

SCIENCE IN POETIC CONTEXTS: ASTRONOMY AND
ASTROLOGY IN THE HEBREW POETRY OF SEPHARAD*

Ciencia en un contexto poético:
Astronomía y astrología en la poesía hebrea de Sefarad

JOSEFINA RODRÍGUEZ-ARRIBAS
The Warburg Institute, University of London

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Resumen: Este artículo es una primera aproximación a la presencia del conocimiento astronómico-astrológico en un considerable número de poemas escritos por judíos de Sefarad o asimilados a dicha tradición (ss. XI-XV). El conocimiento científico, en particular conceptos astronómicos y astrológicos, al igual que la poesía, jugó un papel importante en el currículo de los musulmanes y judíos de la Edad Media. Ahora bien, la transmisión de este conocimiento científico en forma poética tuvo lugar tanto en árabe, como en griego y latín (poesía didáctica). Además, en sus orígenes el *piyyut* (ajeno a la tradición sefardí y anterior a influencia islámica alguna) también hizo breves alusiones a temas astronómicos. Con todo, parece que astronomía y astrología florecieron en hebreo en Sefarad y por influencia árabe, que también dejó una gran impronta en la poética judía; muestras de ello se tendrán en cuenta en esta ocasión (con traducciones en el apéndice).

Abstract: This article is a preliminary overview of the presence of astronomical-astrological knowledge in a considerable number of poems written by Jews in Sepharad or rooted in the Sephardic tradition (11th-15th c.). Scientific knowledge, notably astronomical and astrological concepts, played an important role in the curriculum of medieval Muslims and Jews, as did poetry. However, the transmission of scientific knowledge in poetic form took place not only in Arabic, but also in Greek and Latin (didactic poetry). In addition, early *piyyutim* (written outside the Sephardic tradition and prior to Muslim influence) also made brief references to astronomical subjects. In any case, it seems that astronomy and astrology in Hebrew flourished mainly in Sepharad and under Arabic influence, which also left an impressive imprint on the poetic work of its Jews, samples of which will be considered here (with translations in the appendix).

Palabras clave: Sefarad, astronomía, astrología, poesía.

Key words: Sepharad, astronomy, astrology, poetry.

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POETRY AS A VEHICLE OF SCIENCE?

Verse as vehicle for stellar knowledge and lore has a long history in literature. Greek and Latin literature present two different groups of poetic works that might well be the source of this tradition and could aid our understanding of this phenomenon in medieval literature. The various occurrences of astral subject matter in the Hebrew poetry of the Iberian «Golden Age» and its descendents (to which this article is dedicated) should be considered as part of a long tradition with Graeco-Latin roots, although the main reference is Arabic literature, which still lacks a specific study regarding stellar topics in poetry.¹ Astrology and astronomy were fashionable areas of knowledge in al-Andalus and in Christian lands, as seen by the movement of translations from Greek into Arabic and from Arabic into Latin (treatises dealing with astronomical/astrological questions were among the first sources to be translated).² First of all, we encounter the emergence of astronomy in Greek poetry with Aratus (c. 315/310-245/240 BCE) and of astrology in Latin poetry with Manilius (1st century). It seems that the astronomy/astrology relationship with poetry in

1. Regarding the subjects of Arabic and Hebrew poetry, see Schippers, 1994 and Tobi, 2004. Stellar motifs and content are much neglected in the studies devoted to the literature in these two languages. The most likely reason is that philologists do not usually display special interest in science and many historians of science regard certain literary genres as unsuitable for a «serious» approach to science. The result is that scientific allusions and contents are neglected or misunderstood in translations and commentaries, for instance, several medieval Hebrew poems. Abraham bar Hiyya refers to an Arabic poem in the fifth chapter of his *Megillat ha-megalleh* about predicting the future through the study of the cyclical conjunctions of Jupiter and Saturn: «Among the Muslim ... Someone else among them did likewise in a poem that he composed about the events in the kingdom of Ishmael since the arrival of this conjunction. He says that he has neither permission nor capacity to tell the misfortune of Ishmael, for they are children of his people and his family», see Poznanski and Guttmann, 1968:146. As regards the similitudes of Arabic/Hebrew and Hellenistic literatures in relation to stellar topics in poetry, it seems that Arabic writers do not have any knowledge (or very limited) of Greek poets, see Tobi, 2004: 323-363; and Gutas, 1998: 193-196. Regarding a partial (non-extant) Arabic translation of Aratus, which al-Bīrūnī (973-1048) mentions, see Poochigian, 2010: 27 (introduction); and Honigmann, 1950. For some reminiscence of Hellenistic poetry in Arabic poetry, see Kennedy, 1997: 59 (note 116) and 181 (note 68).

2. For an overview of the involvement of Jews in the stellar sciences, see Langermann, 1999 and Goldstein, 1999 and 2009. In relation to the waves of translations taking place on the Iberian Peninsula, see Millás Vallicrosa, 1960 (from Arabic into Latin) and Rothschild, 1989 (from Arabic into Hebrew).

the work of these Hellenistic writers was only a particular case of the ancient genre of didactic poetry, which faded in the 5th century BCE with the rise of prose but experienced a revival in Hellenistic times. In the didactic tradition, the metric regularity of verse was considered a good mnemonic device intended to facilitate memorization of the content displayed in the poem. In addition, this kind of content became very popular in Alexandria, among the scholars and poets clustered around the famous Museum and Library of this city. These poets were eager to prove their ability to combine the most sophisticated forms with the most sophisticated content in their poems.³ These two tendencies (didactic and cultish) were also widespread in medieval literature, including Arabic and Hebrew literature, either because of their Greek influences or for parallel sociological circumstances. The first impression is that Arabic and Hebrew poets were more interested in the sophistication of form and content than in the mnemonic qualities of metrics. In other words, the frequent presence of astronomical/astrological topics in Hebrew poems would be due to cultish intentions, whose didactic counterpart is more likely to be found in medieval Hebrew encyclopedias.⁴ This learned poetry is apparent in Hebrew in the works of Shmuel ha-Nagid and Ibn Gabirol (11th century) and continued later in Christian lands (Spain, Italy, and Provence) with such relevant and prolific writers as Abraham ibn Ezra (12th c.) or Immanuel of Rome (13th-14th centuries). For them, the imbricated form, the rich imagery, and the resonance of the multiple meanings and contexts of the biblical words (known as the *mussiv* style) were the focus of their poetic work. So far, regarding the presence of astronomy and astrology in poems. However, we also encounter whole cosmological treatises in verse devoted to these topics. Ibn Gabirol and Abraham ibn Ezra are both composers of two treatises in verse, in which

3. For several samples of this poetry, see Harder, 2009.

4. Regarding medieval encyclopedias in Hebrew, see Harvey, 2000. «[Moshe] ibn Ezra writes in his book of poetics that, generally speaking, the inclusion of scientific and astronomical matters in the liturgy was more of a burden than pure Hebrew could bear», which very likely proves that the introduction of astronomical and astrological subjects in liturgical poetry was widespread in Moshe ibn Ezra's time, see Cole, 2001: 21-22.

astrological and astronomical topics are conspicuous: *Keter malkut* and *Ḥai ben meqis*, respectively.⁵

Though not very common, «astronomical» subject matter derived from rabbinic (and Hellenistic) sources does occasionally appear in the Hebrew liturgical poetry of late antiquity and the early Middle Ages (early *piyyutim*), sometimes in considerable detail, mainly when dealing with the religious laws of calendar calculation.⁶ In the Hebrew poetry of Sepharad, on the other hand, themes and concepts relating to the sciences of the stars can be found in various other poetic contexts, secular as well as liturgical, and typically reflecting the poets' reliance on «universal» (i.e. Arabic) rather than on traditional Jewish sources, although the former is integrated in the latter (the most obvious sample is Abraham bar Hiyya's and Abraham ibn Ezra's writings). The frequent presence of astronomical and astrological subjects and images in this corpus of medieval Hebrew poetry has to do with the popularity of these disciplines in medieval Arabic culture.⁷ Hebrew poets were following cultural and social models spread throughout Muslim courts: many Muslim astrologers were also poets (for instance, Ibn al-Šamir, the poet and astrologer of Abd ar-Raḥmān ibn al-Ḥakam, better known as Abd ar-Raḥmān II, 790-852).⁸ Indeed, physicians, astronomers, secretaries, and warriors were all frequently involved in literature, especially poetry, for the ability to write poems was held in high esteem in the Muslim courts, where many of the Hebrew poets considered in this article learned the art.

As a rule, astronomy and astrology themes may appear in medieval Hebrew poems in two ways: as conventional motifs and images (often calqued on Arabic models and using motifs taken from the Bible) involving a minimum or nonexistent degree of scientific knowledge, or as poetic subjects in their own right, which usually implies a certain display

5. As regards Ibn Gabirol's *Keter malkut*, see Loewe, 1989; and for Ibn Ezra's *Ḥai ben meqis*, see Hughes, 2004.

6. See, for example, Spiegel, 1996: 124-137. (I owe this reference to Yehoshua Granat.)

7. Regarding the complex relations of these two disciplines in the Middle Ages (including the overlap of some of their calculations and the confusion of their denominations in Hebrew and Latin), see, for instance, Sela, 2001: 59-100; and Holo, 2006: 291-323.

