel Isserlein, Austria 1390-1460) himself is not so clear as to his personal views (see *Shut Terumat Ha-deshen 1:1*), but this is how the majority of Acharonim understand him.

(*Tzeit Ha-kochavim*). On the other hand, the Vilna Gaon (*Shulchan Aruch Orach Chaim* 459:3) argues that daytime begins with sunrise (*Neitz Ha-chamah*) and ends with sunset (*shekiah*).[30]

Depending on the start and end of *halakhic* daytime, the length of a *mil* in terms of time will change. In order to make this calculation, one is required to divide the average day (which is 12 hours of 60 minutes of daytime and 12 hours of 60 minutes of nighttime) into 12 equal parts. Accordingly, one hour is 60 minutes, and there is a total of 720 minutes each day. The *Terumat Ha-deshen*, who posits that daytime begins at *Alot Ha-shachar* and ends at *Tzeit Ha-kochavim*, understands that a *mil* is 18 minutes long.[31] He reaches this conclusion by dividing 720 minutes by 40 *mil;* hence each *mil* is 18 minutes. On the other hand, the Vilna Gaon, who maintains that halakhic daytime begins at *Neitz Ha-chamah* and ends at *Shekiah*, divides these 720 minutes into 32 equal parts[32] and concludes that a *mil* is 24 minutes long. Alternatively, the Vilna Gaon divides the 720 minutes into 30 equal parts,[33] thereby concluding that a *mil* is 22.5 minutes long. Nevertheless, the *Shulchan Aruch* (*Orach Chaim 459:2)* rules that a *mil* is 18 minutes long. The Vilna Gaon explains that the reason for this ruling is not as the *Terumat Ha-deshen's* explanation

[30] The *Hiddushei Ha-razah* presents a third minority opinion that daytime begins from *Alot Ha-shachar* and ends at *Shekiah* although this is a novel interpretation that is rejected by nearly all other authorities.

[31] This is the traditional interpretation of the *Terumat Ha-deshen*. See further for a novel explanation for the *Terumat Ha-deshen's* opinion.

[32] This is in accordance with Rabbi Yehuda who declares that one travels four *mil* between *Alot Ha-shachar* and *Neitz Ha-chamah*, and one also travels four *mil* between *Shekiah* and *Tzeit Ha-kochavim,* making one *mil* 24 minutes. This is also the opinion of Maimonides in his commentary to the Mishnah in Pesachim (3:2). The Vilna Gaon points out that Maimonides contradicts himself in his commentary to the Mishnah in Berachot (1:1) where he claims that there are 72 minutes from *Alot Ha-shachar* until *Neitz Ha-chamah* (i.e., each *mil* is 18 minutes long because 720/40=18), since this according to Rabbi Yehuda's opinion that there are 4 *mil* between *Alot Ha-shachar* and *Neitz Ha-chamah*. One approach in reconciling this contradictuion is provided by R. Avraham Yeshayahu Karelitz (Chazon Ish, 1878-1953, *Orach Chaim 13:2* in *Sefer Chazon Ish*) who explains that Maimonides originally thought that a *mil* is 24 minutes, but he later changed his mind to a *mil* being only 18 minutes.

[33] This is in accordance with Ulla who maintains that a person travels five *mil* between *Alot Ha-shachar* and *Neitz Ha-chamah*, and one also travels five *mil* between *Shekiah* and *Tzeit Ha-kochavim,* making one *mil* 22.5 minutes.

since he is astronomically incorrect.[34] For this reason, the Vilna Gaon asserts that the reason a *mil* is 18 minutes long is because the final outcome of the Talmud in Pesachim is that a person travels 40 *mil* between *Neitz Ha-chamah* and *Shekiah* (and the four *mil* that one travels between *Alot Ha-shachar* and *Neitz Ha-chamah* is irrelevant to the Talmud's calculation). This results in a *mil* being 18 minutes long, and a person can travel 48 *mil* in one day (as opposed to the 40 *mil* which is the simple understanding of the Talmud).

