Shlomo Sela

The Astrological-Astronomical Encyclopedia in MS Paris 1058

The four extant chapters of a vast astrological and astronomical encyclopedia, *Sefer ha-Kolel* (The Comprehensive book), are examined. Composed in 1256, and originally consisting of at least thirty-four sections ("gates"), it is conserved today only in Paris, Bibliothèque nationale de France, MS héb. 1058, fols. 50a–126a. It contains the oldest surviving copies of the astronomical and astrological works of Abraham Bar Ḥiyya (ca. 1065–ca. 1136) and Abraham Ibn Ezra (ca. 1089–ca. 1161). Unlike typical manuscript collections of astrological and astronomical texts, this work was compiled by an anonymous and learned scribe who made an intelligent selection of sources and interspersed them with his own articles and comments. This study has three main objectives: to identify, as far as possible, all the items in *Sefer ha-Kolel*, summarizing their contents and locating their sources; to study the encyclopedist's role in the final shape of *Sefer ha-Kolel* by marking off his own comments and articles from the articles based on quotations from other authors; and on the basis of the study of the encyclopedia's components, to place this encyclopedia in the context of similar medieval Hebrew texts, evaluate the encyclopedist's *modus operandi* and distinct contribution, and produce a concise catalogue of the surviving part of *Sefer ha-Kolel*.

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The Astrological-Astronomical Encyclopedia in MS Paris 1058

The present study scrutinizes four chapters of a vast astrological and astronomical work which was originally comprised of at least thirty-four Gates. It is conserved today only in fols. 50a–126a of Paris, Bibliothèque nationale de France, MS héb. 1058 (IMHM: F 22230; henceforth MS Paris 1058),[1] and was already examined in the nineteenth century by Salomon Munk and Hermann Zotenberg, who designated it "un vaste ouvrage d'astrologie." They suggested that it was composed in the first half of the twelfth century by Abraham Bar Ḥiyya (ca. 1065–ca. 1136), and that it constitutes in fact the fulfillment of the pledge the latter made to write a separate astrological work.[2]

1 An examination of the paper of this manuscript indicates that it was produced in Italy in the second half of the fourteenth century. I am very grateful to Philippe Bobichon for performing this codicological analysis. This manuscript, copied in Sephardi script, contains in its first part a typical collection of Ibn Ezra's astrological works (fols. 1a–39b) and an essay on the Jewish calendar which is ascribed to Maimonides (fols. 39b-49a).

2 *Manuscrits orientaux. Catalogues des manuscrits hébreux et samaritains de la Bibliothèque impériale* - Bibliothèque Nationale. Dépt. des Manuscrits Compiled successively by S. Munk, J. Derenbourg and A. Franck, completed and ed. by H.

Almost one hundred years later, George Vajda, in a short article, convincingly showed that this work could not have possibly been composed by Abraham Bar Ḥiyya, identified a limited number of its components as quotations from Abraham Bar Ḥiyya's and Abraham Ibn Ezra's (ca. 1089–ca. 1161) oeuvre, and claimed that it was compiled by a Provencal or Spanish Jew between 1246 and 1265.[3]

This work aroused my curiosity because, from the early stages of its examination, it became clear to me that it contains a great number of astrological and astronomical quotations of various length, some of them evidently borrowed from Abraham Bar Ḥiyya's and Abraham Ibn Ezra's work. A preliminary examination also showed me that, unlike typical manuscript collections of astrological and astronomical texts, this work was compiled by an anonymous and learned scribe who made clever selections of sources and interspersed them with articles and comments authored by himself. Since this work was allegedly compiled in the mid-thirteenth century, and because this is substantially earlier than the date of any other manuscript of any scientific treatise written by Bar Ḥiyya or Ibn Ezra, I realized that it contains the earliest available copies of their work. It also became clear to me that the examination of this work provides the researcher with a golden opportunity to learn about the reception of Bar Ḥiyya's and Ibn Ezra's astrological and astronomical work in one of the earliest phases of its transmission.

Despite the fact that the first 31 Gates of this work are at present lost, and that its title is therefore lacking, the author himself refers to this work twice as *Sefer ha-Kolel*, Comprehensive Book (see below, p. 202, Appendix 1, §4, p. 229). This is an indication that the author of *Sefer ha-Kolel* considered it to be an original and self-contained work, not a mere collection of texts whose inclusion reflected the specific preferences of the person

who requested the services of the scribe. Moreover, the meaning of the title suggests that *Sefer ha-Kolel* was designed to serve as a compendium of astrological and astronomical knowledge. Therefore, in what follows, I will sometimes refer to *Sefer ha-Kolel* as an "encyclopedia" and to its author as the "encyclopedist," two terms which, as I will show throughout this study, adequately fit in the case of *Sefer ha-Kolel* the real function they are designed to fulfill. This study has three main objectives. First, to identify, as far as possible, all the items of *Sefer ha-Kolel*, studying summarily their contents and locating their sources. Second, to study the encyclopedist's role in the final shape of *Sefer ha-Kolel*, which means marking off the encyclopedist's own comments and articles from the articles based on quotations from other authors. Finally, on the basis of the study of the encyclopedia's components, to place this encyclopedia in the context of other similar medieval Hebrew texts, to evaluate the encyclopedist's *modus operandi* and distinct contribution, and to produce a concise catalogue of the surviving part of *Sefer ha-Kolel*.

Zotenberg. Pref. by J. Taschereau (Paris: Impr. Imperial, 1866), p. 195, note on Ms. 1058, sixth item, and p. 233, note on Ms. 1299. Bar Ḥiyya made in *Ṣurat ha-'areṣ* (Form of the Earth) a pledge to write a separate astrological work. See Abraham Bar Ḥiyya, *Sefer Ṣurat ha-'Areṣ* (Offenbach, 1720), p. 1b, in *Po'al ha-Šem*, vol. I (Bne Braq, 1998). Zotenberg was aware that this work includes a number of quotations from Abraham Ibn Ezra's work, but claimed that they should be attributed to a later redaction of it.

3 Georges Vajda, "Une compilation astrologique faussement attribuée a Abraham Bar Ḥiyya," *Sefarad* 20 (1960): 159-162. As for the *terminus post quem*, Vajda showed that MS Héb. 1058, fols. 127a-129a contains the translation made by Moshe Ibn Tibbon in 1246 of *Eisagoge* by Geminus. The current study demonstrates, however, that the latter text is not part of the work studied here.

Gate 32

Sefer ha-Kolel, according to the single surviving manuscript, starts directly from Gate 32, at the top of which the encyclopedist interpolated a preface of 10 lines (see below, Appendix 1, §1, on pp. 227–228). It functions as a sort of table of contents of Gate 32, although the order appearance of its items is not always the same as the order of appearance of the components of Gate 32. The year 4865 A.M (= 1005 C.E.), which appears in this preface as the compilation's date of a good deal of the astronomical data included in this Gate, is the date mentioned in one of the main sources employed by the encyclopedist (see below, p. 196). We turn now to survey the various articles of Gate 32, one of the richest in sources and most complex in content.

32.1 — Fixed Stars

The first article of Gate 32 includes a literal copy of chapters 30 and 31 of Gate 7 in Abraham Bar Ḥiyya's *Ṣurat ha-ʾareṣ* (The Form of the Earth), without revealing this source or its author.[4] The first chapter, according to its title, deals with "reckoning the motion in latitude of the fixed stars <with respect to the ecliptic>"; in like manner, the second chapter is concerned with "the difference between the position of the star with respect to the ecliptic and its degree when it passes the midheaven, its rising and descending <with respect to the earth> due to its latitude <with respect to the ecliptic>."[5] In fact, these two titles were copied *verbatim* from the headings of chapters 30 and 31 of *Ṣurat ha-ʾareṣ*. These two chapters from *Ṣurat ha-ʾareṣ* are based on chapter 23 of Al-Farghānī's (d. Egypt, after 861) *Jawāmiʿ ʿilm al-nujūm wa ʾl-ḥarakāt al-samāwiyya*.[6]

32.2 — Star Lists

The next article of Gate 32 displays six star lists, which the encyclopedist borrowed from *Luḥot ha-nasi*ʾ (The Tables of the Prince),[7] Abraham Bar Ḥiyya's astronomical tables, without revealing

their provenance.[8] The title that the encyclopedist gave to the first list (see below, Appendix 1, §2, on p. 228), which is an amalgamation of the headings of two columns displayed in the corresponding table of *Luḥot ha-nasi*ʾ,[9] makes it clear that it is predominantly concerned with the fixed stars' astrological properties.

As in *Luḥot ha-nasi*ʾ, this star list in *Sefer ha-Kolel* has two columns and 15 items, the first column displaying the Hebrew name of the asterism and the sign in which it is located, and the second displaying the asterism's range of degree in the sign, which is accompanied, in some cases, by the ecliptical coordinates as well as by the names of the planets whose astrological properties are associated to the astrological "nature" of the corresponding asterism.[10] For example, the first item runs as follows: "*Kimah* in

4 MS Paris 1058, fols. 50a, line 11 – 51b, line 10; Cf. Abraham Bar Ḥiyya, *Sefer Ṣurat ha-ʾAreṣ* (Offenbach, 1720), Seventh Gate, chapters 30 & 31, pp. 35a–36b, in *Poʿal ha-Shem*, vol. I (Bnei Beraq, 1998).

5 Respectively, MS Paris 1058, fol. 50a, line 11: "סדר מרחב כוכבי השבת"; and fol. 50b, lines 1–2: "פתח החלוק אשר בין מקום הכוכב מאופן המזלות ובין חלק מאופן מעברו על חצי השמים ועלייתו ושקיעתו באשר מפני מרחבו."

6 Muhammedis Fil. Ketiri Ferganensis, qui vulgo Alfraganus dicitur, *Elementa Astronomica*, Arabice & Latine cum notis ad res exoticas sive orientales, quae in iis occurrunt. Opera Golius, Jacobus (Amsterdam: Apud Johannem Janssonium à Waasberge, & viduam Elizei Weyerstraet, 1669), chapter 23, pp. 85–88.

7 To check the tables in the encyclopedia, I used the manuscript copy of *Luḥot ha-nasi*ʾ in MS Paris 1045 (IMHM: F 33996), fols. 1a–79b.

8 MS Paris 1058, fols. 51b, line 10 – 54b; Cf. MS Paris 1045, fols. 54a–56b.

9 MS Paris 1045, fol. 56b.

10 MS Paris 1058 fol. 51b, lines 10–30; Cf. MS Paris 1045, fol. 56b. The tradition of ascribing to some fixed star an astrological nature which is associated with the astrological properties of some planet goes back to Ptolemy's *Tetrabiblos* I:9. For

the sign of Taurus"; "two degrees from <Taurus> 6° to 8°, like the power of the Moon and Mars."[11] A possible source for this list is Abū Maʿshar's *Great Introduction*, which displays a similar list of asterisms and characterizes them as signifying eye diseases.[12]

The second and third lists in *Sefer ha-Kolel* are a replica of two star lists in *Luḥot ha-nasi'* displaying each 14 stars of the first and second magnitude, respectively.[13] Each entry in these two star lists, which depend on al-Battānī's tables,[14] includes the Hebrew and Arabic name of the corresponding star, as well as its ecliptic and equatorial coordinates. The encyclopedist, however, broke the continuity of these two star lists. Between them he inserted the following title: "Ibn Ezra wrote regarding the latitude of the stars inscribed in the *rete* of the astrolabe <as follows>."[15] Then the encyclopedist interpolated a word-for-word copy of a fragment from the second version of *Sefer Keli ha-Neḥošet* (henceforth *Neḥošet* II), Abraham Ibn Ezra's Book of the Astrolabe, which explains how the position of a fixed star may be determined with the assistance of an astrolabe.[16]

The following three folios of *Sefer ha-Kolel* carry three lists of 14, 17 and 14 stars, respectively, which are a replica of three star lists in three consecutive folios in *Luḥot ha-nasi'*. All of them have five columns which display for each entry the Hebrew name of the star, its ecliptical coordinates, its equatorial coordinates, its magnitude, and the planetary astrological "nature" of the corresponding star.[17] The titles of these three star lists exhibit their close connection to astrology. Two of them address "the fixed stars signifying human events when they are located in the cardines of the horoscope, or when they conjoin the luminaries, or when their [the luminaries'] declination and ecliptical latitude is in the same side as that of the corrected fixed star"; the third refers to the "fixed stars signifying dimming of the light <of the eyes>."[18]

medieval astronomical tables displaying lists of stars whose astrological "nature" is associated to the astrological properties of planets, see José Chabás and Bernard R. Goldstein, *A Survey of European Astronomical Tables in the Late Middle Ages* (Leiden: Brill, 2012), pp. 185–199.

11 Also Abraham Ibn Ezra characterizes *Kimah* as an asterism signifying eye diseases in the second version of *Sefer ha-Ṭeʿamim*. See *The Book of Reasons*, *A Parallel Hebrew-English Critical Edition of the Two Versions of the Text*, ed., trans., and annot. Shlomo Sela (Leiden: Brill, 2007), *Ṭeʿamim* II §8.7:7, pp. 254–255: "כי הנה אמרו כי כוכבי כימה הם בממסך מאדים עם הלבנה, על כן כל מולד שתהיה הלבנה במקום כימה יורה על חולי העינים." = "For they said that the stars of *Kimah* have the complexion of Mars together with the Moon, so that any nativity in which the Moon is in the place of *Kimah* indicates an eye disease." This edition will be used for all quotations from or references to the Hebrew text of the first and the second redactions of *Sefer ha-Ṭeʿamim,* in the format: (a) *Ṭeʿamim* I, §3.2:1, 70–71 = *Ṭeʿamim* I, ed. Sela, chapter 3, section 2, passage 1 on pp. 70–71; (b) *Ṭeʿamim* II, §3.2:1, 223–24 = *Ṭeʿamim* II, ed. Sela, chapter 3, section 2, passage 1, on pp. 223–24.