8. See Terés, 1959: 449-463.

of scientific notions. The present article focuses mainly on the second category. The conventional images of the stars, the sun, the moon, the movements of the heavenly bodies in the sky, the mention of the number of the planets, or the qualities of their astrological influences and the like are too general or too common to imply any significant scientific knowledge or specific interest in astronomy and scientific astrology on the part of the writer. In addition, the mere presence of names of stars or visual images based on heavenly phenomena hardly makes them subjects of the poem. These elements should rather be regarded here merely as a vehicle for something else, the astronomical information they convey being insignificant. For instance, we have a beautiful poem attributed to Yehudah ha-Levi (Tudela, before 1075-1141), in which, at some point, he works the image of the seven lights of the sky (i.e. the planets) and the seven lights of the menorah.⁹ There is no scientific content in this image.¹⁰ We certainly find in this poem very general notions about the heavens, which were common knowledge among learned people in medieval times (which does not necessarily mean that Yehudah ha-Levi would not have a deeper knowledge of the stellar sciences). Possibly this poem (like many others) highlights a new kind of (secular) interest in the cosmos and specifically in the heavenly bodies, which the diffusion of Arabic texts on astronomy and astrology must have introduced and which also left their imprint on poetry. It must be said that the boundary between these two

9. This image has a precedent at least in the 6th-7th centuries, the Palestinian *paytan* Yehudah already used this image in a *piyyut*, see Van Bekkum, 1998: 124 [poem 39].

10. See Elizur, 2008: 5, lines 18-25 (Hebrew ed.): «The heavenly nails (*vave rum*) / and the heavenly spheres (*huge rum*), / which are staying / for His wisdom; // the stars (*koḳavim*), / which are fixed / in their spheres (*be-galgalim*) / according to His precept; // the sun, which reaches / its cardines [i.e. the solstices and equinoxes] (*mi-qṣotam*) / [in] its revolution (*tequfato*); // and the canopy (*'afriyon*) / in the highest height / were formed / according to His / plan (*bi-tkumato*). // The [upper] sphere (*ha-galgal*), / which got fit properly / as His / belt (*ḥešev 'afuddato*); // the spheres [of the planets] (*pelaḳim*), / which constantly / revolve (*sovev vi-isovev*) / within / its perimeter (*ba-'agul-lato*); // it is the ruler / of every sphere (*peleg*) / whose revolution (*mesibato*) / is below it; // its direction (*u-merkabo*) / is like their heart / and their souls / depend on / its soul». The expression *ḥešev 'afuddato* means the sphere of the constellations and stars (the eighth orb in the universe). This sphere is, in Ha-Levi's view, the source and motor of the diurnal motion (from east to west), which all of the heavenly bodies share.

types of occurrence of astronomy/astrology in Hebrew poetry is not always very clear.

ASTRONOMICAL TOPICS AND MOTIFS IN HEBREW VERSE: A PRELIMINARY SURVEY

Shmuel ha-Nagid (Cordoba 993-1055/1056) is a good example of a secretary of state and a warrior showing his mastery to write poetry. I have selected two poems from his *Diwan*. The world as an egg is a brilliant and handy metaphor of the structure of the universe in spheres and the idea that the universe is closed, with limits and layers, and there is an order/hierarchy in its components.¹¹ Like the onion (which al-Bīrūnī used as an image in his description of the universe of spheres),¹² the egg is something one could have brought to a medieval lesson to explain medieval cosmology. This poem is a great introduction to the medieval cosmos and to some of the ways medieval men positioned themselves *vis-à-vis* a universe that was closed, defined, and limited. In general terms, the universe was spherical with the motionless Earth at its center, and several orbs for the seven planets, the fixed stars, and, occasionally, a ninth orb for the diurnal movement shared by all the heavenly bodies. Some astronomers, like Moshe ibn Ezra, Salomon ibn Gabirol, and Abraham ibn Ezra had a system of ten or even more spheres, the ninth for the diurnal movement of the sky, and the sphere/s above it for the Agent Intellect and other mystic or Intellectual entities. The planetary and starry spheres were material but were not made up of any of the four elements, whose place in the order of beings was below the sphere of the moon. Once the metaphor of the egg-universe is fully realized in his poem, Ha-Nagid draws conclusions: we are enclosed in this universe and its laws are unavoidable. God established everything the way it is: «God's creations got ahead of us. ... The judgment has already been decided». The impression in these lines is one of fatalism, which was a subject of discussion among scholars.¹³

11. Abraham bar Hiyya also used the image of the egg (notably an ostrich egg) for the universe in the second chapter of his *Sefer ha-'ibbur*, see Filipovski, 1851 (no pagination in this edition).

12. See Wright, 1934: 43 [121].

13. One of the best sources for this polemic among Jews is Abraham bar Hiyya's *Letter to Yehudah ben Barzillai* (d. after 1136), in which he fights most of the criticism

In the second poem I have selected for the appendix, Ha-Nagid refers to the astronomical phenomenon of two eclipses, lunar and solar, in the same month (1044, *Kislev* 15 and 29, respectively) and predicts an eclipse of the moon for 'Iyyar 15, 1045. This poem is more revealing from the point of view of the terminology. The rule is usually that the sophistication of the terms points to a sophistication of the technical (astronomical and astrological) content. Some of the concepts in the poem observe this rule: *šurah*, the different forms of the root q-d-r, and 'ašmuraḥ are terms from very specific fields. They concern the observation of the sky (*šurah* or alignment of heavenly bodies in the sky at specific moments and *qadrut/qadar/hiqdir* or eclipse/to be eclipsed/to eclipse) and the division of time ('ašmuraḥ or any of the three equal parts in which the time between the evening and the morning twilights is divided). These are activities relating to astronomers, astrologers, and time-keepers. In addition to these terms, in his poem, Ha-Nagid gives a clear description and reasoning about how solar and lunar eclipses take place, which was basic knowledge, at least among astronomers. In the first case, the moon, positioned between the Earth and the sun, hides the body of the sun making it totally or partially invisible. A solar eclipse can take place only at the end of the month (new moon or *molad*), namely, when the sun and the moon are in conjunction, while the eclipse of the moon may happen only in the half of the month, when there is full moonlight, since the sun and moon are in opposition. A lunar eclipse is the result of the Earth coming between the moon and the sun, so that the Earth prevents the rays of the sun from reaching the moon. This phenomenon can only take place if there is an alignment (*šurah*) of the three bodies (the sun, the Earth, and the moon). In addition, solar eclipses are perceived only during daylight, whereas lunar eclipses are apparent in twilight or at night. An eclipse was always deemed to be a bad omen, especially a solar

hurled against astrology among his contemporaries, notably, the possibility of having complete or partial knowledge of the future through astrology and the convenience for religious Jews of studying and practicing astrology, see Schwarz, 1917. A completely different source is Maimonides' *Letter to the Jews of Montpellier*, in which he makes it clear that the future cannot be predicted by means of astrology and that it is a forbidden practice, see Marx, 1926: 311-358, and 1927: 493-494; and Targarona Borrás, 1987: 225-251. Regarding this polemic in Arabic sources, see, for instance, Livingston, 1971: 96-103.

eclipse (which was less frequent than a lunar one), and was not something desirable (except in the horoscope of an enemy). That is the reason for an image of the earth crying in Ha-Nagid's poem: «the appearance of the earth upon which the sun moves is like a girl whose cry makes her face redden»; and of death and poisoning: «like a king who makes his servant drink a cup of poison and after that he makes his queen drink». From the imagery of the poem I deduce that the lunar eclipse was partial («like the face of a girl, a half of it got reddened while the other half remains in shadow»), while the solar one was surely total («a bit of its light remains above the darkness like a diadem on the head of a dark-skinned Libyan girl»). Despite the technical information displayed in the poem and its length, ha-Nagid is successful in evoking a contrasted beauty and interrelation that stems from coupling dignified heavenly bodies and very quotidian objects (a cooking pot, the snare of a trapper). This pairing of opposite realms (in which the relationship is only possible with the highest impinging upon the lowest) breaks the Aristotelian and medieval notion that heavens and Earth are completely separate and describes the heavenly realm in terms characteristic of sublunary beings.

