ISSN 1565-1525

Aleph

Historical Studies in Science & Judaism

No. 3 (2003)

The Hebrew University of Jerusalem

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A Rediscovered Autograph Manuscript by Mordekay Finzi

Introduction

While examining Hebrew manuscripts at the Accademia Nazionale dei Lincei in Rome, I chanced upon an interesting autograph manuscript of astronomical texts, written by Mordekay Finzi and long regarded as lost.[1] A short note on this codex was published at the end of the nineteenth century by Pietro Riccardi; this elicited a prompt reaction by Moritz Steinschneider.[2] In later years, however, both notes were all but

[1] The manuscript was recognized during the preparation of the catalogue for the exhibition *Il trionfo sul tempo: Manoscritti illustrati dell'Accademia Nazionale dei Lincei* (Rome, 2002). A brief description of our codex is included in the catalogue. On the Hebrew manuscripts in the Accademia dei Lincei, see Giancarlo Lacerenza, "I manoscritti ebraici dell'Accademia Nazionale dei Lincei," *Materia giudaica* 8/1 (2003) [in press]. For the present article, I owe many thanks to Maria C. Casaburi, Gad Freudenthal, Bernard R. Goldstein, Tony Lévy, Benjamin Richler, Shlomo Sela, Giuliano Tamani, and the four anonymous referees for *Aleph* for their valuable comments and suggestions.

[2] Pietro Riccardi, "Sopra un codice ebraico contenente alcuni scritti matematici ed astronomici," *Bibliotheca Mathematica* 7 (1893): 54–56; Moritz Steinschneider, "Kurze Bemerkungen zur Beschreibung eines hebräischen Manuscripts von Herrn

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forgotten. Only in recent times have some scholars referred to the codex and to Riccardi's article.[3] Although unaware of Steinschneider's previous interest in Finzi,[4] Riccardi recognized the value of the codex, which he had seen in "private hands." Some years later, the manuscript was in the collection of the orientalist Leone Caetani;[5] it is listed in an inventory of oriental books and manuscripts that Caetani donated to the Accademia dei Lincei, drawn up by librarian Giuseppe Gabrieli and published in 1911.[6] For unknown reasons, however, the codex was not included in the general inventory of Accademia dei Lincei oriental manuscripts published by Gabrieli in 1926.[7]

Mordekay Finzi and his Writings

Besides his banking activities, Mordekay ben Avraham Finzi—מרדכי בן אברהם פינצי, called Angelo or Agnolo in Italian documents (Bologna, early fifteenth century–Mantua 1475)—had wide-ranging interests in medicine, philosophy, grammar, and astronomy.[8] It has been suggested that he was the author of the *Tables for the Length of Daylight*, published anonymously in Mantua by Avraham ben Šelomoh Konat between 1474 and 1477.[9] Apparently, however, he did not write many scientific works—or, if he did, they have not yet been found.[10]

Finzi used many manuscripts. The library owned by his family, in Bologna—whose inventory was drawn up in 1454—included about two hundred codices,[11] of which only six or seven are recognizable as astronomical. In 1435, Finzi was living with his brother Yiṣḥaq in Mantua: while there he copied and translated various kinds of texts, mainly for his own use.

In addition to the Accademia dei Lincei codex, eight autograph manuscripts by Finzi have been identified so far:[12]

1. Oxford, Bodleian Library, Lyell 96: William Batecombe, *Tabulae Oxonienses*, for 1348, translated from Latin into

Riccardi" [Miscellen zur Geschichte der Mathematik 12.], ibid., 73. Since Riccardi could not read Hebrew, he examined the manuscript with the assistance of Salomone Jona, Chief Rabbi of Modena.

3 Bernard R. Goldstein, "Descriptions of Astronomical Instruments in Hebrew," *Annals of the New York Academy of Sciences* 500 (1987) [= David A. King and George Saliba, eds., *From Deferent to Equant: A Volume of Studies in the History of Science in the Ancient and Medieval Near East in Honor of E. S. Kennedy*]: 105–41, on p. 138, n. 17; Tony Lévy, "Les *Eléments* d'Euclide en hébreu (XIII^{e}-XVI^{e} siècles)," in Ahmad Hasnawi et al., eds., *Perspectives arabes et médiévales sur la tradition scientifique et philosophique grecque*. Actes du colloque de la SIHSPAI, Paris 1993 (Leuven-Paris: Peeters, 1997), pp. 79–94, on p. 87; Giuliano Tamani, "La biblioteca scientifica di Mordekay Finzi (Mantova, sec. XV)," *Micrologus* 9 (2001) [Proceedings of the International Congress *Gli ebrei e le scienze*, Trento, 3–5 giugno 1998]: 237–47, on p. 241, n. A2.

4 Moritz Steinschneider, *Letteratura italiana dei Giudei. Cenni* (Rome, 1884), pp. 51–56 [first published in *Il Buonarroti* 11 (1876): 120–25]. Cf. idem, "Die mathematischen Wissenschaften bei den Juden 1411–1500," *Bibliotheca Mathematica* n.s. 2 (1901): 59–61 [repr. in idem, *Die Mathematik bei die Juden* (Hildesheim: Olms, 1964; repr. 2001), 193–95].

5 Caetani may have bought it at one of the auctions he frequented in his pursuit of oriental manuscripts and rare books.

6 Giuseppe Gabrieli, "Collezione di manoscritti e libri orientali donati all'Accademia dal Corrispondente Don Leone Caetani Principe di Teano," *Rendiconti dell'Accademia Nazionale dei Lincei: Classe di scienze morali, storiche e filologiche* 20.7–10 (1911): 570–88, on p. 572, n. 34: "Codice ebraico in pergamena e carta, contenente alcuni scritti matematici ed astronomici: 8° gr., rileg. occid.–Descritto dal Riccardi in *Journal d'Histoire des Mathématiques*, Stockholm 1893." Modern researchers seem to have overlooked this reference to our manuscript.

