



HAL
open science

Arab stars in the Castilian sky: Al-Sūfī's Book of Fixed Stars amongst the manuscripts of Alfonso X

Laura Fernandez Fernandez

► **To cite this version:**

Laura Fernandez Fernandez. Arab stars in the Castilian sky: Al-Sūfī's Book of Fixed Stars amongst the manuscripts of Alfonso X. Stars in the Classical and Medieval Traditions, 2019. hal-02554120

HAL Id: hal-02554120

<https://hal.science/hal-02554120v1>

Submitted on 27 Apr 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Arab Stars in the Castilian Sky: Al-Sūfī's *Book of Fixed Stars* amongst the Manuscripts of Alfonso X

Laura Fernández Fernández
(Complutense University, Madrid)

Introduction

The *Libro de las figuras de las estrellas fixas* is the first treatise of the *Libro del saber de astrología* (LSA), one of the most important scientific compilations commissioned by King Alfonso X el Sabio, 'the Learned'.¹ This treatise is an adapted version of the al-Sūfī's *Kitab uwar al-Kawākib al-Thābita* (*The Book of the Fixed Stars*). As such, al-Sūfī's text and its illustrations form a key component of the representation of the constellations contained within Alfonsine astronomical and astrological manuscripts.²

The LSA is currently held in Madrid at the Complutense Historical Library (Madrid, UCM, BH Ms 156). It was the result of a lengthy project, which was initiated in the early years of Alfonso's reign and lasted several decades. Work on the text started in the mid-1250s, when Alfonso commissioned the translation of a series of books on astronomical and astrological subjects, among them the *Libro de las figuras de*

This research was done in the framework of the project ALFA from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 723085).

This chapter is a revised and extended version of part of a paper that, although presented years ago, has been recently published in FERNÁNDEZ 2018. I would sincerely like to thank Alena Hadravová and Petr Hadrava for giving me the opportunity to participate in the present volume, and to Kristen Lippincott for her careful and precise review of the text.

¹ *Libro del saber de astrología* (*Book of knowledge of astrology*) is the name of the book as it appears in the original text, but it was printed for the first time in 1867 by Manuel Rico y Sinobas under the title *Libros del saber de astronomía* (RICO Y SINOBAS 1863–1867). Regarding the question of the title, see CÁRDENAS 1980 and FERNÁNDEZ 2013, p. 214.

² This Persian astronomer, 'Abd al-Rahmān al-Sūfī (c. 903–986), made a revision star catalogue, which appears in Books 7 and 8 of the *Syntaxis mathematica* (or *Almagest*, as it came to be known), of Ptolemy. The work is titled: the *Kitab uwar al-Kawākib al-Thābita*. Al-Sūfī studied the parts of Ptolemy's work which focused on constellations and made amendments where he deemed his own observations to be more accurate than those of the Alexandrian astronomer. Also, he updated the Classical constellations combining them with those present in the pre-Islamic culture and established a specific iconography for each constellation from the basis of the Ptolemaic images, setting the number of stars included in each constellation and the qualities of each of them. For additional information, see WELLESZ 1964; KUNITZSCH 1986; SAVAGE-SMITH 1992; CAIOZZO 2003 and CAREY 2001.

las estrellas fixas (1256).³ These texts, along with other writings, which were translated and redacted *ex novo* in the royal scriptorium over the succeeding years, were revised and expanded in order to include them in the aforementioned compilation, the final version of which was completed in 1278 in the city of Burgos.⁴

The sixteen treatises that make up the book are grouped into three main thematic blocks: 1) the analysis of constellations,⁵ 2) the scientific instruments used for the study of the stars and the application of these tools,⁶ and 3) a discussion of differing time-measurement systems.⁷ Each of the sixteen treatises is introduced by a prologue, which provides detailed information about the writing process of each section, as well as a discussion of the general issues related to the production of the work. As such, they often provide the names of the scholars who participated in the production of the texts, either by working on the translations or by making additions to them. The prologues also connect the monarch directly with the creative process by mentioning him either in the third or the first person, underscoring his role as the promoter of the project and, occasionally, suggesting that he participated directly in the process.

The *Libro de las figuras de las estrellas fixas*

[...] *Este es el libro de las figuras de las estrellas fixas que son en el ochauo cielo. que mando trasladar de caldeo et de arábigo en lenguaje castellano el Rey D. Alfonso [...] et trasladólo por su mandado Yhuda el Cohen. so alphaquin. et Guillen Arremon Daspa. so clérigo. Et fue fecho en el quarto anno que reynó este Rey sobredicho. que andaua la era de Cesar en mil doscientos et nouenta et quatro annos. Et despues lo endereço. et lo mandó componer este Rey sobredicho (...) et quanto en el lenguaje endereçólo él por si. Et en los otros saberes ouo por ayuntadores á maestre Joan de Mesina et á maestre Joan de Cremona. et a Yhuda el sobredicho. et a Samuel; et esto fue fecho en el anno XXIV de su reynado. et andaua la era de Cesar en M. et CCC. et. XIII. annos et la de nuestro Sennor Jesu Xpo. en M. et. CC. et. LXX. et. VI annos.*

³ These early texts were the *Libro de las figuras de las estrellas fixas* (1256), *Libro de la açafeha* (1255–1256) and *Libro dell alcora* (1259).

⁴ For a study on the content of the different treatises included in the *Libro del saber de astrología*, see RICO Y SINOBAS 1863–1867; CÁRDENAS 1974; COMÉS – SAMSÓ 1985; COMÉS – SAMSÓ 1990 and FERNÁNDEZ 2013. For a detailed study of the codex, see CÁRDENAS 1974; CÁRDENAS 1986; FERNÁNDEZ 2010; FERNÁNDEZ 2013, pp. 213–279 and FERNÁNDEZ – CHICO 2019, pp. 751–756. The manuscript can be consulted on Biblioteca Digital Mundial web portal: <https://www.wdl.org/es/item/15401/>.

⁵ Part I: *Libro de las figuras de las estrellas fixas* (*Book of the figures of the fixed stars*).

⁶ Parts II–XI + XVI: *Libro dell Alcora* (*Book of the globe*), *Libro de las armellas del ataçyr* (*Book of the rings of the ataçyr*), *Libro del astrolabio redondo* (*Book of the spherical astrolabe*), *Libro del astrolabio llano* (*Book of the plane astrolabe*), *Libro de la lámina universal* (*Book of the universal astrolabe*), *Libro de la azafea de Azarquiel* (*Book of the astrolabe of Arzachel*), *Libro de las armellas* (*Book of the armillary sphere*), *Libro de las láminas de los siete planetas* (*Book of the plates of the seven planets*), *Libro del cuadrante* (*book of the quadrant*), *Instrumento para hacer el ataçyr* (*Book of the ataçyr*).