Solomon Ibn Gabirol (Malaga, ca. 1021-ca. 1058) displayed very detailed and specific astronomical content in his long religious poem *Keter malkut*, and also in his secular poems. In Hebrew secular poetry (like its Arabic models), astronomical references frequently typify specific features of the beloved or the addressee in the poem. For instance, we find the following comparison referred to the wine (and the beloved) in one of Ibn Gabirol's secular poems: «It rises (*tizrah*) like the [vernal] equinox in Aries (*kemo Tannin be-Ṭaleh*) and is / in my eyes like a fire guarded in a glass».¹⁴ When the sun rises in Aries, it crosses from the southern to the northern hemisphere, which means that the sun is moving closer to the inhabited part of the Earth, the hours of daylight are longer, and its heat increases until it reaches its maximum power in Cancer (the summer solstice). As was customary in homoerotic Arabic poetry, stellar bodies also typified the beauty of men, as exemplified in these verses of Ibn Gabirol: «his land is below the stars of the southern hemisphere (*koḵve Teman*) / and the sight of

14. According to Yarden (1975-1976: II, 486), these verses are taken from a wine poem and used as the introductory section to a friendship poem. The image of the wine refers to the beloved.

his cheek is in them».¹⁵ In these examples, there are references to conspicuous astronomical phenomena like the vernal equinox (indicated by the equality of hours of daylight and darkness, which was the natural beginning of the year) and the brightness of specific stars. Ibn Gabirol refers in his poem to a group of stars in the southern hemisphere (*koḳve Teman*), an intriguing reference to a part of the Earth (the southern hemisphere), in principle, considered to be uninhabited, and whose sky was therefore unseen, although it was already mapped in Antiquity.¹⁶ As regards astrological subjects, I have selected a secular poem by Ibn Gabirol, in which there is a reference to the signs of the zodiac that are the domiciles of the planets (namely, their natural positions, the places where they were created, according to old astrological lore) and to their influence on fortune in a case concerning electional astrology, one of the most popular branches of medieval astrology. This specific practice entailed finding the most suitable moment to do something (a wedding, a trip, a battle, buy a house, etc.). This favorable moment was determined by calculating the stellar positions in the sky for a specific moment and their relationship with the natal chart of the person who was going to get married, travel, engage in battle, or buy a house. The reason for Bar Hiyya's letter to the rabbi of Barcelona Yehudah ben Barzillai (already mentioned) is also a case of electional astrology for a wedding, which proves how widespread this practice was among Jews (although it was not free of controversy). Ibn Gabirol's poem mentions a man pursued by misfortune, despite the fact that he or someone else looked for a good position for him in an electional horoscope (the domicile of Venus, one of the two planets considered to be benefic in astrology). Venus has two domiciles, Libra and Taurus, but there is not enough information in the poem to determine which one was selected or for what purpose (the choice was intended to bring good fortune, since

15. Poems number 40 and 106, see Brody and Schirmann, 1974: 23 and 59, respectively.

16. Abraham ibn Ezra also refers to the stars of the southern hemisphere in his biblical commentaries, see, for instance, his commentary on Amos 5:8: «There is close to the pole a large red star, which is called the Red one, in Arabic, Sahil. There are other stars close to it but smaller than it. They are visible sometimes for those inhabiting the equator. Those inhabiting the northern hemisphere cannot see them. For this reason, the Bible calls them Southern Chambers (Job 9:9), for they are not visible in the inhabited world», see Simon, 1989: 209-210.

Venus is considered to be a benefic planet). This brief but specific mention is illuminating about the high degree of familiarity (and interest) of medieval readers of poetry with certain technicalities of astrology.

Isaac ibn Ghiyyat (Lucena 1038-Cordoba 1089) also included astronomical topics in his religious poems. I have appended a poem with an amazing amount of astronomical information embedded in its verses. Like Shmuel ha-Nagid's poem on the eclipses and in contrast to the selected poems of Ibn Gabirol, astronomy is the main subject of this poem, although the general context is to declare the power of God, who made the heavens and rules over them. In this poem, Ibn Ghiyyat makes explicit the egg-universe of Ha-Nagid's eloquent metaphor mentioned above. We learn that the stars are fixed in their sphere, which moves from east to west spinning around a motionless axis. Two positions of the starry sphere are outlined: *'Eglah* (Taurus) in the north and *'Aqrav* (Scorpio) in the south,¹⁷ which are called («the foundations of the heavens»). These constellations are located in opposite directions in the sky (when the sun is in either of them, it is moving northward or southward in its path, respectively), and these are the constellations in which the sun rises just after the equinoctial signs (Aries and Libra). These zodiac signs are called in astrology «solid» and that is the reason why they are considered «foundations».¹⁸ There are eight orbs in all (the fixed stars and the seven planets). In contrast with the sphere of the fixed stars (*galgal ha-'elion*), which spins with the stars fixed within it, the sphere (*raqi'a* or *galgal*) for every planet (*Kesilim*) and the planet itself both move, but with separate motions. We are told that the planets can have two motions in the sky, direct (from west to east) and retrograde (in the opposite direction), and that they display four positions in their respective periods (*tequfot*), namely, northern, southern, eastern, and western with respect to the solar path or zodiac.¹⁹ However, all the orbs of the planets share the diurnal motion of the eighth sphere in the westward motions of their own spheres. This motion takes on a mystical connotation in some of the medieval

17. See the Talmud Yerushalmi, *Eruvim* 56a and *Pesahim* 94a.

18. See Robbins, 1998: 66-67 [1.11]: «they are so called [solids] because when the sun is in them the moisture, heat, dryness, and cold of the seasons that begin in the preceding signs touch us more firmly...».

19. Cf. Abraham ibn Ezra's commentary on Amos 5:8 (Simon, 1989: 209-215).

writers, like Abraham ibn Ezra (who related it to the ninth sphere) as it is the common trait of all the spheres and heavenly bodies. In this common motion, the hand of God and His law is particularly apparent; for this reason, it is the superior movement, as Ibn Ezra described it.²⁰ When Hebrew poetry refers to heavenly constellations, the rule is to always mention the names of the constellations and stars referred to in the Bible: *Kesil*, *Kimah*, *'Aš*, and *koḵve Teman*, or biblical names that were interpreted at some point as alluding to some of the heavenly bodies, like *Kiyun* (Saturn) or *Ben Šaḥar* (Venus as the morning star). In the first half of the 12th century, most of the stellar terminology was Arabic. The first names of stars and constellations in Hebrew (except for the names of the planets and the biblical names *Kesil*, *Kimah*, and *'Aš*) first appeared (as far as I know) in the manuscripts of the astronomers Abraham bar Hiyya (d. after 1136) and Abraham ibn Ezra (1089/1092-1164/1167).²¹ In fact, Ibn Ghiyyat only introduced the biblical names of the stars in his poems, like the Hebrew poets before and after him, possibly to avoid the Arabic names (with which they were evidently quite familiar) in the midst of their poems stuffed with biblical words and references. However, the translation of these biblical names of stars and constellations is problematic, since it is not always apparent what stars and constellations they denoted, their meanings depending on the exegesis of the different interpreters. For instance, we know (because he said it explicitly), that Abraham ibn Ezra understood *Kimah* as denoting the Pleiades and *Kesil* Scorpio (or its brightest star, Aldebaran).²² For this reason, I have decided not to translate the Hebrew names of stars, except where the meaning is clear from some other indication in the text (like in the reference to the seven stars of the Pleiades). The meaning of *'Aš* seems to be more consistent and usually denotes the asterism *Ursa Major*. The real biblical meanings of these words and the heavenly bodies denoted by them in the Bible are outside the scope of this article. A very intriguing term is the

20. In his commentary on Exod. 33:21, Ibn Ezra states: «Man's movement is forward, the upper body's movement is rightward [i.e., westward], and the plant's movement is upward», see Weizer, 1977: 215.

21. For the names of stars in these two writers, see Goldstein, 1985a: 185-208.

22. See A. ibn Ezra's commentary on Amos 5:8 (Simon, 1989: I, 209-215). For an explanation of Ibn Ezra's commentary on Amos 5.8, see Sela, 2003: 257-273.

word *Teli*, which appears in the poem of Ibn Ghiyyat. The mention seems to imply a constellation (*Draco* or *naḥaš bariaḥi* in biblical terminology, a very large circumpolar constellation close to *Ursa Minor* and to the pole of the ecliptic). The mention of *Tanninim* refers clearly to the two points in the lunar orbit where it intersects the path of the sun (namely, the lunar nodes). These two points are related to eclipses, since they are only possible when the moon is in one of them (only then is there an alignment of the bodies of the luminaries, one of the indispensable conditions for any eclipse, either of the sun or the moon, as I have already explained). The use of *Teli* for denoting either the constellation or the lunar nodes (as we will see in the selected fragments of Abraham ibn Ezra and Immanuel of Rome) has to do with a very old myth about the sun or the moon being swallowed up at the time of their eclipse by a celestial dragon or serpent stretching out the heavens and whose heavenly image would be the constellation *Draco*.²³ The final stanza of my selection mentions, but does not explain, the anomaly of the change in the degree of brilliance of the planets and the anomaly of their motion (sometimes fast, sometimes slow), which makes using the mean motions the most frequent procedure in astronomical calculations.²⁴ As a rule, medieval men were much more aware of what happens in the sky than we are, immersed in the lights of our cities.

Moshe ibn Ezra (c. 1055-d. after 1135) made frequent references to stars and astronomical phenomena in his poems. The poem included in the appendix comments on the seasonal change that takes place when the sun approaches the first degree of Aries (the vernal point), the moment when its position in the ecliptic places the solar path closer to the northern hemisphere and spring (and a new cycle) begins («the sun departs at the vernal equinox»). This cycle was very apparent in ancient and medieval times, when daily life depended more closely than today on the natural cycles of weather, light and vegetation. The notion of natural cycles, and especially of the solar cycle was paramount: it mainly determined the calendar, the hours of work, the type of activity in the fields (agriculture

23. For the relation of a dragon/serpent with eclipses, its imprint in medieval iconography, and its Persian origin, see Hartner, 1938: 113-154; and Azarpay - Kilmer, 1978: 363-374.