7 Giuseppe Gabrieli, *La Fondazione Caetani per gli studi musulmani. Notizia della sua istituzione e catalogo dei suoi mss. orientali* (Rome, 1926), including four Hebrew entries: Nos. 114 (amulet on parchment), 241 (personal papers of Albino Nagy), 252 (Naḥmanides, *Peruš ha-torah*), 253 (Ptolemy, *Almagest*.) In a later and more com-

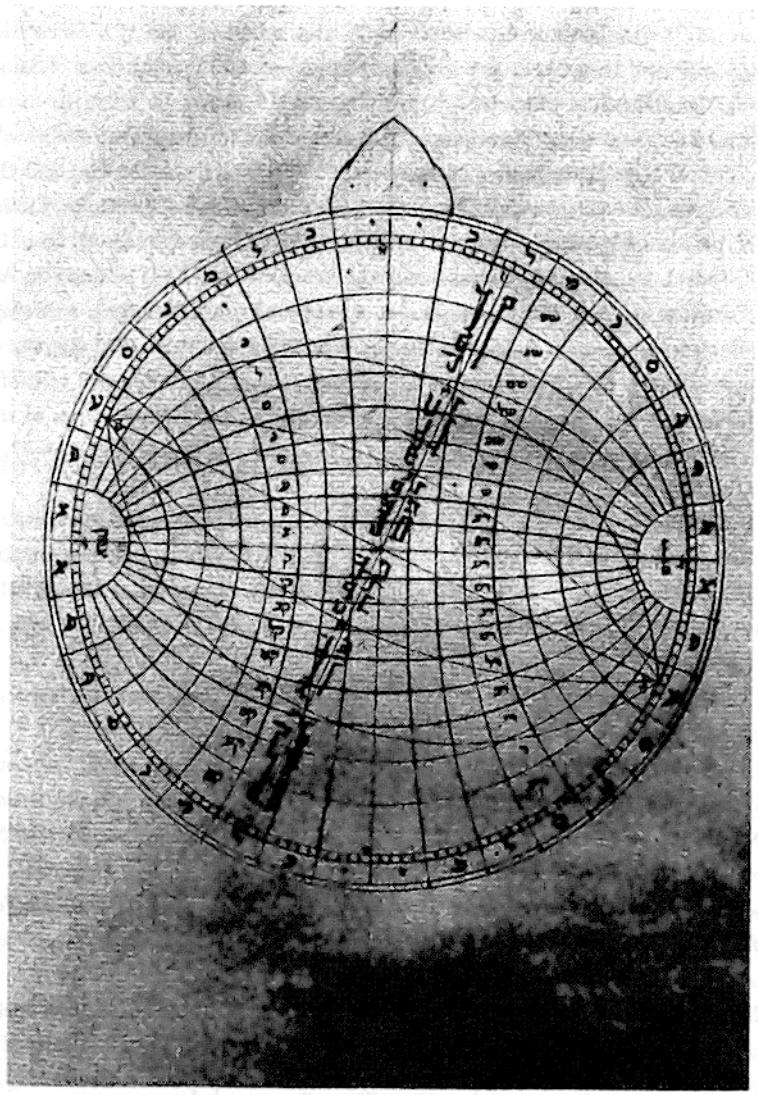

Fig1 (f. 109v)

prehensive catalogue, *Manoscritti e carte orientali nelle biblioteche e negli archivi d'Italia* (Florence, 1930), 48 and 65, Gabrieli mentions four Hebrew manuscripts in the collections of the Accademia dei Lincei, one of which (not included in his earlier catalogue) was "described by Riccardi."

8 For information on Finzi, see Shlomo Simonsohn, *History of the Jews in the Duchy of Mantua* (Jerusalem: Kiryat Sepher, 1977), pp. 603, 640–41, 647, 649, 677–78, 709; Vittore Colorni, "Genealogia della famiglia Finzi. Le prime generazioni," in V. Colorni, *Judaica minora. Saggi sulla storia dell'ebraismo italiano dall'antichità all'età moderna* (Milan: Giuffré, 1983), pp. 329–41, esp. 333–38; Y. Tzvi Langermann, "The Scientific Writings of Mordekhai Finzi," *Italia* 7 (1988): 7–44; Tamani, "La biblioteca scientifica." On his mathematical translations, cf. also Moritz Steinschneider, "Zur Geschichte der Übersetzungen aus dem Indischen ins Arabische und ihres Einflusses auf die arabische Literatur," *Zeitschrift der deutschen morgenländischen Gesellschaft* 25 (1871): 378–428, on pp. 405–409; Gustavo Sacerdote, "Il trattato del pentagono e del decagono di Abu Kamil Shogia' ben Aslam ben Muhammed," in *Festschrift zum Achtzigsten Geburtstage Moritz Steinschneider's* (Leipzig, 1896), pp. 168–94; Langermann, "The Scientific Writings," pp. 10–11 and 32–39; Tony Lévy, "La littérature mathématique hébraïque en Europe (du XI[e] au XVI[e] siècle)," in Catherine Goldstein et al., eds., *L'Europe mathématique. Histoires, mythes, identités* (Paris: Maison des Sciences de l'Homme, 1996), pp. 85–99, on pp. 93–94; Tony Lévy, "Hebrew Mathematics in the Middle Ages: An Assessment," in F. Jamil Ragep and Sally P. Ragep, eds., *Tradition, Transmission, Transformation*. Proceedings of Two Conferences on Pre-Modern Science (Leiden: Brill, 1996), pp. 71–88, on pp. 79–80.

9 Only two copies of this work are known, one in the Biblioteca Palatina in Parma and the other in the Bibliotheca Rosenthaliana in Amsterdam. See Adriaan K. Offenberg and Corretje Moed-van Walraven, *Hebrew Incunabula in Public Collections. A First International Census* (Nieuwkoop: De Graaf, 1990); Giuliano Tamani, "Gli incunaboli ebraici delle biblioteche d'Italia," in Enrichetta Valenziani and Paolo Veneziani, eds., *Indice generale degli incunaboli delle biblioteche d'Italia* VI (Rome: Libreria dello Stato, 1981), pp. 281–304, no. 48. Finzi's authorship of this text was first suggested by Steinschneider; a different view has been expressed by Langermann, "The Scientific Writings," pp. 11–12.

Hebrew and annotated by Finzi; completed in Mantua on 22 Elul 5201 (Sept. 8, 1441).[13]

2. Oxford, Bodleian Library, Mich. 350 (Cat. Neubauer 2052), fols. 1–64, 83–96: astronomical miscellanea, including texts authored by Finzi and an astronomical work by ʿImmanuʾel ben Yaʿaqov; written in Mantua in different stages between 1446 and 1470: fols. 54^{r}–61^{v} completed on June 21, 1446; the years 1463/64 and 1469/70 are indicated, respectively, on fols. 22^{v} and 49^{r}.[14]
3. Cambridge, Trinity College, F.12.35 (Cat. Loewe 124): Averroes, *Middle Commentary* on *De anima*, with additions; Šemuʾel Ibn Tibbon, *Commentary on Qohelet*; al-Baṭalyūsī, *The Book of Intellectual Circles* (Sefer ha-ʿagullot ha-raʿyoniyyot); translation from Arabic into Hebrew by Mošeh Ibn Tibbon (first and third text); completed in Mantua on December 13, 1446.[15]
4. Amsterdam, Bibliotheca Rosenthaliana, MS Ros. 72 (Cat. Fuks-Mansfeld 472): Averroes, *Middle Commentary* on *De generatione et corruptione* and *Meteora*, translated from Arabic into Hebrew by Qalonymos ben Qalonymos; completed in Mantua (probably in the last week of September 1447).[16]
5. Vienna, formerly at the Israelitische Kultusgemeinde, MS VI—medical miscellanea: Pietro da Tussignano, *Descriptiones receptarum noni Almansoris*, translated from Latin into Hebrew; Maimonides, *De theriaca* and *De emorrhoidarum liber*, translated from Arabic into Hebrew; Lanfranco, *Chirurgia parva*, translated from Latin into Hebrew; medical prescriptions; completed in Legnago on January 28, 1466.[17]
6. Berlin, Staatsbibliothek, MS Or. 4° 648 (Cat. Steinschneider 119), fols. 120^{v}:11–148^{r}: Mošeh ben Yehošuaʿ of Narbonne, *Commentary* on Ibn Ṭufayl, *Epistle of Ḥayy Ibn Yaqzan* (Finzi completed the work of an anonymous copyist who

10 For a list of his works, see Tamani, "La biblioteca scientifica," 245–47, where all the information provided by Steinschneider and Langermann is collected. The title or subject is sometimes mentioned by Finzi himself.

