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The Medieval Qaraite Calendar in the Diaspora

ABSTRACT: One of the most salient divisions between medieval Rabbanites and Qaraites was in the field of calendar. Qaraites and Rabbanites disagreed on how to determine which years to intercalate (i.e., to extend with the insertion of a thirteenth month) in order to keep up with the seasons. While the Rabbanites used a fixed nineteen-year cycle of intercalation, the Qaraites maintained that intercalation must be based on the state of ripeness of barley crops in Palestine. This created problems for Qaraite communities outside of the Land of Israel, many of whom found it impossible to receive information about the state of crops in Palestine in time to celebrate Passover. This article investigates how medieval Qaraite Diaspora communities made a decision to intercalate. Based on a wide range of sources many of which were not previously discussed, it studies the Diaspora communities' approaches to empirical intercalation and provides an in-depth analysis of the Qaraites' attitude toward and use of mathematical methods, such as the method of the vernal equinox and the Rabbanite nineteen-year cycle of intercalations. The article also reflects on the attitude of Palestinian Qaraite ideologists toward the calendar situation in the Diaspora and argues that the division between Qaraites as adherents of an empirical intercalation vs. Rabbanites as followers of a fixed calculated scheme was never clear-cut when considered in the context of the entire Qaraite Jewish community, and of lived practice rather than ideology.

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Introduction

One of the most salient divisions between medieval Rabbanites and Qaraites was in the field of calendar. The Rabbanite calendar was based on a fixed calculation. The Qaraites maintained that the Jewish calendar must be observational. They argued that this was commanded in the Bible and has always been Jewish practice, as manifest even in the sources revered by the Rabbanites themselves such as the Mishnah. In the empirical Qaraite calendar months were fixed by observing the first appearance of the lunar crescent, underpinned by interpretations of Gen. 1:14 "And God said, Let there be lights in the dome of the sky to separate the day from the night; and let them be for signs and for seasons and for days and years," and Ps. 104:19 "You have made the moon to mark the seasons." Years were intercalated (i.e., extended with the insertion of a thirteenth month) to ensure that Passover was celebrated in the correct season, based on the state of ripeness of the barley crops. The main biblical proof for this method was Deut. 16:1 "Observe the month of *ʾaviv* and keep the Passover to the Lord your God," where the term *ʾaviv* refers to a progressed stage in the ripening of crops, specifically barley (Ex. 9:31, Lev. 2:14).

As was noted already by Zvi Ankori, these two elements of the Qaraite empirical calendar differed substantially.[1] Whereas Qaraites permitted observing the crescent and sanctifying the new month locally anywhere in the world,[2] the mainstream opinion was that barley crops had to be checked in Palestine. The earliest preserved Qaraite source that explicitly links the observation of barley crops with Palestine is Daniel al-Qūmisī's late ninth-century sermon, where observing the month of *ʾaviv* in its right time is given as one of the reasons to emigrate to Jerusalem.[3] Numerous later Qaraite scholars confirmed that

1 Zvi Ankori, *Karaites in Byzantium: The Formative Years, 970–1100* (New York: Columbia University Press, 1959), pp. 299, 344–345.

2 Ibid., pp. 344, 352; Nadia Vidro, "Non-Rabbanite Jewish Calendars in the Works of Jacob al-Qirqisānī and Saadia Gaon," *Aleph: Historical Studies in Science and Judaism* 21.1 (2021): 149–187, on p. 162; Nadia Vidro, "Qaraite New Moon Observation in the Tenth and Eleventh Centuries and Its Ritual and Calendrical Implications," *Jewish Studies Quarterly* (forthcoming).

3 Leon Nemoy, "The Pseudo-Qūmisīan Sermon to the Karaites," *Proceedings of the American Academy for Jewish Research* 43 (1976): 49–105, on p. 76. While al-Qūmisī's authorship of the sermon is uncertain (ibid., p. 49), its dating to the ninth century is generally accepted.

ʾaviv barley had to be checked in Palestine.[4] They defined the Land of Israel as stretching from al-Šajaratayn and Rafaḥ in Gaza (some said from Pelusium in the eastern Nile delta) in the West to Zoar in the East. The northern border was not properly discussed because barley ripened there late. The general opinion was that *ʾaviv* should be sought in Gaza, the district of Asqalon, the district of Ramla, the Darom, the Jordan Valley including Jericho, and the area around Zoar (although the latter was disputed).[5]

Jerusalem Qaraites discussed whether it was obligatory to come to Palestine in order to fulfil the commandment of observing the month of *ʾaviv*.[6] While Sahl b. Maṣliaḥ in the tenth century echoed Daniel al-Qūmisī's view that those outside of the Land of Israel must come there in order to observe the month of *ʾaviv*,[7] Levi b. Yefet and Joseph al-Baṣīr in the first half of the eleventh century

4 For example, Jacob al-Qirqisānī, *Kitāb al-Anwār*, VII.17.1 (edited in Leon Nemoy, *Kitāb al-Anwār wal-Maraqib* = *Code of Karaite Law*, 5 vols [New York: Alexander Kohut Memorial Foundation, 1939–1943]. Here and in the following, references to *Kitāb al-Anwār* are given according to discourse, chapter, and paragraph number in Nemoy's edition and not according to volume and page number); Israel b. Daniel, *Book of Commandments*, MS RNL Evr Arab I 1012, fols 158r–158v; Sahl b. Maṣliaḥ, Abridgement of the *Book of Commandments* (prepared by Moses b. Solomon), MS RNL Evr Arab I 800, fols 6r–6v; Yefet b. ʿEli, *Commentary on Leviticus*, MS RNL Evr Arab I 73, fol. 106v; Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fols 89r, 92v–95r; Joseph al-Baṣīr, *Kitāb al-Istibṣār*, discourse IV, chapter 5, RNL Evr Arab I I 1170, fols 22r–28r; Yefet b. David Ibn Ṣaghīr, *Book of Commandments*, discourse III, chapter 22, MS RNL Evr Arab I 910, fols 41r–43r; Samuel b. Moses ha-Maʿaravi, *Al-Muršid*, discourse III, chapter 12 (edited in Felix Kauffmann, *Traktat über die Neulichtbeobachtung und den Jahresbeginn bei den Karäern von Samuel b. Moses* [Leipzig: Drugulin, 1903], pp. 24–25 [translation], 15*–16* [text]), etc.

5 See references in footnote 4.

6 On the more general early Qaraite discussions regarding whether commandments should be observed and festivals should be celebrated outside the Land of Israel see Yoram Erder, "The Observance of the Commandments in the Diaspora on the Eve of the Redemption in the Doctrine of the Karaite Mourners of Zion," *Henoch* 19 (1997): 175–202; Yoram Erder, "The Centrality of Eretz-Israel in Early Karaite Circles as Reflected in the *Halakha* of Mishawayh al-ʿUkbari," *Zion* 60 (1995): 37–67, esp. 43–44 (Heb.).

7 Levi b. Yefet, *Book of Differences Between Yefet b. ʿEli and Sahl b. Maṣliaḥ*, MS BL Or 2573, fols 23r–23v.

decreed that it was unreasonable to expect all Jews to come to Palestine for that purpose.[8] Joseph al-Baṣīr explained that observing the month of *ʾaviv* was an obligation imposed on the entire community rather than on individual believers (*farḍ kifāya*), making it sufficient if only some Qaraites performed it.

The more realistic view that coming to Palestine for the sake of observing the month of *ʾaviv* was not obligatory became generally accepted from the eleventh century onwards. Despite this, the fact that the calendar could be correctly regulated only by the state of barley crops in Palestine created obvious problems for Qaraite communities outside of the Land of Israel.[9] Diasporic Qaraite communities existed during the Middle Ages in Babylonia, Egypt, Syria, Maghreb, Byzantium, and Spain.[10] Many of these communities found it hard and often impossible to receive information about the state of barley crops in Palestine in time to prepare for and celebrate Passover. Aware of this problem Joseph al-Baṣīr recommended that people in the Diaspora "should consider a year plain or intercalated on the basis of signs such as their knowledge of habitual features of years."[11]

In this article I investigate how Qaraites in different Diaspora communities regulated the beginning of years, i.e., decided to make a year plain (of twelve months) or intercalated (of thirteen months). Intercalation practices of medieval Babylonian and Byzantine Qaraites were previously discussed by Zvi Ankori.[12]

8 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 85r; Joseph al-Baṣīr, *Kitāb al-Istibṣār*, discourse IV, chapter 3, MS RNL Evr Arab I 1170, fols 14r–14v; see also Ankori, *Karaites in Byzantium*, pp. 320–321.

9 This problem was pointed out already by Saadia Gaon (first half of the tenth century) who argued that since Qaraites required that *ʾaviv* be sought in Palestine, it was impossible for Jews who lived all over the world to practice this system (*Kitāb al-Tamyīz*, MS RNL Evr Arab II 1189/12, fol. 26r).

10 Judith Olszowy-Schlanger, *Karaite Marriage Documents from the Cairo Genizah* (Leiden: Brill, 1998), pp. 46–47; Elinoar Bareket, "Karaite Communities in the Middle East during the Tenth to Fifteenth Centuries," *A Guide to Karaite Studies: The History and Literary Sources of Medieval and Modern Karaite Judaism*, ed. Meira Polliack (Boston: Brill, 2003), pp. 237–252; Ankori, *Karaites in Byzantium*, pp. 119–152.

11 ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fol. 7v:

"אלאולי פיהם אן יכון אן אלסנה בסיטה או כביסה באמארה נחו מערפתהם בעאדאת אלסנין".

12 Ankori, *Karaites in Byzantium*, pp. 305–344.

Since Ankori's seminal work many new sources became available, mostly preserved in the Firkovitch Collection in the National Library of Russia and identified in the course of an ongoing effort to catalogue the collection. The present article is based on literary and documentary sources emanating from Qaraite communities in the Diaspora together with information derived from works of Palestinian Qaraites who refer to intercalation practices of communities elsewhere, sometimes condoning them, sometimes polemicizing against them. The analyzed sources shed new light on many of the intercalation methods identified by Ankori. They also allow one to reflect on the attitude of Palestinian Qaraites toward the calendar situation in the Diaspora and to reconsider the division between Qaraites as followers of an observational calendar vs. Rabbanites as followers of a fixed calculated calendar in the context of the entire Qaraite Jewish community and of lived practice rather than ideology.