⁷ Parts XII–XV: *Tratado de la piedra de la sombra* (*Book of the Stone of shadow – sundial clock*), *Libro del reloj de agua* (*Book of water clock – clepsydra*), *Libro del reloj del argento vivo* (*Book of mercury clock*), *Libro del reloj de la candela* (*Book of candle clock*), *Palacio de las horas* (*Book of the Hours Palace – sundial clock*).

'In the name of God, Amen. This is the book of the figures of the fixed stars that are found in the eighth heaven, which was translated from Chaldean and Arabic into Castilian language by commission of King Alfonso, son of the most noble King Fernando, and of the noble Queen Beatrice, and Lord of Castile, Toledo, León, Galicia, Seville, Cordova, Murcia, Jaén, and the Algarbe. And it was translated by Yhuda son of Cohen, his alfaquim, and Guillen Arremon Daspa, his cleric. And this was done in the fourth year of the reign of the above-mentioned King, which was at the time of the one thousand and two hundred and ninety and fourth year of Caesar's era. And after that, he straightened it. And the above-mentioned King mandated that it be composed, and he cut the words that he understood were superfluous, and repeated, and that were not in correct Castilian. And he put in others that he thought fit in. And regarding the language, he corrected that himself; and in the other knowledges, he had as compilers master Joan of Mesina, and master Joan of Cremona, and the above mentioned Yhuda, and Samuel. And this was done in the 30 year of his reign, which was at the time of the 1314 years of Caesar's era, and in 1276 years of Jesus Christ era.'⁸

As one can see, the prologue of the *Libro de las figuras de las estrellas fixas* documents the different stages of the project. The first translation of this text 'from Chaldean and Arabic' was made in 1256 by Yehudá ben Mōsé, one of the most important Jewish members of the Royal *scriptorium*, and Guillén Arremón Daspa, a clergyman. Although there is no surviving physical evidence of this first translation, in all likelihood, it remained in a draft format to be used by the scientific workshop. Two decades later, several collaborators were involved in its revision and adaptation for the new compilation. This was carried out by the aforementioned Yehudá, two Italians (Joan de Mesina and Joan de Cremona), another Jewish contributor, Samuel and, if we read carefully, there is the suggestion is that even the Monarch himself participated in the revision of the Castilian language.⁹

This prologue is the only one in the *LSA* that does not provide information on the original source which served as starting point for the Alfonsine text, although traditionally it is thought that it was a translation of the *Book of Images of the Fixed Stars* written by Persian astronomer al-Sūfī. Mercé Comes, however, has established that, although the translation of al-Sūfī served as the main basis for the Alfonsine text, the latter should not be interpreted as a literal translation, but more as a free interpretation of the original. Moreover, Comes's study confirmed that, in addition to the Arabic text, fragments from other sources – not all of which have been identified – were introduced. Furthermore, in addition to the Arabic sources, the Latin translation of the *Almagest* by Gerard of Cremona, completed in Toledo a few years earlier (1175), was

⁸ RICO Y SINOBAS 1863–1867, vol. I, pp. 7–8. The English translation is mine.

⁹ The role of the King as 'editor' or 'corrector' of his texts, and his deliberate involvement in the development of the Castilian language, has been one of the most frequently mentioned and debated subjects in the field of the Alfonsine studies. The question is directly related to the prologue of the *Libro de las estrellas fixas*, which relates (according to Rico y Sinobas's edition), how the King *tolló las razones que eran sobejanas et dobladas, et que non eran en castellano drecho* ('the King removed the phrases that he thought were superfluous and duplicated, and that were not in correct Castilian'). For a study of this interesting issue, see GARCÍA SOLALINDE 1915; CANO 1985; CÁRDENAS 1992 and FERNÁNDEZ 2013, pp. 36–38.

also used. Therefore, Arabic and Latin sources were used jointly in the production of the text.¹⁰

The text is divided into four sections, the first three of which are devoted to the description and depiction of the constellations: northern, zodiacal and southern. The final section, titled the *Cuento de las estrellas*, works as a kind of summary of the preceding three sections and includes a discussion of the stars that are included on Ptolemy's astrolabe (fig. 1). The first three sections begin with a brief prologue, followed by a descriptive text regarding each constellation quoting its name in Castilian, Latin and Arabic (and, sometimes, in Greek), with the express purpose of making this book the most complete and meticulous ever written on the subject. In each case, this information consistently appears on the verso of a folio.¹¹ Next – on the recto of the following/facing folio – the positions of all the stars in the constellation are described in relation to their figurative representation. The image of the constellation is set in the middle of a wheel or 'rota', the *rueda*, with the stars marked as small dots on the figure (fig. 2). Information about each star position within the figure of the constellation, its magnitude, latitude and longitude, and its features according to its dominant planets (hot and dry, or cold and wet), is specified in radial strips of text running from the central image to the edge of the rota. Therefore, instead of using an independent table to list this data, as one sees in al-Sūfī manuscripts, the *rueda* itself becomes the table. This type of wheel is a visual scheme frequently used in Alfonsine scientific manuscripts, becoming a very efficient formula of combining text and visual information.¹²

One aspect of this design worth noting is how the layout – one side of the folio for text and one for the wheel – is consistent throughout the manuscript, regardless of the number of stars that make up each constellation, which ranges from over forty (*Pisces*) to only two (*Canis minor*). This detail, first pointed out by Comes and Samsó,¹³ supports the argument that the manuscript was created with a strong aesthetic purpose; and that, in order to avoid alterations in the *mise-en-page* of the manuscript, complementary sources were used, extended or reduced depending on the space available, so that the 'text-side' of the folio would always be covered. As I have recently suggested, the content of the text in this manuscript is sub-servient to the overall design-concept of the book. Thus, in this case, instead of using the text solely for an informational

¹⁰ COMES 1990, p. 27 and COMES 1991–1992.

¹¹ According to the oldest copy of the *LSA*, this layout had to be different in the first lost part of this treatise since the extension of the prologue displaced the text one page, leaving the explanation of the constellation in the recto and the image in the verso. This lack of coordination of text and image was resolved at the beginning of the descriptions of the zodiacal constellations.

¹² The Alfonsine wheels take up this visual composition from ancient motifs and perfect it in function of the needs of the text, converting them into sophisticated elements of synthesis that provide in a single glance the necessary information of each constellation. This formula is used in the *Lapidario*, *Libro del saber de astrología* and *Libro de astromagia*. For more information about the *rueda*, see FERNÁNDEZ 2013, pp. 180–188.

¹³ COMES – SAMSÓ 1988; COMES 1990, p. 28.

purpose, the narrative discourse has been determined by the sophisticated aesthetic demands of the book itself¹⁴.

The iconography of the constellations in Alfonsine manuscripts

It is known that the Alfonsine iconography of constellations stems from the figurative tradition deriving from the illustrations to al-Sūfī's *Book of the Fixed Stars* which, as mentioned, served as the primary source for the *Libro de las figuras de las estrellas fijas*. It is not known whether the first Castilian translation of the al-Sūfī's book made in 1256 was illuminated, but it is clear that the members of the Alfonsine *scriptorium* were aware of al-Sūfī's iconography since that time.