11 Carlo Bernheimer, "Una collezione privata di duecento manoscritti ebraici nel XV secolo," *La Bibliofilia* 26 (1924–25): 300–25; Simonsohn, *History of the Jews*, pp. 677–78; Jean-Pierre Rothschild, "Les listes des livres, reflet de la culture des Juifs de l'Italie du Nord au XV^{e} et au XVI^{e} siècle?" in Giuliano Tamani and Angelo Vivian, eds., *Manoscritti, frammenti e libri ebraici nell'Italia dei secoli XV–XVI* (Rome: Carucci, 1991), pp. 164–93, on pp. 167–68.

12 The best presentations are provided by Malachi Beit-Arié, "Mordecai Finzi's Copy of a Work by Averroes," in Adriaan K. Offenberg et al., eds., *Bibliotheca Rosenthaliana. Treasures of Jewish Booklore*, second edition (Amsterdam: Amsterdam University Press, 1996), p. 8; Giuliano Tamani, "Manoscritti ebraici copiati a Mantova nel secolo XV," *Annali Ca' Foscari* 35 [Serie Orientale 27] (1996): 7–36; idem, "La biblioteca scientifica."

13 Missing in Adolf Neubauer, *Catalogue of the Hebrew Manuscripts in the Bodleian Library and in the College Libraries of Oxford* (Oxford, 1886). The original text was edited by Finzi, as established by Bernard R. Goldstein, "Scientific Traditions in Late Medieval Jewish Communities," in Gilbert Dahan ed., *Les Juifs au regard de l'histoire. Mélanges en l'honneur de Bernhard Blumenkranz* (Paris: Picard, 1985), pp. 235–47, on p. 238. See also Langermann, "The Scientific Writings," pp. 26–28, n. 8; Tamani, "Manoscritti ebraici," pp. 18, 27 n. 20; idem, "La biblioteca scientifica," no. A1.

14 Simonsohn, *History of the Jews*, 649; Langermann, "The Scientific Writings," pp. 14–26, 28–30, 39–41, entries 1–7, 9, and 17; Tamani, "Manoscritti ebraici," 18, 27 no. 21; idem, "La biblioteca scientifica," pp. 242 no. A3.

15 Tamani, "Manoscritti ebraici," pp. 17, 27 n. 22; idem, "La biblioteca scientifica," p. 242 no. A4.

16 Beit-Arié, "Mordecai Finzi's Copy." See also Tamani, "Manoscritti ebraici," pp. 18, 28 n. 23; idem, "La biblioteca scientifica," 242 no. A5.

17 Lost during World War II; cf. Arthur Z. Schwarz, *Die hebräischen Handschriften in Österreich* II.A (New York: American Academy for Jewish Research, 1973), pp. 29–

wrote a Sephardi script); copy completed in Viadana on January 24, 1460.[18]

7. Jerusalem, Jewish National and University Library, Heb. 8° 3915: Mastro Dardi of Pisa, *Algebra*, translated from Italian into Hebrew by Mordekay Finzi; begun in Mantua on November 24, 1473.[19]
8. Mantua, Biblioteca Comunale, MS ebr. 17 (Cat. Mortara p. 19), containing: (a) a treatise on algebra in three parts by Abū Kāmil Šuǧāᶜ Ibn Aslam, translated from Latin (?) into Hebrew by Finzi;[20] (b) an anonymous essay on geometry; (c) a short text by Finzi himself, *On the Measuring of Buckets and Barrels*;[21] place and date uncertain.[22]

Valuable information on Finzi's reading and studies can be gained from the manuscripts that contain his autograph marginal notes and from manuscripts in which these notes were reproduced by later copyists; in the latter case they can be identified by the introductory abbreviation אמ"פ, for אמר מרדכי פינצי for, "Mordekay Finzi said." Notable among these are the following manuscripts:

a. New York, Jewish Theological Seminary of America, Mic 2637 (formerly Steinschneider 14): astronomical miscellanea;
b. London, British Library, Or. 10547: Levi ben Geršom, *Maᶜaśeh ḥošev*, with autograph notes by Finzi;[23]
c. Mantua, Biblioteca Comunale, MS ebr. 4: astronomical texts and *Sefer ṣurat ha-ʾareṣ* by Avraham bar Ḥiyya, with annotations by Finzi;[24]
d. Florence, Biblioteca Nazionale Centrale, III.368, which contains a text on geomancy and a horoscope, both by Finzi (fols. 50ᵛ–58ᵛ and 59);[25]
e. Naples, Biblioteca Nazionale, III.F.9; Levi ben Geršom, *Astronomy*;[26]
f. An Italian manuscript of Mastro Dardi's *Algebra*, with what are probably Finzi's autograph notes in Hebrew (see n. 19.)

34, n. 298. Cf. Tamani, "Manoscritti ebraici," pp. 18, 28 n. 25; idem, "La biblioteca scientifica," p. 243 no. A7. Some authors erroneously date the manuscript to 1446.

18 Beit-Arié, "Mordecai Finzi's Copy;" Tamani, "Manoscritti ebraici," pp. 17, 28 n. 24; idem, "La biblioteca scientifica," pp. 242–43, no. A6.

19 Moritz Steinschneider, *Die hebräischen Übersetzungen des Mittelalters und die Juden als Dolmetscher* (Berlin, 1893), pp. 630–31, § 397; Warren Van Egmond, "The Algebra of Master Dardi of Pisa," *Historia Mathematica* 10 (1983): 399–421; Tamani, "Manoscritti ebraici," pp. 18, 28 n. 26; idem, "La biblioteca scientifica," p. 243, no. A8. Finzi's translation stops at equation 51 (there are 194 equations in the original text). A manuscript of Master Dardi's *Algebra*, in Italian, presently at the Arizona State University Library (Tempe), containing 35 glosses in Hebrew, may have been Finzi's exemplar, as suggested in Barry D. Hughes, "An Early 15th-Century Algebra Codex: A Description," *Historia Mathematica* 14 (1987): 167–72. This suggestion has been confirmed by Tony Lévy, "L'algèbre arabe au Moyen Age: le témoignage des textes hébraïques (XIIᵉ–XVIᵉ siècles)," *Arabic Sciences and Philosophy* [forthcoming].