24. See Bar Hiyya's *Megillat ha-megalleh*, Poznanski and Guttmann, 1968: 127.

was the main occupation of the medieval population), the season for waging wars (spring was usually the season of wars), and many other civil and religious activities. According to astrologers, the fate of every year is determined at the moment the sun enters the vernal point (*ha-tequfah*). The horoscope of this moment (*molad ha-'olam* or *molad ha-tequfah*) was calculated every year, so that the king could take decisions regarding politics, wars, plagues, famine, drought, etc; all these threats could be read in the situation of the sky at the beginning of the spring.²⁵ This idea of recurrence of the solar cycle and its centrality for the life of the creatures on the Earth («like a sovereign in its circular procession») is the subject of this particular stanza. The poem incorporates an ancient image of the sun in a chariot driven by horses («with its horses and its chariot, the sun departs»), which is present in the zodiac of several Palestinian synagogues and harks back to Homer (8th c. BCE) and Pindarus (6th-5th c. BCE).²⁶ The persistence of this image in the Semitic tradition is a proof of the degree of diffusion of classical (and pagan) images and topics in medieval literature.

Abraham ibn Ezra (1089/1092-1164/1167) also wrote religious and secular poetry with astronomical content. We find explicit astronomical information introduced in the content of the religious poem included in the appendix whose purpose is to praise God. Ibn Ezra displays a description of the cosmos in which the seven planets move southward and northward with respect to the ecliptic. All of them are related to *Teli*, which here means the large constellation *Draco*, whose length is equivalent to half of the zodiac. The idea that the planets and the cosmos are hung from *Teli* emerged in the mystic work *Sefer yesirah* (6.3).²⁷ Here the relationship of the constellation *Draco* with the axis of the universe, namely the axis of the zodiac or solar path must be implicit. This axis can be understood as the point from which

25. For an overview of the astrological practices relating to the annual revolution of the sun and its influence on the fate of the world, see Sela, 2009.

26. Seven synagogues in total: Beth Alpha, Hammath Tiberias, Na'aran, Khirbet Susiya, Husifa, Yafia, and Sepphoris. On these mosaics, however, the sun is shown in a *quadriga* or four-horse chariot, see Magness, 2003: 363-389. For the Greek roots of this image, see Homer, *Iliad* xvi.779 (the chariot is guided by fiery bulls) and Pindar *Olympian* vii.71 (the chariot is guided by fiery horses).

27. «The *Teli* in the Universe is like a king on his throne». Some of the interpreters of this text associated *Teli* with the root t-l-h, which means «to hang» and developed the idea that the universe was hung from *Teli*, see Kaplan, 1997: 233-236.

the universe and all the stars and their motions hang. Ibn Ezra also mentions the sphere of every planet, their changes, and the various anomalies in the motion of the planets (the fact that they are not always above the horizon, but they rise and set in their orbits, their retrograde movements, and the changes in their distances with respect to the Earth). All of this is God's work in Ibn Ezra's understanding (and in monotheistic medieval thought in general). The existence of a moving sphere responsible for the motions of the spheres of the seven planets and the fixed stars is referred to in the third and fourth poems of Ibn Ezra in my selection. This sphere is the ninth in Ibn Ezra's astronomical system, which consists of ten in all.²⁸ I have already mentioned the cosmological role of this sphere in the whole of the universe, for all the heavenly bodies share its motion westward. In addition, Ibn Ezra seems to indicate a mystical role for this bodiless sphere («my knowledge of it will become my chariot [to God]»), which remains rather esoteric throughout his writings. In the fourth, fifth, and sixth poems of Abraham ibn Ezra in my selection, there are references to *Teli*, which in the contexts of these poems refers to the nodes of the moon and the nodes of the planets (i.e. the points where the orbits of the moon or of the planets intersect the solar path). The last poem conveys the astrological belief that the northern node (i.e. the Head, the point of the ecliptic at which the planet or luminary changes its latitude from south to north) is powerful and benefic, while the southern one (the Tail) is destructive, at the same time conjuring up the image of the dragon, which is at the origin of the myth relating nodes and eclipses, as we have said above.

Isaac ha-Levi Bar Zerahia lived between the end of the 11th and the first half of the 12th century. The poem selected for the appendix, in addition to a description of several of the components of the universe, displays a good knowledge of the tenets of astrology, specifically, the way the planets are allotted their domiciles in a certain order with respect to the axis separating the domiciles of the sun (Leo) and the moon (Cancer) and dividing the zodiac into two halves. However, this information is

28. «The tenth [orb], which is holy, is called the Throne of Glory (*Kise' ha-kavod*), because its power is made manifest by the Throne of Glory. It is the most powerful (*ha-taqqif*) and encircles the bodies [of all the orbs]», see Abraham ibn Ezra's long commentary on Exod. 3:15, Weizer, 1977: 27. Sela holds a different view on the number of orbs in Ibn Ezra's system, see Sela, 2003: 214-237, and Sela, 2007: 263 (explanation of the second version [1.2.1-5]).

conveyed in an obscure sentence of the poem, which makes it difficult to understand for someone not familiar with astrology: «He made the paths of every one of them be opposite to the position of its hinge [the sun or the moon]». The domiciles of the planets are their natural positions, for, according to an old tradition, they were there when the world was created.²⁹ The axis separating the domiciles of the sun (Leo) and the moon (Cancer) divides the zodiac into two halves, one solar and the other lunar, which play a role in astrological interpretation.³⁰

Judah ben Solomon al-Ḥarizi (1165-1225) was a Hebrew poet and translator born in Spain, very likely in Toledo. He wrote poetry and rhymed prose (*maqama*), being one of the first to introduce this Arabic form in Hebrew. Al-Ḥarizi himself used this form for his major work *Sefer Tahkemoni*, completed after 1220.³¹ Among the various chapters of this book, there is one (22nd) devoted to make fun of astrologers, although al-Ḥarizi, who was a physician, must have been well versed in astrology and used it in his practice of medicine. The most interesting mention in the first fragment in the appendix is the reference to an astronomical instrument, a planispheric astrolabe, the most significant instrument of

29. The Roman astrologer Firmicus Maternus (4th century) explains the Thema Mundi in his *Mathesis* (3, 1.10). According to this, at the time of creation, the Sun was in Leo and the Moon was in Cancer, the two most northerly signs with the greatest number of daylight hours. Thus, each of the remaining planets was given two residences in each of the successive domiciles and following the order of their spheres, one side fanning out from the Sun and the other from the Moon: Mercury in Virgo and Gemini, Venus in Libra and Taurus, Mars in Scorpio and Sagittarius, Jupiter in Sagittarius and Pisces, and Saturn in Capricorn and Aquarius. See also Macrobius (5th century), *Commentarii in somnium Scipionis* (1, 21) and Ptolemy (2nd century), *Tetrabiblos* (1.17). For an explanation of the origin and variations of this theory, see Bouché-Leclercq, 1979: 184-192.

30. So it is explained in Ptolemy's *Tetrabiblos*: «Since the most northern of the twelve signs, which are closer than the others to our zenith and therefore most productive of heat and of warmth, are Cancer and Leo, they assigned these to the greatest and most powerful heavenly bodies, that is, to the luminaries, as houses: Leo, which is masculine, to the sun; and Cancer, feminine, to the moon. In keeping with this idea, they assumed the semicircle between Leo and Capricorn to be solar and the one between Aquarius and Cancer to be lunar...», see Robbins, 1998: 78-79. A similar explanation is in Abraham ibn Ezra's *Sefer ha-te'amim*, first version (2.5, 1-4) and second version (8.1, 1-4), see Sela, 2007: 44-45 and 248-249, respectively.