Qaraite Intercalation Methods in the Diaspora

ʾAviv-based Intercalation

ʾAviv-based intercalation is the method of determining the beginning of a year that is most firmly associated with the medieval Qaraite calendar. It was believed by medieval Qaraites to be the correct way of fulfilling the Biblical commandment to celebrate Passover in the month of *ʾaviv* (Deut. 16:1). Qaraites interpreted the term *ʾaviv* as a relatively progressed stage in the development of barley crops. The basic principle of the Qaraite *ʾaviv*-based intercalation was as follows: barley fields in Palestine were examined twelve months after the beginning of the previous Nisan. If barley in the state of *ʾaviv* was found, the month was declared Nisan—the biblical first month, and Passover was celebrated. Otherwise, the year was intercalated by adding a thirteenth month. What exactly the correct *ʾaviv* stage was, and when, where, and how much barley in this stage should be found in order to celebrate Passover, were some of the questions discussed in Qaraite treatises on the calendar, and divergent opinions were expressed in theoretical works and implemented in practice.[13]

ʾAviv-based intercalation was practiced by Diaspora communities in certain periods and regions despite the difficulties involved in knowing the state of barley crops in Palestine. The most natural way to obtain this information was

13 Nadia Vidro, "*Aviv* Barley and Calendar Diversity among Jews in Eleventh-Century Palestine," *Journal of Jewish Studies* 72/2 (2021): 283–312.

by letter or oral testimony of visitors to Palestine. Qaraites within Palestine exchanged letters about the state of the crops in their respective areas,[14] and we have evidence of letters about the *ʾaviv* sent to various Qaraite Diasporas, especially in the period when the Qaraite center in Jerusalem was in existence. MS Oxford, Bodleian Heb. b. 11.10 contains a letter about the *ʾaviv* sent from Jerusalem to a Qaraite leader in Fusṭāṭ, probably in 1044.[15] MS T-S 20.45 contains an eleventh-century letter of a Byzantine Rabbanite to his brother in Egypt conveying that Byzantine Qaraites received letters from Palestine which stated that *ʾaviv* was not found in Nisan, so that the Qaraites intercalated the year and celebrated Passover a month later than the Rabbanites.[16] Babylonian Qaraites are reported in an eleventh-century source to have complained that letters from Palestine take too long to arrive so that "by the time news [about the *ʾaviv*] reaches faraway lands, the first year already ends."[17] An intra-Qaraite polemic on the *ʾaviv* composed in Palestine (probably in the tenth century) tells a story about one of the polemicists changing his mind about the state of barley and sending letters with his new decision to "those who are far."[18] In the twelfth century, when regular communication with Jerusalem was disrupted due to the capture of the city by the Seljuqs in 1070 CE and by the Crusaders in 1099 CE, Judah Hadassi (Byzantium) mentioned that information about the *ʾaviv* could be gained from visitors to Palestine who find out the state of barley crops from Qaraites residing there.[19]

It is unclear if any officials in Palestine were specifically responsible for sending letters to the Diaspora. Moses b. Isaac ha-Sefaradi, the sender of the eleventh-century letter found in MS Oxford, Bodleian Heb. b. 11.10, is not

14 MS RNL Evr Arab I 1151, fol. 1v (edited in Vidro, "*Aviv* Barley," pp. 288–289 [text], 291 [translation], 295). See also MS RNL Evr Arab I 1163, fol. 47v:

"ולו כאן אלסאכן בהא ממן יקול בשרע אלאביב לקד כאן הו יורד אלכבר".

"If he who lives in [one of the places that ripen early] upholds the commandment of the *ʾaviv*, he should supply the news."

15 Moshe Gil, *A History of Palestine, 634–1099* (Tel *Aviv*: Tel *Aviv* University, 1983), vol. 2, pp. 540–543 (doc. 301) (Heb.).

16 Ankori, *Karaites in Byzantium*, pp. 328–336.

17 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 83r:

"ואלי אן תבלג אלאכבאר אלי אלבלאד אלבעידה תכרג אלסנה אלאולי".

18 See below, footnote 21.

19 Judah Hadassi, *ʾEškol ha-Kofer*, alphabet 188, alphabet 190, ed. Gozlov 1836, fols 76r, 77r.

known to have held any official titles or positions. The polemicists in the intra-Qaraite polemic were most likely members of the Jerusalem scholarly community.[20] However, the discussed letter appears to have expressed not an official position but a personal view of its sender. Indeed, the wording in the polemic suggests that the communicated decision was not supported by others.[21] In Palestine itself Qaraites did not always follow centrally-made decisions about intercalation. At least in the first half of the eleventh century such decisions could be made independently by those groups who had access to barley fields in Palestine.[22] It is possible that representatives of these different groups wrote to their correspondents in the Diaspora, communicating their own views about the state of the crops and intercalation.

Because intercalation was not centralised, Qaraites in the Diaspora could legitimately organize their own expeditions to Palestine and make the inspection

20 This suggestion is based, among other things, on the fact that both were Qaraites who lived in Jerusalem (MS BL Or 2523, fols 82v–83r, 86r), both composed books including a *Book of Commandments* (MS BL Or 2523, fol. 83r) and a refutation of opponents' approaches to the *'aviv* (MS BL Or 2523, fols 71r, fol. 84v), as well as on a close similarity of methods, opinions, and wording in the polemic, with some surviving works by tenth–eleventh-century Jerusalem Qaraite scholars.

21 MS RNL Evr Arab II 3105, fol. 9r:

"פרגעת אן תעתקד אלסנה בסיטה בעד מא כנת מגוז אנהא כביסה וכתבת אלי מן כתבת באנהא בסיטה פמא כפאך חירתך חתי תחיר מן הו פי אלבעד".

"So you turned to believing that the year was plain after you approved that it was intercalated. You wrote to whomever you wrote that it was plain. And it was not enough for you that you yourself were confused, you also confused those who are far."

Similarly, in another part of the polemic, MS RNL Evr Arab I 1163, fol. 11r:

"וכתבת אלי מן תחירה בקולך אן אלסנה בסיטה בעד מא קד צח ענד אלאכתר אנהא כביסה".

"You wrote to those whom you [thereby] confused by saying that the year was plain after the majority considered it correct to make it intercalated."

22 Vidro, "*Aviv* Barley," pp. 306–307. This approach ties in well with the pluralism typical of ninth-eleventh-century Qaraites and their interpretation of the commandments based on individual reasoning (sometimes referred to as *ijtihād*). Yoram Erder, *The Karaite Mourners of Zion and the Qumran Scrolls: On the History of an Alternative to Rabbinic Judaism* (Turnhout: Brepols, 2017), pp. 38 and footnote 50 there, 73, 75–77; Daniel Frank, *Search Scripture Well: Karaite Exegetes and the Origins of the Jewish Bible Commentary in the Islamic East* (Leiden: Brill, 2004), pp. 22–32.

and decisions for themselves. There is evidence that Qaraites from Babylonia, Egypt, and Syria sent *'aviv*-seeking parties to Palestine. The evidence for Babylonia comes from Abū Rayḥān al-Bīrūnī's (1000 CE) description of calendar practices of ʿAnan b. Daniel (end-ninth century), the great-grandson of ʿAnan b. David (mid-eighth century).[23] According to al-Bīrūnī, ʿAnan b. Daniel practiced intercalation based on the observation of barley crops between the first and the fourteenth of Nisan in some areas of Iraq and Palestine.[24] Al-Bīrūnī then states that prior knowledge of the state of crops was possible if examination parties went out when seven days remained of Shevaṭ (i.e., on the twenty-third or the twenty-fourth of the month) in order to examine the state of the barley crops in Palestine and the countries of a similar climate. This prior knowledge about the state of crops could be used to predict whether crops would be ripe in time for Passover on the fourteenth of Nisan, based on empirically gained knowledge that grain usually matures in fifty days. Jacob al-Qirqisānī (first half of the tenth century, Babylonia) attributed the practice of examining the state of crops on the twenty-fourth of Shevaṭ to the earlier ʿAnan b. David and other members of his movement.[25] Al-Qirqisānī did not explicitly say where this examination took place but neither did he extend to ʿAnan b. David his criticism of Qaraite groups who observed the *'aviv* outside of Palestine.[26]

Al-Bīrūnī and al-Qirqisānī's statements were interpreted in research literature in two diametrically opposed ways. Ankori, against the plain meaning of al-Bīrūnī's passage, assigned both the practice of intercalating on the basis of the state of crops in Iraq and Palestine between the first and the fourteenth of Nisan and the collection of preliminary data in Shevaṭ to ʿAnan b. David in the eighth century. He concluded that by the middle and second half of the ninth century, when ʿAnan b. Daniel was active, Babylonians began to abandon the *'aviv* system

23 C. Eduard Sachau, *Chronologie Orientalischer Völker von Alberuni* (Leipzig: F.A. Brockhaus, 1878), p. 59 [text]; C. Edward Sachau, *The Chronology of Ancient Nations* (London: W.H. Allen & Co., 1879), p. 69 [translation]; See also Ankori, *Karaites in Byzantium*, pp. 305–306 and n. 33 there.

24 Sachau translates "Syria" rather than "Palestine." The term used by al-Bīrūnī is al-Shām, which may refer to the whole of the district of Syria but was also frequently used (at least in a Jewish context) for Palestine, and it is most likely that this narrower meaning is intended here.