The Length of a *Mil* According to Rabbeinu Tam

Rabbeinu Tam does not explicitly state his position on the length of a *mil*, and as noted earlier, the length of a *mil* will affect the time when *Tzeit Ha-kochavim* occurs.[35] Rabbeinu Tam writes (Tosafot Berachot 2a s.v. *Me-eimatai*) that nighttime begins at *Plag Ha-mincha*, which is one and a quarter hours before[36] *Tzeit Ha-kochavim* or 1/6 *mil* before *Shekiah*.[37] Logically, it makes sense to claim that midday is when the sun is in the middle of the sky, and this is also the implication of the Talmud in tractate Pesachim (11b). R. Mordechai Willig posits (*Am*

[34] According to the *Terumat Ha-deshen*, the length of time between *Alot Ha-shachar* and *Neitz Ha-chamah* must be the same as the length of time between *Shekiah* and *Tzeit Ha-kochavim.* This is clearly not so as the time between *Alot Ha-shachar* and *Neitz Ha-chamah* is longer than the time between *Shekiah* and *Tzeit Ha-kochavim.* Even on an average day in Israel, this is astronomically impossible.

[35] This is assuming that one views *Tzeit Ha-kochavim* according to Rabbeinu Tam as a fixed amount of time after *Shekiah* (see, for example, *Pri Megadim Eshel Avraham 261:9* who states that Rabbeinu Tam holds that *Tzeit Ha-kochavim* is a fixed 72 minutes after *Shekiah* in all locations), however, the *Minchat Kohen* (R. Avraham Pimintal 1627-1697) explains (*Minchat Kohen Mevo Ha-Shemesh Maamar 2 Chapter* 4) that Rabbeinu Tam agrees that nighttime has begun when three medium-sized stars are visible to the naked eye, even if this is before the time of 4 *mil*. According to this interpretation, the time for nighttime is not affected by the length of a *mil*.

[36] The Levush, who understands like the Vilna Gaon that daytime is calculated from *Neitz Ha-chamah* to *Shekiah,* argues that *Plag Ha-minchah* is one and a quarter hours before *Shekiah*.

[37] This is how the *Terumat Ha-deshen* (1:1) and the Ramban in his *Torat HaAdam (Aveilut Yeshanah page 252 in Mossad HaRav Kook edition)* explain the opinion of Rabbeinu Tam. This is also how R. Mordechai Willig defends the *Terumat Ha-deshen* from the Vilna Gaon's attacks, and that the *Terumat Ha-deshen* agrees to Rabbeinu Tam that a *mil* is 22.5 minutes, since the talmudic hour is 75 minutes long.

Mordechai al Masechet Berachot section 2) that Rabbeinu Tam maintains that a *mil* is 22.5 minutes long, while the Vilna Gaon (and presumably the Geonim) contends that a *mil* is only 18 minutes long. He proves this from Rabbeinu Tam's view that daytime begins at *Alot Ha-shachar* and extends until *Tzeit Ha-kochavim,* thereby dividing the 900 minutes of the (average) day into 40 equal parts of 22.5 minutes each. On the other hand, the Vilna Gaon (according to his final conclusion in *Orach Chaim 459:3*) understands that daytime extends from *Neitz Ha-chamah* until *Shekiah*, dividing the 720 minutes of the (average) day into 40 equal parts of 18 minutes. Rabbeinu Tam holds that day begins at *Alot Ha-Shachar* and ends at *Tzeit Ha-kochavim*. From this Rabbi Willig proves, it must be that the average day is 900 minutes, and each halakhic hour is 75 minutes (since there are 12 hours in the day, and 900/12=75). Accordingly, *Plag Ha-mincha* is 93.75 minutes before *Tzeit Ha-kochavim* which is 1/6 *mil* before *Shekiah* (since 1/6 of a 75-minute hour is 3.75 minutes),[38] and that *Tzeit Ha-kochavim* according to Rabbeinu Tam is 90 minutes after Shekiah.

Timekeeping in the Ancient World and during the Middle Ages

The way people tell time has evolved over the millennia, and this has affected the way people determine *Shekiah, Bein Ha-shmashot,* and *Tzeit Ha-kochavim*. Starting in the ancient Egyptian civilization, time was originally measured using sundials and water clocks. The Greek and Roman cultures utilized these devices to measure temporal hours which varied by the length of the day/night. This is also known as *shaot zemaniyot*, and they are longer in the summer and shorter in the winter. The earliest recorded mechanical clock, however, was not invented until

[38] This results from the time between *Shekiah* and *Tzeit Ha-kochavim* being four *mil* of 22.5 minutes each (i.e. 22.5 *4=90, and add 3.75 which is 1/6 *mil* to reach a conclusion of *Plag Ha-mincha* being 93.75 minutes before *Shekiah*).