Sadly, the *Libro de las estrellas fijas* in the Complutense manuscript was severely damaged and most of the images of constellations in it have disappeared.¹⁵ Thanks to the several copies made before the manuscript was mutilated, however, we can easily compare the iconography of Alfonso's book with examples from al-Sūfī manuscripts, leaving no doubt about their connection.¹⁶ In addition to the *LSA*, there is the set of images of the constellations included in the *Lapidario* (El Escorial, RBME Ms. h-I-15), another scientific book commissioned by the King, in fact, the first translation he ordered. There are also the zodiacal pictures that appear in the *Libro de astromagia* (Cittá del Vaticano, BAV Ms. Reg. Lat. 1283a, ff. 1–36), which is devoted to magical practices and one of the last compendia made by the royal *scriptorium*.

The *Lapidario*¹⁷ is a collection of four 'lapidaries', books concerning the magical properties of stones, all of which can be credited to the Alfonsine milieu. The text gathers together the Greek tradition of the study of stones, their properties and medicinal applications (following the guidelines drawn up in Book V of Dioscorides's *Materia medica*), in addition to their healing properties in keeping with the influence of the stars. Although essentially Aristotelian in outlook, the text also draws upon the influence of both Aristotelian and Islamic scientific trends – thus offering a wider approach to the study of stones and their applications under the influence of the stars.

¹⁴ FERNÁNDEZ 2018.

¹⁵ The only constellations that were not cut are Piscis (Piscis Austrinus), Rio (Eridanus) and Corona Meridional (Corona Meridionalis).

¹⁶ For a detailed study of the *LSA* copies see FERNÁNDEZ 2013, pp. 252–278.

¹⁷ The bibliography of the *Lapidario* is very extensive. For the essential titles for the study of the text, the illumination, and the manuscript, see: DIMAN – WINGET 1980; *El Primer Lapidario* 1982; DOMÍNGUEZ RODRÍGUEZ 1984; AMASUNO 1987; SÁNCHEZ PRIETO 2014 and FERNÁNDEZ 2013, pp. 135–211.

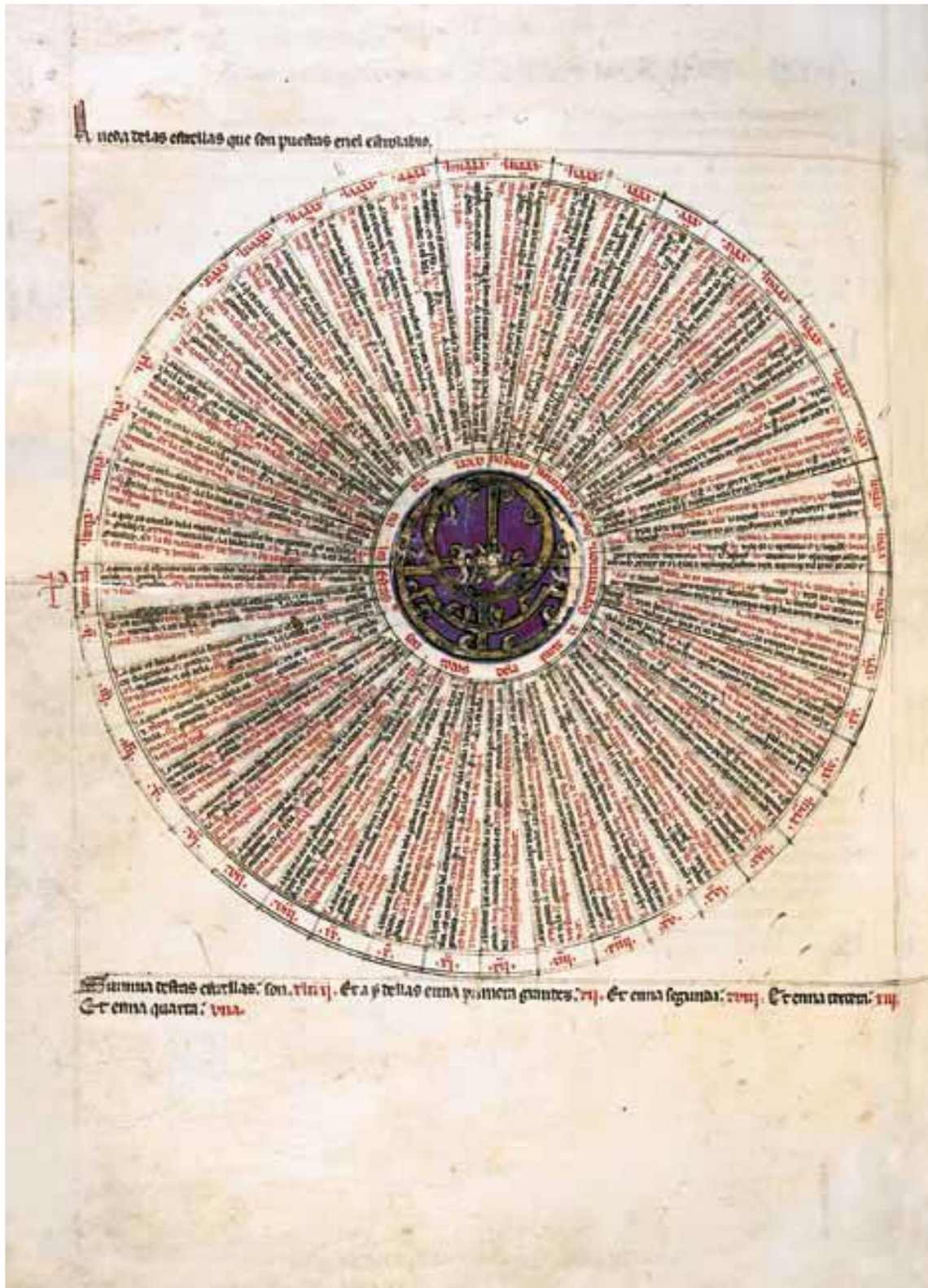


Fig. 1: *Libro del saber de astrología*, 'Rueda de las estrellas que son puestas en el estrolabio', Madrid, BH UCM, Ms. 156, f. 25v. © UCM



Fig. 2: *Libro del saber de astrología*, 'Rueda de las estrellas de pisces', Madrid, BH UCM, Ms. 156, f. 4r. © UCM

According to the prologue of the first *Lapidary*, an Arabic book had reached Alfonso in the city of Toledo when he was still 'Infante'. Advised by his physician, Yehudá ben Mošé, of the importance of the book, Alfonso decided to commission its translation into Castilian. The mission was entrusted to Yehudá himself together with a clergyman, Garcí Pérez, also a regular collaborator in the royal *scriptorium*. According to the prologue, both were experts in the field of astronomy, 'arte de la astronomía'. They completed the first translation of the book between 1243 and 1250, and – on the basis of that first translation – work continued to develop and new refinements were incorporated to update the content of the *Lapidario*, which finally emerged as the richly illuminated manuscript we can admire today in around 1270–1275.