12 Abū Maʿshar al-Balkhī (Albumasar), *Kitāb al-madḫal al-kabīr*, Liber introductorii maioris as scientiam judiciorum astrorum, ed. Richard Lemay (Naples: Istituto Universitario Orientale, 1996), vol. III [Arabic text], VI:20, p. 406–407.

13 MS Paris 1058, fols. 52a–53a; Cf. MS Paris 1045, fol. 54a and fol. 54b, respectively.

14 See Bernard. R. Goldstein, "Star Lists in Hebrew," *Centaurus* 28 (1985): 185–208, esp. pp. 186–191.

15 MS Paris 1058, fols. 52a, last line of the folio: "אבן עזרא כתב במרחב הכוכבים הרשומים ברשת כלי הנחושת".

16 MS Paris 1058, fols. 52a, last line of the folio – 52b, line 14. Cf. *Neḥošet* II, Mantua, Comunità Israelitica, MS ebr. 10, (IMHM: F 00790; hereafter *Neḥošet* II, MS Mantua 10), fols. 43b–44a.

17 MS Paris 1058, fols. 53b– 54b; Cf. MS Paris 1045, fols. 55a–56a.

18 MS Paris 1058, fol. 53b, lines 1–2: "לוח מקומות כוכבי שבת המעידים על מאורעות בני האדם בהיותם עומדים על חלקי יתדות הגלגל או שיהיה אחד מן המאורות עומדים ותהיה נמיכותם או מרחב מן הארץ בפאת מרחב הכוכב המיושר."; fol. 54a, line 1: "לוח כוכבי שבת המורים על האור וכהותו".

32.3 — The 48 Ptolemaic Constellations and the 28 Lunar Mansions

The third article of Gate 32 carries on the discussion of the fixed stars by means of a verbatim copy of the whole of chapter 17 of Abraham Bar Ḥiyya's *Ḥešbon mahalaḵot ha-koḵavim* (Calculation of the stellar motions, hereafter *Ḥešbon*), which represents the canons of Bar Ḥiyya's *Luḥot ha-nasi*. This chapter, the bulk of which remains at present in manuscript,[19] is based on chapters 19 and 20 of Al-Farghānī's *Jawāmiʿ ʿilm al-nujūm wa 'l-ḥarakāt al-samāwiyya*[20] and on chapter 51 of Al-Battānī's *Zīj al-Ṣābi*,[21] and is concerned with the following topics:

(a) A brief discussion of the fixed stars' motion with respect to the ecliptic: a steady westward motion of 1° in 100 years is endorsed, which is ultimately Ptolemy's value of precession, although another value of 1° in 67 years is also mentioned and ascribed to the modern scientists.[22]

(b) A list of the values of the planetary apogees and nodes for the first year of the 257th <Metonic> cycle, that is, 4865 A.M (= 1005 C.E.).[23] Bar Ḥiyya addressed the motion of the planetary apogees and the planetary nodes in chapter 17 of *Ḥešbon* (concerned with the fixed stars) because he considered this topic to be ultimately connected to the fixed stars: according to the Ptolemaic approach the planetary apogees (except for the Sun) and the planetary nodes are considered to be sidereally fixed and subject to precession, that is, moving at the rate of 1° in 100 years. The encyclopedist was aware of this connection. He will admit below that for the current lists of planetary apogee he was drawing on *ha-Nasi'*, that is, on Abraham Bar Ḥiyya, who followed Ptolemy's approach and used a rate of motion of 1° in 100 years.[24]

(c) A division of the 48 Ptolemaic constellations, comprising 1022 stars, into 12 zodiacal constellations, 21 northern constellations, and 15 southern constellations,[25] which is followed by a list of the

northern and southern constellations. Each of the entries of these two lists includes the Hebrew and Arabic name of the constellation, sometimes also the Greek name and the name of some prominent star in it.[26] Next *Sefer ha-Kolel*, following chapter 17 of *Ḥešbon*, displays a list of 15 stars of the first magnitude and a list of 13 stars of the second magnitude. The stars included in these two lists are almost identical to those displayed in two lists already presented above in

19 José Maria Millás Vallicrosa, who edited Bar Ḥiyya's *Ḥešbon mahalaḵot ha-koḵavim* and translated it into Spanish, did not include in his edition the list of constellations and lunar mansions which are part and parcel of chapter of this work. See José Maria Millás Vallicrosa, ed. and trans., *La obra Séfer hesbón mahlekot ha-kokabim* (Libro del cálculo de los movimientos de los astros) de R. Abraham bar Ḥiyya ha-Bargeloní (Madrid: CSIC, 1959), (Hebrew part) pp. 101–102.

20 Al-Farghānī, *Elementa Astronomica*, ed. and trans. Jacobus Golius, chapters 19 (fixed stars) and 20 (lunar mansions), pp. 74–79.

21 *Al-Battani sive Albatenii Opus astronomicum* ad fidem codicis Escurialensis Arabice editum, Latine versum, adnotationibus instructum a Carolo Alphonso Nallino (Hildesheim and New York, 1977 [Milan: Pubblicazioni del Reale Osservatorio de Brera in Milano, 1899–1907]), chapter 51, pp. 124–126.

22 MS Paris 1058, fol. 55a, lines 4–11; MS Firenze - Biblioteca Medicea Laurentiana Plut.88.28 (IMHM: F 17849; hereafter MS Firenze 88.28), fol. 208b; Cf. Bar Ḥiyya, *Sefer Ḥešbon*, ed. Millás Vallicrosa, (Hebrew part) chap. 17, p. 101, lines 5–11.

23 MS Paris 1058, fol. 55a, lines 11–30; MS Firenze 88.28, fols. 208b–209a; Cf. Bar Ḥiyya, *Sefer Ḥešbon*, ed. Millás Vallicrosa, (Hebrew part) chap. 17, p. 101, 11–23 – p. 102, 1–5.

24 See below, Appendix 1, §5, p.230.

25 *Ptolemy's Almagest*, trans. and annot. G. J. Toomer (London: Duckworth, 1984), III:5, pp. 341–370; VIII:1, pp. 371–399. Cf. Ptolemy, *Tetrabiblos*, ed. and trans. Frank Egleston Robbins (Cambridge, Ma: Harvard University Press, 1980), I:9, pp. 47–59.

26 MS Paris 1058, fol. 55b, lines 1–30 to fol. 56a, lines 1–5; MS Firenze 88.28, fols. 209a–210a.

the encyclopedia.[27] However, instead of the ecliptical and equatorial coordinates, the current two lists display the astrological properties of each of the stars and the names of the planets whose astrological properties are associated to the astrological "nature" of the star.[28]

(d) A bipartite account of the 28 lunar mansions, that is, the zodiacal places where the Moon "lodges" on each day of the lunar month, which are taken to have a bearing on weather forecasting, in general, and on rainfall, in particular. The first part of this account consists of a brief presentation of the main astronomical features of the lunar mansions (i.e., they are located in the zodiac and each of them covers approximately 13°); its second part is a list of the 28 lunar mansions, which includes, for each mansion, the Hebrew and Arabic name of the asterism located in the corresponding mansion, the number of its stars, and their magnitude. This two-part account follows *verbatim* a section of chapter 17 of Bar Ḥiyya's *Ḥešbon*,[29] which in its turn is based on chapter 20 of Al-Farghānī's *Jawāmiʿ ʿilm al-nujūm wa 'l-ḥarakāt al-samāwiyya*.[30] But the encyclopedist did not copy slavishly from Bar Ḥiyya's *Ḥešbon*: at the beginning of each item of the list of 28 lunar mansions, he interpolated one of three keywords whose meanings convey the meteorological character of the corresponding lunar mansion: either *laḥah* (moist), *yevešah* (dry), or *beinonit*, (intermediate). The encyclopedist gleaned this information from Ibn Ezra's second version of *Sefer ha-ʿOlam* (Book of the World), and we know this because these three keywords, which do not appear in the list of the 28 lunar mansions of chapter 17 of Bar Ḥiyya's *Ḥešbon*,[31] are used in *ʿOlam* II to describe the weather-related character of the 28 lunar mansions.[32]

(e) Immediately after the end of the list of 28 lunar mansions, the encyclopedist interpolated a passage of 20 lines with a theoretical account explaining how predictions about rainfall may be made by means of the 28 lunar mansions and some reflections about their sizes (see below, Appendix 1, §3, on pp. 228–229). The following considerations suggest

that this passage was composed by the encyclopedist: (i) This passage applies a terminology which characterizes both Abraham Ibn Ezra and Abraham Bar Ḥiyya;[33] a similar hybrid terminology occurs below in the preface of Gate 33, certainly composed by the encyclopedist.[34] (ii) This passage is neither a paraphrase nor a *verbatim* quotation from any of Ibn Ezra's references to the lunar mansions.[35] (iii) The size of the

27 See above, p. 194.

28 MS Paris 1058, fol. 56a, lines 5–29; MS Firenze 88.28, fols. 210a–210b.

29 MS Paris 1058, fol. 56a, line 29 – fol. 57a, line 5; MS Firenze 88.28, fols. 210b–211b.

30 Al-Farghānī, *Elementa Astronomica*, ed. and trans. Jacobus Golius, chapter 20, pp. 77–79.

31 See above, note 29.

32 *The Book of the World, A Parallel Hebrew-English Critical Edition of the Two Versions of the Text*, edited, translated, and annotated by Shlomo Sela (Leiden: Brill, 2010), §37:4, on pp. 180–181: "ויש במחנות הלבנה מה שהם יבשות או לחות או בינוניות כאשר אפרש לך" = "Some of the mansions of the Moon are dry, others are moist, and <others are> intermediate, as I shall explain." This edition will be used for all quotations from or references to the Hebrew text of the first and the second redactions of *Sefer ha-ʿOlam,* in the format: (a) *ʿOlam* I, §19:1, 70–71 = *ʿOlam* I, ed. Sela, section 19, passage 1 on pp. 64–65; (b) *ʿOlam* II, §54:1, 223–24 = *ʿOlam* II, ed. Sela, section 54, passage 1, on pp. 109–191).

33 Idiosyncratic technical terms in this passage by Ibn Ezra: *ḥešev 'afudat ha-mazzalot* = zodiac; *maḥberet* = conjunction; by Bar Ḥiyya: *dibbuq* = conjunction.

34 See below, Appendix 1, §6, p. 231.

35 Ibn Ezra addressed the technical aspects of the 28 lunar mansions in *ʿOlam* I, §62:1–5, §63:1–2; on pp. 92–95; *ʿOlam* II, §37:4, §43:4, §44:1–3, §45:1–4, §49:6, on pp. 180–181, 184–189; and in two of the three versions of *Keli ha-Neḥošet*, Book of the astrolabe, (*Keli ha-Neḥošet* [first version], MS Paris, Bibliothèque nationale de France, héb. 1061 [IMHM : F 14645], fols. 156b–157a; *Keli ha-Neḥošet* [second version], MS Mantua 10, fols. 46a–46b).

lunar mansions offered in this passage (12;41,52°) does not match the value given by Ibn Ezra (12;51°).[36] In addition, the passage displays the geographical latitude of 45°, which probably corresponds to the location in Southern France where *Sefer ha-Kolel* was composed.

(f) Next the encyclopedia addresses the tripartite division of the lunar mansions into "mansions of rain" (מחנות הגשם), "dry mansions" (מחנות יבשות) and "mansions of moistness" (מחנות הלחות) by means of a brief passage of 7 lines which depends on a word-for-word copy of a fragment from the second version of *ʿOlam* II.[37]

(g) Finally, after the aforementioned digression about the lunar mentions (items [e] and[f]), the encyclopedist returned to the last lines of chapter 17 of *Ḥešbon*, where Bar Ḥiyya mentioned Ptolemy as the ultimate source for the 1022 fixed stars and highlighted that the fixed stars, some of which are engraved in the astrolabe's *rete*, are significant in astrology for casting natal horoscopes.[38]

32.4 — Zodiacal Signs and the Motion of the Fixed Stars

The next article of Gate 32 starts with a preface by the encyclopedist (see below, Appendix 1, §4, on pp. 229–230). For one thing, we learn from this preface that the encyclopedist was cognizant of the fact that Ptolemy assembled a list of fixed stars, obviously in his *Almagest*, and that Al-Farghānī put together a list of lunar mansions, evidently in *Jawāmiʿ ʿilm al-nujūm wa 'l-ḥarakāt al-samāwiyya*, which is the source on which Bar Ḥiyya drew for the lunar mansions in Chapter 17 of *Ḥešbon*.[39] The encyclopedist probably became acquainted with these two astronomical works through the Arabic-into-Hebrew translations of Ptolemy's *Almagest* and of Al-Farghānī's *Elementa Astronomica* produced by Jacob Anatoli between 1231–1235, that is, approximately 25 years before the composition of the encyclopedia.[40] Secondly, we learn that the encyclopedia extended well beyond the last surviving Gate 35, and also included a Gate 37. Last but not least, we learn that our work is explicitly named by its

author as *Sefer ha-Kolel*, Comprehensive Book, an adequate name for an encyclopedia. Following this comment, this article includes the following elements.