20 On the text and its tradition, see Martin Levey, ed., *The Algebra of Abū Kāmil. Kitāb fi al-jabr waʾl-muqābala, in a Commentary by Mordecai Finzi* (Madison: University of Wisconsin Press, 1966), pp. 3–13. (Levey, who believed the text to be a translation from an Arabic original, did not use the Mantua MS; see pp. 8–9.)

21 Y. Tzvi Langermann, "The Treatise on the Mensuration of Buckets of Mordekhay Finzi," *Kiryat Sefer* 59 (1984): 636–37 (Hebrew); idem, "The Scientific Writings," pp. 32–33, n. 14.

22 The indication "Mantua, 1473/75," which appears in the manuscript, is reliable, according to Tamani, "Manoscritti ebraici," pp. 18, 29 n. 28; idem, "Opere scientifiche in ebraico nei manoscritti della Biblioteca della Comunità Ebraica presso la Biblioteca Comunale di Mantova," *Materia giudaica* 2 (1996): 20–23; idem, "La biblioteca scientifica," 244, no. A10 (with references to previous scholarship). See, however, the different view expressed by Lévy, "L'algèbre arabe."

23 Langermann, "The Scientific Writings," p. 39.

24 Ibid., pp. 30–31; Tamani, "Manoscritti ebraici," pp. 18, 28–29 n. 27; idem, "Opere scientifiche," 21; idem, "La biblioteca scientifica," 243, no. A9.

25 Langermann, "The Scientific Writings," 42–4.

The Accademia dei Lincei Manuscript

Description[27]

Rome, Biblioteca dell' Accademia Nazionale dei Lincei e Corsiniana; Sezione Orientale, MS Or. 259, is a Hebrew codex written in Mantua by Mordekay ben Avraham Finzi, either before 1441 (colophon 1, by text no. 3) or between 1441 and 1446 (colophon 2, by text no. 7); texts 8–11 were probably added shortly afterwards. It measures 245□182 mm. It has a fifteenth- or sixteenth-century Western parchment binding. The leaves are numbered on the upper left corner of the *recto*. The earlier Hebrew numbering is in semi-cursive script; the modern stamped numbering (added after 1893) skips fol. 57bis and consequently does not correspond with the Hebrew numbering from fol. 58 onward.[28]

The manuscript is written on Italian paper, except for the outer bifolium of each quire, which is parchment, and several.[29] There are a total of 147 leaves, of which 144 are numbered (fols. 66–67 lack Hebrew numbering; fol. 57bis lacks modern numbering). There are several blank leaves: 1^{r}, 109^{r}, 124^{v}, 141^{v}, 144^{v}, and 145–146 (unnumbered). Finzi wrote in black ink, using an Italian semi-cursive hand. The main text is in a central column (140□80 mm); lateral columns occasionally contain glosses and notes.

Colophon 1, on fol. 96^{v},[30] in very small writing, reads as follows:

כתבתיו אני מרדכי פינצי והגהתיו כלו מלבד השער האחרן בחרש שבט שנת רא

"I, Mordekay Finzi, wrote this, and checked it entirely, except for the last chapter, in the month of Ševaṭ, year 201" [= 5201, January/February 1441].

Colophon 2, on fol. 140^{r},[31] reads:

השלמתיו לכתבו אני מרדכי פינצי יום ד׳ ימים לחרש אגושטו רו הנה בעיר מנטואה והוא מדויק מאד ת״ל

"I, Mordekay Finzi, completed the writing of this on the fourth day (= Wednesday), August[32] 10 [year] 206 (= 5206/1446),[33] here in the city of Mantua; and it is very accurate. *T[odah] l[a-ʾEl]* [Deo gratias]."

There are Hebrew signatures in cursive Ashkenazi script by Mordekay bar Ašer Halevy Šaliṭ (שלי מרדכי בר אשר הלוי שליט) in the upper right-hand corners of fols. 1^{v} and 137^{v}, in both cases followed by a mono-

26 Gabriella Moscati Steindler, "I manoscritti ebraici della Biblioteca Nazionale di Napoli," *Annali dell'Istituto Universitario Orientale di Napoli* 31 (1971): 313–40, on pp. 324–25, n. 9. On Finzi's (non-autograph) marginal notes in this manuscript, see Bernard R. Goldstein, *The Astronomy of Levi ben Gershon (1288–1344): A Critical Edition of Chapters 1–20 with Translation and Commentary* (New York: Springer-Verlag, 1985), pp. x, 10, 33, 136, 217; Langermann, "The Scientific Writings," p. 32, n. 13.

27 See also Lacerenza, "I manoscritti ebraici," no. 4.

28 The numbering used by Jona is based on the Hebrew numbering; therefore, the modern numbering must have been added immediately after the manuscript was acquired by Caetani.

29 The complete list of parchment folios is: 1, 8–9, 16–17, 25–26, 34–35, 42–43, 50–51, 57bis–58, 65–68, 75–76, 83–84, 91–92, 99–100, 108–109, 117–118, 125–126, 133–134, 141–142.

30 Riccardi, "Sopra un codice ebraico," erroneously places it on fol. 104^{r}.

31 Riccardi erroneously places it on fol. 143^{r}.

32 The name of the month is given in Italian, אגושטו, *agosto*.

33 The year was read by Jona, followed by Riccardi, as 216 (= 5216/1456). But whereas Aug. 10, 1446, was indeed a Wednesday, Aug. 10, 1456, was a Tuesday. The earlier date is therefore definitely the correct one. Indeed, a difference of five years between the two parts of the manuscript is more plausible.

gram.[34] A note about Šaliṭ's remuneration, also followed by the monogram, appears under the signature on fol. 1^{v}:

בכסף מלא הקימותיהו לי מאת בן הלטיף
נאם מרדכי בר אשר הלוי שליט[35].

On fol. 137^{v}, under his signature, Šaliṭ wrote a short index to the codex, also in cursive script:

[1] מאמרי(ם) ראשוני(ם) לאקלידס העתקת ר' יעקב מכיר
[2] ביאור האיצטורלאב לבן עזרה
[3] ביאור כלי האצטורלאב העתקת ר' יעקב מכיר
[4] ביאור מעשה האצטורלאב
[text no. 5 not included]
[6] ספר הצפיחה לאלזרקאל ואופן עשייתו
[7] ספר הכדור לקסטא בן לוקה ואופן עשייתו
[text no. 8 not included]
[9] מעשה כלי המחט מהקאלמיטה לדעת השעות
[10] דרך מרובע עגולה לדעת השעות
[11] מעשה הרובע הישן

Contents

The contents of the codex may be summarized as follows:

1. Euclid, *Sefer ha-yesodot* (Elements) (1^{v}–68^{v})
Limited to books I–VII, the text follows the translation from Arabic into Hebrew by Ya^{c}aqov ben Maḵir Ibn Tibbon.[36] It is abundantly illustrated with plane geometric figures (2^{v}–9^{v}, 10^{v}–17^{v}, 18^{v}–20^{v}, 21^{v}–22^{v}, 23^{v}–38^{r}, 39^{r}–^{v}, 41^{r}, 49^{r}–59^{r}).