The two first *Lapidaries* analyse the influence of the zodiac on certain stones, a narrative which was enriched with a magnificent visual repertoire illustrating the findings of these influences, alongside depictions of the constellations and zodiac signs that determined their properties in the first one, and of the decans in the second. The third *Lapidary*, unfortunately unfinished, was meant to illustrate the relationship between the stones and the planets, while the fourth *Lapidary*, which describes the physical properties of the stones and how can change in contact with water, does not include figurative illumination, just pen-flourished initials. In addition to these illustrations, the manuscript opens with an image depicting Aristotle, one of the key authoritative references in the text, addressing his disciples from a chair. Immediately below his figure, there is a rendering of Don Alfonso attended by two male figures, probably the translators of the work mentioned in the prologue. The close physical juxtaposition of the two images serves to signal an intended connection between them (fig. 3).¹⁸

The depictions of the constellations play a dominant role in the first *Lapidary*. The structure of the treatise is based on the 12 zodiac signs, each one of which is divided into 30 degrees. In turn, each degree is linked to a specific star in a related constellation and each of these stars exerts its influence on a particular stone. The connection between a given degree of the zodiacal sign and a specific star in a constellation is reinforced by its depiction, which appears immediately after the description, and explanation of the use of the stone. At the end of each zodiacal section, there is a large *rueda* in which the zodiac sign figures in the centre of a wheel that is divided into segments of 30 degrees. Each segment contains the depiction of the pertinent constellation whose star corresponds to that degree (fig. 4). All the representations of the individual constellations follow the iconography established by al-Sūfi's star catalogue. The *Lapidario*, then, exists as the oldest surviving example of al-Sūfi's pictorial tradition preserved within a specifically Alphonsine context.¹⁹

The *Libro de Astromagia* is a *compendium* of astral magic, which was begun around 1280. This enigmatic manuscript, sadly unfinished and partially preserved, is also a richly illuminated book. Amongst its treatises is the only remaining fragment of the Castilian translation of the *Picatrix*, as well as a series of texts devoted to the zodiac

¹⁸ For this image, see CARDOSO GONÇALVES 1929, p. 32; DOMÍNGUEZ RODRÍGUEZ 1984, pp. 10–12 and FERNÁNDEZ 2013, pp. 164–167.

¹⁹ This direct connections amongst the *Lapidario*, the *Libro de las estrellas fijas* and Al-Sūfi's book have been studied by DOMÍNGUEZ RODRÍGUEZ 1984, GARCÍA AVILÉS 2007, and FERNÁNDEZ 2013.

signs and the planets from differing sources. The depictions of the zodiac signs within this compilation also follow the same iconography that the *LSA* and the *Lapidario*²⁰.

Returning to al-Sūfī's book, in the illustrations that accompany his stellar tables, the Persian astronomer introduced an interesting innovation in that each constellation is depicted twice – in mirror-image versions²¹. The first represents the constellation as it is seen in the sky from the earth (or the so-called 'sky-view'); the second records the constellation as it is seen from outside the sphere of the fixed stars, or as it would appear on the surface of a celestial globe (the so-called 'globe-view').²²

Moya Carey has noted that these figures played an essential role as mnemonic devices to help students to memorise constellations, mapping the entire sky in forty-eight figures. Indeed, at the end of his text, al-Sūfī himself specifies the pedagogical value of these figures, which were 'designed to assist the student of astronomy'.²³

In the *Libro de las estrellas fixas*, however, as well as in the other mentioned Alfonsine examples, the constellations are represented only by one figure, most of which follow the requirements associated with the so-called 'globe view'.²⁴ This decision, as the text explains, appears to be a deliberate choice in response to a specific didactic purpose:

Et cuemo quier que sean mas uerdaderas las del cielo que estas que son de pintura en la alcora, pero porque los sabios dieron carrera et mostraron que por las dell alcora se podrian mas connoscer las del çielo, por eso fablamos primero dellas segun parescen en ell Alcora.

'The figures of the sky were more authentic than those depicted in the celestial globe, but because scholars showed that the figures in the celestial globe provided a better

²⁰ WARBURG 1966 [1920]; GARCÍA SOLALINDE 1926; PINGREE 1981; D'AGOSTINO 1992; GARCÍA AVILÉS 1996, 1997, 1999, 2001 and 2006–2007 and FERNÁNDEZ 2013, pp. 289–319.

²¹ Although al-Sūfī refers to an earlier illustrated book on the constellations, the one made by Utārid, scholars agree that providing two illustrations of each constellation was provably al-Sūfī's innovative contribution. CAREY 2001, p. 112, pointed out that in the preface al-Sūfī mentioned that 'Utārid mistakenly depicted Sagittarius facing east', and from this remark, it does not appear that Utārid provided more than one image of the constellation. In fact, al-Sūfī himself said 'we see the stars in their true position, because we look upwards from the centre of the globe... and it is for this reason that we have included both positions; for otherwise the beholder might be confused if he saw the figure on the globe differing from what he sees in the sky. If we want to see the constellations in their true state we must raise the page over our head and look at the second figure from underneath. We shall then see it conforming to what is found in the sky.' SCHJELLERUP 1874, pp. 45–46, cf. WELLESZ 1959, p. 5.

²² The manner in which constellations are to be drawn on a globe considering left and right in Antiquity is analysed by DEKKER 2013, pp. 34–37.

²³ CAREY 2001, p. 78. For further information of al-Sūfī's Uranography see DEKKER 2013, pp. 286–307.

²⁴ 'Except for the following constellations: Corona borealis, Lyra, Cignus, Delphinus, Andromeda, Libra, Canis minor, Argo and Piscis austrinus which appear as they are seen on the sky; and for Sagitta, Triangulum, Cancer and Crater, the pattern of which is difficult to identify'. See COMES – SAMSÓ 1988.

understanding of the figures in the sky, for that reason we (the Alfonsine team) talk first of them.'²⁵



Fig. 3: *Lapidario*, opening image with Aristotle teaching his students and an historiated initial with Alfonso X and his collaborators, El Escorial, RBME, Ms. h-I-15, f. 1r. © Patrimonio Nacional

²⁵ RICO Y SINOBAS 1863–1867, vol. I, p. 15.