1283 in Bedfordshire, England, where the Roman Catholic Church needed to adhere to strict prayer times. As time progressed, the clock became a domestic device as well, and eventually, was transformed into a pocket and wristwatch.[39] Nevertheless, the halakhic literature remains silent about the clock for approximately 200 years following its invention.[40] While it is unclear as to the reason why, Professor Yisrael Ta-Shma (*Knesset Mechkarim Vol. 4 p. 216*) surmises that there was no need for the Jewish community to utilize these devices since halakhic times could be determined based on sight alone and there is a broad window of time to fulfill one's halakhic obligations, so they did not need to be very precise with time. Accordingly, there is little discussion about it in the halakhic literature for the first 200 years of its existence.[41] The first mention of a clock is found in the writings of the fifteenth-century German rabbinic authority, R. Jacob Weil (section 130), where he prohibits the use of an alarm clock on the Sabbath because it violates the prohibition of making noise. This question was also addressed by R. Israel Isserlein, as quoted by his student, R. Joseph ben Moses in his work *Leket Yosher* (Berlin, 1903, p. 48 Freimen edition). R. Joseph ben Moses further (ibid., p. 64-65) notes that there is no formal prohibition for turning over a sand/water clock, although people acted as though it is not allowed. It is clear that although this form of timekeeping had already been in existence for several centuries, its use did not become widespread amongst the Jewish community until the 15th century when it is first mentioned in the Rabbinic literature. Professor

[39] Andrewes, William J. H. "Timekeeping Has a Long, Colorful History." *Scientific American*, Scientific American, 24 Oct. 2014, https://www.scientificamerican.com/article/timekeeping-has-a-long-colorful-history/.
[40] Ta-Shma, Yisrael. *Chapter 17: Rishumei Medidot Ha-zman Bsafrut Ha-rabanit Shel Yemei Habeinayim. Knesset Mekhkarim Vol. 4.* Bialik Institute. 2010.
[41] The Mishnah (i.e., Eiduyot 3:8, Keilim 12:4-5) discusses sundials, and some of the early sources in the Middle Ages (e.g. see Rashba on Berachot (3b) where he quotes Rav Hai Gaon that King David had a water clock) discuss the usage of water clocks and sand clocks.

Ta-Shma notes that the Sephardic communities permitted the usage of clocks on the Sabbath, while the Ashkenaz communities prohibited them.

Possible suggestion for *Terumat Ha-deshen*

A possible correlation may be drawn between the *Terumat Ha-deshen*'s opinion and the advent of clocks. As noted above, the first mention in halakhic literature regarding clocks is by the *Terumat Ha-deshen*'s main student, R. Joseph ben Moses. As clocks became more widespread, the hour became standardized into 24 equal hours, as Ta-Shma describes in his aforementioned article (p. 216-217). This might have been one of the incentives for the *Terumat Ha-deshen* to decide the halakhah in accordance with the opinion of Rabbeinu Tam. As the *Terumat Ha-deshen* writes (section 1), "the custom has become [to pray the night prayers before *plag ha-minchah*] because of the weakness which descended upon the world, and many people are hungry and eat early,[42] especially when the days are long". People were no longer adhering to the strict halakha of praying at the proper times, and they would pray earlier in order to eat after prayers. Therefore, by establishing rigid times for *Shekiah, Bein Ha-shmashot,* and *Tzeit Ha-kochavim*, the *Terumat Ha-deshen* was able to ensure that people could eat and not forget to pray. The clock facilitated this development as it allowed for people to identify the time for prayer as a fixed 4 *mil* (irrespective if the *Terumat Ha-deshen* understands a *mil* as being 18 minutes or more likely, 22.5 minutes long).

[42] It is prohibited to eat before praying, so therefore, people would pray early so that they could eat dinner while it was still light outside.

This approach is supported by the comments of R. Mordechai Yoffe (c. 1530-1612) in his magnum opus, Levush, on Orach Hayyim (267:2). R. Yoffe writes that the custom is to pray *maariv* early on the Sabbath Eve, but not before *plag ha-minchah*. He continues that the *Terumat Ha-deshen* was mistaken with his interpretation, and attributes it to the *Terumat Hadeshen'*s lack of scientific measurements and works. Therefore, he claims, the *Terumat Ha-deshen* misunderstood Hazal's interpretation that the day is from *Alot Ha-shachar* until *Tzeit Ha-kochavim*, but rather, the day lasts from *Neitz Ha-chamah* until *shekiah*. However, it is possible to suggest that the *Terumat Ha-deshen* based his opinion on the technological advances in timekeeping, and that the clock was the impetus for his halakhic decision. The standardization of time which the clock provided was a sufficient reason to assume that this is the halakha. Similarly, Rabbeinu Tam, might have decided the halakha as a strict four *mil* after *Tzeit Ha-kochavim* in order to make it simpler for the layman to determine nighttime if it is a fixed amount of time after *shekiah*.[43] Although Rabbeinu Tam did not have access to a mechanical clock, he did have access to a water and sand clock which is reliable to keep a specific measurement of time. Nevertheless, Rabbeinu Tam and the *Terumat Ha-deshen* would agree that if a person saw three stars, then it would be considered nighttime, even before the time it takes to travel four *mil* has transpired.