2. Abraham Ibn Ezra, *Sefer keli ha-neḥošet* (Book of the Astrolabe) (69^{r}–84^{v})

The text, which is preceded by four rhymed quatrains, includes interpolations by Finzi (introduced by the usual אמר מרדכי פינצי, "Mordekay Finzi said") and marginal notes. There are no illustrations. Shlomo Sela has recently shown that Ibn Ezra wrote three different Hebrew ver-

[34] This Mordekay Šaliṭ also owned at least one other manuscript by Finzi, the abovementioned MS Cambridge, Trinity College, F.12.35. Dr. Benjamin Richler of the Institute of Microfilmed Hebrew Manuscripts in Jerusalem kindly informed me that Šaliṭ is known to have bought some manuscripts from the famous philologist Elijah Levita. This means that he was active around the middle of the sixteenth century. A list of manuscripts owned by Šaliṭ can be found in Jordan S. Penkower, "The Tosaphist R. Menaḥem of Joigny and the Massoretic Work 'Okhlah ve-Okhlah': The Halle Manuscript Recension," *Studies in Bible and Exegesis* III [*Sefer zikkaron le-Mošeh Gošen Gottstein*] (Ramat Gan: Bar-Ilan University Press, 1993), pp. 287–315, on p. 314 n. 84 (Hebrew; on MS Halle, Universitätsbibliothek, MS Hebr. Yb. 10.4Q.) To this list may be added: MSS Leiden, Bibliotheek der Rijksuniversiteit, Or. 4726; Cambridge, University Library, Add. 1563,1 and Add. 858,2. The two incunabula with Šaliṭ's signature listed by Penkower can be supplemented by David Qimḥi's *Sefer ha-šorašim* (Naples, 1490)–Vienna, Österreichische Nationalbibliothek, I.K.25–as can be seen in the photo published by Gérard E. Weil, *Élie Lévita, humaniste et massorète (1469–1549)* (Leiden: Brill, 1963), figure on p. 5. Šaliṭ bought this copy of the *Sefer ha-šorašim* from Elijah Levita, with whom one of Šaliṭ's sons had studied (ibid., p. 4 n. 1). No further biographical details on Mordekay Šaliṭ seem to be available. He may have been a member of the Šaliṭ family of Padua (also known as Šaliṭ Padovani), Ashkenazi printers who settled in Mantua in the second half of the sixteenth century.

[35] Similar annotations by Šaliṭ can be found elsewhere: see Penkower, "The Tosaphist"; Weil, *Élie Lévita*, p. 5.

[36] Steinschneider, *Die hebräischen Übersetzungen*, 503–6, § 312; 607–8, § 383; 1002, Note to § 36; Lévy, "Les *Eléments* d'Euclide"; idem, "Une version hébraïque inédite des *Eléments* d'Euclide," in Danielle Jacquart, ed., *Les voies de la science grecque* (Geneva: Droz, 1997), pp. 181–239.

sions of his *Sefer keli ha-neḥošet* (plus a fourth version in Latin). The first and second (and possibly the Latin version too) were written in 1146, the third not before 1148.[37] Finzi's copy is eclectic. According to Sela—to whom I showed this new copy of the *Keli ha-neḥošet*[38]—the text is basically that of the third version; on fols. 78^{v}–80^{r}, however, Finzi interpolated another text on the same subject, also by Ibn Ezra, which he introduced as follows:

ואלה הדברים הם בדרך קרובה: והנה לך נוסח אחר לזה מבאור אחר לאצטרלב שעשה עוד החכם ר׳ אברהם אבן עזרה בשנת ארבעת אלפים ותשע מאות ושש לבריאת עולם

"But all these things are [said] in an approximate way. And so here is another text on this [subject] for you, [taken] from another explanation of the astrolabe, also made by the sage R. Abraham Ibn Ezrah in the year four thousand nine hundred six of the creation of the world [4906 AM = 1146 CE]."

This "other text" is a compilation of extracts from the second and still-unpublished version of the *Keli ha-neḥošet*, written in 1146.[39]

After this interpolation the text continues with the third version, with some notes by Finzi, and, at the end of the main text, two notes by ʿImmanuʾel ben Yaʿaqov Bonfils of Tarascon (ca. 1350) on a method to calculate distances and altitudes.[40] The first note (84^{r}–^{v}) begins as follows:

אמר ע״בר״י [=עמנואל בן ר׳ יעקב] מה גדול מעשיך בעיני עם ועם (...)

The second note (end of 84^{v}) begins:

אמר ע״בר״י לדעת המרחק בידיעת הגובה (...)

and ends:

וחלק העולה על צל ההפוך והיוצא הוא המרחק

3. [Ibn al-Ṣaffār] *Beʾur keli ha-aṣṭerolav la-ḥaḳam Baṭlamyus* (Explanation of the Astrolabe by the Scholar Ptolemy) (85^{r}–96^{v})

Incipit (85^{v}):

השער הראשון בזכרון כלי האצטרלב והשמות הנופלים בו (...)

This is followed by the table of contents and forty chapters (שערים), without figures, of the *Kitāb al-ʿamal bi-aṣṭurlāb* of Abū ʾl-Qāsim Aḥmad al-Andalusī Ibn al-Ṣaffār (d. 1035), an anonymous translation from Arabic into Hebrew, known in two different Hebrew versions.[41]

37 Shlomo Sela, "Abraham Ibn Ezra's Scientific Corpus—Basic Constituents and General Characterization," *Arabic Sciences and Philosophy* 11 (2001): 91–149, esp. pp. 104–13 and 137.

38 I am grateful to Dr. Sela for his competent advice.

39 The existence of this second version has been recognized by Sela, ibid., pp. 104–105, where (at note 45) a list of the most important manuscripts can be found. The first version was edited by Hirsch Edelmann, *Sefer keli ha-neḥošet* (Königsberg, 1845); for a list of its manuscripts, see Sela, "Abraham Ibn Ezra's Scientific Corpus," n. 41.

40 On such notes, see Steinschneider, "Kurze Bemerkungen," p. 73, no. II. On ʿImmanuʾel ben Yaʿaqov, see Peter Solon, "The Six Wings of Immanuel Bonfils and Michael Chrysokokkes," *Centaurus* 15 (1970): 1–20; Bernard R. Goldstein, "The Role of Science in the Jewish Community in Fourteenth-Century France," *Annals of the New York Academy of Sciences* 314 (1978): 39–49, on pp. 46–47.