(a) A table in three columns and twelve rows which displays, for each zodiacal constellation, the Hebrew and Arabic name of its corresponding "head," "belly," and "tail," and concludes with a statement that the significations of these asterism bear on nativities and human events.[41] This table was compiled in all likelihood by the encyclopedist himself.

(b) A discussion of the period of occultation of the fixed stars which is based on a word-for-word quotation of chapter 35, Gate Eight, of Bar Ḥiyya's *Ṣurat ha-ʾareṣ*.[42]

(c) A discussion of a variety of theories proposed by the astronomers to explain the motion of the fixed stars. This discussion depends on a *verbatim* quotation of the long complete Gate 10 of Bar Ḥiyya's *Ṣurat ha-ʾareṣ*.[43] But in the middle of the quotation from Gate 10 of *Ṣurat ha-ʾareṣ* the encyclopedist interpolated the

36 See, for example, in *Neḥošet* II, MS Mantua 10, fol. 46a.

37 MS Paris 1058, fols. 57a, line 26 – 57b, line 2; Cf. *ʿOlam* II, §44:1–3; §45:1, pp. 184–185.

38 MS Paris 1058, fol. 57b, lines 2–7; Cf. Bar Ḥiyya, *Sefer Ḥešbon*, ed. Millás Vallicrosa, (Hebrew part) chap. 17, p. 102, lines 12–17.

39 See above, note 30.

40 Mauro Zonta, "Medieval Hebrew Translations of Philosophical and Scientific Texts: A Chronological Table," in Gad Freudenthal, ed., *Science in Medieval Jewish Cultures* (Cambridge: Cambridge University Press, 2011), p. 29.

41 MS Paris 1058, fol. 57b, lines 12–28.

42 MS Paris 1058, fols. 57b, line 27 – 58a, line 21; Cf. Abraham Bar Ḥiyya, *Sefer Ṣurat ha-ʾAreṣ* (Offenbach, 1720), Gate Eight, Chapter 35, p. 38a–38b.

43 MS Paris 1058, fols. 58a, line 21 – 60b, line 21; Cf. Abraham Bar Ḥiyya, *Sefer Ṣurat ha-ʾAreṣ* (Offenbach, 1720), Gate Ten, p. 39b–41b.

following comment: "A table has been compiled for you in Gate 21 of our *Sefer ha-Kolel*, and there it may be found the opinion on this topic of the Arabic scientists."[44] This attests to the fact that originally the encyclopedia contained a Gate 21, which is well before the extant Gate 32.

32.5 — Planetary Apogees, Perigees and Nodes

The next article comprises the following elements:

(a) The first, as specified by the encyclopedist in a title, is "a table to know the motion of the apogees and the Heads of the Dragon of the planets in single Egyptian years [i.e., years 365 days long] according to some scientists who calculated their motions <and found it> to be of approximately 1° in 70 years."[45] The latter is one of the values proposed by Arabic astronomers for the motion of the fixed stars (the so-called precession),[46] but was also considered to be equivalent to the pace of motion of the planetary apogees and nodes. The encyclopedist himself will disclose in the following element of the current article wherefrom he obtained this value. The referred to table, which appears above the aforementioned title and was in all likelihood compiled by the encyclopedist himself, has four rows and 16 columns. The rows display the accumulated longitude of the apogees in minutes, seconds, thirds and fourths of degrees; the columns display in the first ten columns the accumulated longitude in single Egyptian years for the 1–10 years range, and then in the following six columns the accumulated longitude in decades for the 20-70 years range.[47]

(b) The second element starts with a preface by the encyclopedist (see below, Appendix 1, §5, on p. 230). Underlying this preface is the fact that one of the foregoing articles of *Sefer ha-Kolel*, which now the encyclopedist admits to be based on Bar Ḥiyya's work, (chapter 17 of *Ḥešbon*; see above, p. 196) had already addressed the planetary apogees and nodes, and that according to the Ptolemaic approach

the planetary apogees (except for the solar apogee) are considered to be sidereally fixed and subject to precession.[48] Therefore the current new reference to the same topic is not a superfluous repetition, because instead of 1° in 100 years, which is the value of precession put forward by Ptolemy,[49] the encyclopedist uses in this section 1° in 70 years, and a new value of precession yields different values of the planetary apogees and the planetary nodes.

In the same breath, the encyclopedist mentioned the names of two recent Jewish scholars who endorsed the value of precession of 1° in 70 years:[50] Maimonides and Abraham Ibn Ezra. Regarding the former, the encyclopedist certainly alluded to a fragment in chapter 12 of the *Sanctification of the New Moon*, where Maimonides

44 MS Paris 1058, fol. 58b, lines 14–15: "והוחק לוח לך ושוב (צ"ל חשוב) בשער האחד ועשרים בחלק השלישי מספרינו זה הכולל ושם ימצא ענינו לדעת חכמי ישמעאל".

45 MS Paris 1058, fol. 60b, lines 27–28: "זה הלוח לדעת מהלך רומי הכוכבים וראשי תניניהם בשנה פשוטה מצריית לדעת קצת החכמים שחשבו מהלכם מעלה אחת בשבעים שנה בקירוב".

46 According to Ibn Ezra, 1° in 70 is the value of precession proposed by the astronomer al-Sūfī (903–986). See José M. Millás Vallicrosa, ed., *El Libro de los Fundamentos de las Tablas Astronómicas de R. Abraham Ibn Ezra* (Madrid and Barcelona: CSIC, 1947), p. 78: "antiqui vero et Ptholomeus dicunt quod 100 annis unum gradum pretereunt Albateni vero probavit quod 66 annis uno gradu moventur; Azofi vero 70 annis uno gradu."

47 MS Paris 1058, fol. 60b, lines 22–26.

48 *Ptolemy's Almagest*, trans. Toomer, IX:7, pp. 449–453. See Chabás and Goldstein, *A Survey of European Astronomical Tables*, p. 47.

49 *Ptolemy's Almagest*, trans. Toomer, VII:3, pp. 333–338, esp. p. 338.

50 This is the value of precession on which is based the previous table compiled by the encyclopedist (item one of this section), as well as the following discussion about the planetary apogees and nodes (item three of this section), also composed in all likelihood by the encyclopedist.

explicitly refers (in the same fashion as the encyclopedist does in the aforementioned preface) to 1° in 70 years as the rate of motion of the planetary apogees.[51] As for Abraham Ibn Ezra, 1° in 70 years is the value of precession that the latter endorses throughout his scientific work, although he never refers to this value in relation to the planetary apogees.[52]

The remainder of this article addresses the topics which have been brought up for discussion in the aforementioned preface (see below, Appendix 1, §5, on p. 230). The encyclopedist offers, first, lists of positions of the planetary apogees and nodes,[53] and then discusses the variations of the velocity of the planets with respect to their mean motion when they descend from apogee to perigee or ascend from perigee to apogee.[54] The encyclopedist states twice, at the beginning of the two aforementioned parts of this segment, that the positions of the planetary apogees and nodes are calculated for the first year of the 265th Metonic cycle, that is, 5017 A.M (= 1256 C.E.).[55] This is the year of composition of *Sefer ha-Kolel* (see below, Appendix 1, §7, pp. 231–232).

32.6 — Fardār *and Directions*

The last article of Gate 32 is concerned with two astrological topics related to world astrology, as follows:

(a) The first is the period of *al-fardār*, a rather complicated doctrine which divides history into intervals of 75 years, which are subsequently sub-divided into nine periods of different length ruled by the seven planets and the Head and Tail of the Dragon. Each of these nine periods is then split into seven equal sub-periods in which the ruler of the whole *fardār*ship shares its power with the remaining planets in the descending order of their orbs. The encyclopedist introduced first this doctrine by means of a word-for-word quotation of a fragment from Ibn Ezra's first version of *Sefer ha-ʿOlam* (hereafter *ʿOlam* I), which addresses

the theoretical grounds of the period of *al-fardār*.[56] Next the encyclopedist inserted a passage of his own, designed to show that Jupiter is the ruler of the *fardār*ship in the first year of the 265th Metonic cycle, that is, 5017 A.M. or 1256 C.E.,[57] which corresponds to the year of composition of *Sefer ha-Kolel* (see below, Appendix 1, §7, pp. 231–232). In fact, by bringing the *al-fardār* up to the date of composition of the encyclopedia, the

51 Maimonides, *Hilk̲ot qidduš ha-ḥodeš*, (Frankfurt am Main: Johanes Kelner, 1720), XII, p. 29, in in *Poʿal ha-Šem*, vol. I (Bne Braq, 1998): "נקודה אחת יש בגלגל השמש, וכן בשאר גלגלי השבעה כוכבים, בעת שיהיה הכוכב בה, יהיה גבוה מעל הארץ כל מאודו; ואותה הנקודה של גלגל השמש ושאר הכוכבים חוץ מן הירח, סובבת בשווה, ומהלכה בכל שבעים שנה בקירוב, מעלה אחת. ונקודה זו, היא הנקראת גובה. גובה השמש - מהלכו בכל עשרה ימים, שנייה אחת וחצי שנייה, שהיא שלושים שלישייות." = "In the orbit of the Sun, as well as in the orbits of the other seven planets, there is one point at which the planet reaches its maximum distance from the earth. This point in the orbit of the sun, and of the other planets except the moon, rotates in a uniform motion which amounts approximately 1° in 70 years; it is called the sun's apogee. In ten years it traverses a distance of one second and a half—that is, one second and thirty thirds." (*The Code of Maimonides, Sanctification of the New Moon*, translated by S. Gandz, with an introduction by Julian Obermann and an astronomical commentary by O. Neugebauer [New Haven, 1967], XII:3, p. 48). Maimonides also referred to a value of precession of 1° in 70 years in *Laws of the Foundation of the Torah*, III, 7.

52 See, *inter alia*, *Ṭeʿamim* I, §2.12:10, pp. 50–51; *Ṭeʿamim* II, §1.2:4, pp. 182–183; and *Olam* I, §24:5, pp. 68–69. These are all works by Ibn Ezra well known by the encyclopedist because he employed them in his encyclopedia.

53 MS Paris 1058, fol. 61a, lines 9–27.

54 MS Paris 1058, fols. 61a, line 27 – 63a, line 18.

55 MS Paris 1058, fol. 61a, line 9 and fol. 61a, lines 28–29.

56 MS Paris 1058, fol. 62a, lines 20–29; Cf. *Olam* I, §23:1–12, pp. 66–67.

57 MS Paris 1058, fols. 62a line 29 – 62b line 14.

encyclopedist was emulating Ibn Ezra: *ʿOlam* I, immediately after the passage that was quoted in *Sefer ha-Kolel*, shows that Mars is the ruler of the *fardār*ship in 4,908 A.M., which corresponds to 1148 C.E., and is the year of composition of *ʿOlam* I.[58]

(b) The second topic is *nihugim* (directions), an astrological procedure according to which indicators are launched from certain zodiacal points and moved at several speeds along the zodiac; as they move, the indicators complete cycles, which punctuate history (or human life, if *nihugim* are applied to nativities). To illustrate this doctrine, the encyclopedist inserted a literal copy of the complete Gate 10 of *Rešit Ḥoḵmah*, Abraham Ibn Ezra's most famous introduction to astrology.[59] Ibn Ezra's main source in this part of *Rešit Ḥoḵmah* is Abū Maʿshar's *Kitāb al-Ulūf*.[60] Following Ibn Ezra's Gate 10 of *Reshit Ḥoḵmah*, the encyclopedist also mentions the well-known "great," "middle," and "small" conjunctions of Saturn and Jupiter, but in this context they are not addressed as conjunctions *per se* (with their own specific type of historical signification, as in the standard form of conjunctionalism), but as initial and final points of cycles of 960, 240 and 20 years in the framework of three additional types of *nihugim*, each of which moves 360° in each of their respective cycles.[61]

Next, precisely as in the presentation of the period of al-*fardār*, the encyclopedist inserted a passage of his own whose main goal was to update the *nihugim* addressed by Ibn Ezra to the first year of the 265th Metonic cycle (= 1256 C.E.), that is, to the date of composition of *Sefer ha-Kolel*.[62] To conclude Gate 32, the encyclopedist states that since the directions of the "great," "middle," and "small" conjunctions of Saturn and Jupiter require a lengthy treatment, a special Gate will be allocated in the encyclopedia to this subject.[63] Indeed, the Saturn-Jupiter conjunctions are the main topic of the following Gate, as we shall see next.

Gate 33

The encyclopedist opened the new Gate with a new preface (see below, Appendix 1, §6, on p. 231). The hybrid Hebrew terminology employed in this brief preface to denote the concept of planetary conjunction (*hitḥabrut*, *maḥberet* and *dibbuq*), the main topic of

58 *ʿOlam* I, §24:1, pp. 68–69.

59 MS Paris 1058, fols. 62b, line 16 – 63a, line 26; Cf. *The Beginning of Wisdom*, An Astrological Treatise by Abraham Ibn Ezra, edited by Raphael Levy and Francisco Cantera (Baltimore, 1939), X, pp. lxxv, line 27 – lxxvi, line 16. In addition to the aforementioned al-*fardār*, Gate 10 of *Rešit Ḥoḵmah* addresses *nihugim* which *Ibn Ezra* labeled as of "thousands," "hundreds," "tens," and "units," that is, indicators which move along the zodiac at a speed of one zodiacal sign (30°) in 1000, 100, 10 and 1 years, thus completing their cycles in 12000, 1200, 120 and 12 years, respectively.