25 Al-Qirqisānī, *Kitāb al-Anwār*, I.13.2, VII.20.2, VII.21.12.

26 Ibid., VII.17.2–3.

in favor of computation.[27] In contrast, Marina Rustow accepted al-Bīrūnī's attribution of both practices to ʿAnan b. Daniel and suggested that al-Qirqisānī ascribed empirical intercalation to ʿAnan b. David on the basis of later sources and conjecture, retrojecting late ninth-century empirism to the beginning of the ʿAnanite movement in the eighth century.[28] In the absence of further evidence, it is difficult to establish the accuracy of either interpretation. For the purposes of the present article, it is sufficient to conclude that Babylonian ʿAnanites and Qaraites sent *ʾaviv* observation parties to Palestine sometime between mid-eighth–end-ninth centuries, a practice abandoned by Babylonian Qaraites in later centuries.

The method of inspecting the barley both in Palestine and in other countries with a similar climate, including in Iraq itself, received further development when some Babylonian Qaraites argued for relying purely on the local *ʾaviv*.[29] According to al-Qirqisānī, a group of Babylonian Qaraites maintained that *ʾaviv* is not limited to Palestine at all, so that one can rely on the state of barley crops anywhere. Other Qaraites from Baghdad admitted that the correct *ʾaviv* is that of Palestine, but thought that local *ʾaviv* could be used if certain conditions were met. Namely, if it was established over a long period of time that barley reaches the stage of *ʾaviv* in a place outside of Palestine at the same time as in Palestine, one can rely on barley crops of that place. This constituted a way of predicting the state of the barley in Palestine. Al-Qirqisānī rejected the opinion that the *ʾaviv* is not linked to Palestine, but accepted the method of the Baghdadis with the proviso that it was not the correct way to intercalate but a permissible substitute in case of doubt, used as a precaution or in times of need, i.e., when no information about the state of barley in Palestine could be obtained.[30]

Our information on *ʾaviv*-related practices in Babylonia is scanty and relates mainly to the eighth/ninth(?)–tenth centuries. More information is preserved about the *ʾaviv*-related practices of the Qaraites of Egypt and Syria, especially

27 Ankori, *Karaites in Byzantium*, pp. 305–306, 307–308.

28 Marina Rustow, *Heresy and the Politics of Community: The Jews of the Fatimid Caliphate* (Ithaca, NY: Cornell University Press, 2008), pp. 58, 61.

29 Al-Qirqisānī, *Kitāb al-Anwār*, I.19.2, VII.17.2–3; See also Ankori, *Karaites in Byzantium*, p. 306.

30 Ankori interprets this as "complete independence from Palestine" (*Karaites in Byzantium*, p. 306). This seems to be an exaggeration for the sake of Ankori's argument for a Qaraite Babylonian rebellion against Palestinian supremacy (ibid., pp. 301–317).

in the period after the destruction of the Qaraite center in Palestine at the end of the eleventh century. Throughout the Middle Ages and beyond, these Qaraite Diasporas sent *ʾaviv*-searching parties to Palestine.[31] Israel ha-Maʿaravi (fourteenth century, Cairo) reported that *ʾaviv*-searching parties were sent by the communities of Cairo, Alexandria, Damascus, and Aleppo.[32] These delegations examined barley in places in Palestine that were known to ripen early and, if barley was sufficiently ripe, brought two sheaves back to their communities as proof of finding the *ʾaviv*.[33] The delegations returned by the tenth of Nisan, allowing just enough time to prepare for Passover in case the year was declared plain.[34] Additional information on *ʾaviv*-observation parties sent to Palestine from Cairo and Damascus is found in MS RNL Evr Arab I 1180 (a sixteenth-century manuscript, the date of the text is uncertain), which ascribes this practice to earlier generations. According to this source, the communities of Jerusalem, Cairo, and Damascus used to send three experienced envoys (*šeluḥim*) each, to perform an extensive survey of fields in Palestine over a number of days. The journey of the Cairo party started from al-Šajaratayn, on the border of Egypt and Palestine, and continued further into the country, to Rafaḥ, in the district of Gaza, and the Darom, an area around Beit Guvrin.[35] Two such expeditions from Cairo in the years 1237 CE and 1240 CE, together with their findings, are mentioned in the *Book of Commandments* by Yefet b. David Ibn Ṣaghīr (fourteenth century, Cairo).[36] Another expedition (probably in the fifteenth

31 See also Ankori, *Karaites in Byzantium*, pp. 341–343.

32 Jo. Christ. Wolf, *Bibliotheca Hebraea* (Apud B. Theod. Christoph. Felgineri Viduam, 1733), vol. 4, p. 1079; See also Ankori, *Karaites in Byzantium*, pp. 341–342 and the references given there.

33 The practice of bringing handfuls of barley as evidence is also mentioned in barley investigation reports of Palestinian Qaraites in the eleventh century, e.g., MS RNL Evr Arab I 1151, fol. 1v, ed. Vidro, "*Aviv* Barley," pp. 289 [text], 291 [translation]; MS T-S 12.147r mentions that handfuls of barley were not taken from a particular field *inter alia* because others were present who presumably could verify the evaluation of the state of grain in it.

34 The tenth of Nisan is said in the Bible to be the time when preparations for the Passover sacrifice must begin (Ex. 12:3).

35 MS RNL Evr Arab I 1180, fol. 8v.

36 Yefet b. David Ibn Ṣaghīr, *Book of Commandments*, discourse III, chapter 22 (MS RNL Evr Arab I 910, fols 43v–44r).

century) and the decision-making process based on its results are described in detail in MS RNL Evr Arab II 1497.[37] MS RNL Evr Arab I 1180 also explains that in the author's own time it was impossible for Qaraites in Egypt and Syria to send envoys to Palestine. Instead they sent a courier to Gaza where he met the Jerusalem investigation party and was handed their report.[38] In years when no information about the *'aviv* could be obtained, for example, because the envoys or the courier got in trouble or died *en route*, mathematical methods were used instead. This is demonstrated in a copy of a letter exchange between the communities of Egypt and Palestine in MS ENA NS 63.2r,[39] in which the Egyptians attempted to justify their decision to intercalate on the basis of calculation despite having sent a messenger to Palestine.

Intercalation Based on Calculation

By the second half of the thirteenth century, Egypt and Syria remained the only Qaraite Diasporas that were still following an *'aviv*-based calendar.[40] The rest of the Diasporas (Babylonia, Byzantium, Spain) turned to methods based on calculation, with Babylonian Qaraites probably using such methods as early as the second half of the tenth century. The main mathematical methods used by the Qaraites were the method of the vernal equinox and the nineteen-year cycle of intercalations.

a. The Method of the Vernal Equinox

A number of Qaraite works on calendar mention, discuss, and refute the method of intercalation of the so-called supporters of the equinox.[41] I am not aware of

37 An edition and study of this fragment is in preparation by the author of the present article in cooperation with Dotan Arad (Bar-Ilan University).

38 MS RNL Evr Arab I 1180, fols 8v–9r. ENA 1691.20v (1682 CE) preserves a legal testimony by Jerusalem Qaraites who reported finding the *'aviv* and sending letters about it to the Qaraites in Cairo and Damascus.

39 The Egyptians' letter quotes and hence must postdate a text by Israel ha-Maʿaravi (see footnote 32), which refers to 1313/14 CE as "the year in which we stand," but may be significantly later.

40 Ankori, *Karaites in Byzantium*, pp. 339–344.

41 Yefet b. ʿEli, *Commentary on Deuteronomy*, MS RNL Evr Arab I 19, fols 84r–84v, 110r–110v; Sahl b. Maṣliaḥ, *Commentary on Exodus*, MS RNL Evr Arab I 3177, fol. 22r; Sahl b. Maṣliaḥ, *Book of Commandments*, MS RNL Evr Arab I 819, fols 7v–9r and MS RNL Evr Arab I 823,

any descriptions of the method by the supporters of the equinox themselves, but its details can be established with some degree of accuracy from the available texts of the supporters of the *ʾaviv*.

The equinox (Ar. *iʿtidāl*) is the day when the length of the night is equal to the length of the day. The moment of the equinox on that day is defined as the time when the sun, moving along the ecliptic, crosses the celestial equator. It was traditionally described in medieval astronomical works as the time when the sun enters the constellation of Aries (Ar. *ḥamal*, Heb. *ṭale*). The general idea of the method of supporters of the equinox was to rely on the vernal equinox rather than the *ʾaviv* as a criterion for celebrating Passover. When the vernal equinox fell before a certain date in the thirteenth month since the previous Nisan (more on this date will be said below), the year was made plain, the thirteenth month was declared Nisan, and Passover was celebrated. If the vernal equinox fell later than that date, the year was intercalated and Passover was celebrated in the following fourteenth month.

According to Levi b. Yefet, the equinox method was practiced by Babylonian Qaraites.[42] In the intra-Qaraite polemic on the *ʾaviv* this method is attributed more specifically to the Kūfans.[43] Despite this, the method of the equinox is missing from Babylonian Qaraite and proto-Qaraite works, including surviving fragments of the *Books of Commandments* by ʿAnan b. David and Benjamin Nahāwandī (first half of the ninth century),[44] and

fol. 27v; Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fols 82v–83v; Levi b. Yefet, *Book of Differences*, MS BL Or 2573, fols 13v–14v; Joseph al-Baṣīr, *Book against the People of the Equinox,* MS T-S K6.63, MS T-S Ar 50.121, MS T-S AS 154.512, MS T-S Ar 28.36; ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fols 3r–8v; Jeshuʿa b. Judah, *Short Commentary on Genesis*, MS RNL Evr Arab I 3204, fols 23v–24r; an anonymous Qaraite treatise on intercalation, MS RNL Evr Arab II 1115.35, fols 75r–76v and MS RNL Evr Arab II 220; Ibn al-Hītī, *Chronicle of Karaite Doctors*, edited in George Margoliouth, "Ibn Al-Hītī's Arabic Chronicle of Karaite Doctors," *The Jewish Quarterly Review* 9/3 (1897): 429–443, on pp. 435 [text] and 442, 443 [translation, translated as "a book on 'Equalization'"].

42 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fols 82r–82v.

