4. Landau, *Derushei Haẓelah* (Warsaw, 1899; Jerusalem, 1966), p. 29b. *Ir Damasek Eliezer*, quoted in Piekarz, p. 166.

5. Joseph ibn Shem Tov, *Ein Hakore*, British Museum MS Or. 10550,f. 14b. A translation of this and other passages from this text will appear in my forthcoming book *Jewish Preaching, 1200–1800*.

6. Eliezer Fleckeles, *Olat Ḥodesh* (Prague, 1785), pp. 7a-b. Cf. R. Asher on Rosh Hashanah 3, 4 (end), p. 77a, and R. Nissim in Alfasi, Rosh Hashanah, p. 6b.

7. *Ein Hakore*, pp. 15a-b.

8. Zerah Eidlitz, *Or Layesharim* (Prague, 1785), p. 17b; cf. Alsheikh, *Mar'ot Ẓoveot* on Isaiah 58:1.

9. Issachar Baer Bloch, *Binat Yissachar* (Prague, 1785), p. 4d; cf. Benjamin Meir ben Elhanan, *Kerem Binyamin* (Vilna, 1885), p. 26d, and Piekarz, p. 116 at n. 71.

10. Judah Messer Leon, *Nofet Ẓufim*, in Isaac Rabinowitz, *The Book of the Honeycomb's Flow* (Ithaca: Cornell University Press, 1983), pp. 128–19.

11. Fleckeles, *Olat Ḥodesh*, p. 4b–5a.

12. Elijah ben Moses Gerson, *Hadrat Eliyahu*, p. 101b; cf. *Kerem Binyamin*, p. 26b.

13. *Hadrat Eliyahu*, 101b; cf. Piekarz, pp. 116–17.

14. Luntshitz, *Olelot Ephraim*, II, 31, 210–11. This entire passage is translated in my forthcoming book.

15. Eidlitz, *Or Layesharim*, pp. 27b–c. This entire passage, and the interesting parable preceding it, is translated in my forthcoming book.

16. Joseph Weiss, "Via Passiva in Early Hasidism," *Journal of Jewish Studies*, 11:3 and 4 (1960), esp. pp. 141–42. This imagery is similar to that used by Christian preachers, such as Vincent Ferrer: "When a musician plays a horn, to which does the melody belong, to the horn or to the musician? Surely to the musician. So with a good preacher, who lives a good life: he is the instrument, but Jesus Christ is the musician who inflames the will to love, the intellect to discern, the memory to recall" (Sermons, ed. Josep Sanchis Sivera [Barcelona, 1934], 2, 72); cf. Grasso, *Proclaiming God's Word*, pp. 33–34.

17. Rivka Shatz-Ufenheimer, *Haḥasidut Kemistikah* (Jerusalem, 1980), pp. 117–18. Piekarz, p. 117, warns against pressing such a passage too far as evidence for a kind of social activism. However, it should be noted that this passage appears to have been adumbrated in a 1745 sermon by Jonathan Eybeschuetz (*Ya'arot Devash* [Jerusalem, 1968], I, p. 80d), where the message is clearly that the preacher should not fear punishment from powerful opponents in criticizing the sins of the people.

The Strange Case of December 4: A Liturgical Problem

Arnold A. Lasker and Daniel J. Lasker

Every year, around the beginning of December, the question arises among Jews familiar with the daily prayers, "When do we start saying *tal u-matar?*" This is the prayer for "dew and rain" inserted in the ninth benediction (*Birkat Hashanim*) of the *Shemoneh Esreh* in every weekday service during winter, until it is discontinued with the coming of Passover.[1]

One reason for this recurring perplexity is that most prayerbooks provide inadequate, confusing, and even incorrect instructions on the subject. Prayerbooks printed in this century generally indicate that one begins recitation of *tal u-matar* "starting on December 4." Others mention December 5 and/or December 6. Prayerbooks printed prior to 1900, however, refer to December 3 (or 4 and/or 5). Usually reference to a *luah minhagei beit knesset* (the specifically liturgical calendar) is necessary to know the exact starting time for *tal u-matar*, but even there, mistakes have been known to occur.[2]

The answer to the question is actually quite simple. In this century, three years out of four, the words *"tal u-matar"* are inserted beginning with the *ma'ariv* service of December 4. In the other year, the insertion starts with the *ma'ariv* service of December 5.[3] The quadrennial years are those in which December falls during a Hebrew year divisible by 4, such as 5744 or 5748, which is the same as the December immediately preceding a civil leap year (1983 or 1987).