60 See D. Pingree, *The Thousands of Abū Maʿshar* (London, 1968), pp. 60, 63–64; E. Kennedy, "Ramifications of the world-year concept in Islamic astrology," in Ithaca; 26 viii 1962 - 2 ix 1962; *Actes du dixième congrès international d'histoire des sciences* (Paris, 1964), pp. 23-43, esp. pp. 26–28. Abū Maʿshar in *Kitāb al-Ulūf* collects previous Persian sources and reports on five cycles that are virtually identical with Ibn Ezra's five *nihugim*.

61 Abraham Ibn Ezra, *Rešit Ḥoḵmah*, ed. Levy and Cantera, X, p. lxxvi, lines 16–21. See also Abraham Ibn Ezra, *Sefer ha-ʿOlam*, ed. and trans. Sela, pp. 261–269.

62 MS Paris 1058, fols. 63a, line 26 – 63b, line 13. The encyclopedist concludes that from the beginning of the sixth millennium Virgo rules the world in the *nihugim* of "thousands" and Gemini rules the world in the *nihugim* of "hundreds," which, at the first year of the 265th Metonic cycle (= 1256 C.E.) reaches Gemini 5° 48′; from 5011 A.M. (= 1251 C.E.) Capricorn rules the world in the *nihugim* of "tens," which, at the first year of the 265th Metonic cycle reaches Capricorn 19°; in the same year Aries rules the world in the *nihugim* of "units."

63 MS Paris 1058, fol. 63b, lines 13–15.

Gate 33, betrays the two main sources used by the encyclopedist to convey the contents of this Gate: whereas two of them (*hitḥabrut*, *maḥberet*) were frequently employed by Abraham Ibn Ezra,[64] the third one (*dibbuq*) is Abraham Bar Ḥiyya's choice to denote the concept of conjunction.[65] However, to denote the concept of triplicity,[66] the encyclopedist used *mešulešet*, a term never used by Ibn Ezra or Bar Ḥiyya. As will be shown next, the four sentences into which has been divided the preface succinctly reflect the contents of the four articles of this Gate.

33.1 — An Astrological History

The first article, spanning three-quarters of the total amount of folios of Gate 33, includes a complete word-for-word copy of the fifth chapter of Abraham Bar Ḥiyya's *Megillat ha-Megalleh* (Scroll of the Revealer).[67] This long text offers an astrological prognostication of the coming of the Messiah in the framework of a Jewish and universal astrological history, by dint of the interpretation of horoscopes cast at the vernal equinox of years in which conjunctions of Saturn and Jupiter took place, as well as other cycles.[68] On the whole, the text of *Sefer ha-Kolel* runs very close to the text of the fifth Gate of *Megillat ha-Megalleh*, but at the very end the encyclopedist interpolated a passage of his own (see below, Appendix 1, §7, on pp. 231–232). We learn from this passage that the year 5,017 A.M., (= 1256 C.E.), repeatedly mentioned in the previous Gate to bring up to date the values of the planetary apogees and nodes (p. 204), the ruler of the current *fardār*ship (p. 205), and the *nihugim* (p. 206), is the current year in which the encyclopedist is living ("in the year 5,017 … *we are* in the 11th year after the second conjunction"), and therefore is also the year of composition of *Sefer ha-Kolel*. Moreover, emulating the method employed by Bar Ḥiyya in the astrological history, the encyclopedist puts to good use his

calculating skills and sets the date of composition in the framework of the closest past and future Saturn-Jupiter conjunctions. Thus, we are informed about the precise time of the next future Saturn-Jupiter conjunction (5,026 A.M. = 1265 C.E.), expressed in terms of the Jewish, Christian and Muslim calendars, of the precise time of the previous Saturn-Jupiter conjunction (5,006 A.M. = 1245 C.E), and, in order to set these two conjunctions in their proper conjunctional framework, the encyclopedist informs that these two are the second and third in a cycle of 12 conjunctions in the airy signs that began in the previous "great"[69] Saturn-Jupiter conjunction in Aquarius 3° (4986 A.M. = 1225 C.E.).

64 See Abraham Ibn Ezra, *Sefer ha-ʿOlam*, ed. and trans. Sela, "Glossary of Technical Terms," on pp. 334–335.

65 See, for example, Abraham Bar Ḥiyya, *Sefer Megillat ha-Megalle von Abraham bar Chija*, published by A. Poznanski with introduction and notes by J. Guttman (Berlin, 1924), Gate V, p. 117, lines 6–15.

66 The concept of triplicity denotes four groups of three zodiacal signs, each 120° apart from the other, and linked with the same element of the four basic elements; consequently, they are considered to have an identical nature. Their name stems from the perception that they form four equilateral triangles across the zodiac.

67 MS Paris 1058, fols. 63b, line 21 – 85b, line 9.

68 Abraham Bar Ḥiyya, *Sefer Megillat ha-Megalle*, ed. Poznanski, V, pp. 111–155. For an account of this astrological history and a study of its astrological vocabulary, see Josefina Rodríguez Arribas, "Terminology for Historical Astrology According to Bar Ḥiyya and Ibn Ezra," *Aleph* 11.1 (2011): 11–40.

69 Here the encyclopedist applies Bar Ḥiyya's peculiar terminology, according to which the first Saturn-Jupiter conjunction that switches from one triplicity to another after approximately 240 years is called "great," and note "middle" as is usual in medieval astrological literature.

33.2 — The 120 Planetary Conjunctions

The next article, whose contents correspond of the third sentence of the Gate's preface, opens with a preface by the encyclopedist about the 120 conjunctions of the seven planets (see below, Appendix 1, §8, on pp. 232–233). The 120 planetary conjunctions, (that is, the total sum of the combinations of two, three, four, five, six, and seven planets, when the order in which the planets are taken is insignificant but no planet may appear more than once in any particular combination,) play a prominent role in the fiftieth aphorism of Pseudo Ptolemy's *Centiloquium*,[70] but for this topic the encyclopedist drew on Abraham Ibn Ezra. We know this for certain not only because the encyclopedist admits this in a remark at the end of this section, but also because the 120 planetary conjunctions are one of the first topics treated in *ʿOlam* II by Abraham Ibn Ezra, and the encyclopedist introduced a complete transcription of *ʿOlam* II in the last section of Gate 33. However, in sharp contrast to *ʿOlam* I, where Ibn Ezra offers a lengthy and detailed mathematical demonstration of the 120 planetary conjunctions,[71] in *ʿOlam* II there is only a laconic statement which merely highlights the phenomenon of the 120 planetary conjunctions.[72] This is very likely the reason why the encyclopedist, in the aforementioned preface, wrongly asserts that three planets conjoin in 34 ways and four planets in 36 ways,[73] and in the following one and a half folios decides to expand on this topic and painstakingly specifies, for each of the partial combinations of two, three, four, five, six, and seven planets respectively, the names of the planets participating in each of the combinations.[74] At the end of this demonstration, the encyclopedist authored a remark where he admits that he learnt about this topic from Ibn Ezra, and refers to its utility to answer any question and solve any mystery and its theological connotations (see below, Appendix 1, §9, on pp. 233–234).

33.3 — Māshāʾallāh's Book on Eclipses

Next the encyclopedist inserted an article with a *verbatim* copy of the Hebrew translation of the last five chapters of Māshāʾallāh's *Book on the Eclipses of the Moon and the Sun, the Conjunctions of the Planets, and the Revolutions of the Years*.[75] The rationale behind this selection of chapters is easy to explain: in contrast to the previous chapters, these five address various topics related to the conjunctions of the uppermost planets (Saturn, Jupiter and Mars), which is the chief topic of Gate 33.

33.4 — A Second Version of Sefer ha-ʿOlam

The last article opens with a comment by the encyclopedist where he proclaims that Ibn Ezra wrote weighty things about the planetary conjunctions, to such an extent that they deserve to be inserted in this Gate (see below, §10 on p. 234). Next the encyclopedist inserted the complete text of Ibn Ezra's *ʿOlam* II,[76] which runs very close to

70 *Sefer ha-Peri*, MS Paris 1055, fol. 60a: "דבור נ'. אמר בטלמיוס: לא תתעלם מענין המאה ועשרים מחברות אשר לכוכבים הנבוכים כי מהם ידיעת רוב מה שיפול בעולם ההויה וההפסד." = "Aphorism 50: Ptolemy said: do not be oblivious to the 120 conjunctions of the planets, because from them comes the knowledge of almost everything that occurs in the world of generation and corruption."

71 *ʿOlam* I, §2:1–4; §3:1–3; §4:1–8; §5:1–20; §6:1–7, pp. 52–55.

72 *ʿOlam* II, §2:1, pp. 156–157.

73 Actually, combinations of three and four planets conjoin in both cases in 35 ways, as shown by Ibn Ezra in *ʿOlam* I, §4:1–8; §5:1–20, pp. 52–55.

74 MS Paris 1058, fols. 85b, line 28 – 86b line 7.

75 MS Paris 1058, fols.86b line 13 – 87b line 3 Cf. the critical edition of the Hebrew translation of Māshāʾallāh's *Book on Eclipses* in: Abraham Ibn Ezra, *Sefer ha-ʿOlam*, ed. and trans. Sela, pp. 252–259.

76 MS Paris 1058, fols. 87b, line 6 – 93a, line 24.

the version appearing in the great majority of the manuscript copies of *ʿOlam* II.[77] With one significant exception. In one of its inner sections, *ʿOlam* II addresses the topic of the period of al-*fardār* in historical astrology. In this framework, Ibn Ezra gives some cryptic instructions to identify the ruler of the current *fardār*ship for the year 4,902 A.M. (= 1141 C.E.), which is the first year of the 259th Metonic cycle.[78] The encyclopedist, instead of slavishly copying this passage, changed the date given by Ibn Ezra for the first year of the Metonic 265th cycle, which corresponds to the date of composition of *Sefer ha-Kolel*, and found that at this time Jupiter is the ruler of the current *fardār*ship (see below, Appendix 1, §11, on p. 234).

Gate 34: The 12 Horoscopic Places

Gate 34, which carries no preface by the encyclopedist, addresses theoretical and practical principles for the calculation of the the cardines and the twelve places of the horoscope. It consists of the four following articles.

(a) The first includes the full text of chapter 18 of Abraham Bar Ḥiyya's *Ḥešbon*, which addresses the calculation of the cardines and the 12 horoscopic places[79] and is based on chapter 35 of al-Battānī's *Zīj al-Ṣābi*.[80]

(b) The second opens with the following statement: "Ibn Ezra wrote about the horoscopic places."[81] Next the encyclopedist inserted a short quotation from Abraham Ibn Ezra's *Neḥošet* II, which sets out some theoretical principles about the 12 horoscopic places and gives instruction for their calculation with the assistance of an astrolabe.[82]

(c) The third starts with the following statement: "He also wrote regarding the aspects and <horoscopic> places."[83] Next the encyclopedist inserted the complete Gate 10 of the first version of

Sefer ha-Ṭeʿamim (hereafter *Ṭeʿamim* I) by Abraham Ibn Ezra.[84] In this relatively long chapter, (which is a commentary on Gate 10 of *Rešit Ḥoḵmah*, which was already quoted by the encyclopedist at the end of Gate 32; see above p. 206) Ibn Ezra sets out the technicalities of two methods for rectifying the horoscopic places and the astrological aspects, being the first calculated in zodiacal degrees and the second according to the geographical latitude where the horoscope is cast.[85]

77 For a critical edition of the second version of *Sefer ha-ʿOlam*, see Abraham Ibn Ezra, *ʿOlam* II, ed. and trans. Sela, pp. 156–191.

78 *ʿOlam* II, §31:1–3, pp. 176–177: "ואם תרצה לדעת למי כח השנה חסר משנות העולם בשנת ארבעת אלפים ותתק"ב, שהיא תחלת מחזור רנ"ט, י"א שנה, ישארו ד' תת"צא. והוצא הנשאר ע"ה ע"ה אז תדע מי הוא הממונה." = "If you want to know which <planet> has power this year, subtract 11 years from the years of the world in the year 4902, which is the beginning of the 259th <Metonic> cycle. The remainder is 4891. From this remainder cast out 75s to find the lord <of the *fardār*>."

79 MS Paris 1058, fols. 93a, line 28 – 94a line 28; Cf. Bar Ḥiyya, *Sefer Ḥešbon*, ed. Millás Vallicrosa, (Hebrew part) chap. 18, pp. 103–105.

80 *Al-Battani sive Albatenii Opus astronomicum*, ed. and trans. Carolo Alphonso Nallino, XXXV, pp. 73–74.

81 MS Paris 1058, fol. 94a line 29: "ואבן עזרא כתב בענין תקון הבתים".

82 MS Paris 1058, fols. 94a line 29 – 94b line 20; Cf. *Neḥošet* II, MS Mantua 10, fols. 46b–47a.

83 MS Paris 1058, fol. 94b lines 2021: "וכתב עוד בענין המבטים וקתון הבתים".

84 MS Paris 1058, fols. 94b line 20 – 97a line 15. At the end of the quotation from Ibn Ezra's *Ṭeʿamim* I the encyclopedist writes: "וא"ע"פ שאין השער הזה מיוחס למבטים רק לתקון הבתים הבאתי כל דבריו מהיותם נמשכים לזה." = "Although this chapter deals not only with the horoscopic places but also with the aspects, I brought the whole chapter because they [the places and the aspects] are related one to each other."

85 *Ṭeʿamim* I, §10, pp. 94–107.