43 MS RNL Evr Arab II 3105, fol. 9r.

44 Edited in Abraham Harkavy, *Aus den Ältesten Karäischen Gesetzbüchern (von Anan, Beniamin Nehawendi und Daniel Kummissi)* (St. Petersburg: I. Lurje&Co Printing House, 1903) (Heb.).

al-Qirqisānī's *Kitāb al-Anwār*. A calculation of the *tequfot* is found in Nahāwandī's *Book of Commandments*, but it is not linked to the problem of intercalating the year.[45] Al-Qirqisānī included calculating when Sun enters Aries (i.e., the time of the vernal equinox) among permitted astronomical calculations,[46] but he never mentioned that this calculation was used to fix the calendar. In contrast, the Rabbanite nineteen-year cycle and the method of relying on the state of local barley crops are discussed as makeshift alternatives to seeking the *'aviv* in Palestine.[47] This suggests that the method of the supporters of the equinox may not have been developed by 927 CE, when al-Qirqisānī was writing.[48] The earliest references to the method of the equinox that are known to me are found in tenth-century works of Jerusalem Qaraites. In the commentary on Eccl. 1:6 composed between c. 953–957, Salmon b. Yeruḥam stressed that *'aviv* and not the equinox is the correct sign of a new year (i.e., the correct criterium for declaring the month of Nisan, the Biblical first month).[49] Yefet b. ʿEli referred explicitly to "the method of the supporters of the equinox" and refuted it in his commentary on Deuteronomy composed toward the end of 960s CE,[50] and so did Sahl b. Maṣliaḥ (mid-

45 Harkavy, *Aus den Ältesten Karäischen Gesetzbüchern*, p. 177. Al-Nahāwandī explicitly states that years should be intercalated on the basis of the state of the crops (the location where crops must be checked is not mentioned in the surviving passage, ibid., p. 176).

46 As opposed to using the science of the stars for making judgements about the future (Al-Qirqisānī, *Kitāb al-Anwār*, VI.11.2).

47 Al-Qirqisānī, *Kitāb al-Anwār*, VII.4.3 and I.19.2, VII.17.2–3 respectively.

48 For the date of *Kitāb al-Anwār* see Bruno Chiesa, "Yaʿqūb al-Qirqisānī come fonte storiografica," in *On Jewish Sects and Christianity: A Translation of Kitāb Al-Anwār Book I with Two Introductory Essays*, eds. Bruno Chiesa and Wilfrid Lockwood (Frankfurt am Main: P. Lang, 1984), pp. 15–47, esp. pp. 17–23.

49 James T. Robinson, *Asceticism, Eschatology, Opposition to Philosophy: The Arabic Translation and Commentary of Salmon Ben Yeroham on Qohelet (Ecclesiastes)* (Leiden: Brill, 2012), pp. 18 [dates] and 203, 205 [text of the commentary on Eccl. 1:6], 202, 204 [translation].

50 See footnote 41. For the dating of Yefet b. ʿEli's Bible commentaries see Haggai Ben-Shammai, "Edition and Versions in Yephet b. Ali's Bible Commentary," *Alei Sefer: Studies in Bibliography and in the History of the Printed and the Digital Hebrew Book* 2 (1976): 17–32, on pp. 29–31 (Heb.).

second half of the tenth century).[51] This suggests that the method of the equinox was developed sometime between 927–late 960s CE.

The arguments of the people of the equinox in favor of their method and against the method of the *ʾaviv* can be learned from Levi b. Yefet's *Book of Commandments* and ʿAlī b. Sulaymān's abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*.[52] The central argument for the equinox as the sign of the year was based on Gen. 1:14 "And God said, Let there be lights in the dome of the sky to separate the day from the night; and let them be for signs and for seasons and for days and years." All Qaraites interpreted this verse as saying that the moon serves as the divider between months and the sun serves as the divider between days and between years. Supporters of the equinox believed that the sun divides between years by equinoxes, and the *ʾaviv* makes it clear which of the two equinoxes should determine the first month.[53] They claimed that this was the original way of dividing between years, used by Adam, Noah, and others before the commandment of keeping the month of *ʾaviv* was given to Moses (Deut. 16:1). They insisted that this original commandment should not be abrogated by a later one,[54] but rather the original way

51 See footnote 41. Sahl's life and works are usually dated to the second half of the tenth century. Leon Nemoy, *Karaite Anthology: Excerpts from the Early Literature* (New Haven: Yale University Press, 1952), p. 109. His work *Tokhahat Megulla* is dated to 957/8 CE in MS RNL Evr I 736, fol. 21r, but this date is not found in other copies of the work. Sacha Stern, *The Jewish Calendar Controversy of 921/2 CE* (Leiden: Brill, 2019), p. 431.

52 See references in footnote 41.

53 Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fol. 82v; ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fol. 4v.

54 Abrogation (*naskh*) refers to the view held by some medieval Jewish exegetes in Muslim lands that a biblical commandment can be replaced by another commandment given in a later verse. This principle was derived from a similar principle in Qur'anic exegesis and was used to explain apparent contradictions and changes of practice in the text of the Bible, including the differences between pre-Mosaic laws and the laws revealed to Moses. See Yoram Erder, "Early Karaite Conceptions about the Commandments Given Before the Revelation of the Torah," *PAAJR* 60 (1994): 101–140; Marzena Zawanowska, *The Arabic Translation and Commentary of Yefet ben ʿEli the Karaite on the Abraham Narratives (Genesis 11:10–25:18)* (Leiden: Brill, 2012), p. 53 and footnote 71 there; Miriam Goldstein, *Karaite Exegesis in Medieval Jerusalem: The Judeo-Arabic Pentateuch Commentary of Yūsuf ibn Nūḥ and Abū al-Faraj Hārūn* (Tübingen: Mohr Siebeck, 2011), pp. 169–173, and further references cited in these sources.

of dividing between years should be maintained.[55] Their arguments against the *ʾaviv* included that the state of the crops in Palestine is not accessible to people in the Diaspora and that the state of crops depends on the location within the Land and on unpredictable weather changes. In Biblical times, they argued, the *ʾaviv* method could not have been used by the Israelites in the desert, nor could it have been used in times of drought and in sabbatical and jubilee years.[56]

A number of dates in the thirteenth month are mentioned as cut-off points before which the vernal equinox should occur for a year to be plain. Some supporters of the equinox made the year plain if the equinox occurred at the beginning of the month. Others if it occurred up to seven days of the month, yet others up to fourteen days, i.e., up to the time of the Passover sacrifice itself.[57] The latter opinion strongly resembles the so-called "rule of the equinox," i.e., that Passover may not fall before the vernal equinox. This rule is known from the Talmudic calendar (Babylonian Talmud, Rosh Hashanah 21a) and also applies in the Christian Easter calculation.[58] In the rabbinic tradition, Passover was assimilated into the Festival of Unleavened Bread, so that the talmudic rule of the equinox stated that the fifteenth of Nisan, the first day of Unleavened Bread, may not occur before the vernal equinox.[59] In the Christian tradition as well as in the Qaraite tradition the Passover sacrifice remained separate from the Festival of Unleavened Bread. For this reason, both Christians and Qaraite supporters of the rule of the equinox used the fourteenth of Nisan, the day of the Passover sacrifice, as a cut-off point for intercalation, in contrast to the Rabbanites.

55 Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fol. 83r; Jeshuʿa b. Judah, *Short Commentary on Genesis*, MS RNL Evr Arab I 3204, fol. 22v.

56 Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fols 83r–83v; ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fols 7v–8v.

57 Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fol. 82v; see also Sahl b. Maṣliaḥ, *Book of Commandments*, MS RNL Evr Arab I 819, fol. 8r.

58 Sacha Stern, *Calendar and Community: A History of the Jewish Calendar, 2nd cent. BCE–10th cent. CE* (Oxford: Oxford University Press, 2001), pp. 167–170 (accessed online DOI: 10.1093/0198270348.001.0001); Alden A. Mosshammer, *The Easter Computus and the Origins of the Christian Era* (Oxford: Oxford UP, 2008), pp. 51, 69.

59 In a second recension of this rule, the equinox cannot occur after the sixteenth of Nisan (Stern, *Calendar and Community*, p. 168).

All Qaraites associated with the Jerusalem scholarly community rejected the principle that the vernal equinox is the true sign of the beginning of a new year.[60] Despite this, some Palestinian Qaraites remarked that *'aviv* barley usually became widespread in particular areas of Palestine close to the vernal equinox so that intercalations based on the *'aviv* and those based on the equinox usually occurred in the same years.[61] This correlation, they explained, follows from the fact that solar years are roughly eleven days longer than lunar years so that the equinox falls later in the lunar month by about eleven days each year. The time when the *'aviv* becomes wide-spread also moves forward by about one third of a month. Yefet b. ʿEli wrote:[62]

> In a plain year that follows an intercalated year in which [crops] are not scarce we find that *'aviv* is wide-spread by the beginning of the thirteenth month. We find that the second year is plain because *'aviv* is wide-spread in it on the tenth of the [thirteenth] month. And the third year is intercalated because *'aviv* is wide-spread in it after the twentieth of [the month]. We find that the spread of *'aviv* comes with the equinox. It is clear to him who performed observations of it.

Due to this approximate synchronisation some Palestinian Qaraites considered the equinox a legitimate substitute for the *'aviv*. Joseph al-Baṣīr consented that the equinox, as well as the Rabbanite nineteen-year cycle, may be used as a criterion

60 See references in footnote 41.

61 Yefet b. ʿEli, *Book of Commandments*, MS RNL Evr Arab I 829, fols 33v, 38r; Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 87r; Jeshuʿa b. Judah, *Short Commentary on Genesis*, MS RNL Evr Arab I 3204, fol. 23v. Others stressed that this is not always the case: Salmon b. Yeruḥam (Robinson, *Asceticism*, pp. 203, 205 [text], 202, 204 [translation]), an anonymous Qaraite treatise on intercalation, MS RNL Evr Arab II 220, fol. 1v; Joseph al-Baṣīr composed the *Book against the People of the Equinox* at the request of a person who noticed that people celebrated Passover at two different times when the equinox did not co-occur with the *'aviv* (MS T-S K6.63r).