Connected with the question of when *tal u-matar* is to be said is another one: "Why is the time of saying this particular prayer dependent upon the "Christian" (or "civil" or "secular") calendar—based on the sun—when all other liturgical prescriptions are scheduled on the basis of the Jewish—lunisolar—calendar? The question is even more puzzling in the light of the fact that in Israel the saying of *tal u-matar* begins on the evening of the seventh of Marḥeshvan (which fluctuates during this century from

RABBI ARNOLD A. LASKER *is retired and living in Margate, Fla.*

DR. DANIEL J. LASKER *is a Lecturer in Medieval Jewish Philosophy at Ben Gurion University in Beer Sheva. Rabbis Lasker are father and son.*

October 11 to November 9, as much as 54 days before December 4) and is totally unconnected with the solar, Christian calendar.[4] Only in the Diaspora is the solar date followed.

These facts lead to additional questions. Why is the Diaspora date so much later than the one followed in Israel? What is the significance of the dates December 4 and 5? Furthermore, since the Diaspora prayers are obviously not determined by the needs of the Land of Israel, for whose benefit do Diaspora Jews pray?

The date for starting to pray for rain in the Land of Israel derives from a discussion in the Mishnah (Ta'anit 1:3), where we read: "On the third of Marheshvan one is to begin praying for rain; Rabban Gamaliel says: 'On the seventh of that month, fifteen days after the feast of Tabernacles, so that even the tardiest Israelite may reach the Euphrates [on the return journey from the pilgrimage to Jerusalem].'" The Babylonian Talmud (Ta'anit 10a) quotes Rabbi Eleazar as stating that the law is in accordance with Rabban Gamaliel, that one must postpone the start of the request for rain so as to give pilgrims an opportunity to return home while the roads are still dry. On this basis, the date of the seventh of Marheshvan is followed in Israel to this day.[5]

That explains the date for the Land of Israel, but already in Mishnaic times that date was not followed by Jews everywhere. We are told in a baraita (Ta'anit 10a) that Hananiah, who had lived in Babylonia, reported that the Jews there started praying for rain at a different time. He is quoted as saying, "But in the Golah, [one waits] until the sixtieth day from the [autumnal] equinox." This statement is followed by the assertion of Samuel that "the halakhah is in accordance with Hananiah."[6]

The date given by Hananiah was "shishim yom batekufah" (which we have translated here as "the sixtieth day from the [autumnal] equinox"). The term tekufah is used in the Talmud either to indicate a season (winter, spring, etc.) or the beginning of a season (solstice or equinox).[7] Hence, "sixty days in the tekufah" can mean either the sixtieth day from the [autumnal] equinox or the sixtieth day of the [autumn] season.[8] This still is not sufficient to define the date conclusively. There are two questions involved. First, is the day of the tekufah to be considered as the end of the preceding season or the beginning of the new season? Second, does the prayer for rain begin on the sixtieth day or on the morrow? The answers are that the day of the tekufah is counted as the first day, and the prayer is begun on the sixtieth day. Hence, the saying of tal u-matar starts fifty-nine days after the day of the tekufah.[9]

The Babylonian practice, as reported by Hananiah, was apparently a well-established one. The reason for the late start for the recitation of tal u-matar in that country as compared with the date in the Land of Israel is, however, not specified in the talmudic sources.[10] Various explanations, meteorological, topographical and agricultural, have been suggested for this divergence. Among them all, the most compelling reason for the delay in Babylonia seems to have been the desire of the inhabitants there to avoid the likelihood of rain until after the date crop had been fully harvested.[11] Whatever the reasons may have been, it is quite evident that the Jews both in the Land of Israel and in Babylonia set the beginning dates of their prayers for rain according to their respective local needs.[12]

When Jews found themselves in other countries, they were confronted with the question: should they also pray for rain according to the needs of their own country of residence, or should they follow an already established schedule, either that of the Land of Israel or that of Babylonia? Since Babylonian procedures were usually followed in the whole Diaspora, it became the general practice of Jews almost everywhere outside the Land of Israel to offer their prayers for rain on the same dates as did their Babylonian coreligionists.