(d) The fourth article of Gate 34 starts with the following statement: "In *Sefer Keli ha-Neḥošet* (Book on the Astrolabe), which is called *Riṣālat al-asṭurlāb*, he set out another method for the rectification of the places; <there> he discussed a procedure for establishing the twelve places."[86] Next the encyclopedist inserted a text spanning two folios and presenting four parallel methods for the calculation of the twelve horoscopic places with the assistance of an astrolabe.[87] Despite the fact that the aforementioned statement explicitly mentions *Sefer Keli ha-Neḥošet*, which is the name that Ibn Ezra gave to his treatises on the astrolabe, and although the encyclopedist in the aforementioned preface insinuates that he is again drawing on Ibn Ezra, the passage with the four methods for calculating the twelve places does not match any known extant work on the astrolabe authored by Ibn Ezra. However, since the encyclopedist mentions in the same breath *Sefer Keli ha-Neḥošet* and *Riṣālat al-asṭurlāb*, Epistle on the astrolabe, one is tempted to assume that he was referring to a Hebrew translation of an Arabic treatise on the astrolabe, one which the encyclopedist deemed to be a translation carried out by Ibn Ezra. In any case, the passage with the four methods for calculating the twelve places refuses at present identification and requires further scrutiny.

Gate 35

Still in the last lines of Gate 34, the encyclopedist presented a list of topics to be treated in the next Gate 35 (see below, Appendix 1, §12:1–3 on pp. 234–237). A scrutiny of the short items included in the central section of this text (see below, Appendix1, §12:2, on pp. 234–235), which covers the bulk of the aforementioned list of topics to be treated in Gate 35, reveals that all of them were excerpted from the second version of Abraham Ibn Ezra's *Sefer ha-Ṭeʿamim* (hereafter *Ṭeʿamim* II).[88] Moreover, an even closer examination reveals that these

excerpts are all short quotations from *Rešit Ḥoḵmah* II in *Ṭeʿamim* II,[89] which suggests that the encyclopedist, in acting in this peculiar way, was probably motivated by the enigmatic character of these brief quotations from *Rešit Ḥoḵmah* II in *Ṭeʿamim* II.[90] The first brief section of the aforementioned text (see below, Appendix 1, §12:1 on pp. 234–235), although it also points to topics addressed within Gate 35, is marked off from the central long section (see below, Appendix1, §12:2, on pp. 234–235) because the encyclopedist uses there astrological terms never employed by either Abraham Ibn Ezra or Abraham Bar Ḥiyya, who are the two sources employed in Gate 35: *yeridah*, *nesi'ut* and *mešulešet*, which mean, respectively, dejection, exaltation, and triplicity.[91] Perhaps the encyclopedist coined himself these terms,

86 MS Paris 1058, fol. 97a lines 15–18: "ובספר כלי הנחשת הנק' רצלאת אלאצטורלב הביא דרך אחרת לתקון הבתים, ואמר סדר חשבון לדעת הבתים השנים עשר.".

87 MS Paris 1058, fols. 97a line 18 – 98a line 10.

88 See below, Appendix 1, note after §12:1–3, on pp. 236–237.

89 Just as *Ṭeʿamim* I comments on quotations from *Rešit Ḥoḵmah* I, which is extant today in more than 50 manuscript copies, so *Ṭeʿamim* II comments on quotations from *Rešit Ḥoḵmah* II, of which only a short fragment survives. See S. Sela, "A Fragment From an Unknown Redaction of *Re'šit Ḥoḵmah* by Abraham Ibn Ezra," *Aleph* 10.1 (2010): 43–66. However, the quotations from *Rešit Ḥoḵmah* II in *Ṭeʿamim* II can be readily identified: as a rule they appear in the form of short lemmas, usually made up of one or two intriguing keywords taken from *Rešit Ḥoḵmah* II, which are followed by a commentary.

90 At first sight it is hard to see the connection between these brief quotations from *Rešit Ḥoḵmah* II and the ensuing commentary in *Ṭeʿamim* II. For example, see the commentary offered in *Ṭeʿamim* II, §2.9:6, pp. 202–203, to the keyword "nature" which is surprisingly related to the zodiacal signs that are assigned to the decans.

91 For the astrological concepts of dejection and exaltation, see below, note 100; for the concept of triplicity, see above, note 66.

by means of translating them from Arabic or Latin, but it cannot be ruled out that he borrowed them from some unknown source. In the third part of the aforementioned text (§12:3, on pp. 235–236), the encyclopedist formally opens Gate 35 and again refers very briefly to its inner contents.

Gate 35, the longest of the four surviving Gates of *Sefer ha-Kolel*,[92] addresses topics that are commonplace in introductions to astrology and includes the following three articles.

35.1 — A "New" Version of Sefer ha-Ṭeʿamim

The encyclopedist organized the first article of Gate 35 as a smooth and clever combination of excerpts from *Ṭeʿamim* I and *Ṭeʿamim* II, which, avoiding repetitions and redundancies, in fact creates a new version of *Sefer ha-Ṭeʿamim*.[93] Let us look, as an illustration, at the first part of this article, which the encyclopedist introduced with the statement: "The scholar Ibn Ezra said in *the Book of Reasons*."[94] He then segued into the whole introduction to *Ṭeʿamim* II, which offers a demonstration of the existence of the orbs of the planets and fixed stars, and of the ninth starless orb as well.[95] Then, without alerting the reader, the encyclopedist inserted the whole introduction of *Ṭeʿamim* I, which addresses the rationale behind the division of the zodiac into 360°, the difference between zodiacal signs and zodiacal constellations, and the 48 Ptolemaic constellations.[96] At this point, returning precisely to the point from which he left *Ṭeʿamim* II before, the encyclopedist inserted the following passage of *Ṭeʿamim* II addressing the physical nature of the zodiacal signs and stating that the triplicities, despite their names (fiery, earthy, watery, airy), are neither compounded of the four elements nor cold or hot, and only generate heat as a consequence of their motion.[97] Again, returning precisely to the point from which he left *Ṭeʿamim* I before, the encyclopedist inserted the next passage of *Ṭeʿamim* I addressing the question of why Aries, Leo and Sagittarius, which comprise the fiery triplicity, are said to have a fiery nature, and

discussing the physical nature of the planets.[98] In short, the discussion in *Sefer ha-Kolel* of the structure and physical nature of the supralunar domain runs smoothly, and a reader unfamiliar with the two versions of *Sefer ha-Ṭeʿamim* will never perceive that it was compiled with excerpts of two different works.

But the encyclopedist went well beyond the mere copying of passages from *Ṭeʿamim* I and *Ṭeʿamim* II, and interspersed them with astrological tables compiled by himself. One of them, spanning two whole folios, is a set of 12 tables, each of them divided into four columns and 30 rows, displaying, for each of the 12 zodiacal signs, various categories of degrees endowed with astrological influence: "bright," "dark," "intermediate," "masculine," feminine," "pits," and degrees which "add beauty and honor." Under scrutiny, it emerges that the values in these 12 tables were painstakingly gathered by the encyclopedist from Gate 2 of *Rešit Ḥoḵmah* I, which is divided into twelve sections addressing the various astrological features of each of the 12 zodiacal signs.[99]

92 MS Paris 1058, fols 98a line 23 – 127a line 5.

93 MS Paris 1058, fols 98a line 23 – 113a line 13.

94 MS Paris 1058, fol. 98a line 23: "אמר החכם אבן עזרא בספר הטעמים".

95 MS Paris 1058, fols. 98a line 23 – 98b line 16; Cf. *Ṭeʿamim* II, §1.1:1–6, §1.2:1–7, §1.3:1–3, pp. 182–185.

96 MS Paris 1058, fols 98b line 16 – 99a line 27; Cf. *Ṭeʿamim* I, §1.1:1–6, §1.2:1–6, §1.3:1–12, pp. 28–33.

97 MS Paris 1058, fols. 99a line 27 – 99b line 12; Cf. *Ṭeʿamim* II, §2.1:1–10, pp. 184–187.

98 MS Paris 1058, 99b line 12 – 100b line 1; Cf. *Ṭeʿamim* I, §1.4:1–6, §1.5:1–17, §1.6:1–5, pp. 32–37.

99 MS Paris 1058, fols. 102b – 104a. For example, for the various categories of degrees endowed with astrological influence in Aries, see MS Paris 1058, fol. 102b (first four columns); Cf. *Rešit Ḥoḵmah* I, *in Raphael Levy and Francisco Cantera, The Beginning of Wisdom* (Baltimore, 1939), Gate II (Hebrew part), p. xi, lines 5–15.

Another table, of 12 columns (for each of the 12 zodiacal signs) and four rows, was compiled by the encyclopedist to display the planets in their houses, exaltations, dejections and detriments.[100] But the encyclopedist uses in the headings of this table his own astrological terminology, and turns a blind eye to that of *Ṭeʿamim* I and *Ṭeʿamim* II.[101] Other tables, sometimes accompanied by brief explanations, were compiled by the encyclopedist to address the solar and lunar domains of the planetary houses,[102] the lords of the triplicities,[103] the terms according to Ptolemy[104] and according to the Egyptians and the Babylonians,[105] the signs assigned to the decans according to the Indians and Egyptians,[106] the lords of the dodecatemoria,[107] and the lords of the ninth parts.[108] For the data in all these tables, the encyclopedist drew in all likelihood on *Rešit Ḥoḵmah* I, where may be found all the tabulated values.

35.2 — Continuous Horoscopy in Nativities

The second article of Gate 35 is concerned with continuous horoscopy in nativities, which posits that a new horoscopic chart should be cast on every anniversary or "revolution of the year"—when the Sun arrives at the same point in the zodiac where it was at the time of the native's birth—or even at the beginning of every month, week, day, or hour, and that this new chart should be compared with the natal chart. Taking into account its sources, this article may be divided into three main segments. The first includes a passage from *Ṭeʿamim* II which addresses the mathematical technicalities of the "revolution of the year" and the "terminal sign."[109] Immediately following this, the encyclopedist wrote the words: *we-ha-Nasiʾ katav*, "the Prince wrote,"[110] thereby opening the second segment devoted entirely to Abraham Bar Ḥiyya, which ends with the words *kelal ʾaḥer le-ʾIbn ʿEzraʾ*, "another method by Ibn Ezra,"[111] where the third segment, entirely devoted to Ibn Ezra, begins.

Bar Ḥiyya's segment consists of the following elements: (1) all of chapter 19 of *Ḥešbon*, based on chapter 53 of al-Battānī's

Zīj al-Ṣābi, concerned with the revolution of the years;[112] (2) tables of planetary motions and the revolution of the years, all of them excerpted from *Luḥot ha-nasiʾ*;[113] (3) the full text of *Seder*

100 House and exaltation are two of the planets' essential dignities, that is, distinct zodiacal positions (a whole sign, a degree in a sign, or an interval of degrees in a sign) where a planet is said to acquire strength, for good or for evil, according to its nature. A planet is said to be in its house of dejection if it is in the house opposite its exaltation, and in its house of detriment if it is in the seventh sign from its planetary house.

101 MS Paris 1058, fol. 107b lines 1–5. For exaltation, the encyclopedist uses נשיאות (instead of כבוד); for dejection, ירידה (instead of קלון), and for detriment עניות (instead of שנאה). Note that the two first terms were already used by the encyclopedist in the aforementioned list of items of Gate 35.

102 MS Paris 1058, fol. 105a lines 1–6. The encyclopedist uses his own terminology and names the lunar domains of the planetary houses as החלק הטוב מהשמש ("the solar good part") and החלק הטוב מהלבנה ("the lunar good part").

103 MS Paris 1058, fol. 108b lines 1–6. Here, as elsewhere in the encyclopedia, the triplicity is named by the encyclopedist as משלשת.

104 MS Paris 1058, fol. 108b lines 24–30.

105 MS Paris 1058, fol. 109a lines 1–7.

106 MS Paris 1058, fol. 109b lines 1–17.

107 MS Paris 1058, fol. 110a.

108 MS Paris 1058, fol. 110b lines 1–20.

109 MS Paris 1058, fols. 112b line 9 – 113a line 13. The "terminal sign" is an indicator which moves at a rate of one sign in one year, creating cycles of 12 years.

110 MS Paris 1058, fol. 113a line 13.

111 MS Paris 1058, fol. 120a line 11.

112 MS Paris 1058, fols. 113a, line 13 –114a line 7; Cf. Bar Ḥiyya, *Sefer Ḥešbon*, ed. Millás Vallicrosa, (Hebrew part) chap. 19, pp. 106–107. See *Al-Battani sive Albatenii Opus astronomicum*, ed. and trans. Carolo Alphonso Nallino, LIII, pp. 128–129.