62 Yefet b. ʿEli, *Book of Commandments*, MS RNL Evr Arab I 829, fol. 38r:
"אדא כאנת אלסנה בסיטה בעקב כביסה ליסת צייקה נגד אשתה[א]ר אלאביב מע ראס אלשהר א[ל]
יוֹ ונגד אלסנה אלתאניה בסיטה אדֿ אשתהאר אלאביב פי יֹ מנה ותכון אלסנה אלתאלתה כביסה אדֿ
אשתהאר אלאביב פימא זאד עלי כֹ מנה: ווגדנא אשתהאר אלאביב מע אלאעתדאל גארי והדא יקף
עליה מן געל רצדה מנה".

for intercalation by the people of the Diaspora if they are unable to follow the *ʾaviv*. He cautioned that the nineteen-year cycle and the equinox should not be regarded as correct signs of the year supported by Scriptural proofs (*dalāla*) but as mere indications (*amāra*).[63] Levi b. Yefet maintained that even those Qaraites who had access to *ʾaviv* barley in Palestine should rely on the equinox in years with atypical weather. He wrote that irregular weather patterns can make crops ripen much earlier or much later than usual, which can disturb the normal arrangement of years. For example, if autumn rains come early and are followed by a period of hot weather, *ʾaviv* barley can be found already in the beginning of the twelfth month. In contrast, persistent rains and cold can make the barley ripen too late. To control for such deviations and ensure that years are no less than twelve and no more than thirteen months long, Levi b. Yefet suggested that one should rely on the *ʾaviv* in sound years when rains and temperatures follow their expected pattern. In irregular years one should make a decision about intercalation on the basis of one's experience of what happens in regular years, taking the time of the equinox as a sign of when the *ʾaviv* would be, had the weather been regular.[64]

The view that the equinox can be used to predict the time of the ripening of barley is discussed in later sources composed in Egypt and Byzantium. It was supported by Judah Hadassi (twelfth century, Byzantium)[65] but rejected by Aharon b. Elijah (fourteenth century, Byzantium) who believed that the equinox should not be used because it was derived from Gen. 1:14 which had been abrogated by Deut. 16:1.[66] In Cairo in 1240 CE, when Qaraites found *ʾaviv* barley and celebrated Passover a month before the Rabbanites but the equinox aligned with the Rabbanite date, Obadya b. Moses Ibn Kūjak admonished that the equinox should be ignored and praised God for showing the truth through the *ʾaviv*.[67] That he found it necessary to make this remark and knew the exact

63 ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fols 7v–8r.

64 Levi b. Yefet, *Book of Commandments,* MS RNL Evr Arab I 3920, fols 86*v–87v.

65 Judah Hadassi, *ʾEškol ha-Kofer*, alphabets 187, 188, ed. Gozlov 1836, fol. 76; See also Ankori, *Karaites in Byzantium*, pp. 337–338.

66 Aharon b. Elijah, *Gan Eden*, discourse "On the Sign by which Years are Divided," chapter 11, ed. Gozlov 1864, fol. 22r; On the notion of the abrogation of an earlier verse by a later one, see footnote 54.

67 Yefet b. David Ibn Ṣaghīr, *Book of Commandments*, discourse III, chapter 22, MS RNL Evr Arab I 910, fol. 44r.

date of the vernal equinox (18 Shaʿbān, around 14 March) suggests that the equinox method was well-known in Egypt and a discord between the time of finding the *ʾaviv* and the date of the equinox could create confusion. The intercalation on the basis of the vernal equinox (and of the nineteen-year cycle) is defended in MS ENA NS 63.2r, a copy of a letter of Egyptian Qaraites to the Qaraites of Palestine. It is important to note, however, that while the Babylonian supporters of the equinox appear to have argued for it as the primary sign of the year and the true intercalation method, Palestinian, Byzantine, and Egyptian Qaraites discussed it only in the context of predicting which years would be intercalated on the basis of the *ʾaviv*, a fact that stresses the continued Palestino-centrism of these communities.

In the absence of sources produced by the supporters of the equinox method, it is hard to be certain about the type of equinox they relied upon and how they established its date and time. They could have relied on the true vernal equinox, the mean vernal equinox, or on some simplified calculation scheme. If relying on the true equinox, supporters of the equinox could have calculated its date and time, using data in astronomical tables and annual ephemerides. Alternatively, they could have observed the equinox, although even equinoxes determined by observation were often not directly observed but calculated on the basis of other parameters established by direct observation.[68]

In what follows, I attempt to infer information on these technical aspects of the Babylonian equinox method on the basis of sources all but one of which were composed in Palestine. Since Qaraites who composed these works were first- or second-generation emigrants from Babylonia and allowed the use of the method for predicting the time of the *ʾaviv*, their testimonies can be considered sufficiently trustworthy.

It has been recently suggested by Haggai Ben-Shammai that supporters of the equinox established it by observation, and that the difference between Qaraites who relied on the *ʾaviv* and those who relied on the equinox was only

68 On observing the moment of the equinox and the precision of such observation by ancient and medieval Muslim astronomers see James Evans, *The History and Practice of Ancient Astronomy* (New York: Oxford UP, 1998), pp. 205–207; Stern, *Calendar and Community*, p. 200; S. S. Said and F. Richard Stephenson, "Precision of Medieval Islamic Measurements of Solar Altitudes and Equinox Times," *Journal for the History of Astronomy* 26/2 (1995): 117–132; John Phillips Britton, *Models and Precision: The Quality of Ptolemy's Observations and Parameters* (New York: Garland, 1992), pp. 12–47.

about what to observe, not whether to observe or to calculate.[69] However, this hypothesis is not supported by primary evidence. Al-Qirqisānī talks about calculating the time when the sun enters Aries (i.e., the vernal equinox): "[...] he who applies this science by using calculation in order to find out when the new moon will appear, or when the sun will enter the sign of Aries [trans. Nemoy]."[70] One of the arguments of supporters of the equinox as presented by Levi b. Yefet contrasts the *ʾaviv* with a calculation, not an observation of a different, astronomical phenomenon. Referring to draughts in the Bible as well as Sabbatical and Jubilee years when there are no crops they asked: "God sometimes did not give them rain and their crops did not grow. What should they have relied upon if calculating is not correct?!"[71] When refuting the method of the equinox, some authors mentioned that the equinox was determined by calculation. An anonymous text preserved in MS RNL Evr Arab II 1115.35 and MS RNL Evr Arab II 220 reads: "because in some years the equinox according to their calculation falls near the beginning of the month but the *ʾaviv* cannot be found in [this time]..."[72] Yefet b. ʿEli included the following arguments in his refutation of the method of the equinox, which target its being a calculation:

> The third aspect is that God, may He be blessed and exalted, did not obligate us [to perform any] calculation that is not recorded in His Book, did not mention solar months, and did not make any worship incumbent upon us in them. If this is so, then on what basis can his [an equinox follower's] claim be substantiated?
>
> The fourth aspect is that one cannot find out the true value of the equinox other than by calculation and one must turn for it to those who profess the approach of the stars. But God forbade that there be

69 Haggai Ben-Shammai, "Levi ben Yefet on the Calendar – Revisited," conference paper delivered at the Research Workshop "Karaite Studies: The State of the Field," Ben-Gurion University of the Negev, Israel, February 2012. A video recording of the talk is available at https://youtu.be/WxWHccHJraY (accessed on 16 September 2021).

70 Al-Qirqisānī, *Kitāb al-Anwār*, VI.11.2.; Leon Nemoy, "Al-Qirqisānī on the Occult Sciences," *The Jewish Quarterly Review* 76/4 (1986): 329–367, on p. 362.

71 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fols 83r–83v:
"קד כאן ימנע אללה אלמטר ענהם פלא תנבת זרועהם פעלי מא דא יעולון אלם יכן אלחסאב צחיח".

72 MS RNL Evr Arab II 220, fol. 1v:
"אד וקע אלאעתדאל עלי חסאבהם פי בעץ אלסנין מגאור צדר אלשהר מע פקד אלאביב פיה".

> astronomers/astrologers [*munajjimūn*] among us [see Deut. 18:10], and even more so that we use it [the science of the stars] to [observe] a commandment. Besides, astronomers do not all agree regarding the day when the equinox falls and there can be days between them because of their different calculations.[73]

I am aware of only two references to observations in the context of the equinox. The first passage is found in Levi b. Yefet's *Book of Commandments*.[74] Levi b. Yefet approved setting the calendar on the basis of the equinox under certain conditions. When challenged about his readiness to rely on a calculation he argued that the return of the sun to its position at the equinox could be observed, albeit approximately, with a potential error of a few days. Importantly, Levi is not talking here about determining the equinox by observation but about confirming and validating the results of the calculation with the help of observation. The second Qaraite reference to observations in the context of the equinox is found in *Kitāb al-Istibṣār*, where Joseph al-Baṣīr quoted his own *Book against the People of the Equinox* (this passage has not survived in the identified fragments of this work or of its abridgement by ʿAlī b. Sulaymān):[75]

73 This last point is a rejoinder to the argument of the followers of the equinox that the parameters of the *'aviv* are not clearly defined. Yefet b. ʿEli, *Commentary on Deuteronomy*, MS RNL Evr Arab I 19, fol. 84v:
"ווגה ג והו אן אללה תבארך ותעאלי לם ילזמנא חסאב אלדי ליס הו מנצוץ פי כתאבה ולא דכר לנא שהור אלשמס ולא וקע לנא תעבד פיהא ואדא כאן הדא הכדי פמנין יתבת לה הדא אלדעוי וגה ד והו אן אלאעתדאל לא יוקף עלי חקיקתה אלא באלחסאב וליס ירגע פיה אלא אלי אלמנחלין מדהב אלנגום ואללה קד מנענא אן יכון פי וסטנא אלמנגמין פבאלאחרי אן נסתעמלה פי אלפרץ ומע דלך ליס אלמנגמין כלהם מתפקין פי יום וקוע אלאעתדאל ויכון בינהם איאם לאכתלאף חסבאנאתהם".