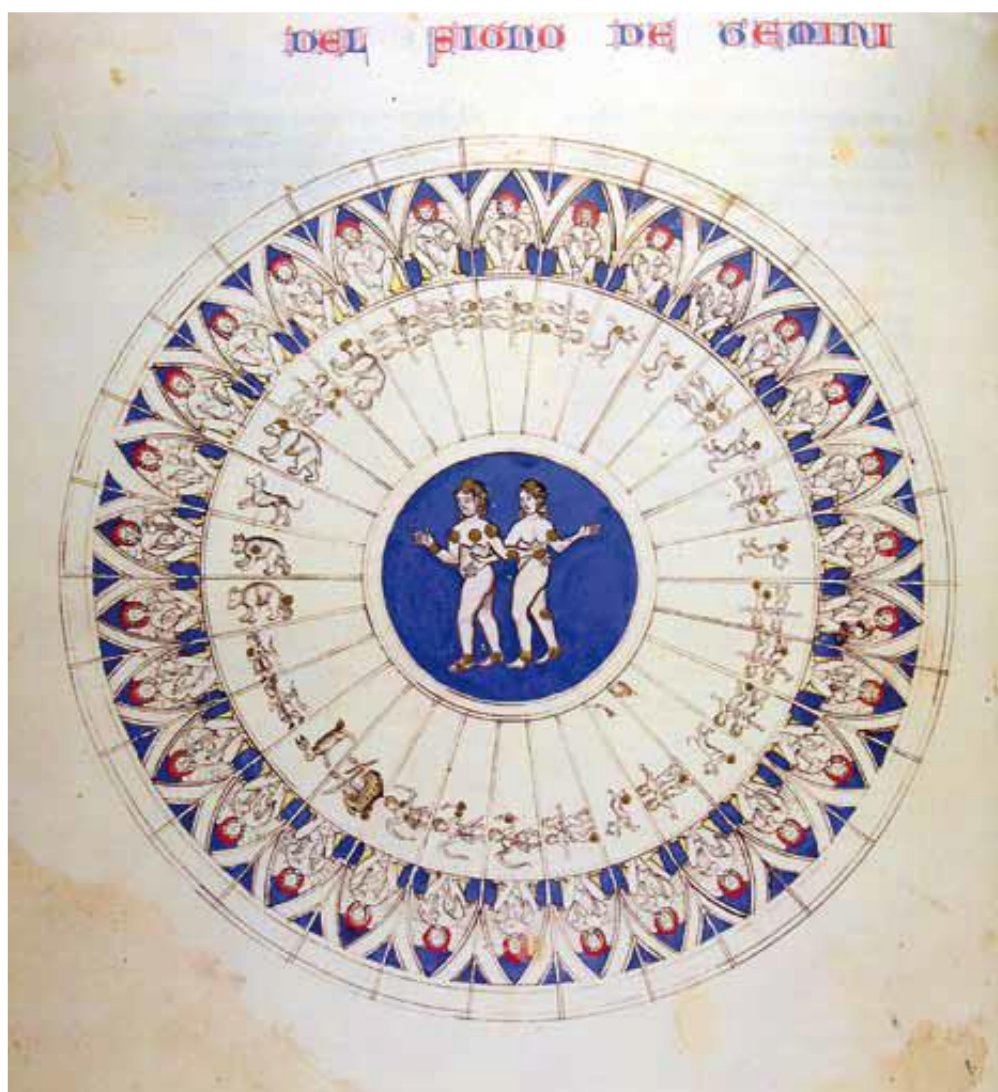


Fig. 4: *Lapidario*, 'Rueda de Géminis', El Escorial, RBME, Ms. h-I-15, f. 30v. © Patrimonio Nacional

Although no celestial globe made in the Alfonsine court has been preserved, this instrument must have been well known in the Castilian court.²⁶ As Emilie Savage-Smith asserts, 'every wealthy gentleman and prominent ruler would have had a globe as part of his library';²⁷ and there are several indications that Alfonso X had one celestial globe in his collection. For example, one of the treatises of the *LSA* – the *Libro dell alcóra* – deals specifically with the construction and use of a celestial globe.²⁸ The

²⁶ For celestial globes in the medieval Iberian Peninsula, see SAMSÓ 2005.

²⁷ SAVAGE-SMITH 2013, p. 153.

²⁸ The first 'translation' was made by Yehudá ben Mošé and Johan Daspa in 1259. It was later revised, apparently by the same translators, and enriched with the new chapters redacted by Rabiçag (Isaac ben Sid) in 1277. See SAMSÓ 2005, pp. 66–69, FERNÁNDEZ 2013, pp. 225–226 and FERNÁNDEZ 2018, p. 391. Spanish text of this treatise has been published by RICO Y SINOBAS 1863–1867, vol. I, pp. 166–167.

text itself based on Qustā ben Lūqā's book *Risāla fī'l-'amal bi'l-kura al-falakiyya*,²⁹ and includes four chapters concerning the construction of a celestial globe redacted *ex novo*, in all likelihood by Rabiçag de Toledo, who probably used the *Almagest* as his primary source of inspiration.³⁰ It describes every stage of the globe's production, from the drawing of its shape with a compass to the depiction of the figures of the constellations on its surface, and demonstrates what must have been a high level of interest in this process at the Alfonsine court.³¹ There is also a text, which is dated 1347, in which a 'Parisian astronomer', recently identified as Geoffrey of Meaux³², claims to have seen not only a Castilian version of the Alfonsine *Book of the Fixed Stars* taken from the King's bookshelves, but also a celestial globe that had been made for Alfonso himself.³³ Beyond the rhetorical flourish of turning the King into the maker of the globe, the noting of the existence of a celestial globe at the Alfonsine court is also of considerable interest as it might well be related to the representations of constellations in contemporary Alfonsine manuscripts (as is discussed below).

As for the iconography of the constellations themselves, images in the surviving al-Sūfī manuscripts show that he tended to adapt the classical representations of each figure with specific elements originating from the Islamic tradition, as well as with a number of astronomical innovations that were introduced by his own revisions of Ptolemy's catalogue. Some of these variations include the transformation of a few constellations by combining two systems of representation: the Classical and the Islamic one. For instance – as was pointed out by Saxl and Panofsky several decades ago – in the constellation of *Perseus*, the head of Medusa was replaced by the head of a

²⁹ SAMSÓ 2005.

³⁰ SAMSÓ 2005, p. 70.

³¹ 'Although the Castilian text does not state it explicitly, the implication is that the Alfonsine globe probably aimed to depict the full set of stars listed in star catalogues (class A in Savage-Smith's classification of Islamicate celestial globes)'. Cited from SAMSÓ 2005, p. 69.

³² NOTHAFT 2015. I would like to thank Nick Jacobson from ALFA project for sending me this article.