Despite the above-mentioned approach, as R. Abraham ha-Kohen Pimentel (seventeenth century) suggests in his *Minhat Kohen (Maamar Mevo Ha-shemesh 2:4)*, even Rabbeinu Tam would agree that once three medium-sized stars can be seen, it is considered nighttime. Due to the abundance of clocks in the *Minhat Kohen*'s locale (Amsterdam), he was able to calculate that nighttime began 48 minutes after *shekiah* in Amsterdam in the Spring. Similarly, he writes (ibid.)

[43] This is in accordance with the suggestion of Pri Megadim (*Eshel Avraham* 261:9), as quoted by the Bi'ur Halakhah (261:2 s.v. *shehu*), that *tosefet shabbat* is a fixed 72 minutes after *Shekiah.*

that the length of *Bein Ha-shmashot* fluctuates depending on the season of the year, *Bein Ha-shmashot* is longer during the summer and shorter during the winter. He concludes that the Talmudic measurements of *Bein Ha-shmashot* were only for the latitudes of Israel and Babylonia. Nevertheless, he was reluctant to tell people to follow his conclusions because he was upending the common custom of following Rabbeinu Tam at a fixed four *mil.* Therefore, "since many Rishonim followed Rabbeinu Tam, and since the approach of the Geonim did not resolve the contradiction from Pesachim, the *Minhat Kohen* ruled that for davening *Minchah* and such Rabbinic Mitzvot, one may rely on Rabbeinu Tam" (The Great Z'manim Debate, Notis, Lakewood, 2022 p. 108-109). On the other hand, for laws on a Torah level, the *Minhat Kohen* rules stringently as per the opinion of the Geonim (i.e. that *Bein Ha-shmashot* begins immediately after *shekiah*, prohibiting one from performing acts of labor on the Sabbath Eve from *shekiah*), and the *Beiur Ha-lachah* (Orach Hayyim 261 s.v. *shehu*) quotes this as the common practice. Furthermore, on *Motzei Shabbat*, the *Bi'ur Ha-lachah* rules that one should act stringently in deference to the opinion of Rabbeinu Tam since it is hard to calculate *Tzeit Ha-kochavim* and people would determine *Tzeit Ha-kochavim* by eyesight alone (i.e., if they saw three medium-sized stars).

Determing *Tzeit Ha-kochavim* Using Degrees

As mentioned earlier, R. Elijah of Vilna explains that the intervals that the Talmud records for determining *Tzeit Ha-kochavim* are referring to the latitude of Israel during the average day at the time of the equinox. As a result, R. Elijah of Vilna establishes that nighttime throughout the world will be when the level of darkness reaches that in Israel at the time that the Talmud records

(i.e., ¾ of a *mil* after *Bein Ha-shmashot* for R. Elijah of Vilna, or 4 *mil* after *Bein Ha-shmashot* for Rabbeinu Tam). This level of darkness can be ascertained via spherical trigonometry[44] by calculating how many degrees the sun has sunk below the horizon at the time of *Tzeit Ha-kochavim* (according to each of the different opinions). The first known source to explicitly calculate halakhic times through use of degrees is R. Joseph Solomon Delmedigo (1591-1655) in his work *Chukot Shamayim.*[45] This approach gained popularity throughout the years and was first incorporated in R. Raphael Hanover's (1685-1779) calendar in 1776, where he determined that *Tzeit Ha-kochavim* is when the sun is 7.5 degrees beneath the horizon.[46] Similarly, R. Abraham ha-Kohen Pimentel writes in his *Minhat Kohen* (*Maamar 2 Chapter 5*) that *Tzeit Ha-kochavim* is 48 minutes after *Shekiah*, at which time the sun is 8.1 degrees beneath the horizon. On the other hand, several Hungarian Rabbinic authorities determined that *Tzeit Ha-kochavim* is when the sun is approximately 9.3 degrees below the horizon. In R. Dovid Braunfeld's work *Dvar Yom,*[47] he converts the amount of time after *Bein Ha-shmashot* until *Tzeit Ha-kochavim* into degrees according to each of the opinions of the length of a *mil*. For example, if one abides by the 22.5-minute *mil,* this is equivalent to when the sun is 4.4 degrees below the horizon for R. Elijah of Vilna, and 19.75 degrees below the horizon according to Rabbeinu Tam. Nevertheless, R. Dovid Braunfeld is calculating in Israel on the average day at the equinox when determining *Tzeit Ha-kochavim* using medium-sized stars.