The most noteworthy attempt to alter the practice was made by Rabbenu Asher ben Yehiel (Rosh, c. 1250-2327). He tried to establish the principle that Jews in each country would decide for themselves when to say tal u-matar, but he was rebuffed by his contemporaries. The fact that an authority of such repute was unsuccessful in this endeavor made it practically impossible for the question to be raised, at least in Europe, ever again. (The problem did arise in a different context when Jews settled in the southern hemisphere, where the order of the seasons is reversed. General rabbinic opinion has been that the Babylonian pattern should still be followed.[13]) The result is that Jews throughout the Diaspora set their liturgical calendar according to the agricultural needs of Iraq, the site of ancient Babylonia, starting to pray for rain on the sixtieth day after the autumnal equinox regardless of local needs and conditions.

The Dating Problem

Since the date for tal u-matar in Babylonia given in the Talmud is based on a solar phenomenon, the equinox, it is clear why the civil, solar calendar is used to determine the date. What is still unclear is the actual date in use. If the prayer for rain is to be said beginning on the sixtieth day after the equinox, why December 4 or 5? The equinox, we know, comes on September 22 or 23. The sixtieth day following would be November 20 or 21. How is it that we now mark "sixty days from the tekufah" on the evening of December 4 or 5?

The answer to this question is to be found in a miscalculation of the length of the year. Present-day astronomers calculate the mean solar year to be 365.2422 days (365 days, 5 hours, 48 minutes, and 46 seconds).[14] This is slightly shorter than the 365.25 days (365 days, 6 hours) given by Samuel, the third century amora and astronomer, the one who ruled that the law concerning tal u-matar was to follow Hananiah.[15] The difference, as we shall see, has resulted in the forward movement of the day of starting the prayer for rain from November to December.

The assumption that the year consists of exactly 365.25 days was not unique to Samuel. It is the basis of the Julian calendar, named for Julius

Caesar, who was responsible for Roman calendar reform. According to the Julian system, three years out of four would be 365 days long, while the fourth year would be a leap year of 366 days.[16]

The discrepancy between the assumed length of the year (365.25 days) and the actual length (365.2422) may not seem like very much. After all, it is only .0078 days (11 minutes, 14 seconds) a year. Still, after a period of 128 years, the difference amounts to just about one day. In a thousand years, a difference of 7.8 days is accumulated.[17] In a history counted in terms of millenia, such an error takes on significance.

The Catholic Church was the first to take action to rectify the anomaly created by the Julian miscalculation. In 325 C.E., the Nicene Council had fixed the vernal equinox correctly at March 21 and had declared that day to be the equinox for the purpose of determining when Easter would come each year. As each 128 years passed, March 21 moved forward relative to the sun by a full day. Therefore, by the latter part of the sixteenth century, it had shifted by approximately ten days from the equinoctial position. Pope Gregory XIII decided to drop the extra ten days from the calendar in 1582. The day after Thursday, October 4, in the Julian calendar, was declared to be Friday, October 15, in the new "Gregorian" calendar.[18]

Gregory knew that the dropping of ten days was only a temporary measure, necessary to return the calendar to agree with the motion of the sun. This act was not sufficient, though, to prevent future deviations. Therefore, the Gregorian calendar eliminated three leap years every 400 years, i.e., those century years not divisible by 400. Thus, while 1600 and 2000 are leap years in both the Julian and Gregorian systems, 1700, 1800, and 1900 are leap years only in the Julian calendar. This resulted in an average year of 365.2425 days, so that it would take about 3300 years (rather than 128 years) to accumulate an extra day.

Let us return to Samuel. Using the figure 365¼ days per year, he proceeded to divide the year into four equal parts to arrive at 91 days and 7½ hours for each of the four seasons, *Tekufat Nisan* (spring), *Tekufat Tammuz* (summer), *Tekufat Tishrei* (autumn), and *Tekufat Tevet* (winter). If one wanted to know when the season began, i.e., when the *tekufah* (equinox or solstice) would fall, he had simply to add 91 days, 7½ hours to the previous *tekufah*. Thus, in Samuel's calculation, one autumnal equinox, *Tekufat Tishrei*, would come exactly 365¼ days after the previous one.[19]

Since Samuel's calculations and those of the Julian calendar are based on the same calculations of 365¼ days in a year, the two systems have kept in step throughout the centuries. Thus, just as in Samuel's time the day of *Tekufat Tishrei* fell on the Julian September 24, so, too, today does it invariably fall on that date.[20] In this century, however, the Julian September 24 is the Gregorian October 7. By adding 59 days to October 7, the day of the calculated autumnal equinox, we find that the "sixtieth day from the *tekufah*" is now December 5. Since the Hebrew day begins on the preceding evening, one begins to recite *tal u-matar* in *ma'ariv* of December 4.