41 See, for instance, MS Naples, Biblioteca Nazionale, III.F.12, fols. 190^{r}–193^{r} (Moscati Steindler, "I manoscritti ebraici," p. 334, n. 13.33). On this treatise and its Hebrew tradition, see Steinschneider, *Die hebräischen Übersetzungen*, pp. 580–83, § 362; idem, "Kurze Bemerkungen," p. 73 no. III; Bernard R. Goldstein, "Ibn al-Ṣaffār," in *Encyclopaedia of Islam*, second edition, vol. 3 (Leiden and London: Brill, 1971), p. 924;

The explicit (96^{v}) attributes the translation to Ya^{c}aqov ben Maḵir Ibn Tibbon.[42] The text is followed by Finzi's own colophon, attesting that he finished copying the work in January/February 1441.[43]

4. *Ma^{c}aśeh ha-aṣṭerolav we-hu^{ɔ} le-Baṭlamyus le-šiv^{c}ah aqlimim* (Construction of the Astrolabe according to Ptolemy for the Seven Climates) (97^{r}–104^{v})

Incipit (97^{r}):

נרצה לעשות שטח עגול פשוט כדי לצייר בו הכדור ועגולותיו (...)

Explicit (104^{v}):

ובכאן נשלם מעשה האצטרלב לחכם
בטלמיוס לשבעה האקלי(י)מים

The text—with a different heading, עשיית האצטרלב, at fol. 98^{r}—is pseudonymous.[44] It contains two short interpolations by Finzi, on fols. 98^{v} and 101^{v}. It is remarkable for its accurate illustrations of a plane astrolabe, on fols. 99^{r} (tympan), 100^{v} (dorsum of the mater, with zodiacal calendar and shadow square), 101^{v} (rete), 102r (guidelines for the dorsum, introduced at the end of fol. 101^{v}: והנה לפניך בדף הבא תמונת כל זה—"and in front of you, on the next page, the picture of all this").[45]

5. *[A Method to Measure Space and Divide the Hours]* (105r)

Incipit:

כאשר רצית לרשום על בריח האצטרלב חלוקת השעות המעונתות (...)

Explicit:

ובמקומות שיחתכו את קו אב הם הם רשמי השעות: וזה מה ש"ל

This is a short text—seven lines—about the device described in the

previous text. On the right, a drawing shows the projection of a shadow on a plane where six hours of the day are marked.

6. Ibn al-Zarqāllu, *^{ɔ}Iggeret ha-ma^{c}aśeh ba-luaḥ ha-niqra^{ɔ} ṣafiḥah* (Epistle on the construction of the plate called *ṣafiḥah*) (105^{v}–124^{r})

Margarita Castells and Julio Samsó, "Seven Chapters of Ibn al-Ṣaffār's Lost Zīj," *Archives Internationales d'Histoire des Sciences* 45 (1995): 229–62.

42 ובכאן נשלם הוראות האצטרלב העתיקו מלשון הגרי אל לשון עברי החכם ר' יעקב החכם היקר ר' מכיר ז"ל ת"ל.
Ya^{c}aqov ben Maḵīr Ibn Tibbon did indeed translate many astronomical works from Arabic into Hebrew: see Steinschneider, *Die Mathematik*, p. 111; Bernard R. Goldstein, "The Survival of Arabic Astronomy in Hebrew," *Journal for the History of Arabic Science* 3 (1979): 31–39.

43 Despite the break between the two parts of the manuscript, Riccardi treats our 3 and 4 as a single item (nos. 3*a* and 3*b*.)

44 See Steinschneider, *Die hebräischen Übersetzungen*, p. 537, who also points out that different specimens of this text have different titles. See, for instance, MS British Library Add. 26,984 (in Steinschneider: Alm. 96), in George Margoliouth, *Catalogue of the Hebrew and Samaritan Manuscripts in the British Museum* III (London, 1915), p. 320, no. 1002/I.

45 The astrolabe shown in these drawings displays interesting features that will be discussed in another study. The most striking is that the rete—a badly executed drawing made elsewhere, then cut and glued onto the leaf—is absolutely identical with a rete with Hebrew star names added to a medieval astrolabe of Muḥammad Ibn al-Sahlī. The latter is discussed in Bernard R. Goldstein and George Saliba, "A Hispano-Arabic Astrolabe with Hebrew Star Names," *Annali dell'Istituto e Museo di Storia della Scienza di Firenze* 8 (1983): 19–28; Sharon Gibbs and George Saliba, *Planispheric Astrolabes from the National Museum of American History* (Washington D.C.: Smithsonian Institution Press, 1984), pp. 174–77, no. 2752; David A. King, "The Earliest Known European Astrolabe in the Light of Other Early Astrolabes," *Physis*

This is a translation, from Arabic into Hebrew, of the description of the azafea (*al-ṣafiḥah*), the single-plate universal-plane astrolabe invented by Ibn al-Zarqāllu (or Arzachel, as he was called in the Latin West; Cordoba, d. 1100).[46] A long gloss by the anonymous translator occupies the right margin of fol. 106^{v}, at the end of the table of contents.

Ibn al-Zarqāllu's text is divided into 61 chapters. It does not begin immediately after the table of contents. Instead, there is a short text by Finzi himself (fols. 106^{v}–108^{v}), illustrated with drawings of some small mobile elements of the astrolabe (107^{v}–108^{r}) and accompanied by marginal notes (106^{v}, upper left; 107^{r})—some of them Italian glosses written in vocalized Hebrew characters. This interpolation contains several comments, mainly concerning mechanical aspects, on Ibn al-Zarqāllu's illustration of the azafea, the "universal plate" (or "common plate" לוח משותף.)[47] Finzi states that he benefited greatly from the assistance of Bartolomeo Manfredi, a mathematician and astrologer in the service of the Gonzagas, the ducal family of Mantua. Manfredi, who had designed and executed the mechanism of the Clock Tower in Mantua, was accordingly known as "Bartolomeo degli orologi" (Bartolomeo of the clocks):

> וקודם התחילי לבאר השערים ראיתי אני מרדכי פינצי לתאר הלוח המשותף ולבארו כפי מה שהשגתי מפי החכם משטרו ברטלומיאו דליארלוג'י אשר בעיר הזאת היא מנטואה ומהשם נשאל העזר
>
> "Before beginning to explain [these] chapters, I, Mordekay Finzi, saw fit to describe the universal plate and explain it according to what I learned from the scholar *mastro Bartolomeo degli orologi*, who lives in this city of Mantua; and assistance is requested from God."

There are two more illustrations on fols. 108^{v} and 109^{v}. The latter is a

well-executed drawing of an azafea *zarqāliyya* or *šakkāziyya* (Fig. 1, p. 304).[48] After all this, Ibn al-Zarqāllu's text begins on fol. 110^{r}.