³³ MS B, f. 212va: *Vidi namque librum stellarum fixarum scriptum in Hispanico continentem radices stellarum fixarum eodem modo cum tabulis. Qui liber extractus fuit de armario Regis Alfontii, sicut dixit mihi ille qui extrahi eum procuravit. Vidi etiam stellas fixas situatas isto modo in spera solida facta pro ipsomet Alfontio.* This passage was previously cited in J. D. North, 'The Alfonsine Tables in England', in ΠΙΡΙΣΜΑΤΑ, ed. by Y. Maeyama and W. G. Saltzer (Wiesbaden: F. Steiner 1977), 269–301, pp. 289–90, where he misreads '*sicut dixit*' as '*Servus (?) dixit*'. Cited from NOTHAFT 2015, p. 94. For this interesting data, see also NORTH 1986, pp. 470–471; COMES – SAMSÓ 1987, p. 39; CHABÁS – GOLDSTEIN 2003, pp. 247–248 and FERNÁNDEZ 2016. As Chabás and Goldstein have pointed out, it is unclear whether this book was seen in Castile or in Paris, but Nothaft considers that: 'Since our author makes no allusion whatsoever to having visited the Iberian Peninsula, it would seem that a copy of the *Libro* — together with a celestial globe based on it — had been removed from the King Alfonso's private library and transported to France at some point between the 1270s and 1347' (NOTHAFT 2015, p. 82). Although one cannot rule out the presence of a Parisian astronomer in the Castilian court after the *LSA* was finished, this hypothesis can be reinforced recognise the connection with the Italian copy of the *LSA* that was carried out in Seville in 1341. The study of this connection is part of a forthcoming study, see FERNÁNDEZ (forthcoming).

demon *Ra's al-Ghul* (literally, 'the Head of the Demon');³⁴ and the figure of Andromeda incorporates depictions of two fish, which have been derived from the constellation of the Great Fish, which appears in this part of the sky according to the Bedouin tradition.³⁵

In addition to these iconographic adaptations, al-Sūfī's forms also altered the basically Greco-Roman aesthetic and attributes assigned to each figure, adapting them to reflect a more 'Eastern' style of depiction. Conversely, when these 'Eastern' figures were subsequently redrawn by artists in the Alphonsine *scriptorium*, they added a decidedly Western touch, more suited to the cultural context and the audience for which this visual repertoire was designed, while simultaneously respecting al-Sūfī's iconographic structure.

Having spoken of an iconographic tradition stemming from the star catalogues of al-Sūfī, it is important to point out that this was not – as previously thought – a single, homogenous set of pictorial conventions. Indeed, there are essentially two main iconographic traditions.³⁶ As Emmy Wellesz has shown, one of these two traditions, 'Group B', 'follows classical usage more closely', while the 'Group A' introduces significant changes brought about by the incorporation of elements characteristic of the Bedouin tradition. Both groups also introduce variations and sometimes even rely upon other Classical sources, such as the *Aratean* manuscripts or ancient celestial globes, in addition to the more conventional imagery derived from Ptolemy.³⁷

One of the constellation figures that best illustrates this dual visual tradition is the constellation of Virgo. In one group of al-Sūfī manuscripts, the depiction of Virgo remains closer to the Classical heritage, where the wings of Virgo have been preserved. In the other line of dissemination, the wings are absent and the figure adopts a somewhat awkward pose as the result of needing to incorporate one of the stars, which was traditionally included in the wing, into the shoulder – so that part of the body and shoulder are raised and the head is tilted.³⁸ This variation³⁹ features in the al-Sūfī manuscript in the Bodleian Library (Marsh. 144, ff. 223–224), which traditionally had been considered the oldest surviving version of the text as it bears a date of 400 AH (1009–1010 AD),⁴⁰ and it is this iconography of the wingless shoulder-hunching Virgo

³⁴ SAXL – PANOFKY 1913, p. 41.

³⁵ WELLESZ 1959; SAVAGE-SMITH 1992, p. 52.

³⁶ Even though one can outline two main traditions in the iconographical dissemination of al-Sūfī's manuscripts, this differentiation is not always constant, as there are variations which connect both groups. Therefore, there are several iconographical groups and lines of dissemination (WELLESZ 1959, p. 23). These iconographical and stylistic variations have been recently updated by CAREY 2001, pp. 121–122.

³⁷ WELLESZ 1959, p. 23, WELLESZ 1965, p. 5 and CAREY 2001, pp. 121–122.

³⁸ According to BERLEKAMP 2011, pp. 123–25, Virgo was transformed into a 'dancing girl'.

³⁹ WELLESZ 1959, p. 10, thought that the wingless Virgo finds no parallel in antiquity but there is one on the Kugel globe. I thank to Kristen Lippincott for this information. See LIPPINCOTT at <https://www.thesaxlproject.com> (June 2019).

⁴⁰ The manuscript has a colophon dated 400 AH, which current scholars believe to be a latter 'fraudulent' addition.



Fig. 5: *Lapidario*, Perseo and Casiopea, El Escorial, RBME, Ms. h-I-15, f. 9v. © Patrimonio Nacional



Fig. 6: *Lapidario*, Virgo and Engonasín, El Escorial, RBME, Ms. h-I-15, f. 56v. © Patrimonio Nacional

that was passed on to the Latin West via the series of manuscripts known as the *Sufi Latinus*.⁴¹ Several scholars, however, have disputed the legitimacy of the inscription and, therefore, the early dating of Marsh. 144. They argue that it belongs stylistically to a much later period, perhaps as late as the end of the 12th century AD.⁴² There is, however, a variant tradition for the depiction of Virgo that appears in what is now considered by many to be the oldest surviving manuscripts of al-Sūfi's stellar tables: Ms. 2.1998, 1125 in the Museum of Islamic Art in Doha, which was made in Baghdād and is dated 519 AH (or April 1125 AD).⁴³ In the Doha manuscript, Virgo retains her

⁴¹ KUNITZSCH 1986, pp. 71–74; GOUSSET 1985, pp. 37–38; DOLAN 2017, pp. 179–181.

⁴² See, for example, BREND 1994 and SOUDAVAR 1999, pp. 262–263, the latter who described the manuscript as a ‘semi-fake’. Emilie Savage-Smith has suggested that Marsh. 144 was made at the end of the 12th century, rather than in 1009–1010 AD, and that the Virgo variation without wings is due to a misunderstanding generated by an illuminator who was not an astronomer – so the manuscript was not completed by either al-Sūfi or his son, who would have recognised that the wings of Virgo are named in the text and, consequently, are required for the depiction of the constellation. See SAVAGE-SMITH 2013, p. 152. Moreover, if this chronology is accepted, then Marsh. 144 would no longer be cited as the oldest al-Sūfi manuscript with this Virgo variation, since the al-Sūfi manuscript in Istanbul (Topkapı Sarayı Müzesi, Ms Ahmet III 3493, dated in 1131) also presents Virgo without wings.