113 MS Paris 1058, fols. 114a–116a; Cf. MS Paris 1045 (IMHM: F 33996), fols. 57a–58b.

tiqqun ha-tequfot min ha-luḥot ha-ʾeleh (Method for determining the revolutions from these tables; hereafter *Seder tiqqun*), a self-contained essay which studies a miscellany of doctrines related to anniversary horoscopy and gives instructions about the use of tables that facilitate their implementation.[114] *Seder tiqqun*, which was composed in all likelihood by Bar Ḥiyya, besides being part and parcel of our encyclopedia, is embedded in seven manuscript copies of *Luḥot ha-nasiʾ*.[115] In fact, the encyclopedist included *Seder tiqqun* in this segment because he took it to be an independent essay by Bar Ḥiyya, and excerpted the tables of planetary motions and the revolution of the years from *Luḥot ha-nasiʾ* and included them within this segment, just before *Seder tiqqun*, because all these tables are referred to within *Seder tiqqun*.[116]

The third segment, consists of the following elements, all of them excerpted from *Ṭeʿamim* II, except for the first one, which was taken from *Neḥošet* II: (1) a short fragment explaining the calculation of the revolution of the year with the help of an astrolabe;[117] (2) a passage discussing the revolution of the months;[118] (3) a passage discussing the revolution of the weeks;[119] (3) a passage discussing the revolution of the days;[120] (4) the final section of *Ṭeʿamim* II, which discusses the length of the solar year according to the approach of the Indian scientists, Ptolemy, and Greek and Arab scientists;[121] (5) a passage setting out a doctrine that divides life into equal one-year periods: the lord of the first hour of birth is the ruler of the first year of life; the subsequent years are ruled by the planets that are the lords of the hours that follow the hour of birth.[122]

35.3 — Lots

The last article of Gate 35 is concerned with the astrological lots, imaginary ecliptical points influential in the horoscope, whose calculation implies three horoscopic entities. the distance of two of them (place of the planets, cusps of horoscopic places, etc.)

is added to the position of the third, usually the ascendant. The encyclopedist addressed this topic by means of inserting the entire sections addressing the lots in *Ṭeʿamim* II[123] and in *Ṭeʿamim* I,[124] as well as the entire Gate 9 of *Rešit Ḥoḵmah*, which includes a detailed treatment of the lots.[125]

Conclusion

Sefer ha-Kolel (Comprehensive Book), which is how our encyclopedia was twice designated by its author, was composed in 1256, possibly in

114 MS Paris 1058, fols. 116b, line 5 –120a line 11.

115 See, for example, MS Paris 1045, fols. 58b–63a.

116 For a study of the recently identified *Seder tiqqun*, see S. Sela, "A Newly Identified Essay on Anniversary Horoscopy Embedded in Abraham Bar Ḥiyya's Astronomical Tables: Hebrew Edition, Translation and Commentary," 13.1 *Aleph*, (2013): 27–76.

117 MS Paris 1058, fol. 120a, lines 11–20; Cf. *Neḥošet* II, MS Mantua 10, fol. 46b.

118 MS Paris 1058, fols. 120a, line 20 – 120b line 14 ; Cf. *Ṭeʿamim* II, §8.2:1–11, §8.3:1–3, pp. 248–251.

119 MS Paris 1058, fol. 120b lines 14–20 ; Cf. *Ṭeʿamim* II, §8.4:1–4, pp. 252–253.

120 MS Paris 1058, fols. 120b line 20 – 121a line 6; Cf. *Ṭeʿamim* II, §8.5:1–6, §8.6:1–3, pp. 252–255.

121 MS Paris 1058, fol. 121a lines 6–26; Cf. *Ṭeʿamim* II, §8.7:1–12, pp. 254–257.

122 MS Paris 1058, fols. 121a line 26 – 121b line 3; Cf. *Ṭeʿamim* II, §6.7:1–3, pp. 240–241.

123 MS Paris 1058, fols. 121b line 3 – 122b line 12; Cf. *Ṭeʿamim* II, §7.1:1–11, §7.2:1–31, §8.1:1–4, pp. 242–249.

124 MS Paris 1058, fols. 122b line 13 – 123a line 16; Cf. *Ṭeʿamim* I, §9.1:1–8, §9.2:1–6, §9.3:1–4, pp. 92–95.

125 MS Paris 1058, fols. 123a line 18 – 127a line 5; Cf. *Rešit Ḥoḵmah*, ed. *Raphael Levy and Francisco Cantera*, Gate IX (Hebrew part), pp. lxvii line 6 – lxxv line 8.

a location in Southern France or Northern Italy which corresponds to the geographical latitude 45°. The four surviving Gates of *Sefer ha-Kolel* reveal close to nothing about its author, but his choice of sources and the contribution he made himself attest to the fact that he was fully conversant with astrology and astronomy, though especially interested in astrology. To put in a nutshell the contents of *Sefer ha-Kolel*, a catalogue of all its sources is tabulated below, sorted by the names of the authors and their corresponding works (see Appendix 2, on pp. 237–241).

Sefer ha-Kolel should be placed in the context of an increasing Jewish curiosity about astrology, which, after the completion of Ibn Ezra's astrological writings, sought further channels of expression. One was the spread of Ibn Ezra's and Bar Ḥiyya's writings through their repetitive copying in varied collections of manuscript copies, which gathered impetus after the second half of the 13th century. But given the creative approach of the author of *Sefer ha-Kolel*, it becomes clear that his *modus operandi* was a far cry from that used by the scribes who compiled typical manuscripts collections of Abraham Ibn Ezra's and Abraham Bar Ḥiyya's astrological and astronomical works.[126] Another channel for satisfying the growing Jewish curiosity about astrology was the inclusion of sections devoted to astrology in Hebrew medieval encyclopedias of science. Time is not yet ripe for a comprehensive scrutiny of these interesting texts.[127] Nevertheless, I sketch in what follows the main features of two of these astrological encyclopedias and draw a comparison between them and *Sefer ha-Kolel*. I have selected them not only because I have a performed a preliminary study of their contents, but particularly because they were roughly contemporaneous with *Sefer ha-Kolel*.

Midraš ha-Ḥokmah, an encyclopedia of science composed by Judah ben Solomon ha-Cohen Ibn Mathkah of Toledo originally in Arabic while he was in Christian Spain and then translated into

Hebrew in 1247 while he resided in Lombardy, contains a whole section entirely devoted to astrology.[128] Interspersed with remarks by Judah ben Solomon conveying his ideas about astrology, this section contains a detailed paraphrase or summary of Ptolemy's *Tetrabiblos*. Despite its seemingly monolithic composition, the encyclopedic character of the astrological section of *Midraš ha-Ḥokmah* is due to the fact that Ptolemy devoted the first part of *Tetrabiblos* to an introduction to astrology, the second part to general astrology, and the last two parts to nativities.[129] In sharp contrast with *Sefer*

126 In the same category should be included another work, also entitled *Sefer ha-Kolel*, which appears to be no more than a mere collection of astrological works, predominantly by Abraham Ibn Ezra. Thus, the copy of this *Sefer ha-Kolel* in MS New York, Jewish Theological Seminary, 2601 (IMHM: F 28854), fols. 90a–147a, includes Ibn Ezra's *Sefer ha-Moladot*, *'Olam* I, the second version of *Sefer ha-Mivḥarim* II, the frist version of *Še'elot*, as well as an Hebrew translation of *Sefer ha-Peri* (Pseudo-Ptolemy's *Centiloquium*).

127 No study of any of the known works of this type has been as yet carried out nor a systematic mapping of the manuscripts for the identification of new specimens has been so far performed. For some preliminary remarks, see: R. Leicht, "Towards a History of Hebrew Astrological Literature," in: G. Freudenthal, (ed.) *Science in Medieval Jewish Cultures*, (Cambridge: Cambridge University Press, 2012), pp. 262–281; S. Sela, "Astrology in Medieval Jewish Thought," in: idem, pp. 98–299.

128 Marienza Benedetto, *Filosofia e astrologia nel Midrash ha-hokmah di Yehudah ha-Cohen* (Bari: Edizioni de Pagina, 2010); Resianne Fontaine, "Judah Ben Solomon Ha-Cohen's *Midrash Ha-Ḥokmah*," in *The Medieval Hebrew Encyclopedias of Science and Philosophy*, ed. Steven Harvey (Dordrecht: Kluver Academic Publishers, 2000), pp. 181–210; Y. Tzvi Langermann, "Some Remarks on Judah Ben Solomon Ha-Cohen and His Encyclopedia, *Midrash Ha-Ḥokmah*," in: idem, pp. 371–389.

129 Judah, for his part, does not omit the treatment of any of these components of *Tetrabiblos.* The astrological section of *Midraš ha-Ḥokmah* was transmitted in

ha-Kolel, however, Judah not only uses an idiosyncratic astrological terminology that depends neither on Ibn Ezra nor on Bar Ḥiyya,[130] but also leaves aside the rich Arabic astrological literature in vogue as well as Ibn Ezra's and Bar Ḥiyya's Hebrew astrological works. The rationale behind Judah's choices is at present not clear, but his *modus operandi* suggests that by the mid-thirteenth century Ibn Ezra's astrological writings were much less known in Christian Spain than in Provence. By the same token, our encyclopedist marked acquaintance with and reliance on Ibn Ezra's astrological work suggests that *Sefer ha-Kolel* was composed in Provence, where Ibn Ezra's astrological writings were well known as early as in the final decades of the twelfth century.[131]

Chapter 40 of *Liwyat ḥen* (Chaplet of Grace), a scientific encyclopedia composed by Levi ben Abraham ben Ḥayyim (1235–1305) in Provence after 1276, is also exclusively devoted to astrology.[132] It is somewhat indebted to Bar Ḥiyya, but predominantly adheres to Ibn Ezra's astrological ideas, employs the latter's astrological terminology, and is organized in the mold of Abraham Ibn Ezra's astrological corpus.[133] Consequently, Levi ben Abraham treats, one by one, all the systems of Greco-Arabic astrology with which Ibn Ezra was concerned in his astrological corpus: nativities, elections, astrological history, interrogations and medical astrology.[134] For example, a considerable part of chapter 40 is devoted to genethlialogy and continuous horoscopy and consists of verbatim quotations and paraphrases from *Sefer ha-Moladot*.[135] Interspersed with this astrological material, Levi ben Abraham conveyed his own ideas about astrology, in general, and about Abraham Ibn Ezra's astrological work, in particular. Chapter 40 of *Liwyat ḥen*, then, has not a few points of intersection with *Sefer ha-Kolel*, but, in contrast with our encyclopedia, it is exclusively devoted to astrology (*Liwyat ḥen* treats astronomy separately in chapter 39).[136]

In light of the foregoing study, let us now turn to overview the main features of our encyclopedist's *modus operandi*. To provide the reader access to the body of knowledge addressed in *Sefer*

two different versions. One includes Judah ben Solomon's remarks and ideas about astrology; see, for example, MS Madrid, Biblioteca de la Real Academia de la Historia 7 (IMHM: F 07370), ff. 182a–198a; the other omits completely Judah ben Solomon's remarks and is focused on Ptolemy's *Tetrabiblos*; see MS Paris, Bibliothèque Nationale de France, MS héb. 1028 (IMHM: F 15720), ff. 93a–110b.

130 For example, to denote the concepts of exaltation and conjunction, Judah employs, respectively, נשיאות and קיבוץ, whereas Ibn Ezra uses כבוד and מחברת, and Bar Ḥiyya uses גבהות and דיבוק. Cf. note 101.

131 See S. Sela, "Queries on Astrology Sent from Southern France to Maimonides: Critical Edition of the Hebrew Text, Translation, and Commentary," *Aleph* 4 (2004): 89–190.

132 Warren Zev Harvey, "Levi Ben Abraham of Villefranche's Controversial Encyclopedia," in *The Medieval Hebrew Encyclopedias*, pp. 171–188, esp. pp. 187–188.

133 For the study of this work, I have used MS Paris, Bibliothèque Nationale de France, MS héb. 1066 (IMHM: F 33999), fifteenth century, fols. 1a–106a.

134 For this specific organization, see MS Paris 1066, ff. 4a-4b.

135 MS Paris 1066, fols. 36a–62b. This section is divided into two parts: (a) Fols. 36a–56a, on the doctrine of nativities, includes paraphrases or verbatim quotations from the chapters addressing the rectification of the nativities and the twelve astrological places from *Sefer ha-Moladot*; (b) Fols. 56a–62b, devoted to continuous horoscopy, includes paraphrases or verbatim quotations from *Tequfot ha-Šanim*, the final part of *Sefer ha-Moladot*. Cf. *Abraham Ibn Ezra on Nativities and Continuous Horoscopy,* A Parallel Hebrew English Critical Edition of the Book of Nativities and the Book of Revolution, Edited, Translated and Annotated, by Shlomo Sela (Leiden: Brill, 2013), pp. 84–203.

136 G. Freudenthal, "Sur la partie astronomique du Liwyat Ḥen de Lévi Ben Abraham Ben Ḥayyim," *Revue des études juives* 148 (1989): 103–12.

ha-Kolel, the encyclopedist made good use of the state-of-the-art in Hebrew astrological and astronomical literature available in the mid-thirteenth century: the scientific corpuses of Abraham Bar Ḥiyya and Abraham Ibn Ezra (as detailed below, in Appendix 2, on pp. 237–241), translations of Arabic astrological and astronomical works into Hebrew (Māshā'allāh's *Book on Eclipses* and the unidentified Hebrew translation of *Riṣālat al-asṭurlāb*), as well as oblique references to recent works on the Jewish calendar (Maimonides' *Sanctification of the New Moon*). However, in sharp contrast with the slavish copying of whole works that is commonplace in typical manuscripts collections of astrological and astronomical texts, the author of *Sefer ha-Kolel* in the overwhelming majority of cases carefully selected chapters from whole works, in some instances he excerpted short fragments of a few lines from them, and only in two cases he borrowed whole works. All this bears witness to the fact that he was intimately acquainted with the contents and details of all the works he applied to *Sefer ha-Kolel*.