74 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 87v.

75 *Kitāb al-Istibṣār*, discourse III, chapter 4, MS RNL Evr Arab I 1793, fol. 104r:
"וקד אוצחנא אלכלאם פי דלך פי כתאבנא עלי אלקאילין באלאעתדאל ובינא אן אצחאב אלתקאוים אלמתעאטין במסיר אלכואכב אלמתצאהרין בהדה אלצנאעה אכתלפו פמנהם מן יסיר עלי זיג בטלמיוס ומנהם מן יסיר עלי זיג אלמאמון ובין אלאעתדאלין איאם וחסאב אלרבאנין פי אלתקופה מערוף והו מכאלף להמא ול[א] בד מן אן יכון ראגעא אלי צרב מן אלרצד ונחן נרי אן מן יצרב ותדא פי מוצע מכצוץ אדא רגעת אלשמס אלי דלך אלמוצע לא ינצבט לה הדא כל אלצבט חתי יקטע עלי אן אלאעתדאל חצל פי הדא אלוקת אלמכצוץ ולו אנצבט למא אחתאג אלמאמון אלי תכלף אלאמתחאן ותרתיבה אלזיג מכאלפא למן תקדמ[ה]".

> We said clearly and explained in our *Book against the Supporters of the Equinox* that compilers of ephemerides, who occupy themselves with the motion of the starts pretending [to have][76] this skill uphold different opinions. Some of them follow the *zīj* of Ptolemy and others follow the *zīj* of al-Ma'mūn. There are days between the equinoxes [according to these *zīj*s]. The Rabbanite calculation of the *tequfa* is also known and it differs from them both. This must necessarily go back to some kind of observation. We see that [when] one drives a peg in a specific place [to mark the position of the sun]—if the sun returns to this place, nothing at all is determined precisely until one makes a final decision that the equinox happened at this particular time. Had it been determined precisely, why would al-Ma'mūn take upon himself the investigation and arrangement of a *zīj* that is at variance with that of his predecessor?

It is clear from this passage that al-Baṣīr realized that values in astronomical tables were ultimately based on observations and may have seen equinox observations carried out. However, this is not conclusive evidence of setting the equinox-based calendar by observation. Rather, al-Baṣīr's focus on *zīj*s and ephemerides implies the use of tables to know the time of the equinox. Al-Baṣīr only brought up observations in order to show that calculated values in ephemerides do not reliably describe the objective astronomical reality.

The cited passages strongly suggest that the time of the vernal equinox was determined by calculation. However, all quoted passages except that by al-Qirqisānī are found in the context of polemics against the equinox method. It suited Jerusalem Qaraites to assume that the equinox was calculated, because relying on astronomical calculations was something they were generally opposed to.[77] Yet any gross misrepresentation of their opponents' method would have weakened their position in the polemic, especially when arguing against their contemporaries. In sum, it is probable that Babylonian supporters of the method of the vernal equinox set their calendar by a calculation of this astronomical phenomenon.

I am not aware of actual surviving calendars based on the calculation of the equinox. However, dates and times of the vernal equinox for a number of years

76 Alternatively: making a show of, parading.

77 Vidro, "Non-Rabbanite Jewish Calendars," pp. 158–161.

between 1021–1026 CE as well as for 1240 CE are preserved in Qaraite sources.[78] Although these sources emanate from Palestine and Cairo and focus on Qaraites who intercalated years on the basis of the *ʾaviv*, they may give us some idea of how Qaraites at the time determined the vernal equinox.

Table 1: Vernal equinox in Qaraite sources
The dates and times of the vernal equinox as given in the Qaraite sources are presented in column 2. In column 3 the dates are converted to the Julian calendar.[79] In column 4 the dates and times of the true vernal equinox are given as calculated by modern astronomers.[80]

AH/CE date	Equinox in the Qaraite sources	Julian date of the equinox in the Qaraite sources	True vernal equinox (Julian date, TDT)
411 AH/1021 CE	fourth hour of the night, Wednesday, 29 Ḏū al-Qaʿdah	15 March, 10 p.m.	15 March, 01:49:31
413 AH/1023 CE	fifth hour of the day, Friday, [19] Ḏū al-Ḥijjah[81]	[15] March, 11 a.m.	15 March, 13:16:27

78 MS T-S AS 158.147 and MS RNL Evr Arab I 1151 (edited in Vidro, "*Aviv* Barley," pp. 286–292) and Yefet b. David Ibn Ṣaghīr, *Book of Commandments*, discourse III, chapter 22 (MS RNL Evr Arab II 2894, fol. 1r and MS RNL Evr Arab I 910, fol. 44r), respectively. I thank Dr. Johannes Thomann for his help with the analysis of this data.

79 The Fourmilab's calendar converter was used for the conversion (https://www.fourmilab.ch/documents/calendar/) and the results were adjusted to fit the day of the week mentioned in the sources. The time of the equinox in the Qaraite sources is converted on the assumption that it refers to the day from sunset to sunset that begins at 6 p.m.

80 For the modern data on the true vernal equinox, the equinox and solstice calculator was used (https://stellafane.org/misc/equinox.html) which implements the algorithms in Jean Meeus, *Astronomical Algorithms*, 2nd edition (Richmond, VA: Willmann-Bell, Inc., 1998). The time is given in Terrestrial Dynamical Time (TDT).

81 This reconstruction is based on the fact that 19 Ḏū al-Ḥijjah 413 AH was a Friday two solar years after the previous surviving equinox datum of Wednesday, 29 Ḏū al-Qaʿdah 411 AH.

416 AH/1025 CE	twelfth(?) hour of the night, Monday, 13 Muḥarram	15 March, 6 a.m. (?)	15 March, 00:53:39
417 AH/1026 CE	tenth hour of the night, Tuesday, 23 Muḥarram	15 March, 4 a.m.	15 March, 06:51:39
637 AH/1240 CE	18 Shaʿbān	14 March[82]	13 March, 03:24:40

It is clear from the preserved dates that the equinox in the Qaraite sources fits the date of the modern calculated true vernal equinox[83] (except perhaps in 1240 CE, although the exact correspondence between the Hijri and the Julian calendars cannot be established in the absence of the day of the week of the equinox). It does not fit the Rabbanite *tequfat Shemuel*, which always falls on 25–26 March in the Julian calendar. *Tequfat R. Adda* most likely had not yet been introduced in the first half of the eleventh century but would have fallen on 17–18 March.[84] It fell on 16 March in the thirteenth century. Likewise, the mean vernal equinox falls almost two days after the true vernal equinox and is too late compared with the data in the Qaraite sources.[85] One can conclude that the term "equinox" in the preserved Qaraite sources from Palestine and Egypt refers to the true vernal equinox. It is reasonable to conjecture that it meant the same for the Babylonian supporters of the method of the equinox.

b. The Nineteen-year Cycle of Intercalations

The calculated method most widely used by Qaraites in the Diaspora was the nineteen-year cycle, known as the *maḫzor* or "the Rabbanite calculation." In this scheme, seven out of every nineteen years are intercalated, following a particular order of plain and intercalated years. The nineteen-year cycle was used

82 The day of the week of 18 Shaʿbān 637 AH is not mentioned in the sources, and the conversion is necessarily approximate.

83 The modern dates are very close to what was known already to ninth–eleventh-century Muslim astronomers (Said, Stephenson, "Precision," pp. 129–130).

84 See e.g.: https://webspace.science.uu.nl/~gent0113/hebrew/hebrewyear.htm, accessed on 16 September 2021.

85 Stern, *Calendar and Community*, p. 199, no. 690; See also Moses Maimonides, *Sanctification of the Moon* 10:7.

by Qaraites in Byzantium,[86] Spain,[87] and Babylonia,[88] as well as in Egypt in case information on the *'aviv* was unavailable.[89]

Many tenth–eleventh-century Qaraite authorities spoke approvingly of the use of the nineteen-year cycle as a relatively accurate way of predicting which years would be intercalated in the *'aviv* method.[90] Al-Qirqisānī wrote:

86 Ankori, *Karaites in Byzantium*, pp. 339–344, with examples from the second half of the thirteenth century onwards. In the twelfth century, Judah Hadassi did not explicitly mention the nineteen-year cycle but suggested a scheme of two plain years followed by one intercalated year. Considering that Hadassi wrote about ways of predicting the intercalation if information about the ripening of barley in Palestine was not available, he may have felt that using the entire cycle would not be necessary as information about the *'aviv* would become available at reasonably short intervals (*'Eškol ha-Kofer*, alphabets 188, 190, ed. Gozlov 1836, fols 76r, fol. 77r).

87 As evidenced by Judah Halevi (twelfth century) in *Sefer ha-Kuzari* III:38 (quoted in Ankori, *Karaites in Byzantium*, p. 345).

88 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 87r. Byzantine Qaraites in the fourteenth and fifteenth centuries wrote that Babylonians who had previously supported the equinox now shifted to the Rabbanite calculation (Aharon b. Elijah, *Gan Eden*, discourse "On the Sign by which Years are Divided," chapter 2, ed. Gozlov 1864, fol. 14v, later repeated by Elijah Bashyachi [quoted in Ankori, *Karaites in Byzantium,* p. 304 footnote 32]).

89 MS ENA NS 63.2r (after 1314 CE). Israel ha-Maʿaravi (Cairo, fourteenth century) included a long section on the nineteen-year cycle, confirming that in his time it was used by Qaraites who lived far from the Land of Israel (Wolf, *Bibliotheca Hebraea*, pp. 1079–1080).