⁴³ According to Savage-Smith, ‘the MIA [Museum of Islamic Art manuscript] is not only the most authoritative copy, but also the oldest copy, of what came to be one of the most influential treatises in the history of astronomy’. See SAVAGE-SMITH 2013, p. 153; for additional information

wings in accordance with both the Ptolemaic tradition and in some variants of Latin *Aratean* manuscripts, in which Virgo is described as a woman advancing with her wings outspread.⁴⁴

These distinctive features, such as the winged Virgo, have been thoroughly studied by scholars specialising in the Islamic tradition of constellation iconography, but they are also important for the analysis of manuscripts commissioned by Alfonso X as the whole Alfonsine corpus includes the version of al-Sūfī's iconography that remained closer to the Classical tradition, conclusively demonstrating the manuscript that served as the model necessarily belonged to this line of dissemination (figs. 5, 6, 7).⁴⁵ Also, the arguments of though scholars, who have discussed the sources of the iconography of the Alfonsine constellations prior to the discovery of the Doha manuscript, such as Ana Domínguez and Alejandro García Avilés, will need to be re-examined.⁴⁶ For, rather than cite a set of hypothetical models, however, it seems wiser to suggest that the illuminators of the Alfonsine manuscripts were most likely reproducing the iconography featured in the al-Sūfī book from which they were copying. In fact, as mentioned above, the line dissemination of al-Sūfī's books which remained closer to the Classical iconography, which Wellesz designated as the 'Group B', continues, incorporating the same features in the *Libro de las figuras de las estrellas fixas* and the *Lapidario*.⁴⁷ It is also worth pointing out that the iconography of 'Group B' is 'intimately connected with the iconography of several surviving Islamic celestial

in DOLAN 2017, p. 178. The slightly later manuscript in Istanbul (Fatih Kütüphanesi, Ms 3422), which can be dated to c. 1125–26, contains a similar winged version of Virgo on ff. 131v–r. In addition to these two examples of Virgo with wings, see Oxford, Bodleian Library, Ms Huntington 212; Berlin, Staatsbibliothek Ms Landberg 71; Paris, BnF, Ms. arabe 5036, Ms. arabe 6528 and Ms. Persan 2370; and Istanbul, Süleymaniye Library, Ms 2595.

⁴⁴ WELLESZ 1965, p. 22. For the description of Virgo as winged in the Latin *Aratean* tradition see DOLAN 2017, p. 430.

⁴⁵ In addition to the Alfonsine manuscripts and their copies, there is another manuscript produced in a Christian cultural environment that uses the same iconography for the constellations. It is an astronomical and medical miscellany probably written in Oxford shortly after 1386, currently preserved at Los Angeles, in the J. Paul Getty Museum, Ms. Ludwig XII. 7. According to LIPPINCOTT 1985a, p. 68 the text of this manuscript seems to be derived from the list of constellation names on ff. 3v–4r of the BAV, Ms. Vat. Lat. 8174. As the Vatican manuscript is the oldest copy of the *LSA*, the Getty manuscript apparently derives from Alfonsine material. Anyway how this material arrived at Oxford needs to be studied.

⁴⁶ In her well-known study of the *Lapidario*, Ana Domínguez proposed that these variations were due to the use of other sources in addition to al-Sūfī's text. Domínguez only used the aforementioned Bodleian manuscript as a point of comparison, arguing that the differences present in the Alfonsine corpus, like Virgo wings, by the use of other classical sources such as celestial globes. García Avilés proposed the use of a combination of different manuscripts in order to create a selective iconographical cycle in the Alfonsine environment. See GARCÍA AVILÉS 1995, pp. 13–15; GARCÍA AVILÉS 2007, pp. 224–226.

⁴⁷ Among these features, one can cite not only the previously-mentioned wings of Virgo, but also Andromeda wearing chains, Cassiopeia's seat without cushion and Lyra depicted as a Tortoise instead of a harp. See FERNÁNDEZ 2013, pp. 180–183.

globes – an example of which must have existed as part of the extensive collections associated with the Alfonsine court.⁴⁸

Unfortunately, no illustrated manuscript of al-Sūfī star tables has survived in Spain, although there can be no doubt that the book was known in Castile. In addition to the evidence provided by the dissemination of the text and its iconographic repertoire in the Alfonsine circle, one can also cite the first inventory of books of Gonzalo Pérez Gudiel, an important figure in the intellectual milieu of the Castilian kingdom during the second half of the 13th century.⁴⁹ The entry for item 20 of this inventory lists: *Un libro de arábigo con figuras e puntos d'oro* ('an Arabic book with figures and golden dots'), which must surely represent an illustrated manuscript of al-Sūfī's *Book of the Fixed Stars* – and helps to document the existence of the *Kitab uwar al-Kawākib al-Thābita* in the Kingdom of Castile, filling its sky with Arab stars.

BIBLIOGRAPHY

AMASUNO 1987

Amasuno, Marcelino: *La materia medica de Dioscórides en el Lapidario de Alfonso X el Sabio: un ejemplo de transmisión científica*. Madrid, CSIC 1987.

BERLEKAMP 2011

Berlekamp, Persis: *Wonder, Image, and Cosmos in Medieval Islam*. New Haven, Conn. Yale University Press 2011.

BERLEKAMP 2013

Berlekamp, Persis: 'Visible Art, Invisible Knowledge'. *International Journal of Middle East Studies* 45 (3), 2013, pp. 563–565.

BREND 1994

Brend, Barbara: 'A Reconsideration of the Book of Constellations of 400/1009–10 in the Bodleian Library'. In: *The Art of the Saljūqs in Iran and Anatolia*. Ed. by Robert Hillenbrand. Costa Mesa, Mazda Publishers 1994, pp. 89–93.

CAIOZZO 1994

Caiozzo, Anna: *Images du ziele d'Orient au Moyen Age*. Paris, Presses de l'Université de Paris-Sorbonne 2003.

CANO 1985

Cano Aguilar, Rafael: 'Castellano drecho?'. *Verba* XII, 1985, pp. 287–306.

⁴⁸ Firenze, Museo Galileo, no. 2712, 1085 (AH 478); Paris, Bibliothèque Nationale, Département des Cartes et Plans; Inventory No. Ge. A. 325, ca. 1080 and Smithsonian Museum, no. 38, Oxford, Museum of the History of Science, No. 28, 1074, all have wings. See LIPPINCOTT at <https://www.thesaxlproject.com> (June 2019); British Museum, 1871,0301.1.a-b, 1275-1276 (AH 674) Virgo has no wings; WELLESZ 1959, p. 25; BELLOLI 1985, pp. 99–113.

⁴⁹ Pérez de Gudiel was archbishop in Cuenca, Burgos and, finally, in Toledo. He was also member of the Royal Chancellery. In 1273 (when he was archdeacon of Toledo), and in 1280 (as part of the Curial court in Viterbo), Pérez Gudiel commissioned an inventory his possessions, including his book – a rich collection with numerous scientific manuscripts. An al-Sūfī manuscript, therefore, would fit perfectly with Gudiel's interests. The inventories can be consulted in GONZÁLVIZ RUIZ 1997, pp. 461–549 and HERNÁNDEZ – LINEHAN 2004, pp. 476–505. The reference for *un libro de arábigo con figuras* appears in HERNÁNDEZ – LINEHAN 2004, p. 482.