Why December 5

We mentioned above that every four years *tal u-matar* actually begins in the *ma'ariv* of December 5. The reason for this can be seen when we look at the exact time of day of the *tekufah*. While it always falls on October 7, in a four year cycle it will come at 3:00 A.M. the first year, 9:00 A.M. the next year, 3:00 P.M. the third, and 9:00 P.M. the fourth. The fourth year is always a Hebrew year divisible by four, which begins in the civil year preceding a leap year. When the *tekufah* falls at 9:00 P.M., it is after dark and, therefore, already the next day (October 8) according to Jewish calculations. Hence, fifty-nine days later is December 6. Therefore, in those years, *tal u-matar* will begin in *ma'ariv* of December 5.[21]

The fact that the year in which the *tekufah* comes at 9:00 P.M. is the one just before the civil leap year is what accounts for the date remaining on October 7. Since it will now be 366 days (rather than 365) until the next October 7 will occur, the end of the 365 day interval comes on October 7 (of the leap year) at 3:00 A.M.

We pointed out earlier that prayer books printed in the nineteenth century indicate that the evening of December 3 is the time to start praying for rain. We are now in a position to show how the date changed to December 4 in the twentieth century. The times of the autumnal equinox in last four year cycle in the nineteenth century was as follows: 5657—Oct. 6, 1896, at 3:00 A.M.; 5658—Oct. 6, 1897, at 9:00 A.M.; 5659—Oct. 6, 1898, at 3:00 P.M.; and 5660—Oct. 6, 1899, at 9:00 P.M. Following the principles outlined above, *tal u-matar* began at the *ma'ariv* service of Dec. 3, in 1896, 1897,[22] and 1898, and at the *ma'ariv* service of Dec. 4, in 1899.

If 1900 had been a leap year, like 1888, 1892, and 1896, the calcualted equinox would have returned to Oct. 6, at 3:00 A.M., as at the end of the previous four-year cycles. Then, *tal u-matar* would again have been said starting on the evening of December 3. Following the Gregorian plan, as outlined above, it was not a leap year. Hence, counting 365 days after the 1899 time (Oct. 6, 9:00 P.M.) brought the equinox to October 7, 1900 at 3:00 A.M. Fifty-nine days later was December 5; so *tal u-matar* was said at the *ma'ariv* service of December 4, 1900. In 1901, the *tekufah* was on October 7, at 9:00 A.M., and *tal u-matar* once again began at *ma'ariv* of December 4. Thus became established the twentieth-century cycle of three years in which the prayer for rain starts on the evening of December 4 and of one year in which it starts on the evening of December 5.[23]

A similar shift will not take place in the year 2000. According to the rules of the Gregorian calendar, 2000, unlike 1700, 1800, and 1900, will be a leap year. Hence, the December 4 and December 5 dates will remain for another century, only to move ahead to December 5 and 6 in the year 2100, which will not be a leap year. If, however, one continues the calculation, he will see that this pattern will repeat itself so that the saying of *tal u-matar* will be three days later every 400 years.

We have seen, then, that the beginning date for saying *tal u-matar* is based on a calendrical miscalculation. It is the same miscalculation which is the basis of the Blessing of the Sun (*Birkat Haḥammah*).[24] Halakhic authorities have not been oblivious to the progressive movement of *tal u-matar,* but, in general, they have decided to ignore it. After all, the prayer for rain in the Diaspora is not considered a very important obligation.

This perception of triviality is perhaps reinforced by the relative lack of coordination between the time when the prayer is said and the real needs of most Diaspora communities. When one considers the fact that the sixtieth day of the autumnal equinox is meteorologically significant only in Iraq, what difference does it make if Jews in other countries begin their prayers for rain on a day which is more than the prescribed sixty days after the astronomical equinox? It would seem that, once the decision was made to follow the Babylonian practice to the exclusion of local needs, the prayer for rain became trivialized, and the exact date for starting it became insignificant. Since the saying of *tal u-matar* has become mostly a symbolic act, rather than a real petition for rain in one's country of residence, then Samuel's *tekufot* are good enough, even if they are astronomically inexact. Use of the actual, observed equinox, instead of the calculation of Samuel, as the basis for establishing the beginning date for the prayer for rain has apparently never been seriously suggested.[25] Even though differences between the astronomically observed equinoxes and Samuel's *tekufot* are well known, it would seem that the former have no halakhic status.