The Shulkhan Arukh (Orach Hayyim 293:2) holds that due to *tosefet shabbat*, the Sabbath only ends after the emergence of three small stars. Therefore, it is imperative to understand the

[44] See Prof. Leo Levi's (1926-2019) work *Halakhic times for home and travel*, 1992, p. 22-23 for a formula to calculate these times.
[45] Questions 35-38, p. 275-277 Belinson edition.
[46] As per R. Haim Beinish (*Hazemanim B'halakhah p. 524, Machon Keter Torah Radomsk*).
[47] Chapter 6, p. 105, 2013, Israel Bookshop Publications.

number of degrees at nighttime upon which three small stars emerge. R. Baruch Cohen, in a letter to R. Dovid Tzvi Hoffman[48] writes that that *Tzeit Ha-kochavim* is when the sun is seven degrees and five arcminutes below the horizon, to which R. Dovid Tzvi Hoffman responds by quoting several other opinions of *Tzeit Ha-kochavim* in terms of degrees (such as 6.5 degrees and 10 degrees). Nevertheless, it is important to note that these calculations were made based on observation in the hometowns of these rabbis and not in Israel. The final decisor for *Tzeit Ha-kochavim* in Jerusalem is R. Yechiel Michel Tukacinzky (1871-1955) who determined that *Tzeit Ha-kochavim* is when the sun is 8.5 degrees below the horizon, as he discusses in his work *Bein Ha-shmashot* (1929, *Dfus Tzion Yerushalayim p. 49*). This calculation for *Tzeit Ha-kochavim* is corroborated by R. Moses Feinstein (*Shut Igrot Moshe Orach Chaim 4:62*), as he calculates that *Tzeit Ha-kochavim* for Rabbeinu Tam is 50 minutes after *Shekiah*, at approximately 8.5 degrees.[49] On the other hand, R. Haim Beinish records in his *Hazemanim B'halakhah (p.534)* that the *Hazon Ish* (1878-1953) held that *Tzeit Ha-kochavim* is between 9.1 and 10.2 degrees, depending on the season of the year. Nevertheless, each community follows its customs and rulings as ordained by its Rabbi.

Conclusion

Since time immemorial, there has been a dispute amongst the Rabbis as to the length of time between *Shekiah* and *Tzeit Ha-kochavim.* Starting from the Talmud, there is a contradiction

[48] *Shut Melameid Le-ho'il Section 30.*

[49] It is interesting that R. Moses Feinstein is calculating the time in New York according to Rabbeinu Tam and reached a similar conclusion as R. Yechiel Michel Tukacinzky who calculated according to the opinion of the Geonim in Israel. Nevertheless, this opinion of R. Moses Feinstein is subject to much dispute, as many contemporary Rabbinic authorities hold that *Tzeit Ha-kochavim* is before 8.5 degrees in America.

as to the length of time in *mil* between *Shekiah* and *Tzeit Ha-kochavim*. The resolution to this conflict resulted in two main opinions, the Geonim and Rabbeinu Tam. Whereas the Geonim emphasize that the Talmud in Shabbat is correct, Rabbeinu Tam opined that the Talmud in Pesachim is correct. This led to an age-long debate as to how to determine *Tzeit Ha-kochavim*. In addition, several other factors are necessary to determine in order to definitively conclude the time of *Tzeit Ha-kochavim*. These include converting the length of a *mil* into minutes and halakhic hours. Moreover, there are several contradictions within the medieval opinions, further complicating matters. As a result, a possible correlation can be drawn between those following the opinion of Rabbeinu Tam and the advent of the clock. However, at the end of the day (pun intended), many contemporary Rabbinic authorities advocate for the calculation of *Tzeit Ha-kochavim* based on depression angles and degrees the sun is below the horizon.

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