But the encyclopedist went far beyond making clever selections of texts of variable length from available astrological and astronomical Hebrew sources. He organized his work in the form of Gates, addressing each of them specific subjects in astrology and astronomy, and subdivided each Gate into articles of variable length, covering various topics within the thematic sphere of the Gate. Thus, Gate 32 was devoted to the astrological and astronomical properties of the fixed stars, as well to cycles related to world astrology; Gate 33 addressed various aspects of the conjunctions of the upper planets in the framework of historical and meteorological astrology; Gate 34 was devoted to put forward several methodologies for the calculation of the 12 horoscopical places; and Gate 35 addressed a miscellany of astrological topics which are commonplace in introductions to astrology (the categories of the zodiacal signs, the planets' dignities, continuous horoscopy, the lots, etc.). The author

of *Sefer ha-Kolel* also created a smooth linkage between Gates, by means of detailed prefaces (which served the function of modern tables of contents), and between articles and the internal items of the articles, by means of brief comments introducing the topic to be treated in the following item, the following item's author, and even the title of the specific work used for the subject-matter of the following item. Moreover, the author of *Sefer ha-Kolel* assumed himself the role of contributor to the encyclopedia, by means of authoring articles and tables, as well as by virtue of remarks whose purpose was to bring some astrological or astronomical theory up to the date of composition of *Sefer ha-Kolel*.

Appendix 1: Quotations from *Sefer ha-Kolel*

§1: MS Paris 1058, fols. 50a, lines 1–10.

השער השלשים ושנים. בחשבון מהלך כוכבי שבת, ומהלך נקודת רומי הרום וראשי התנינים לחמשה כוכבי הנבוכה, ומקומות הנקודות האלה בראש מחזור רנ"ז, שהוא תחלת שנת ארבעת אלפים ושמנה מאות וששים וחמש לבריאת העולם. ויתבאר עוד בו מקומות כוכבי שבת אשר במעלה הראשונה ובמעלה השנית ושמותיהם, ומרחבם מאופן המזלות ואופן המישור בראש מחזור רנ"ז; וצורות הלוחות החקוקות לזה; ומספר כוכבי שבת הנחלקים על שמנה וארבעים צורות; ושמות כוכבי שבת ומקומם המורים על מאורעים בני אדם בהיותם עומדים על חלקי יתדות הגלגל או בהיותם אחד מן המאורות עמהם, ותהיה נמיכותם מן האופן בפאה מרחב הכוכב המיושר, וצורות החקוקות לזה. ונבאר בו עוד סדר כוכבי שבת בהתרסותם [צ"ל הסתרותם] והראותם; ושמות מחנות הלבנה; וענין חלקי אלפרדאר; והניהוגים.

Gate 32. On the reckoning of the fixed stars' motion, the motion of the point of the apogee and of the Head of the Dragon of the five planets, and the position of these points in the beginning of the 257th <Metonic> cycle, which is the year 4,865 from the creation of the world. This <Gate> will

also expound on the positions and names of the fixed stars of the first and second magnitude, their latitude with respect to the zodiac and the equator at the beginning of the 257th <Metonic> cycle; the shape of the tables addressing this; the number of stars into which are divided the 48 constellations; the names and positions of the fixed stars which foreshadow human events when they are located in the cardines of the circle or when one of the luminaries conjoins them, when their declination with respect to the circle [the celestial equator] is in the side where the corrected <fixed> star has <some> latitude, and the shapes <of the tables> compiled for this; We will also expound on the method for reckoning the fixed stars in their hidings and their coming into view; the lunar mansions, the topic of the parts of the *fardār*, and the directions.

§2: MS Paris 1058 fol. 51b, lines 10–13.

לוח ערך מעלות הצורות אשר נבחנו להעיד על הכהות האור בהיות המאורות עומדות לנכחם ושמות הצורות המעידות על כהות האור מהעינים לדברי חכמי הנסיון ואין המעלות האלה מתגלגלות לדבריהן.

Table of the range of degrees of the asterisms which were tested and signify the dimming of the light <of the eyes> when the luminaries are in opposition to them, and of the names of the asterisms signifying the dimming of the eye's light according to statements of the astrologers; in their opinion these degree do not move.

§3: MS Paris 1058, fol. 57a, lines 6–26.

גבול המחנות. כל מחנה י״ב מעלות נ״א ראשונים נ״ב שנים. וכשתרצה לדעת ענין החדש, אם לח יבש אם בינוני, דע באי זה מזל ובאי זו מעלה ממנו יתקבצו חמה ולבנה בעת המולד האמתי והמעלה הצומחת אשר בחצי השמים. והחל לספור מטלה ותן לכל מחנה י״ב נ״א נ״ב. ותמצא אם הדבוק יהיה במחנה לח או יבש או בינוני, ואם הצומחת ומעלת חצי השמים יורו במעלת מחברת

המאורות המשפט חזק מאד. הנה נכתבו שמנה ועשרים מחנות הלבנה או מלונות כמו שתרצה לקראם שהם בחשב אפודת המזלות ... ובמרחב מ״ה מעלות יעלה המחנה הראשון כלו ולא עלתה חצי שעה, וכל מחנה שהוא ט״ו מעלות ראוי שיעלה ביותר משעה.

The boundary of the mansions. <The size of> each mansion is 12;41,52°. When you want to know about <the weather of> some month, whether moist, dry or moderate, find out the sign and the degree at which the Sun and the Moon conjoin at the time of the true *molad*, and the ascendant degree and the degree of the midheaven <at the time of the luminaries' conjunction>. Begin the count from Aries and assign to each mansion 12;41,52°. Find out whether the <degree of the> conjunction [*dibbuq*] <of the luminaries> coincides with a moist, dry or temperate mansion, and if the ascendant and the degree of midheaven give an indication at the degree of the conjunction [*maḥberet*] of the luminaries, then the judgment <about the prediction of rain> is very strong. We have just listed 28 lunar mansions, or "lodgings," as you wish to call them, which are located in the ecliptic [*ḥešev 'afudat ha-mazzalot*] … At latitude 45°, the whole first mansion has already ascended before half an hour has elapsed, when <an arch of> 15° should raise in more than an hour.

§4: MS Paris 1058, fol. 57b, lines 7–12.

ובשער שלשים ושבע מן הספר הזה הכולל ימצא דעת בטלמיוס ואלפרגני בשמות הכוכבים הקיימים ומחנות הלבנה. ולפי שיש קצת הבדל בין מה שנכתב בשער הזה ובין מה שכתוב שם, רציתי לכתוב הכל ללבב כל משתדל. עוד אכתוב לך צורות כל המזלות על הסדר שיש לכל מזל ומזל, צורה אחת לראש המזל וצורה שניה לבטן המזל וצורה שלשית לזנבו. ואלה שמותם.

In Gate 37 of this *Sefer ha-Kolel* can be found Ptolemy's and Al-Farghānī's opinion about the names of the fixed stars and the lunar mansions. Since there is some small difference

between what is written down in this Gate and what is written down there <by Ptolemy and Al-Farghānī>, I wish to write everything necessary to satisfy the curiosity of any <reader>. I shall also write down for you the asterisms of all the signs according to the order of each sign, one asterism for the head of the sign, a second asterism for the belly of the sign, and a third asterism for its tail. These are their names.

§5: MS Paris 1058, fol. 61a, lines 1–8.

הנה יעדנו לבאר בשער הזה מקומות נקודת גובה רום החמה וגובה רומי הכוכבים החמשה וראשי תניניהם. והנה בארנו מקומותם לדעת הנשיא שהלך אחרי דעת בטלמיוס וחקקנו בהם לוח למהלכם מעלה אחת במאה שנה. ועתה נכתוב דעת רבינו משה ז"ל ואבן עזרא וכל החושבים מהלכם מעלה אחת בשבעים שנה בקירוב, והיה מהלכם בעשרה ימים שניה אחת ועשרים וארבעה שלישיים ושלשים רביעים. ונוסיף לבאר לדעתם מקומותם וכל עניין רדתם מגובה הרום ועלייתם משפל הרום, והנמשך להם ולחמה ולבנה, ועניין המהלך החוסר מן מהלך השוה והעודף עליו.

Our purpose in this Gate is to establish the positions of the apogee of the Sun and the apogees of the five planets and their Head of the Dragon. We had already established <above> their positions according to the opinion of *ha-Nasi'* who followed Ptolemy's opinion, and <consequently> we compiled this table assuming that their motions is of 1° in 100 years. But now we shall follow the opinion of our Rabbi Moses, may his memory be a blessing, <the opinion> of Ibn Ezra, and of all those who take into account a motion of approximately 1° in 70 years, so that their [the planetary apogees'] motions in 10 days is of 0;0,1,24,30°. We should also establish the positions <of their apogees> and the topic of their descent from apogee and their rise from perigee, and what follows from this topic regarding the Sun and the Moon, and the topic of the excess and deficiency with respect to their mean motion.

§6: MS Paris 1058, fol. 63b, lines 16–21.

(1) שער השלשים ושלשה: בענין התחברות הכוכבים העליונים שהם שבתאי וצדק במשולשת אחת שתים עשרה פעמים וצאתם ממשלשת למשולשת; וענין דבוק קטן ואמצעי וגדול ועצום; (2) וענין התחברות מאדים עם שבתאי הנקרא מחברת אמצעית; וענין התחברות צדק ומאדים הנקרא מחברת קטנה; (3) וענין מאה ועשרים מחברות; (4) והנמשך לזה מספרי החכמים הקדמונים לבא למחקר ענין הגאולה, אשרי המחכה ויגיע.

(1) Gate thirty three: on the topic of the conjunction [*ha-hitḥabrut*] of the uppermost planets, which are Saturn and Jupiter, in one triplicity [*mešulešet*] twelve times and their shift from triplicity to triplicity; on the topic of the small, middle, great and mighty conjunction [*dibbuq*]; (2) on the topic of the conjunction [*hitḥabrut*] of Mars and Jupiter, which is called middle conjunction [*maḥberet*]; on the topic of the conjunction [*hitḥabrut*] of the Jupiter and Mars, which is called the small conjunction [*maḥberet*]; (3) on the topic of 120 conjunctions [*maḥbarot*]; (4) and what follows it from the books of the ancient scholars and is adequate for understanding the <time of> redemption, *happy is he who waits and reaches* (Daniel 12:12).

§7: MS Paris 1058, fol. 85b, lines 9–22

ובשנת שבע עשרה על חמשת אלפים, שהיא שנה ראשונה למחזור רס"ה לחשבון התקופות מניסן, אנחנו בשנת אחת עשרה מהדבוק השני, שהיה בשנת חמשת אלפים ושש במזל מאזנים. והיה זה הדבוק שני מהדבוק הגדול, שהתחברו שבתאי וצדק בשלש מעלות מדלי בשנת ארבעת אלפים ותשע מאות ושמנים ושש לחשבון המולדות שהתחלתם מן בהר"ד. והדבוק ההוא הגדול היה בשעה עשירית מליל יום ראשון, שהוא ארבעה עשר לחדש אדר. ואחר שידעת שניסן של שנה ראשונה למחזור רס"ה היא בשנת אחת עשרה לדבוק השני, יקל לך לדעת שנה אחרי שנה בכמה שנים אתה מהדבוק הגדול הזה שהתחיל במזלות האויר בדלי בשנת ארבעת אלפים ות"תק"פו. והנה יתדבקו שני הכוכבים העליונים בשנת חמשת אלפים ועשרים ושש בתאומים

בכדי שמונה מעלות, ט' בחדש כסלו, ביום שלישי בסוף שעה שמינית מן היום, ביום שמנה ועשרים מן השנה עשירית חמחזור רס"ה ופשוטה יום שמיני לחדש דזימרי שנת אלף רס"ה לנצרים, יום ראשון לחדש צפר לערב משנת ת"רס"ד לחשבונם.

In the year 5,017 <A.M.> (=1256 C.E.), which is the first year in the 265th <Metonic> cycle according to the counting of the vernal equinoxes, *we are* in the 11th year after the second <Saturn-Jupiter> conjunction, which took place in the year 5,006 <A.M.> (= 1245 C.E.) in Libra. This was the second conjunction in the framework of the great conjunction, in which Saturn and Jupiter conjoined in Aquarius 3° in the year 4,986 <A.M.> (= 1225 C.E.), according to the reckoning of the *moladot* from *ba'ha'ra'd'* [= 2d; 5h. 204p].[137] This great conjunction took place in the 10th hour of Sunday night, the 14th day in the month of *'Adar*. Since you know that *Nissan* of the first year of the 265th <Metonic> cycle falls in the 11th year after the second [Saturn-Jupiter] conjunction, you can readily know, year after year, how many years elapsed between your time and the time of this great <Saturn-Jupiter> conjunction, which began in the airy signs, in Aquarius, in the year 4,986 <A.M.> (= 1225 C.E.). So, the two uppermost planets will conjoin in the year 5,026 <A.M.> (= 1265 C.E.) in Gemini 8o, the 9th day in the month of *Kislev*, in Tuesday, at the end of the 8th hour of the day, in the 28th day of the 10th year of the 265th <Metonic> cycle, that is, the 8th day in the month of December in the year 1265 of the Christians, the first day in the month of Safar of the Arabs, in the year 664 according to their reckoning.

§8: MS Paris 1058, fol. 85b, lines 22–28.

ואחר שהשכלתיך בינה בעניין חבור שני הכוכבים הגדולים העליונים שהם שבתאי וצדק רציתי להראות לך ענין המאה ועשרים מחברות על אי זה עניין

הם מתחברים: שנים מהם יוכלו להתחבר בעשרים ואחת דרכים; שלשה מהם יוכלו להתחבר בשלשים וארבעה דרכים; ארבעה מהם יוכלו להתחבר גם כן בשלשים וששה דרכים; חמשה מהם יוכלו להתחבר בעשרים ואחת דרכים; ששה מהם יוכלו להתחבר בשבעה דרכים ועל השבעה יתחברו בדרך אחת לבד, והנה אתן לך דרך חבורם.