Traditionally there has been another consideration. The mistakes in the calendar are considered relatively minor, and it is felt that they would not result in an unbearable condition before the Messiah comes, an arrival which is anticipated to be by the year 6000 (2240 C.E.) at the latest.[26] If there are no changes, the beginning of saying *tal u-matar* could not reach Passover, even in those years when it is at the earliest point in the solar year, for approximatley another 35,000 years, a time long after the beginning of the Messianic age.[27] So, even if the Messiah tarries until 6000, the prayer for rain will then begin no later than the evening of December 6 or 7.[28] If the Messiah does not arrive by then, however, halakhic authorities may eventually have to do something about the beginning date of the Jewish prayer for rain in the Diaspora.

NOTES

1. The phrase is biblical; see I Kings 17:1. In the Sefardic rite, the whole form of the prayer is changed, from the summer *"Barekheinu"* (without the words *tal u-matar*) to the winter *"Bareikh 'Aleinu"* (with those words).

2. Most prayerbooks give almost no guidance to the average worshipper, and those that do are usually wrong. Thus, many prayerbooks record simply that *ve-tein berakhah* ("grant blessing," the summer formula) is said in the summer and *ve-tein tal u-matar* ("grant dew and rain," the winter formula) is said in the winter. Some mention December 4, with no mention of December 5 or 6, and with no variations for *Shaḥarit, Minḥah,* or *Ma'ariv*; others mention all three dates but do not explain when which dates are applicable. Mention

is sometimes made of the "59th day after *tekufat Tishrei*" without indicating when that is. Some prayerbooks with translations give different instructions in Hebrew and in the vernacular.

3. Since *tal u-matar* is recited only in the weekday *Shemoneh 'Esreh,* it is postponed to the first weekday *ma'ariv* if the evening of December 4 or 5, as the case may be, coincides with the Sabbath.

4. This disproves the widely held fallacy that Jews in the Diaspora pray for rain in Israel. Cf., e.g., Elie Munk, *The World of Prayer,* I (New York, 1961), p. 138; Barukh Halevi Epstein, *Barukh She'amar* (Tel Aviv, 1970), p. 128; Mordecai M. Kaplan, *Judaism as a Civilization* (New York: MacMillan Company, 1934), p. 188; Ben Zion Bokser, *The Prayer Book* (New York, 1961), p. 54 (note); Isaac Klein, *A Guide to Jewish Religious Practice* (New York: Jewish Theological Seminary, 1979), p. 23. The first actual signs of rainfall in the Land of Israel come in October; see U.S. Department of Commerce, *Climates of the World,* Wash., D.C., 1972, p. 23.

5. Some authorities, notably Yom Tov ben Abraham Ishbili (Ritba), Naḥmanides, Menaḥem Ha-Meiri, and Nissim ben Reuben (Ran) have argued that after the destruction of the Temple, with the consequent cessation of the obligatory pilgrimages, *tal u-matar* in the Land of Israel should begin right after Shemini Atzeret. For the halakhah, see Isaac Alfasi, *Hilkhot Ha-Rif, Ta'anit* 2a; Maimonides, *Mishneh Torah, Sefer Ahavah, Hilkhot Tefilah,* 2:16; Jacob ben Asher, *Tur, Oraḥ Ḥayyim,* 117; and Joseph Caro, *Shulḥan Arukh, Oraḥ Ḥayyim,* 117. For a full discussion of the various opinions, see Ovadia Yosef, *Sefer She'eilot U-Teshuvot Yabia Omer,* V (Jerusalem, 5729), pp. 49–50.

6. *Golah* refers here only to Babylonia, not the entire Diaspora. Ḥananiah's statement is repeated also in Jerusalem Talmud, *Ta'anit* 63d, in which it is clear that Ḥananiah was reporting the practice that he had found in Babylonia, rather than giving his own ruling. Ḥananiah, the nephew of Rabbi Joshua, was a second century *tanna,* who had moved to Babylonia; see *Berakhot* 63a, *Sanhedrin* 32b. Samuel, the third century *amora,* is called "Yarḥina'ah" for his astronomical skills; see *Bava Meẓia* 85b and below.