Further evidence of the relationship between Finzi and Manfredi is provided by the former's translation into Hebrew, around 1460, of a short Italian treatise by the latter (the original is apparently lost) about an instrument called a *celidario* (a particular type of mechanical *equatorium*) invented by Manfredi himself.[49] This collaboration, in which

32 (1995) [= Wesley M. Stevens et al., eds., *The Oldest Latin Astrolabe*]: 359–404, on pp. 368–69 and 389, fig. 8. On the rete in Finzi's manuscript, see Giancarlo Lacerenza, "Nota sul ragno ebraico dell'astrolabio di Muḥammad ibn al-Sahlī," in *Turcica et islamica. Studi in memoria di Aldo Gallotta* [in press].

46 Steinschneider, *Die hebräischen Übersetzungen*, 592–4, § 371. On the main works of Ibn al-Zarqāllu and their translations, see José M. Millás Villacrosa, *Estudios sobre Azarquiel* (Madrid, 1943–50); Evelyn S. Procter, "The Scientific Works of the Court of Alfonso X of Castille," *Modern Language Review* 40 (1945): 12–29; Gerald J. Toomer, "The Solar Theory of al-Zarqāl: A History of Errors," *Centaurus* 14 (1969): 306–36.

47 *Ha-luaḥ ha-mešuttaf*, "the common plate," misunderstood by Jona (in Riccardi, "Sopra un codice ebraico") who translates "tavola che vi va unita" (*šataf*.) The same text on Ibn al-Zarqāllu's common plate, including the marginal notes, is found in another manuscript (not autograph), New York, JTSA Mic 2637, at 30b; see Steinschneider, *Die hebräischen Übersetzungen*, pp. 592 and 626 §392; Langermann, "The Scientific Writings," p. 31 n. 11.

48 This should be compared with the two instruments illustrated in Roser Puig, *Al-Šakkāziyya: Ibn al-Naqqāš al-Zarqālluh* (Barcelona: Universidad de Barcelona, 1986), pls. IV and XII. See also David A. King, "On the Early History of the Universal Astrolabe in Islamic Astronomy, and on the Origin of the Term 'Shakkāziyya' in Medieval Scientific Arabic," *Journal for the History of Arabic Science* 3 (1979): 244–57 (repr. in idem, *Islamic Astronomical Instruments* [London: Variorum, 1987], essay VII.)

49 Florence, Biblioteca Mediceo-Lauenziana, pl. 88/47, fols. 1^{r}–11^{r}. See Steinschneider, *Die hebräischen Übersetzungen*, p. 626, § 392; Simonsohn, *History of the Jews*, p. 640

Manfredi seems to have played the role of mentor, may be hinted at in a manuscript of William Batecombe's *Tabulae Oxonienses*, translated from Latin into Hebrew, which Finzi completed in Mantua "with the assistance of a non-Jew" in the summer of 1441.[50] Moreover, it is known that Finzi saw and studied the *Tabulae Toletanae* in the house of a non-Jew, probably Manfredi.[51]

7. Qusṭā Ibn Lūqā, *Sefer ha-maᶜaśeh be-kaddur ha-galgal* (Book on the construction of the celestial globe), in the version of Abū Ḥasan ᶜAbdallah Ibn Yaḥyaᵓ (125ʳ–140ʳ)[52]

The *Book on the Construction of the Celestial Globe* is one of the best known original works by the Christian Arab Qusṭā Ibn Lūqā al-Baᶜalbakkī (d. ca. 912/913).[53] As the explicit makes clear, Finzi's text is a copy of Yaᶜaqov ben Maḵir Ibn Tibbon's translation from Arabic into Hebrew, made in 1256 of Ibn Yaḥya's version of the work.[54] The text, divided into 65 chapters and without illustrations, is preceded by a table of contents (125ʳ–127ʳ). The colophon at the end of the third book, following the explicit, reports that Finzi completed his copy on August 10, 1446 (140ʳ).

The last part of the codex contains short anonymous texts. The first of these, on the construction of the sphere, is associated with text no. 7. The others are illustrations of simple instruments for measuring the hours of the day, such as sundials and quadrants.

8. *Beᵓur ᶜaśiyyat ha-kaddur we-ḥilluq rešamaw* (Explanation of the construction of the sphere and the division of its lines) (140ᵛ–141ʳ)

Incipit (140ᵛ):

בראשונה יקח חתכת עץ יבש גדולה או קטנה כפי הרצון ויעגלנה כפי כחו עד שתהיה עגלה בכל צדדיה (...)

Explicit (141ʳ):

עד יעשה רביע עגלה כמו רביע עגלת משוה היום ויחלקנה לֹצ חלקים שוים והיא תקרא רביע העגלה והיא לקחת בה הגובה: נשלם המאמר בעשיית הכדור

9. [Untitled; designated, in the index on fol. 137ᵛ, as: *Maᶜaśeh keli ha-maḥaṭ me-ha-qalamiṭah la-daᶜat ha-šaᶜot* (Construction of a device with a magnetic needle to know the hours)] (142r)

n. 179; Goldstein, "Scientific Traditions," pp. 238–39; idem, "Descriptions," pp. 117 and 120–21, with a bibliography on Manfredi.

50 Goldstein, "Descriptions," p. 120; Langermann, "The Scientific Writings," pp. 10, 26–27. It is worth noting that the first part of our manuscript, ending with text no. 3 (*Beᵓūr keli ha-aṣṭerolav*) was completed in early 1441.

51 On Finzi's relationships with other scholars, including some Christians, see Langermann, "The Scientific Writings," pp. 8–11. On the Toledan Tables, see Gerald J. Toomer, "A Survey of the Toledan Tables," *Osiris* 15 (1968): 5–174. On Finzi's work on these tables, see Langermann, "The Scientific Writings," pp. 39–41, n. 17 (not 16, as misprinted on p. 10, line 9.)

52 The incipit in the text misspells the name "Ibn."

53 See Giuseppe Gabrieli, "Nota biobibliografica su Qusṭā ibn Lūqā," *Rendiconti dell'Accademia Nazionale dei Lincei: Classe di scienze morali, storiche e filologiche* 5ªs., 21 (1912): 341–82; George Sarton, *Introduction to the History of Science* I (Baltimore, 1927), p. 602; William H. Worrell, "Qusṭā ibn Lūqā on the Use of Celestial Globe," *Isis* 35 (1944): 285–93; Donald Hill, "Ḳusṭā ibn Lūḳā," in *Encyclopédie de l'Islam*, second edition, vol. V (Leiden-Paris: Brill, 1986), p. 533.