90 See references in footnotes 91, 92, 93 and near footnote 98. Ibn al-Hītī wrote about a Qaraite work against the nineteen-year cycle and the calculation of the *molad*, but this work has not survived making it impossible to know if it rejected the nineteen-year cycle only as the primary method of intercalation or also as a way of predicting intercalations based on the *'aviv* (Margoliouth, "Ibn Al-Hītī's Arabic chronicle," pp. 435 [text], 442 [translation]). Israel b. Daniel (*Book of Commandments*, MS RNL Evr Arab I 1012, fol. 155r) rejected the cycle because it is not based on Scripture but rather on the sayings of astronomers/astrologers (*munajjimūn*) who are abhorred by God. This is an argument against the use of the cycle as the primary method of intercalation. For the mainstream ninth–tenth-century Qaraites' rejection of astronomical calculations, based among other things on their interpretation of Deut. 18:10, see Vidro, "Non-Rabbanite Jewish Calendars," pp. 158–161.

"If [the nineteen-year cycle] is early in one year, it is late in the year after it, until it balances out."[91] Levi b. Yefet stated that "it is close to the *ʾaviv* at most times."[92] Joseph al-Baṣīr defined it as a sign established by means of individual interpretation rather than based on textual proof and explained that "the Rabbanites' plain and intercalated years are a sign because they are largely correct."[93] The idea that the nineteen-year cycle is a good way of approximating the time of finding the *ʾaviv* in Palestine was prominent in Byzantine Qaraite works since at least the second half of the thirteenth century.[94] In Egypt, Israel ha-Maʿaravi went as far as to claim that the nineteen-year cycle is mostly accurate because it was put together on the basis of *ʾaviv* observations over a long stretch of years.[95] Surviving medieval and early-modern Qaraite calendars suggest that the nineteen-year cycle diverged from *ʾaviv*-based intercalation two to three times per decade.[96] In such years, Qaraites who followed the nineteen-year cycle

91 Al-Qirqisānī, *Kitāb al-Anwār*, VII.4.3.

92 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fol. 82v:

"מגאור אלאביב פי אכתר אלאוקאת".

See also the discussion on fol. 87r.

93 ʿAlī b. Sulaymān, Abridgement of Joseph al-Baṣīr's *Book against the People of the Equinox*, MS RNL Evr Arab I 4446, fol. 7v:

"ובסאיט אלרבאנין וכבאיסהם אמאר[ה] לאן אלאכתר פי דלך הו אלחק".

94 Ankori, *Karaites in Byzantium*, pp. 339–340.

95 Wolf, *Bibliotheca Hebraea*, pp. 1078. See also Ankori, *Karaites in Byzantium*, p. 344 and footnote 119.

96 Vidro, "*Aviv* Barley," p. 305 (eleventh century), MS ENA 4010.35, MS ENA 4196.15, MS T-S K2.107r, and MS T-S NS J 609r (eleventh century), edited in Moshe Gil, *The Tustarīs: The Family and the Sect* (Tel Aviv: Tel Aviv University Press, 1981), pp. 86–94 (Heb.); MS RNL Evr Arab II 2115v (seventeenth century). *ʾAviv* searches performed by Nehemia Gordon in 2000–2016 CE resulted once in a one-month difference between the observational calendar and the calendar regulated by the nineteen-year cycle. Alex Strashny, "Modern Searches for *Aviv* Barley in the Context of the Hebrew Calendar," *Jewish Bible Quarterly* 45/3 (2017) (online publication, https://jbqnew.jewishbible.org/jbq-past-issues/2017/453/modern-searches-*ʾaviv*-barley-context-hebrew-calendar, accessed on 12 August 2021). How well the nineteen-year cycle can represent *ʾaviv*-based intercalation depends *inter alia* on the exact definition of the *ʾaviv*. For example, some eleventh-century definitions produced sequences of two intercalated years in a row, which are impossible in the nineteen-year cycle (Vidro, "*Aviv* Barley", pp. 302–303).

celebrated festivals a month earlier or later than those who followed the *ʾaviv*. Inasmuch as Qaraites did not consider calendar unanimity essential, they were prepared to accept this divergence.[97]

Specific instructions for the use of the nineteen-year cycle in the Diaspora were given by Yefet b. ʿEli, as quoted in Levi b. Yefet's *Book of Differences*:[98]

> [Yefet] said regarding the people in the Diaspora that they must follow the calculation of the Rabbanites according to בהז יגוח, except in two years, namely, the fourth and the fifteenth [of the nineteen-year cycle] because the *tequfa* falls at the end of Tishri. For this reason, the *ʾaviv* ripens late. In these two years it is better to observe two months— the first as a precaution and the second in belief.[99]

This passage refers to the nineteen-year cycle with the mnemonic בהז יגוח. This means that an intercalary month must be inserted in years two, five, seven, ten, thirteen, sixteen, and eighteen of the cycle (in the mnemonic *bet* stands for two, *heh* for five, etc., but for thirteen, sixteen, and eighteen only the units are given but not the tens, e.g. *gimel* stands for thirteen). This scheme differs only superficially from the better-known scheme גוח אדזט currently in use in the Jewish calendar, in which the intercalated years are numbered three, six, eight, eleven, fourteen, seventeen, and nineteen (in the mnemonic *gimel* stands for three, *waw* for six, etc.). In both schemes the intercalation occurs at the same time, but the counting begins from different epochs: the scheme גוח אדזט starts from 3761 BCE, and בהז יגוח from 3760 BCE one year later. Qaraites associated

97 Vidro, "*Aviv* Barley," p. 308; Vidro, "Qaraite New Moon Observation".

98 Levi b. Yefet, *Book of Differences*, MS BL Or 2573, fol. 24r:
"وقال في اهل الجالية انه يجب عليه يتبع حساب الربانين على ب ه ز ي ج* و ح غير سنتين الرابعة والخامسة عشر لان التקופה تقع في اخر شهر תשרי فلذلك يتاخر بلوغ الאביב والاولى في تلك السنتين مسك الشهرين الاول مستظهر والثاني معتقد".

* MS BL Or 2573, fol. 24r mistakenly reads د instead of the expected ج. This mistake is not found in another version of this passage in MS RNL Evr Arab I 671, fol. 21r.

99 The notion of "reasoned belief" (*iʿtiqād*) is central to the Qaraite interpretation of the commandment to "observe the month of *ʾaviv*" (Deut. 16:1) since one has to believe that a particular month is the biblical "first month" in order to fulfil it. Sahl b. Maṣliaḥ, *Book of Commandments*, MS RNL Evr Arab I 823, fol. 22v; Yefet b. ʿEli, *Commentary on Deuteronomy*, MS RNL Evr Arab I 111, fol. 115v.

with the Jerusalem center always referred to the nineteen-year cycle with the mnemonic בהז יגוח.[100] This changed in later works composed in Byzantium and Egypt, where the גוח אדזט scheme was used instead.[101]

Yefet b. ʿEli instructed Diaspora Qaraites to deviate from the nineteen-year cycle in years four and fifteen. In years four and fifteen of the Rabbanite יגוח בהז scheme the distance between the solar and the lunar years is the greatest, meaning that lunar months begin earlier in their respective solar seasons than in other years. If Nisan falls early in spring, barley may reach the state of *ʾaviv* too late in the month to celebrate Passover, requiring an intercalation. In contrast, in the nineteen-year cycle these years are not intercalated. Inasmuch as the cycle is only used to predict the state of barley crops, relying on the cycle in these years is problematic. Yefet suggested to intercalate years four and fifteen, but treated them differently from the rest of the intercalations because the need for them was uncertain. He instructed Diaspora Qaraites to celebrate Passover twice in these years, in months thirteen and fourteen as counted from the previous Nisan, first as a precaution and then again on the date that he believed to be its true date. The recommendation to observe two months when in doubt was also given by Levi b. Yefet, who also mentioned that others opined that festivals should be celebrated once, in the second month.[102] The latter view must have been held by Sahl b. Maṣliaḥ who argued that observing two months made it impossible

100 In addition to Yefet b. ʿEli, see Joseph al-Baṣīr, *Kitāb al-Istibṣār*, discourse 3, chapter 4, MS RNL Evr Arab I 1793, fol. 105r (al-Baṣīr also mentions the scheme אדוטבהז). Levy b. Yefet's equating year 399 AH (=4769 AM) with year eighteen of the cycle (*Book of Commandments*, MS RNL Evr Arab I 3920, fol. 105r) fits the epoch 3760 BCE used in the scheme בהז יגוח.

101 To the best of my knowledge, Hadassi is the first Qaraite to mention the now more common scheme [אדזט] גוח, together with the oldest known Jewish scheme גבטבג (*ʾEškol ha-Kofer*, alphabet 194, ed. Gozlov 1836, fol. 78r). Yefet's passage on the nineteen-year cycle was repeated almost *verbatim* by Yefet b. David Ibn Ṣaghīr in Cairo (*Book of Commandments*, discourse 3, chapter 22, MS RNL Evr Arab I 910, fol. 43v) and was translated by Aharon b. Elijah in Nicomedia (*Gan Eden*, discourse "On the Sign by which Years are Divided," chapter 11, ed. Gozlov 1864, fol. 22r) both of whom re-coded the nineteen-year cycle גוח אדזט. In the process, Yefet b. David Ibn Ṣaghīr incorrectly re-numbered the years four and fifteen as three and fourteen instead of five and sixteen, and Aharon b. Elijah did not re-number them at all.

102 Levi b. Yefet, *Book of Commandments*, MS RNL Evr Arab I 3920, fols 85r–85v.

to believe in any one of the dates and meant adding to God's commandments, something that Qaraites were opposed to.[103]

Yefet b. ʿEli expressed the distance between the solar and the lunar year in terms of the time of *tequfat* Tishri, the mean autumnal equinox as calculated in the Rabbanite calendar (*tequfat Shemuel*).[104] This was linked to his view that the Rabbanite cycle of intercalations is based on the *tequfa* of Tishri:[105]

> They based their calculation on [the following rule:] if the *tequfa* of Tishri falls at the end of Tishri, even on the very last day, they make the first [i.e., previous] year plain. But if they see that the *tequfa* exceeds Tishri, even by one day, they make the previous year intercalated. By intercalating and having two Adars [they ensure that] the *tequfa* falls in Tishri.[106]

According to this rule, intercalation in Nisan in any given year of the Rabbanite nineteen-year cycle depends on the date of the *tequfa* of the following Tishri. This means that the intercalation in Nisan of years four and fifteen is linked to the *tequfa* of Tishri in years five and sixteen. In these years, *tequfat* Tishri falls very late in the month but still does not exceed it (at the end of the tenth century

103 Sahl b. Maṣliaḥ, Abridgement of the *Book of Commandments*, MS RNL Evr Arab I 800, fol. 6v; Levi b. Yefet, *Book of Differences*, MS BL Or 2573, fol. 23r; For Levi b. Yefet's and later Qaraites' view that observing festivals twice in case of doubt did not constitute an addition to the commandments see Nadia Vidro, "Qaraite New Moon Observation".