7. See our article, " *Birkat Haḥammah:* The Blessing of the Sun," *Conservative Judaism,* XXXIV:3 (Jan./Feb., 1981), p. 18.

8. There is no question that the autumnal equinox, *Tekufat Tishrei,* is meant here. The seasonal nature of rain in Babylonia fixes that period, and tradition has always made this assumption. For precipitation amounts and patterns in Iraq (modern-day Babylonia), see *Climates of the World,* p. 23.

9. Inclusion of the day of the *tekufah* is according to Rabbi Jose's opinion in *Sanhedrin* 13a. The issue of the sixtieth day is discussed in *Ta'anit* 10a, with the halakhah following the opinion of Rav, not Samuel.

10. That the date is considerably later is clear. In the third century, the seventh of Marḥeshvan fell between October 3 and November 1 (Gregorian), while the sixtieth day after the astronomical autumnal equinox is November 21. Of course, we do not know for sure exactly how the equinox was calculated but, in any event, sixty days from the equinox must have been much later than the seventh of Marḥeshvan.

11. For a full discussion, see the authors' "The Jewish Prayer for Rain in Babylonia," *The Journal for the Study of Judaism* (June, 1984), pp. 123–144.

12. There has been no difference between the Jews of the Land of Israel and those of Babylonia (or elsewhere) regarding the date for starting the "mentioning of rain" (i.e., *mashiv haruaḥ*) in the second benediction (*Gevurot*) of the *Shemoneh 'Esreh.* The reason is because it is not a petitionary prayer (as is "grant dew and rain") but a praise of God who "causes the wind to blow and the rain to fall." Despite the objection that even mentioning rain might cause precipitation before it is wanted (cf. *Ta'anit* 1:1), apparently this was not a strong enough argument to warrant postponing *mashiv haruaḥ* from Shemini Atzeret either in the Land of Israel or in Babylonia.

13. This intriguing halakhic development is analyzed at length in the authors' "The Jewish Prayer for Rain in the Post-Talmudic Diaspora," *AJS Review* (Fall, 1984).

14. See William Matthew O'Neill, *Time and the Calendars* (Sydney, 1975), p. 22, who

gives the exact mean length of the year as of 1900 as 365.24219879 days. In the time of Samuel (middle of the third century), it was 365.2423 days, slowly decreasing from century to century.

15. See nn. 6 and 19.

16. See Colin A. Roman, "The Julian Calendar" in "Calendar," *Encyclopaedia Britannica*, 15th ed. (Chicago, 1974), *Macropaedia*, 3, pp. 601–602.

17. The calculation is simple: .0078 days/year × 1000 years = 7.8 days.

18. The Gregorian calendar took quite a while to catch on. England and its colonies (including America) changed over in 1752; Russia did so only after the 1917 Revolution. Much of the Eastern Orthodox Church still follows the Julian Calendar, which is why they observe Christmas this century on the Gregorian January 7 (since the gap has now grown to 13 days). For a Jewish evaluation of this changeover, see Israel of Zamosc, *'Ozar Nehmad*, on *Kuzari* IV:29.

19. For the calculation see *Eruvin* 56a. There is good reason to believe, as later Jewish astronomers claimed (cf. Abraham ibn Ezra's *Commentary,* on Exodus 12:2), that Samuel was aware of the discrepancy and used the rounded figures only for the sake of convenience. Hipparchus, in the second century B.C.E., had calculated the mean solar year as 365.2467 days, and he was followed by Ptolemy. Other astronomers gave different measurements; see Otto Neugebauer, *A History of Ancient Mathematical Astronomy* (New York, 1979), pp. 528–29. Samuel was probably also aware that the seasons vary in length (spring now averages about 92 days, 18½ hours; autumn averages about 89 days, 19¾ hours). In *Y. Berakhot* 1:1, the equinoxes are identified as the days upon which day and night are equal. See also *Midrash Tehillim* 19:3, and R. Jose's statement, *Eruvin* 56a, about finding the four directions.

20. Samuel did not use the Julian calendar; he simply used the same length of the year as did the Julian calendar. The Gregorian equivalent of the Julian September 24 in Samuel's time was September 23.