Now that I have enlightened you about the topic of the two great uppermost planets, which are Saturn and Jupiter, I wish to inform you about the topic of the 120 conjunctions, and how do they conjoin: two of them [i.e., two of the seven planets] can conjoin in 21 ways; three of them [i.e., three of the seven planets] can conjoin in 34 ways; four of them [i.e., four of the seven planets] can also conjoin in 36 ways; five of them [i.e., five of the seven planets] can conjoin in 21 ways; six of them [i.e., six of the seven planets] can conjoin in seven ways; and the seven conjoin in one way. Now I show you how do they conjoin.

§9: MS Paris 1058, fol.86b lines 8–13.

ואלה הם החבורים שכתב אבן עזרא מהשבעה כוכבים שיוכלו להתחבר מאה ועשרים חבורים כלם כאחד בגלגל כנגד מעלה אחד מגלגל המזלות ובחלק אחד מן המעלה, או שניים מהם, או שלשה, או ארבעה, או חמשה, או ששה, וזה דבר מועיל מאד לבאר כל שאלה ולגלות כל סתום וכפי התחברותם יורו מה שיורו ומאלהים הכל כי המשפט לאלהים הוא ולאלהים פתרונים ית' שמו וית' אמן.

These are the combinations of the seven planets, about which Ibn Ezra wrote that they may combine in 120 combinations, in one degree of the zodiac and in one minute of the degree,

137 *Ba'ha'ra'd'* is a mnemonic symbol used to express the epochal *molad Tišre*, that occurred Sunday night, 5 hours and 204 *ḥalaqim*, one year before Creation. This is the starting point for calculating all subsequent *moladot*.

either two, three, four, five, or six <planets>. This is useful to answer any question and solve any mystery, for they signify what they signify according to their combinations, and everything derives from God, and the judgment belongs to God, be blessed His name, Amen.

§10: MS Paris 1058, fol. 87b lines 3–6.

והנה החכם אבן עזרא כתב בעניין המחברות ענינים אין ראוי להניחם, וא"ע"פ שקצתם ראוים להכתב בספר משפטי הכוכבים, הסכמנו להניחם בשער הזה עדי שלא יחסר הספר מדברי המחברים.

The scholar Ibn Ezra wrote about the conjunctions things which do not deserve to be overlooked; even though part of them should be written in the book of astrology, we have agreed to insert them in this Gate in order that the topic of the conjunctions should not be lacking from this book.

§11: MS Paris 1058, fol. 90b lines 19–22.

ואם תרצה לדעת למי כח השנה והממונה מי הוא בניסן משנת חמשת אלפים ושבע עשרה, שהוא תחלת מחזור רס"ה לתקופות, דע שכוכב צדק הוא הממונה והשנה ההיא היא ראשונה לכחו.

If you want to know which <planet> has power this year, in *Nissan* in the year 5,017 <A.M.> (=1256 C.E.), which is the beginning of the 265th <Metonic> cycle, know that Jupiter is the ruler in this year, which is the first of its rulership.

§12: MS Paris 1058, fol. 98a lines 10–23.

(1) ואחר שהבאנו דרכי תקון הבתים, צריך שנבאר בתי הכוכבים, והמזלות, וירידתם ונשיאותם בהם, ושפלותם וגבוליהם והפנים, והמשלשת ובעליה ביום ובלילה. (2) וכח השנים עשר, והתולדת, וכח התשיעי, והמזלות המתהפכים והעומדים והשני גופים, והמזלות הארוכים והקצרים, ומזלות האש והמים והאויר והעפר, ומזלות היופי, ומזלות קול, והכח, והמומים, והמתכות, והמטר,

ומזלות המלכים, ומזלות הנביאים, והמזלות הרופאים, ומזל העולם, והשמים, ובתי עבודת השם, ומזל הים והמים, ומזל המשגל, והעקרים, והבינוניים, וענין אור כל כוכב כמה הוא, ודרך ניצוח בהיותו במקום גבהותו, והקבול ונתינת הכח, ועין הבתים הם המראים, והשמחות, ומעלות המולד, והתקופה, והשעות, והגורלות לפי הבתים, ותקופת החדשים, והשבועיים, ותקופת הימים. (3) ומפני שיארך ענין השער, איחד שער לכל הדברים הנזכרים. השער השלשים וחמש: בביאור בתי הכוכבים והמזלות וכל הדברים הנזכרים בסוף השער שלפני זה עד תקופת הימים.

(1) After having presented the methods for the calculation of the <horoscopic> places, we need to discuss the houses of the planets, the signs, their dejections [*yeridatam*] and exaltations [*nesi'utam*] in them [the signs], their [the planets] perigees, terms and decans, the triplicity [*ha-mešulešet*] and its lords by day and night. (2) (i) The power of the dodecatemoria, (ii) the nature, (iii) the power of the ninth part, (iv) the tropical, fixed and bicorporal signs, (v) the long and short signs, (vi) the fiery, watery, airy and earthy signs, (vii) the signs of beauty, (viii) the voiced signs, (ix) power, (x) deformities, (xi) metals, (xii) rain, (xiii) the signs of kings, (xiv) the signs of prophets, (xv) the signs of physicians, (xvi) the sign of the world, (xvii) heavens, (xviii) the houses of divine worship, (xix) the sign of the sea and water, (xx) the sign of sexual intercourse, (xxi) barren, (xxii) intermediate, (xxiii) the topic of the ray of any planet and its extent, (xxiv) the path of victory when it [the planet] is in its apogee, (xxv) receiving and giving power, (xxvi) the color of the <horoscopic> places, which are appearances, (xxvii) joys, (xxviii) the degrees of the nativity, (xxix) the revolution, (xxx) the hours, (xxxi) the lots according to the <horoscopic> places, (xxxii) the revolution of the months, (xxxiii) the weeks, (xxxiv) and the revolution of the days. (3) Since the Gate covers a long discussion, I will allot a

separate Gate for the aforementioned topics. Gate thirty-five: a discussion of the planetary houses, the signs, and all the aforementioned topics at the end of the previous Gate up to the topic of the revolution of the days.

All the items included above in §12:2, (where each item is headed by a roman numeral in parenthesis,) were excerpted from Ibn Ezra's *Ṭeʿamim* II. In the following list, each item includes two related references separated by the sign =, in the following format: iii = §2.9:7, pp. 202–203. Here the left component (iii) points to the item in the aforementioned list of topics that is headed by the same roman numeral in parenthesis, and the right component (§2.9:7, pp. 202–203) points to the chapter, section and sentence, and corresponding page numbers, in *Ṭeʿamim* II, ed. Sela. For example, iii = §2.9:7, pp. 202–203 means that item (iii) in the aforementioned list of topics, that is, "the power of the ninth part," is a quotation from *Ṭeʿamim* II, ed. Sela, §2.9:7, pp. 202–203. For further information about the astrological doctrines referred to in the items of this list, the reader is directed to the text following each of the brief quotations and the corresponding notes in *Ṭeʿamim* II, ed. Sela. i = §2.9:7, pp. 202–203; ii *Ṭeʿamim* II, §2.9:6, pp. 202–203; iii = §2.9:9, pp. 202–203; iv = §2.3:1-4, pp. 188–189; v = §2.3:5, pp. 188–189; vi = §2.1:1–14, pp. 184–187; vii = §2.3:12, pp. 190–191; viii = §2.3:13, pp. 190–191; ix = §2.3:15, pp. 190–191; x = §2.3:17, pp. 190–191; xi = §2.3:18, pp. 190–191; xii = §2.3:20, pp. 190–191; xiii = §2.3:22, pp. 190–191; xiv = §2.3:23, pp. 190–191; xv = §2.4:1, pp. 192–193; xvi = §2.4:6, pp. 192–193; xvii = §2.4:4, pp. 192–193; xviii = §2.4:13, pp. 192–193; xix = §2.4:17, pp. 194–195; xx = §2.4:14, pp. 194–195; xxi = §2.4:15, pp. 194–195; xxii = §2.4:16, pp. 194–195; xxiii = §4.2:1–4, pp. 208–209; xxiv = §4.4:2, pp. 208–209; xxv = §4.9:1, pp. 212–215; xxvi = §4.11:1–4, pp. 214–217; xxvii = §4.12:1–6, pp. 216–217;

xxviii = §6.1:1–5, pp. 234–235; xxix = §6.3:1–5, pp. 238–239; xxx = §6.7:1–3, pp. 240–241; xxxi = §7.2:1–31, pp. 244–249; xxxii = §8.2:1–11, pp. 248–251; xxxiii = §8.4:1–4, pp. 252–253; xxxiv = §8.5:1–6, pp. 252–253.

Appendix 2: A Catalogue of Sources Used in *Sefer ha-Kolel*

Abraham Bar Ḥiyya

Source		Contents	S.K.
Ṣurat ha-ʾareṣ	Gate 10 (complete)	Motion of the fixed stars	32:4
-----	Gate 7, chapter 30	Motion in latitude of the fixed stars	32:1
-----	Gate 7, chapter 31	Position of the star with respect to the ecliptic when it passes the midheaven	32:1
-----	Gate 8, chapter 35	Occultation of the fixed stars	32:4
Ḥešbon mahalaḵot ha-koḵavim	chapter 17	The fixed stars' motion; planetary apogees and nodes; the 48 Ptolemaic constellations; the 28 lunar mansions	32:3
-----	chapter 18	Calculation of the 12 horoscopic places	34:1
-----	chapter 19	The revolution of the years	35:2

Source		Contents	S.K.
Megillat ha-Megalleh	Gate 5 (complete)	A Jewish and universal astrological history	33:1
Luḥot ha-nasi'	MS Paris 1045, fols. 54a–56b	Six astrological lists of stars	32:2
-----	MS Paris 1045, fols. 57a–58a	Tables of planetary motions	35:2
-----	MS Paris 1045, fol. 58b	Tables of the revolution of the years	35:2
Seder tiqqun ha-tequfot min ha-luḥot ha-'eleh	complete text MS Paris 1045, fol. 59b–62a	A miscellany of doctrines related to revolution of the years and months	35:2

Abraham Ibn Ezra

Source		Contents	S.K.
Neḥošet II	(15 lines)	Determining the position of a fixed star with an astrolabe	32:2
'Olam II	§37:4; §44:1–3; §45:1	Lunar mansions	32:3
'Olam I	§23:1–12	The period of al-*fardār*	32:6
Rešit Ḥoḵmah	Gate 10 (complete)	*Nihugim*	32:6

'Olam II	(complete)	Historical and meteorological astrology	33:4
Neḥošet II	(21 lines)	Determining the 12 places with an astrolabe	34:2
Ṭe'amim I	Gate 10 (complete)	Calculation of the horoscopic places and the astrological aspects	34:3
Ṭe'amim I and *Ṭe'amim* II	All through both works	A smooth and clever combination of astrological excerpts	35
Neḥošet II	(11 lines)	Calculation of the revolution of the year with the help of an astrolabe	35:2
Rešit Ḥoḵmah	Gate 9 (complete)	The lots	25:3

Encyclopedist (articles, tables and interpolations)

Content	S.K.
A discussion of the 28 lunar mansions.	(32:3) fol. 57a
Table of the "head," "belly," and "tail," of the 12 zodiacal constellations.	(32:4) fol. 57b
Table of the motion of the apogees and the Heads of the Dragon of the planets in single Egyptian years taking into account a motion of 1° in 70 years.	(32:5) fol. 60b

Lists of positions of the planetary apogees and nodes; variations of the velocity of the planets when they descend from apogee to perigee or ascend from perigee to apogee; updating the planetary apogees and nodes to the date of composition of *Sefer ha-Kolel*.	(32:5) fol. 61a
Updating the *al-fardār* to the date of composition of *Sefer ha-Kolel*.	(32:6) fols. 62a–62b
Updating the *nihugim* to the date of composition of *Sefer ha-Kolel*.	(32:6) fol. 63a
The date of composition of *Sefer ha-Kolel* in the framework of Saturn-Jupiter conjunctions	33:1 fol. 85b
A demonstration of the 120 conjunctions of the seven planets	33:2 fols. 85b–86b
A list of astrological items which are quotations from *Rešit Ḥoḵmah* II in *Ṭeʿamim* II	35 (preface) fol. 98a
12 tables of "bright," "dark," "intermediate," "masculine," feminine," "pits," and degrees which "add beauty and honor."	35:1 fols. 102–104
Table of the planets in their houses, exaltations, dejections and detriments	35:1 fol. 105a
Table of the lords of the triplicities	35:1 fol. 108b
Table of the terms according to Ptolemy	35:1 fol. 108b
Table of the terms according to the Egyptians and the Babylonians	35:1 fol. 109a
Table of the signs assigned to the decans according to the Indians and Egyptians	35:1 fol. 109b
Table of the lords of the dodecatemoria	35:1 fol. 110a
Table of the lords of the ninth parts	35:1 fol. 110b

Māshāʾallāh

Source	Gate/ Chapter	Contents	S.K.
Book on Eclipses	Chapters 8–12	Conjunctions of the uppermost planets	33:3

Maimonides

Source	Chapter	Contents	S.K.
Sanctification of the New Moon	Chapter 12	Reference to the planetary apogees moving 1° in 70 years	32:5

Unidentified source

Content	S.K.
Four methods for calculating the twelve places ostensibly taken from "*Sefer Keli ha-Neḥošet*, which is called *Riṣālat al-aṣturlāb*."	34:4

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