104 Yefet used the term *tequfa* only when speaking of the Rabbanite calendar and the Arabic term *iʿtidāl* in other contexts. This is also the case in *Kitāb al-Istibṣār*, discourse III, chapter 4, MS RNL Evr Arab I 1793, fol. 104r (quoted above in footnote 75).

105 Yefet b. ʿEli, *Commentary on Exodus*, MS BL Or 2469, fol. 56r:
"בנו חסאבהם עלי אן תקופת תשרי תקע פי אכר תשרי ולו ביום ואחד געלו סנה עאם אול בסיטה ואן ראו אן אלתקופה תכרג ען תשרי ולו אנה ביום געלו אלסנה אלתי קבלהא כביסה חתי אדא כבסו וגעלו אדרין וקעת אלתקופה פי תשרי".

106 Yefet's rule is reminiscent of and roughly compatible with Saadia's explanation of the Rabbanite intercalation, except that Saadia linked the time of the *tequfa* to the intercalation in the following rather than the previous Nisan. Saadia, *Refutation of Ibn Sāqawayh*, MS T-S 10Ka.5, fols 1v–3r, edited in Hartwig Hirschfeld, "The Arabic Portion of the Cairo Genizah at Cambridge. (Third Article.): Saʿadyah Fragments," *The Jewish Quarterly Review* 16/1 (1903): 98–112, on pp. 106–109.

these *tequfot* fell on 27–28 Tishri and 29–30 Tishri, respectively). In Yefet's view, this lateness, acceptable to the Rabbanites (according to the rule set out above), made the cycle an unreliable way to predict *'aviv*-based intercalations. However, the *tequfa* falls late (although not as late) in some other years of the nineteen-year cycle, too. Yefet himself wrote that whenever the nineteen-year cycle has a three-year gap between two intercalations (e.g. between years ten and thirteen in the בהז יגוח scheme), in the last plain year *'aviv* is scarce, possibly requiring an intercalation.[107] Despite this, he cautioned against the straightforward use of the nineteen-year cycle only in years four and fifteen. There may be an additional reason for this decision. Years four and fifteen are the only years when the Jewish Rabbanite nineteen-year cycle differs from the Byzantine Christian nineteen-year cycle used in the computation of the date of Easter. In the Rabbanite cycle these years are plain, while in the Christian cycle they are intercalated and the following years are plain.[108] While Yefet does not mention the Christian Easter calculation, Hadassi explicitly talks about it in a passage that is strongly reminiscent of Yefet's rule:[109]

> When Passover of the nations [i.e., Easter] is distanced from [the Passover] of the Rabbanites, the year is intercalated because this is the way of Your Land as investigated in detail by Your sages. We sanctify twice all holy days in this year until we can inquire and understand the way of our Land by hearing from trustworthy witnesses.

That years four and fifteen were intercalated in the Christian Byzantine nineteen-year cycle must have given additional strength to Yefet b. 'Eli's *tequfa*-based argument. Taken together, these facts must have led to the view that the Rabbanite scheme was an unreliable way to predict *'aviv*-based intercalations in years four and fifteen of the cycle.

Hadassi ruled that in a year when Easter and the Rabbanite Passover do not fall in the same month, all festivals should be celebrated twice until news arrives

107 Yefet b. 'Eli, *Commentary on Exodus*, MS BL Or 2469, fols 56v–57r.

108 In the Christian cycle these years are counted five and sixteen, same as in the scheme גוח אדזט most commonly used now.

109 *'Eškol ha-Kofer*, alphabet 190, ed. Gozlov 1836, fol. 77r; a similar statement is found in alphabet 188, ed. Gozlov 1836, fol. 76r; See also Ankori, *Karaites in Byzantium,* pp. 338–339.

of when Nisan was actually declared in Palestine. This ruling was previously misinterpreted by Ankori as referring to celebrating the second day of festivals as is the case in the Rabbanite calendar.[110] Hadassi also reported that Byzantine Qaraites sent a query to Jerusalem about the dates of festivals and received a reply that in the case of doubt regarding the time of sighting the crescent, the *ʾaviv*, or any other similar commandment, one should "observe two."[111] Ankori translated the Jerusalem Qaraites' recommendation "to follow both [ways]" and interpreted it as "to follow in the meantime the Rabbanite way of calendation, pending a report from Palestine, and to afterwards also celebrate the date proclaimed by the Karaite authorities in the Holy Land (to the extent of its practicability, of course)."[112] It is now clear that, as far as intercalation is concerned, the instructions are to observe Passover in both possible months—in the thirteenth month counting from the previous Nisan in case the year is plain, and again in the fourteenth month in case it is intercalated.

Yefet b. ʿEli's warning about the inaccuracy of the Rabbanite nineteen-year cycle in years four and fifteen is repeated in two fourteenth-century works, one composed in Cairo, another in Nicomedia.[113] Their attitude toward the warning is indicative of the status of the nineteen-year cycle in Egypt and Byzantium respectively. Writing in Cairo where intercalation remained *ʾaviv*-based, Yefet b. David Ibn Ṣaghīr integrated Yefet b. ʿEli's passage into his own text without a comment. In Byzantium, where the nineteen-year cycle became the main method of intercalation, Aharon b. Elijah explained that the Rabbanite nineteen-year cycle is, in fact, mostly accurate in these years, making it best to follow it without modifications.

Conclusion

In this article I considered a wide range of medieval Qaraite sources on the calendar composed in Palestine and in the Diaspora, which discuss how medieval

110 Ankori, *Karaites in Byzantium,* p. 339.

111 *ʾEškol ha-Kofer*, alphabet 187, ed. Gozlov 1836, fol. 76r:

"שנים יתפוש בידו בתפלה ובשמירה".

See also Ankori, *Karaites in Byzantium,* p. 325–326.

112 Ankori, *Karaites in Byzantium*, p. 326.

113 Yefet b. David Ibn Ṣaghīr, *Book of Commandments*, discourse III, chapter 22, MS RNL Evr Arab I 910, fols 43r–43v; Aharon b. Elijah, *Gan Eden*, discourse "On the Sign by which Years are Divided," chapter 11, ed. Gozlov 1864, fol. 22r.

Qaraite communities of Babylonia, Egypt, Syria, Byzantium, and Spain regulated the beginning of the year and made a decision to intercalate. Apart from receiving information about the state of barley in Palestine through letters or visitors, these communities organised their own expeditions to Palestine, relied on the ripening of local crops, or used mathematical schemes such as the method of the equinox and the nineteen-year cycle of intercalations.

While the listing of schemes used by Diaspora Qaraites was presented already by Z. Ankori, the sources analyzed in this article supply significant new information about the particulars of the methods. The sources strongly suggest that the method of the equinox, which was previously believed to be based on observations, was probably based on calculated values of true vernal equinoxes. While it is possible that the Qaraite followers of the equinox could calculate these values themselves, it is more likely that they used ready-made calculations. The nineteen-year cycle initially recommended by Qaraite authorities conformed to the Byzantine Christian cycle used in the Easter calculation rather than the Rabbanite cycle, although the Rabbanite dates were also observed as a precaution. This resulted in the double celebration of Passover in some years, in two consecutive months. New details have also been uncovered about *'aviv* expeditions of Egyptian Qaraites, including their route and procedures used when travel to Palestine was impossible.

An important insight was gained into the attitude of members of the Palestinian Qaraite center toward the use of the calculated calendar in the Diaspora. Jerusalem scholars fought vigorously to defend the principle of the empirical *'aviv*-based intercalation and against the Rabbanite view that a calculated scheme could be the true Jewish calendar. Despite this, from the second half of the tenth century at the latest they spoke frequently of the impossibility to observe the *'aviv* calendar in the Diaspora, sanctioned the use of fixed calculated schemes for predicting the time of the ripening of barley, and provided guidance on how to use them. In the early eleventh century, Levi b. Yefet even suggested relying on the equinox calculation in Palestine itself in years when the weather was atypical and barley ripened not at its expected time. This change of attitude was in line with the general turn toward a more realistic and practical Palestino-centrism, developed by the Qaraite scholars of the late tenth–eleventh centuries. These scholars now accepted that it was impossible for all Qaraites to move to Palestine and admitted that adjustments to laws and customs had to be made in order to allow for the existence of the Qaraite movement in the Diaspora.[114] The findings presented in this article suggest that the

114 Ankori, *Karaites in Byzantium*, pp. 320–321.

division between Qaraites as adherents of an empirical intercalation vs. Rabbanites as followers of a fixed calculated scheme was never clear-cut when considered in the context of the entire Qaraite Jewish community and of lived practice rather than ideology.

The Qaraite calendar in the Diaspora, as well as in Palestine itself, was regulated by the local communities rather than by a central authority that distributed calendar decisions. The calculated schemes and empirical methods used by various Qaraite congregations did not always produce compatible results. This led to festivals being occasionally celebrated in different months. Whereas Rabbanites strongly rejected calendar diversity, [115] Qaraites viewed it as completely normal.[116] In their calendation, Qaraites exhibited the same plurality of practice and reluctance to follow a central authority as in other areas of religious law and in biblical exegesis.

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115 Stern, *Calendar and Community*, pp. 241–247.

116 Vidro, "*Aviv* Barley," pp. 303–308; Vidro, "Qaraite New Moon Observation."