21. For determining the times of the *tekufah*, see Maimonides, *Hilkhot Kiddush Hahodesh,* 9:4–8. A chart is given by Judah D. Eisenstein, "Tekufah," *Jewish Encyclopedia,* XII, pp. 76 f. For the halakhah of determining the beginning time of *tal u-matar,* see *Shulhan Arukh, Orah Hayyim,* 117:3. Abraham ben Hayyim Halevi Gombiner (*Magen 'Avraham* on *Orah Hayyim,* 117) set down the rule: "If the equinox is on Sunday, the prayer for rain begins on *ma'ariv* that belongs to Wednesday [i.e., Tuesday night]. There will always be two days between the [day of the] equinox and [day of the prayer] for rain."

22. In reality, the evening of Dec. 3, 1897, was a Sabbath, and, so, *tal u-matar* did not begin that year until the evening of Dec. 4.

23. The same process occurred in the transition from the seventeenth to the eighteenth century, and from the eighteenth to the nineteenth century. In the seventeenth century, the dates for *tal u-matar* were December 1 and 2; in the eighteenth century, they were December 2 and 3; in the nineteenth century, they were December 3 and 4.

24. See the authors' *"Birkat Hahammah"* (note 7, above).

25. No one has suggested using the Rav Adda equinoxes (n. 24, above) for *tal u-matar* either.

26. Cf. *Sanhedrin* 97a.

27. The forward movement of Passover (together with the rest of the Jewish year) relative to the sun is due to the nature of the Jewish lunisolar calendar. The nineteen-year cycle, with its twelve twelve-month years and its seven thirteen-month years, adds up to slightly more than nineteen solar years. They average out to 365.2468 days a year, .0046 days too much. This calculation, attributed to the *amora* Rav Adda (as opposed to the length of 365.25 days per year attributed to Samuel) results in a progression of 4.6 days in the course of a millenium. The calculation of 35,000 years is as follows: the earliest Passover this century is March 27, 112 days after December 5. As noted, Samuel's *tekufot* are moving forward at a rate of 7.8 days per 1,000 years. Passover, along with all the other holidays, is moving forward at a rate of 4.6 days per 1,000 years, Thus , the net decrease in time between *tal u-matar* and Passover is 3.2 days per millenium. At that rate, they will close the gap of 112 days in 35,000 years (assuming that the Messiah will not have arrived and that no changes are made in the calendar). Hence, in the earliest years of the cycle, *tal u-matar* will not be said at all. As more time progresses, Passover in every year of the cycle will come before sixty days from Samuel's *Tekufat Tishrei*.

Those intrigued by the recondite would be interested to know that *tal u-matar* has already overleaped Hanukkah twice. The first time in history that this occurred was in 1899, when the last day of Hanukkah was on December 4. The prayer for rain began with *ma'ariv* that evening, after the holiday was over. The second time, in 1975, the last day of Hanukkah was on Saturday, December 6. Since that year was 5736 (divisible by 4), the starting time would have been on the evening of December 5, except for the fact that December 5–6 was the Sabbath, when *tal u-matar* is not said. So the prayer for rain was postponed until Saturday evening, December 6, immediately after the conclusion of Hanukkah. The next time *tal u-matar* will overleap Hanukkah is in 2146.

28. In 2200, the prayer for rain will start being said in *ma'ariv* of December 6 and 7 rather than in *ma'ariv* of December 5 and 6, which are the correct dates in the twenty-second century.

Calls for pre-messianic calendrical reform have been made by Arthur Spier, *The Comprehensive Jewish Calendar* (New York, 1952), p. 227; Cyrus Adler, "Calendar, History of," *Jewish Encyclopedia,* III, p.501; and W. M. Feldman, *Rabbinic Mathematics and Astronomy* (New York, 1978), pp. 198–202. One of the major difficulties in any calendar reform is the tradition that the present calculations are based on a law going back to Moses at Sinai (*halakhah leMoshe miSinai*); cf. Maimonides, *Kiddush Hahodesh,* 5:2; and *Sefer Hamitzvot,* Positive Commandment 153 (and Nahmanides' criticism there). The idea of the Mosaic origin of the calendar apparently goes back to Saadia Gaon (882–942) and Hananel ben Hushiel of Kairoan (d. 1055/56), both of whom used this principle in polemics against the Karaites.

For other recent treatments of the question of *tal u-matar* on December 4 and 5, see Immanuel Jakobovits, "Survey of Recent Halakhic Periodical Literature," *Tradition,* VII:1 (1964–65), pp. 96–98; Sholom Klass, "Why We Say the Prayer Tal Umatar on Dec. 5th or 6th," *Jewish Press* (Nov. 30, 1979).