54 Steinschneider, *Die hebräischen Übersetzungen*, pp. 552–54, §342; idem, *Die Mathematik*, 193–4. A Latin treatise entitled *De sphaera*, whose author is not indicated, appears in the Finzis' library in Bologna; cf. Bernheimer, "Una collezione," p. 317 n. 158 (*uno quinterno de spera ... in latino magno*). Tamani, "La biblioteca scientifica," p. 238, suggests that it might have been the *Sphaera mundi* by Iohannes de Sacrobosco, translated into Hebrew as *Marᵓeh ha-ᵓofannim* by Šelomoh ben

Incipit:

לדעת השעות שעברו מן היום מתוך כלי המחט. הזר אשר בתוכו קטעים שני מחטים בשתי וערב הוא נקרא זר השעות וסביבו כתוב השעות כתובי השעות (...)

Explicit:

ומעצמך תוכל לדקדק השלוש או הרביע מהשעה גם בחלקים יותר דקים כי הם רשומים סביב תכלו. סלוק

The text, with no illustrations, is written in a very small script and seems to have been added later on a blank page. It may be a hitherto unknown treatise by Finzi himself.[55]

10. [Untitled; designated, in the index on fol. 137^{v}, as: *Derek merubba^{c} ^{c}agullah la-da^{c}at ha-ša^{c}ot* (On the circular quadrant to know the hours)] (142^{v}; see Fig. 2, p. 000)

Incipit:

עשה עגול כזה מנחשת וחלק אותו לשׁשׁ חלקים שוים והם חלקי האופק ויהיה נצב ישר על שטח האופק על ידי קו המשקולת (...)

Explicit:

(...) תעשה רושם בשעות ההם וכשיגיע צל החתכה בשעות ההם יודעו לך שעות היום

The text describes the drawing of a sundial, found to its left (a). At the lower left of the same folio is a drawing of a *quadrans vetus* (b),[56] illustrating text 11, accompanied by the following note in the right margin (see Fig.2, p. 325):

ראה רובע לראות בו שעות היום בשמש לחדש חדש באופק אשר יגבה תקטב בו מה מעלות

11. *Ma^{c}aśeh ha-rova^{c} ha-yašan* (Construction of the *quadrans vetus*) (143^{r}–144^{r})

Incipit (143^{r}):

כאשר תרצה לעשות הכלי הנקרא הרובע הישן: ראשונה תקח רובע עגולה אחת מנחשת ותחלקנו לתשעים מעלות שוות: (...)

Explicit (144^{r}):

ואחר אשר תדע מספר השעו' העקלות שעברו ותרצה לידע הקשת שעבר מן היום מקשת היום תכפול מספר השעות אשר בידך על אורך שעה עקלה ויעלה לידך הקשת שר שעבר מן היום חלק זה הקשת על טו מעלה ויעלה לידך השעה הישרה אשר אתה בה

The text describes the construction of a simple *quadrans vetus.*

Avigdor of Montpellier (see Steinschneider, *Die hebräischen Übersetzungen*, pp. 642–44, §407).

55 As suggested to me by an anonymous referee for *Aleph*. Descriptions of magnetic devices of this kind are rare. A text on a diptych sundial combined with a magnetic compass is illustrated by Goldstein, "Descriptions," pp. 123–24. See also Steven A. Lloyd, ed., *Ivory Diptych Sundials: 1570–1750. Catalogue of the Collection of Historical Scientific Instruments, Harvard University* (Cambridge, Mass.: Harvard University Press, 1992).

56 Compare it with the drawing in MS Bodleian Library Mich. 350, published by Langermann, "The Scientific Writings," pp. 25 and 35 (where "f. 92^{v}" should be "92^{r}").

Conclusion

As mentioned above, some of the new texts and illustrations of the Lincei manuscript deserve further attention. We can also expect still unknown manuscripts and texts by Finzi, or later copies including his glosses, to surface in the future.[57]

[57] Tamani, "Manoscritti ebraici," p. 18 n. 30; idem, "Opere scientifiche," pp. 22–23, mentions some astronomical and mathematical manuscripts in the Municipal Library in Mantua which may have belonged to Finzi. Regarding the miscellaneous codex formerly in the Biblioteca Universitaria di Torino (Cat. Peyron CCXLV), whose relationship to Finzi is uncertain, see Tamani, "La biblioteca scientifica," pp. 244–45, no. A12. In no. A11, Tamani mentions some notes to the Hebrew grammar *Maʿaśeh ʾefod* by Profiat Duran, possibly attributable to Finzi. There was also an essay by Finzi on the Hebrew final letterforms in another codex, presently lost, in the same collection (Cat. Peyron CLXXXVI); another copy of this text survives in a manuscript in Moscow (Günzburg 59, fols. 182^{r}–182^{r}); see Langermann, "The Scientific Writings," p. 42 n. 18.

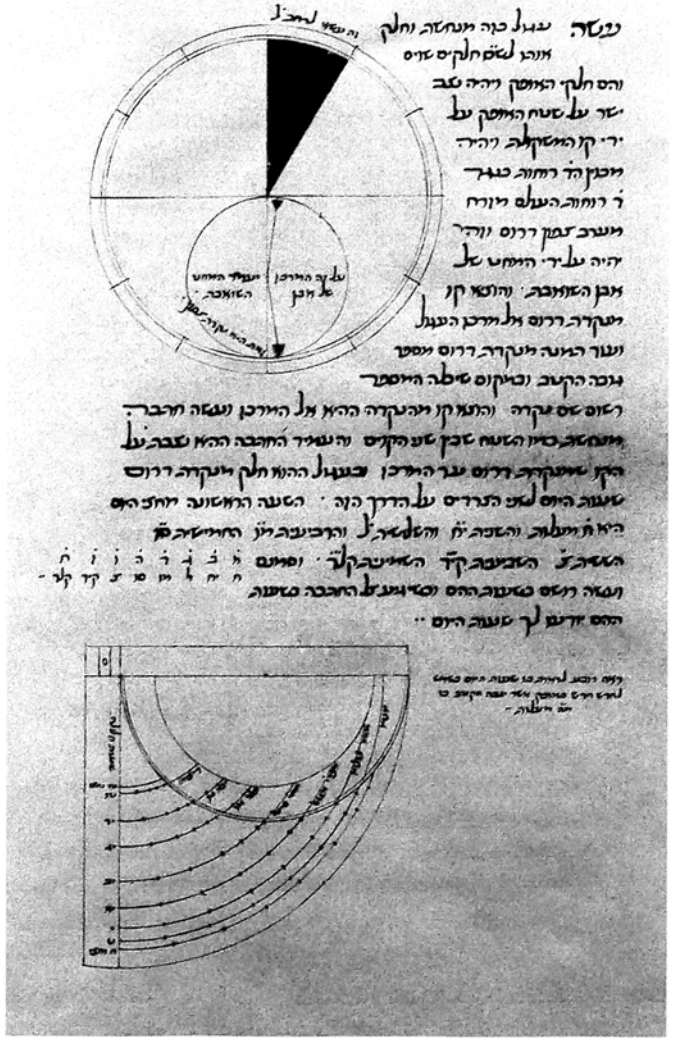

Fig. 2 (f. 142v)