31. See Mirsky *et al*, 2007: I, 655-657. See also Brann, 1992; and Scheindlin, 1993 (I owe these two references to Prof. Yosef Tobi).

medieval astronomy. Al-Ḥarizī's words are explicit about this artifact, for he mentions its most characteristic component (the *rešet*, i.e. the web or spider, which forms the celestial part of the instrument, in which the zodiac and the most prominent stars of the sky are represented) along with some of its uses. Some of the applications are purely astronomical, like the altitude of the sun, its rate, its inclination with respect to a specific horizon, the longitude and angles of the shadow that it projects. Some other applications are just astrological, like the calculation of the rising sign (i.e. the sign of the zodiac and its degree rising above the horizon for a specific place and time) and the division of the zodiac into four angles and twelve astrological houses («its chords and its angles at its four points»). The following fragment in my selection, in addition to being explicit about the way one should handle an astrolabe («he hung the astrolabe from his fingers»), refers to a case of interrogational astrology. A group of men ask a Muslim astrologer about a matter upon which they have agreed before, but they do not set it out for the astrologer. The astrologer must therefore find both the question and the answer, using the only tools of astrology. Al-Ḥarizī refers in his text to the procedure that the astrologer followed to find the question, although it is not clear, even for someone familiar with astrological calculations. It seems that the old man calculated the rising sign of the moment, as was the usual way in such cases (interrogational astrology), and after that he directed the rising sign to the four angles of the horoscope («he made the rising sign go through the four angles»). This procedure seems to refer to the calculation of some type of astrological direction. Directions are one of the most frequent calculations in astrology, although there were different types and different procedures to calculate them.³² The fact of directing the rising sign to the four angles of the horoscope and the way this is related to the answer remains inexplicit in the texts and is something unclear to us. Regarding interrogational horoscopes, astrologers used to study the heavenly positions and would deduce their answers from them, which the astrologer of this story also did («[he] determined the fate of every man according to his judgment of the signs»). However, the way this study was carried out much depended on the tradition and, above all, on individual

32. For an explanation of the various ways of calculating and using directions in a horoscope, see Rodríguez-Arribas, 2011: 201-248.

preferences, knowledge, confidence in one's art, and the integrity of every astrologer (astrology seems to have been a lucrative means of earning a living for some medieval men). It is also possible that the narrator misunderstood the procedure used by the astrologer and thought he was moving the rising sign when he was really using the tooth in the spider of the astrolabe, i.e. a small protruding part of the web just at the beginning of Capricorn used in most of the calculations with the astrolabe.³³ The last sentence («almost as if the stars of Eden knelt down before him and sat with him on the earth») and the way the paragraph continues expresses the irony of the narrator, who has a critical view of these divinatory practices.

Isaac ben Solomon ibn Sahula (b. 1244) included a large amount of scientific material in his main work, *Mešal ha-kadmoni* (1281-1284). The fifth section of this work deals with astrology. However, astrological beliefs and topics crop up throughout this *maqama*. Ibn Sahula's first fragment in the appendix has to do with the condition of man as a sublunary being, subject therefore to the influences of the heavenly bodies and the disposition of the stars at the moment of his birth (his natal chart). Happiness and misfortune are established at birth and, throughout life, stars determine the moment of any event in the life of every single person. Appropriate times (*'ittot*) are the subject of a specific branch of astrology, elections (*mivḥarim*); astrology as a whole is based on the belief that any fraction of time carries the imprint of its specific arrangement of stars. In this way, any instant has a specific quality that astrologers have to determine according to the rules of their art and the study of the horoscope created for that specific instant.³⁴ The second fragment in the selection establishes a close relationship between health and the stars (and also involves medicine and physicians). The content of the poem seems to imply that the arrangement of stars determines gluttony and, therefore, illness («the reason for the awakening of his appetite ... is the change in the time from a purpose to other purpose [already] determined»). In any

33. See, for instance, Abraham ibn Ezra's *Sefer keli ha-neḥošet*, third Hebrew version, MS Günzburg 937 fol. 11b (in the context of the calculation of the astrological aspects).

34. For the specific meaning of *'et* in astrological contexts, see Rodríguez-Arribas, 2006: 435-444.

case, God is the last root of any change: «the reason of the motions of the sphere is magnificent and holy and is in the upper world».

Immanuel of Rome (Rome 1261-Fermo 1328) is a writer who participates in the legacy of Hebrew poetry written in the Sephardic style and the new style and metrics that the *stil nuovo* introduced in the Italian Trecento. His admiration for the poets of Sepharad might explain the presence of frequent stellar subjects in his poems and *maḥberot*. I have selected the fragment of a poem inserted in the rhymed prose of the sixth *maḥberet*, which is a good example of astrological lore related to the prediction of weather, an important branch of medieval astrology and one usually associated with historical or mundane astrology. The idea behind these verses is that every sign of the zodiac lends its qualities and characteristic traits to any of the twelve sections of the year ruled by it and also to the weather (or, exceptionally, to the agricultural activity) of that period: Aries, eastern wind and thunder; Taurus, clouds and fog; Gemini, rain; Cancer, wind; Leo, harvesting; Virgo, water; Libra, water; Scorpio, abundance; Sagittarius, decreasing water; Capricorn, clouds of water; Aquarius, storms; and Pisces, water in highlands. This is a very old and popular tradition, knowledge of which is derived from common experience rather than from technical, astronomical or astrological knowledge. However, I have decided to include it in this selection, as forecasting weather was essential to determine the fate of the realm, for weather was decisive for war, famine, drought, politics, etc. The following text of Immanuel in the appendix is a fragment of rhymed prose taken from the twelfth *maḥberet*. Immanuel explains that the nodes are the places of the planetary and lunar orbits where they intercept the orbit of the sun. When the planets or the moon are at these two points, their latitudes (*merḥavim*) are the same as the sun («it [*Teli*] makes equal the latitudes of the luminaries» and «it [*the Teli*] is their [*the sphere's*] pin»). In this sense, they are close for they share latitude, one of the heavenly parameters considered in astronomy. These points of coincidence of their orbits with the solar path (i.e. nodes) are usually crossed twice by the planets in their cycles, when they change from a southern to a northern latitude at the Head or the opposite at the Tail of *Teli*. As we have seen, the nodes are connoted with different influences: as a rule, the Head (*ro ṣ*) has good influence on a horoscope, while the Tail (*zanav*) is considered malefic and destructive. The custom of using and interpreting these two

points (namely, the lunar nodes) in a horoscope as if they were planets was introduced in Arabic astrology by the influence of Indian astronomy.³⁵

Isaac ben Shlomo al-Aḥdab (mid-14th century - after 1429) was a Hebrew poet and astronomer of Castilian origin who emigrated to Sicily at the end of the 14th century. Like Abraham ibn Ezra, in addition to poetry, he also wrote works on astronomy (still in manuscript): *'Iggeret keli hemdah* (describing an astronomical instrument that he invented in Sicily) and *Keli ha-memūša* ' or *Keli ha-emša* 'i.³⁶ In the poem included in the appendix this astronomer and poet takes pride in his complete knowledge of astronomy («I know the planets in their orbits») and astrology («the secret of the constellations, the heavenly angles and their meanings, and the remaining houses with their lots»). His astrological expertise embraces the different branches of astrology: electional («I let know their [proper] moments to those who ask»), natal, interrogational («I am an expert in natal and interrogational horoscopes»), and any other types of astrological calculations. He is able to relate the terrestrial events to their heavenly causes («understanding the reasons of the spheres») and anticipate them. In any case, this knowledge is not arbitrary, but is supported by rational science («logic, physical sciences, and theology are my foundations»). This approach to astrology places him close to Abraham bar Hiyya and Abraham ibn Ezra, for all three considered astrology to be closer to science than to superstition and dealt with astrological issues in line with this understanding.³⁷

Shlomo Bonafed seems to have been born in Barcelona between 1370 and 1380 and to have died in Belchite after 1445. He spent part of his life in Saragossa, where his main patron and friend was Don Benveniste de la Caballeria, and where he belonged to the last circle of Hebrew poets in Spain (*Adat Ha-Nogenim*), which included Don Vidal ben Labi and Selomoh ben Mesullam of Piera. He was present at the Dispute of Tortosa (1413-1414) and composed several writings on the Jewish-Christian

35. Hartner, 1968: 349-404.

36. See Habermann and Saenz-Badillos, 2007: 654.

37. For an analysis of what this understanding of astrology implies, see Rodríguez-Arribas, 2010: 115-133.

polemic.³⁸ His poems reveal the great influence of the Spanish tradition, notably apparent in his use of astronomical topics, and some Provençal and Italian influences. In the first example, harsh criticism against someone, the rabbi of Saragossa and enemy of Bonafed, who shows off about his knowledge of astronomy/astrology, there is a reference to an astronomical instrument: either a linear astrolabe or the so-called Jacob's staff. The second fragment of Bonafed in the appendix considers the importance of the sun in the sky and the meaning of the poles, for there is no motion in the sphere without an axis. The essential role of axes in heavenly motions is a frequent notion in Bonafed's poems, who uses it to convey opposite emotions (hate and love) in the last two fragments in the appendix: «I would refuse to become a sphere if he were my axis» and «[shall my grief make...] the axis and the sphere of the Earth spin around him». The last fragment contains an amazing statement: the motion of the sphere of the Earth and its axis, which is rare in the context of late medieval astronomy, and more in the context of poetry. I think that this statement does not have astronomical import, but it serves for the purpose of displaying the strong feelings of the poet. In addition, it proves that Bonafed was familiar with astronomical theories that considered the motion of the Earth as being possible. Since the 2nd century, the Ptolemaic system and the basic principle that the Earth was still in the center of the heavenly spheres revolving around it were almost universally accepted. However, there was a medieval astronomical tradition (with Andalusian predecessors) that started at the Maragha observatory and continued with astronomers from the Damascus mosque and Samarkand observatory, who tried to solve the equant problem (the imaginary point close to the real center of the movement around which a planet or the center of an epicycle was conceived to move uniformly) and to produce alternative configurations to the Ptolemaic model keeping the geocentric system. Nasīr al-Dīn al-Tūsī (1201–1274) and Alī Qūšjī (1403-1474) were among the followers of this tradition. They used arguments and evidence that make the motion of the Earth feasible and that resemble those used by Copernicus (1473-1543) many years later.³⁹

38. See Bejarano, 1989; and Sáenz-Badillos, 2000: 191-209.

39. See, for instance, Saliba, 1991: 67-99; and Ragep, 2001: 145-163. There is an influence of the Maragha School upon the Jewish astronomer Levi ben Gerson (France,

CONCLUSIONS

The first and most evident explanation for the presence of astronomical and astrological motifs in Hebrew poetry is the Arabic model which was paramount among the Jews of Sepharad. Muslims wrote extensively on astronomy and astrology and also included such motifs in their poetry. I have not considered the Arabic samples —although they are worthy and manifold—, since it would exceed the limits of this very preliminary study devoted to showing the extent of stellar motifs in the poetry of Sepharad. However, further research needs to be done on these Arabic models and their influence on Hebrew poets (astronomical and astrological sources, poetic stellar images and subjects, and the possible relationship between these elements and the Greek legacy in both languages). An additional reason encompassing the previous one for the presence of science in these poems is the consideration of astrology as «a medieval trend of thought», which requires a critical approach but also a certain amount of leeway with respect to modern prejudices about what was or was not considered rational and reasonable for medieval minds. Abū Ma'šar made a synthesis of the astrological lore available in Arabic and Persian with the Aristotelian philosophy, which made the former apparent in many of the Aristotelian branches of knowledge. Medieval cosmology cannot be understood without the traditions and superstitions clustered around astrology and other similar practices and beliefs (magic, hermeticism, etc.). The impression one gets from these poems is one of immediacy —and intimacy— with the heavenly phenomena. Surely many of these poets also wanted to display their proficiency in a type of knowledge that was highly appreciated by rulers and princes, especially, for its political and military applications (historical and electional astrology, weather forecast, natal charts of rulers, etc.) and were certain that the merging of science and poetry would have a profound impact on benefactors and patrons as well as among their colleagues and opponents. Lacking any study of stellar motifs in medieval Arabic poetry, in addition to any research on the cosmology and stellar subjects of early *piyyutim* (two desirable subjects that should be explored), the purpose of my

14th century), and Mordecai Finzi (Italy, 15th century) knew al-Tūsī's astronomy, see respectively Lévy, 1992: 83-147; and Langermann, 1996: 31-53. All of this shows certain knowledge of the theories coming from this school among the Jewish astronomers of the Mediterranean area.

article could only be to bring attention to the sophistication, complexity, and diversity of stellar motifs in the Hebrew poetry of Sepharad.

APPENDIX: A TENTATIVE TRANSLATION OF CERTAIN FRAGMENTS⁴⁰
Shmuel ha-Nagid

The universe as an egg

My friend, a wall (*meḥiṣṣah*) surrounds us, / and spheres (*galgalim*) that do not have any gap (*periṣah*). // Here we are, like the yolk and the white / within an egg, / and the universe is an egg (*ve-ha-‘olam ke-beiṣah*). // You suppose that there is a shelter for you in bad times (*be-yom ra’*), / but how could you take refuge? There is neither opening nor way out (*petah u-moša’*). // What could we do? God’s creations got ahead of us. / What could we plan? The judgment has already been decided (*ve-ha-‘eṣah ye ‘uṣah*).⁴¹

Three eclipses

My friend, are you falling sleep? Get up and notice / the dawn (*šahar*), and in the height of the heavens (*u-v-išme ma ‘alah*) an alignment (*šurah*).

You will see them (the heavens) like a leopard skin on which there is no / place without a spot.

Look at the moon of half of the month (*ḥaši sahar*), in the night of its perfection (*tummo*) / it gets dark (*qoder*) like a brazier or a cooking pot.⁴²

Like the face of a girl, a half of it / got reddened while the other half remains in shadow.

40. Given the difficulty in keeping the imbricated form of the poems and the resonance of their content, while (at the same time) endeavoring to make their scientific allusions clear and explicit, I have decided to offer a translation in prose of the poetic fragments of this anthology that is as literal as possible (although these translations do not do justice to the beauty and ingenuity of the poems in Hebrew). Several of these texts have already been translated into various languages and all of them are discussed to a greater or lesser degree in their critical editions. I refer those readers interested in gaining a deeper insight (and in the full apparatus of biblical and rabbinical references, which I have omitted) to the footnotes of the critical editions of these poems. Some of the translations available (although not all) are mentioned in the footnotes of this article. I remind readers that the translations proposed here are by no means definitive, rather, let us consider them to be just tentative translations.

41. Rosen, 2008: 215, lines 31-34. Cf. Coles’s translation, 1996: 133.

42. That is, Kislev 15 (November 8, 1044, between 11pm and 2pm), see Yarden, 1966: 266 n. 3 and p. 267 n. 14.

Turn and look (*va-ḥazeh*) at the sun, which became large / and has been brought to the end of the month in darkness (*be-ša'erurah*).⁴³

A bit of its light (*'orah*) remains above its darkening (*ḥoškah*), / like a diadem on the head of a dark-skinned Libyan girl.

The earth upon which its sun (*šimšah*) sets/ is like a girl whose cry makes her face redden.

He struck His two luminaries (*šene 'orav*) in one single month, / which are for Him strength and beauty.

He covered (*kissah*) the face of the moon (*sahar*) with the sphere of His Earth (*be-ḥug 'arṣo*) / and His moon eclipsed (*mesuttarah*) His sun.

All this is the work of God, He makes / His will in the creations that He created.

A bit of darkness (*me'aṭ 'ofel*) was created within the moon (*betok sahar*) / since the beginning, and the sun was created pure.

For this reason, I compare them now, when they are eclipsed (*be-hiqgodram*) / in this sudden night (*be-ḥošek zeh*)

to two mothers deprived from children, one, a bruise on its face, / the other, a bruise and a wound.

He eclipsed (*hiqdir*) the light (*'or*) of the day in the daylight hours, and the light of the night / in the evening (*be-'erev yom*), in the [first] watch (*ve-'ašmurah*).

Like a king who got angry and put all / his ministers in a difficult position in their own lands. // He first struck the nocturnal luminary (*me'or layil*) and / strikes the diurnal luminary (*me'or ha-yom*) later.

Like a king who makes his servant drink a cup / of poison and after that he makes his queen drink.

Look all these things and reflect // upon them, analyze them and [try to] understand them.

Read: Yours is the power that brought / their lights with weight and measure.

You prepared for the moon (*sahar*) an eclipse (*qadrut*) in the half of Kislev, / like the snare of a trapper for a bird.

You will deprive it [the moon] from its light (*'orah*) / a second time this year, in Iyyar.⁴⁴

43. In other words, Kislev 29, i.e. November 22, 1044, between 8 and 11 am, see Yarden, 1966: 266 n. 4 and p. 267 n. 14.

44. Yarden, 1966: 266-267 [poem 109, lines 1-21]. According to the Rosetta Calendar (a database for the conversion of calendars) the date referred to is May 4, 1045, see <<http://www.rosettacalendar.com/>>, copyright 1993-2009, Scott E. Lee. All the dates

Solomon ibn Gabirol

The domicile of Venus

A man gets his spear broken fighting in a battle / and as soon as he runs,
his foot stumbles, // so is the man whom misfortunes cleave to, / although
he places his oracle [his fortune] (*deviro*) in the domicile of Venus (*be-bet
Nogah*).⁴⁵

Isaac ibn Ghiyyat

Constellations, eclipses, Teli, and the two Tanninim

You made the star fixed (*koḳav qabu'a*) and the sphere (*galgal*) turning
(*hozer*) from east to west, / it is in the east and goes to the west, and from
the west approaches the east. / However, the north (*ṣafon*) and the south
(*darom*) remain fixed: 'Eglah (i.e., heifer) in the north and Scorpio
(*'Agrav*) in the south / are the foundations of the heavens (*mosdot ha-
šamayim*). / You made the heavens.

You made the seven spheres (*reqi'im*) move (*leket*), they and their
planets (*Kesilehem*), / from west to east when they are direct (*derek henna
penehem*) [in their motions], / so that they complete their cycle (*tequfatam*)
rising at their four times (*be-'arba'at zemanehem*) / from the extreme of
the heavens.⁴⁶ / You made the heavens.

You made them and their spheres (*galgalam*) similar to the upper
sphere (*galgal ha-'elion*), / so that they get all oriented when the law of the
daily movement (*le-ḳavven hoq yom ve-leil*) pulls all of them westward. /
All the heavenly host (*kol ševa' ha-šamayim*) / inclines before the Lord of
the world. / You made the heavens.

You made motionless (*noah*) the both extremes of the axis of the
sphere (*ro'še sedan ha-galgal mi-šne šedadim*). / The Bear ('*Aš*) remains
fixed in one extreme and Kesil in the other. / They told the glory of God,
they incline, and declare / that God is the creator of the heavens. / You
made the heavens.

...

are given in the Julian calendar. I do not know the sources for the precision of the hours in Yarden's calculations, except for the mention of the first watch, which is the first part of the night, see Yarden, 1966: 267 n. 21, where the data is as follows: Iyyar 15, i.e. May 3, 1045 between 7 and 10 pm.

45. Brody - Schirmann, 1974: 117, poem number 193, lines 27-28. Cf. the beautiful translation (although not completely clear) by Cole, 2001: 98, lines 62-63.

46. This is likely to be a reference to the positions of the planets with respect to the solar path or ecliptic (southern, northern, eastern, and western), see, for instance, Ibn Ezra's *Sefer ha-še'elot*, Ms. Paris BNF 1058 f. 4a.

You made above the Draco (*Teli*), its Head (*ro šo*) moving (*mehal-lek*) leftward (*iṭter*) [i.e. northward] and its Tail (*u-znavo*) opposing it [the Head] (*nekoḥo*). / You aligned the center of Teli with the two Dracos (*Tanninim*, i.e. the nodes), one opposing the other in its influence (*koḥo*).⁴⁷ / His hand makes the axis of the Serpent (*naḥaš bariaḥ*) turn. His blow / lights up the heavens. / You made the heavens.

...

You made Your will with no constriction. The receptacles (*maḳlim*) / in which you placed the stars (*koḳve rom*), some of them are slow (*kevedim*) and some of them are swift (*qal·lim*); / sometimes they shine powerful (*mištarerim*) and sometimes they become dim (*holḳim ve-dal·lim*) / [in the] highest heavens. / You made the heavens.⁴⁸

Moshe ibn Ezra

The annual revolution of the sun

Cold weather has fled like a shadow, its rain / has already come to an end. With its horses and its chariot, / the sun (*ha-šemeš*) departs (*ve-ḥol*) at the vernal equinox (*be-ro š Taleh*), according to the law/ of its annual revolution (*ḥoq tequfato*), like a sovereign in its circular procession (*mesibo*).⁴⁹

Abraham ibn Ezra

Teli, the axis of the ecliptic or zodiac

Their path [of the planets and luminaries] is sometimes in the north (*‘al šemo lam*) / and also sometimes in the south (*‘al yeminam*) [with respect to the solar path].⁵⁰ / God balanced them (*hišvam*) and hung them (*ve-talam*) / from Teli (*bi-Teli*), and He is high and is hidden. / God created the heavenly spheres (*pelaḳim*) / the houses of the seven kings (*battim le-šiv‘ah melaḳim*), which follow their orbits (*holḳim ‘al deraḳim*) / directly (*yašru*) – and if they retrograde (*hafuḳim*), / His right hand holds them /

47. Head (northern) and Tail (southern) are placed opposite in the orbit.

48. David, 1987: 61-63 [poem 27, lines 51-100].

49. Itzhaki and Garel, 1993: 90, lines 1-4.

50. This means their motion around the Earth and their relative positions with respect to the solar path. However, it is clear that they do not share one orbit (path) in their cycles, each one has its own cycle and path, which periodically intersects the solar path (at the so-called planetary nodes), see the second version of Ibn Ezra's *Sefer keli ha-neḥošet*, MS BNF Heb. 1045 f. 193a.

and they are moved by His love / ... / He brings them up and down, / as He hides and shows them, / their apogees (*gavhutam*) and perigees (*ve-šiflam*) – / their activity is the testimony (*'edut*) of God[’s power/existence].⁵¹

God established the motions of the planets as they are

He created the planets (*mešartim*) in seven degrees (*ma'alot*), / they run (*vitrošesu*) day and night in their orbits (*bi-msil·lot*) / in the north (*šafon*) and in the south (*ve-yamin*) around the zodiac (*seviv mazzalot*) – / one is considered for [the count of] days, / other for the [count of] months and a third one for the [count of] years.⁵² / [The motion of] the spheres (*ha-galgalim*) becomes (*ruš*) faster (*ha-rav*) by His power; / their limits (*gevuł*) are sometimes far away and sometimes close, / some in the east and some in the west – / they turn in their orbits (*'iš le-darḳo ponim*), / they move (*nos'im*) according to His commandment and according to His commandment they are stationary (*honim*).⁵³

The ninth sphere and its cosmological role

[The planets and luminaries] run (*rašim*) in their spheres (*be-ma'aglehem*); / ... here the sphere moving (*galgal yanḥeh*) [the others].⁵⁴

The ninth sphere and its mystical role

The sphere around me / my knowledge of it will become my chariot (*da'eto tešavveh rikbi*) [to God].⁵⁵

Teli as the nodes of the planets

The holy [heavenly bodies] walk from God's dwelling without / turning off, / they go (*yelku*) to their southern (*le-zanav*) or northern nodes (*le-ro š ha-Teli*).⁵⁶

51. Levin, 1980: I, 73-74 [41, lines 6-10 and 16-17].

52. For an explanation of this sentence, cf. Levin, 1980: I, 158-159 (note 9). The cycle of the moon is monthly, that of the sun is daily and yearly; for larger cycles the reference are the upper planets, which complete their orbits in a period longer than a solar year, especially Jupiter and Saturn, whose periodical conjunctions were calculated in historical astrology, see for instance, Ibn Ezra's *Sefer ha-'olam*, first version, Sela, 2009: 56-57, [7.1-3, 8.1-4, 9.1-6, and 10.1-2].

53. Levin, 1980: I, 158-159 [85, lines 6-13].

54. Levin, 1980: I, 41 [17, lines 4-5].

55. Levin, 1980: I, 71 [40, line 17]. See *ibid.* Levin's explanation (note 17).

56. Levin, 1980: I, 155 [83, lines 13-14].

Teli as the axis of the ecliptic and the plane of the planetary nodes

The servants (*mešarte*) / of God are like kings in their thrones / in the limits / of the seven (*be-fa'te ševa'*), and the secret of Teli (*sod Teli*) lies in the limits (*be-fe'ot*).⁵⁷

The northern node versus the southern one

The distinctive attribute ('*oz*) of the nodes (*ha-Teli*) is to consolidate and to cause failure, like a dragon (*tannin*): / its tail (*zenavo*) is its destruction and the power (*ho-'ez*) comes from its head (*me-ra'ašotav*).⁵⁸

Isaac ha-Levi Bar Zerahia

How the domiciles of the planets are placed in the zodiac perpendicular with respect to the axis separating the domiciles of the sun and the moon

He made wonderful the heavenly laws (*huqqot šamayim*), their dispositions, / the shape of the orbs (*ha-'ofannim*), and their influences (*ma'asehem*). // He made the deeds (*qorot*) of the seven rulers (*mošlim*) in the twelve celestial houses (*batte 'elionai*) / carry out all that God commanded. // He made the paths (*halikot*) of every one of them be opposite to the position of its hinge (*meqom mišmarto*) [the sun or the moon] / and go to its domicile (*ha-baitah*) to carry out its influence (*mela'kto*) [or His work].⁵⁹ // He made the sages understand that the work of the highest beings (*govhe gebohim*) [the planets and stars] / is all the work of God. // He made that sometimes, by means of the revolutions (*mesibot*), their motion (*tekunatam*) would retrograde (*le-aḥor nehefaḥah*) / and the Gentiles asked: Why did God act in this way? //

He set a limit to the splendor of the sun with respect to the moon through its light [the moon's] / and likewise to the moon [with respect to the sun]. // He made the moon be visible (*mabato*) for the inhabitants of the Earth at the beginning of the month (*be-hithaddeš*) / to carry out all that pertains to the worship of God. // He made the zodiac (*roḥav*) the path of its fixed course (*qav darko*) [of the sun] in the middle of the orb (*pelek*), / likewise He made [with respect to] the moon (*ha-menorah*). // He made the limit of the sun's

57. Levin, 1980: I, 148 [79, lines 12-13]. The mystery of Teli has to do with the inclination (the technical term is «declination») of the ecliptic or solar path a certain number of degrees southward or northward with respect to the equator. These southern and northernmost declinations of the sun determine the limits of the zodiac.

58. Kahana, 1894: 195, lines 107-108 [poem 132].

59. Both interpretations are possible, for the source of this influence is God, since He established it.

movements (*netivotav*), when it changes its light from visible to hidden / and they did not see the work of His hands. // He made its face appear in its moment and that the darkness reached it and hid it / to make His work, strange is His work.⁶⁰ // He made the sun (*heres*) in the enclosure of Teli (*be-hul ha-Teli*), when it [Teli] separates the sun [from the moon], the lunar light is eclipsed.⁶¹ / This is bad for all that will be done on the Earth (*taḥat ha-šemeš*). // He made the beauty of the solar⁶² rise (*zerḥo*) in order to see the stars (*maššavto*), when it sets (*bi-fnoto*) in its orbit (*le-ma'egal*). / He made everything beautiful in its time (*be-'itto*). // He made in the stars the sign (*ha-'ot*) and the proof (*ha-mofet*) to indicate to the chosen people (*'adat ha-monai*) / how numerous are your works, God.⁶³

Judah ben Solomon al-Ḥarizi

The uses of an astrolabe

He told us that there was at the gate of the city one of the Arabic sages who was an astrologer (*hozeh ba-koḳavim*) able to reveal future things (*ha-'atidot*) before they happened. ... We saw a very old man ... in his hand an astrolabe (*kle neḥošet*) and on it something like a web (*ma'aseh rešet*). He measured (*šoqel*) the sun in its circuits (*be-galgaleah*), its rate in its orbit (*meruṣatah ma'egleah*), the inclinations of its path (*merḥave galileah*), and the deviation of its shadow (*neṭiyyat šal'leah*). ... The rising sign (*ha-šomeaḥ*) and the signs of the zodiac [in it, i.e. in the rising sign], its chords (*metareo*) and its angles (*yidotav*) at its four points (*pa'amotav*) [of the horoscope]...⁶⁴

60. A quotation from Isa 28:21. As regards biblical quotations in Hebrew poems and their value and meaning, see Cole, 2001: 35-36: «... the biblical quotation in the Hebrew verse can overpower by sheer strength or deception, and one must be alert to the particular spin of the implant, which —its loaded provenance notwithstanding— was used neutrally much of the time, though also for conscious allusive effect, and sometimes in an ironic manner».

61. A lunar eclipse can take place (although not necessarily) only when this condition is fulfilled, i.e. when the Sun and the moon are each placed in each of the two nodes.

62. According to the editor, this refers to the rise of the moon, see Bar-Tikva, 2009: 246 n. 202. I think that it refers to the rise of the sun, as only once the sun sets, the stars are clearly visible in the sky. This does not happen with the moon, because the stars are also visible when it is in the sky.

63. Bar-Tikva: 245-246 [poem 10, lines 180-205].

64. Reichert, 1965: II, 40-41 (the Hebrew text published by Obadia Sabak, Constantinople, 1578); cf. Reichert's English tr.: II, 96-97.

Interrogational astrology

When we stood before him, we said to him: tell us the question [we are thinking] and we will give you a reward. ... He hung (*talāh*) the astrolabe (*kle nehošet*) from his fingers and measured (*šaqal*) the sun in its orbit (*ma'eglotav*). He made the rising sign go (*hiššiv*) through the four angles (*yitdotav*) and determined (*haqaq*) the fate of every man (*kol koḳav 'iš*) according to his judgement of the signs (*dimmo be-'otiyotav*), almost as if the stars of Eden knelt down before him and sat with him on the earth.⁶⁵

Isaac ben Solomon ibn Sahula

The influence of stars in human life

Man was created to receive all of the accidents / that the fate of his destiny (*menat koso*) and lot (*helqo*) determine. // What was established (*hanigzar*) in his birth (*molado*) will happen to him: / his fortune (*mazzalo*), his aim (*megammato*), and his wish (*hišqo*). // One moment ('*et*) it [his horoscope] decided (*gazar*) that man walks in the heights, / and another moment ('*et*) that he desires bursting into flames his heart, // whether the star of his misfortune (*koḳav 'ašvo*) afflicted a man / or if his nativity (*molado*) decreed (*haqaqo*) his happiness.⁶⁶

Gluttony comes from the stars

If someone asks why someone devours without paying attention to his harm, // we should answer that his sin awaked his appetite / and the mood of his stomach. The reason for the awakening of his appetite, which / is the root of his illness, is the change in the time (*hithapḳut ha-zman*) / from one purpose to another purpose [already] determined (*me-'inyan l-'inyan nisman*). The reason for this change is / motion (*ha-tenu'a*), which depends on the sphere (*bagalgal qebu'ah*). The reason / for the motions of the sphere (*tenu'ot ha-galgal*) is magnificent and holy and is in the upper world (*ve-rum 'olam*). / They are reasons coming from the power of the Creator, / ...⁶⁷

Immanuel of Rome

Forecasting weather according to the sign of the month

What do you say at the beginning of Aries (*be-ro š Taleh*)? / The eastern wind (*qadim*) comes, God's wind rises from the desert. // What is the

65. Reichert, 1965: II, 41 (Hebrew text); cf. Reichert's English tr.: II, 99-100.

66. Loewe, 2004: II, 613 and 615, lines 656-659. Cf. Loewe's English translation *ibid.*: 612 and 614.

67. Loewe, 2004: I, 216, lines 690-697. Cf. Loewe's English translation *ibid.*: 217.

meaning of its rule? / It thunders with the voice of its majesty. // And the beginning of Taurus (*ve-ro 'š Šor*) and its stars? / Clouds and fog around it. // What is in the hand of Gemini? / They purify rain for its fountainhead. / What is the meaning of Cancer? / It collects wind in its hand. // What is the renown of Leo? / The lion is roaring in the jungle and does it not have prey? // What does Virgo say? / They unfold its dress. // And its stars in the sky? / They go out to get water. // In Libra? / Calming down its spirit, they lavish water. // And in Scorpio? / They lavish laughs, they pour many things upon men. // What about the Bow (*ve-qešet*) in the sky (*ba-šamayim*) [i.e. Sagittarius]? / It decreases the drops of water. // And the end of Capricorn (*ve-sof Gedi*) and its stars? / It confines water in its clouds. // What is the role of Aquarius? / The spirit of storm makes its command. // And the rule (*be-mamšelotav*) of Pisces? / Its elevation waters the mountains. // ⁶⁸

Astronomical and astrological values of Teli

I saw you, Teli, among the sages and I rose when I saw Teli in the world cleaving to the throne. When Teli moves (*mavriah*) from one extreme (*min ha-qaseh*) to the other, it makes equal (*maḥbir*) the latitudes of the luminaries (*merḥave ha-me'orim*), and places them closer (*va-išimem ḥaverim*), if they are far away, for it makes them join (*iḥabrem*). Furthermore, it is their pin (*vriḥam*); its Head (*ve-ro 'šo*) makes anything better (*maḥriv*), while its Tail (*u-znavo*) destroys (*maḥriv*)... ⁶⁹

Isaac ben Shlomo al-Aḥdab

Astrology is a rational knowledge

I know the planets (*koḳve leket*) in their orbits (*bi-msil-lotam*) / and the secret of the constellations (*sod mazzalot*), // the heavenly angles (*yitdot ma-rom*) and their meanings (*'ototam*), / and the remaining houses (*battim*) with their lots (*goralot*). // I let know their [proper] moments (*'ittotam*) to those who ask. / I am an expert in natal [charts] (*moladot*) and interrogational horoscopes (*še'elot*), // in understanding the reasons of the spheres (*galgal-le 'il-lot*), / and in any science of numbers. // Logic, physical sciences, and theology / are my foundations. // ⁷⁰

68. Yarden, 1957: I, 108-109 [6th *maḥberet*], lines 77-90. The different subjects of the sentences (it/they) may refer to the zodiac sign (it) or to the stars of the constellation (they).

69. Yarden, 1957: I, 225 [12th *maḥberet*], lines 186-188. Both poems are full of biblical quotations.

70. Raanan, 1988: 71-72, lines 48-52 [poem 13].

Selomoh Bonafed

Astronomical instruments: a linear astrolabe or a cross staff

Voice of the spheres (*reqi'im*), yell, / moving Intelligences (*meni'im*) [of the spheres], wander (*ve-nudu*), / poles (*qeṭavim*) fixed in the heights (*be-marom neṭu'im*), / shake (*ve-ḥirdu*). // ... He makes the comet (*ve-koḵba' dešaviṭ*) / fall with a rod / of ridicule, [with which] he observes (*ve-yabiṭ*) / the movements of the spheres (*tenu'ot reqi'im*) // ...⁷¹

Heavenly axes

The sun of glory went down in our west, / why did it not rise in the sphere ('*al ḥug*) revolving around us (*mesibenu*)? // Were the poles of its spinning [the sun's] (*qetabe gelilah*) removed from the sphere (*mi-zbul*)? Or did it hide between our clouds and our gray sky?⁷²

I hate so much the heart of this who scorns me, that I would refuse / to become a sphere (*heyot galgal*) if he were my axis (*qeṭovi*).⁷³

The motion of the Earth?

Shall my grief make the glory of my prince come back to me/ and the axis (*galil 'eres*) and the sphere (*ve-ḥugah*) of the Earth spin around him?⁷⁴

71. Nirdamim, 1946: IV, 43, lines 1 and 7. Cf. Sáenz-Badillos' translation, 2000: 202. In the first part of the fragment quoted (which is making fun of his enemy's arrogance), the poet is asking the heavenly beings to perform deeds that are contrary to their natures and purposes (the music of the spheres is a yell, the Intelligences move their spheres aimlessly, and the poles cannot be the axis of any movement, since they shake). The instrument alluded to in the poem as a rod must be either a linear astrolabe or the instrument whose invention is credited to Levi ben Gerson (cross staff or Jacob's staff), who also wrote two poems about it, see Goldstein, 1985b: 71-72 (English tr.) and 265-264 (Hebrew ed.). As regards the linear astrolabe, see Charette, 2003: 305.

72. Bejarano, 1989: I, 105 [lines 1-2]; cf. Bejarano's translation: II, 2-3.

73. Bejarano, 1989: I, 290 [line 4]; cf. Bejarano's translation: II, 210.

74. Bejarano, 1989: I, 327 [line 36]; cf. Bejarano's translation: II, 260.

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