CÁRDENAS 1974

Cárdenas, Anthony: *A study and Edition of the Royal scriptorium Manuscript of El Libro del Saber de Astrología by Alfonso X el Sabio*. PhD. diss. University of Wisconsin 1974.

CARDOSO GONÇALVES 1929

Cardoso Gonçalves, José: *O Lapidario del Rey D. Alfonso X el Sabio*. Lisboa, Associação dos Arqueólogos Portugueses 1929.

CÁRDENAS 1980

Cárdenas, Anthony: 'A new title for the alfonsine omnibus on astronomical instruments'. *La Coronica* VII, 2, 1980, pp. 172–178.

CÁRDENAS 1986

Cárdenas, Anthony: 'Hacia una edición crítica del Libro del Saber de Astrología de Alfonso X: estudio codicológico actual de la obra regia, (mutilaciones, fechas y motivos)'. In: *Homenaje a Pedro Sainz Rodríguez*, II. Madrid, Fundación Universitaria Española, 1986, pp. 111–120.

CÁRDENAS 1992

Cárdenas, Anthony: 'Alfonso X nunca escribió *castellano drecho*'. In: *Actas del X Congreso de la Asociación Internacional de Hispanistas*, I. Ed. by Antonio Vilanova. Barcelona, PPU 1992, pp. 151–159.

CAREY 2001

Carey, Moya: 'Painting the Stars in a Century of Change: A Thirteenth-Century Copy of al-Sūfī's Treatise on the Fixed Stars, British Library Or. 5323'. PhD diss. School of Oriental and African Studies. London, University of London 2001.

CAREY 2007

Carey, Moya: 'Mapping the Mnemonic: A Late Thirteenth-Century Copy of al-Sūfī's Book of the Constellations'. In: *Arab Painting: Text and Image in Illustrated Arabic Manuscripts*. Ed. by Anna Contadini. Leiden, Brill 2007.

CAREY 2009

Carey, Moya: 'Al-Sūfī and Son: Ibn al-Sūfī's Poem on the Stars and Its Prose Parent'. *Muqarnas* 26, 2009, pp. 181–204.

COMES 1990

Comes, Mercè: 'Al-Sūfī como fuente del libro de la Ochava Espera de Alfonso X'. In: *Ochava espera y Astrofísica. Textos y estudios sobre las fuentes árabes de la astronomía de Alfonso X*. Coord. by Mercè Comes and Julio Samsó. Barcelona, AECI 1990, pp. 11–114.

COMES 1991–1992

Comes, Mercè: 'El libro de las estrellas de la ochava espera Alfonsí. ¿Traducción del Kitāb suwākib de al-Sūfī?' *Revista del Instituto Egipcio de Estudios Islámicos* 25, 1991–1992, pp. 135–152.

COMES – SAMSÓ 1987

Comes, Mercè – Samsó, Julio: *De Astronomia Alphonsi Regis: actas del Simposio sobre Astronomia Alfonsi celebrado en Berkeley (agosto 1985) y otros trabajos sobre el mismo tema*. Barcelona, Universitat de Barcelona, Instituto "Millas Vallicrosa" de Historia de la Ciencia Árabe 1987.

COMES – SAMSÓ 1988

Comes, Mercè – Samsó, Julio: 'Al-Sūfī and Alfonso X'. *Archives Internationales d'Histoire des Sciences* 38, 1988, pp. 67–76.

COMES – SAMSÓ 1990

Comes, Mercè – Samsó, Julio (ed.): *Ochava espera y Astrofísica. Textos y estudios sobre las fuentes arábes de la astronomía de Alfonso X*. Barcelona, AECE 1990.

D'AGOSTINO 1992

D'Agostino, Alfonso: *Astromagia: ms. Reg. lat. 1283*. Napoli, Liguori 1992.

DIMAN – WINGET 1980

Diman, Roderic C. – Winget, Lynn W.: *Lapidario and Libro de las formas & las ymagenes*. Madison, Hispanic Seminary of Medieval Studies 1980.

DOLAN 2017

Dolan, Marion: *Astronomical knowledge transmission through illustrated Aratea manuscripts*. Cahm, Springer 2017.

DOMÍNGUEZ RODRÍGUEZ 1984

Domínguez Rodríguez, Ana: *Astrología y Arte en el 'Lapidario' de Alfonso X el Sabio*. Madrid, Edilán 1984.

El primer Lapidario 1982

El Primer Lapidario. Madrid, Edilán 1982.

FERNÁNDEZ 2010

Fernández Fernández, Laura: 'La transmisión de los textos científicos de Alfonso X el Sabio: el manuscrito 1197 de la BNE'. *Anales de Historia del Arte*, vol. Ext. octubre, 2010, pp. 51–68.

FERNÁNDEZ 2013

Fernández Fernández, Laura: *Arte y Ciencia en el scriptorium de Alfonso X el Sabio*. Sevilla-Puerto de Santa María, Universidad de Sevilla-Cátedra Alfonso X el Sabio 2013.

FERNÁNDEZ 2015

Fernández Fernández, Laura: 'Armario regis alfontii: la biblioteca de un rey letrado'. In: *Lienzos del recuerdo: estudios en homenaje a José M^a Martínez Frías*. Coord. by María Lucía Lahoz Gutiérrez and Manuel Pérez Hernández. Salamanca, Universidad de Salamanca 2015, pp. 193–201.

FERNÁNDEZ 2017

Fernández Fernández, Laura: 'Astrolabes on Parchment: The Astrolabes Depicted in Alfonso X's *Libro del saber de astrología* and their Relationship to Contemporary Instruments'. *Medieval Encounters* 23, 1–5, 2017, pp. 287–310.

FERNÁNDEZ 2018

Fernández Fernández, Laura: 'Textual and Iconic Plurilingualism in Alfonso the Learned's *Libro del Saber de Astrología*: between theoretical necessity and aesthetic erudition'. In: *Multilingual and multigraphic documents and manuscripts of East and West*. Ed. by Giuseppe Mandalá e Inmaculada Pérez Martín. Gorgias Press 2018, pp. 386–406.

FERNÁNDEZ (forthcoming)

Fernández Fernández, Laura: 'The Palace as Theatre of Knowledge: Performing with Manuscripts in the Alfonsine Court'. In: *Performing with manuscripts* (forthcoming).

FERNÁNDEZ – CHICO 2019

Fernández Fernández, Laura – Chico, María V.: 'El Libro del saber de astrología, Ms. 156'. In: *Catálogo de manuscritos medievales de la Biblioteca Histórica "Marqués de Valdecilla" Universidad Complutense de Madrid*. Ed. by Antonio López Fonseca and Marta Torres. Madrid, UCM 2019.

GARCÍA AVILÉS 1995

García Avilés, Alejandro: 'Alfonso X y las imágenes de los cielos: algunos problemas en torno a la iconografía astrológica de Alfonso X el Sabio'. *Mitteilungen der Carl Justi Vereinigung* 7, 1995, pp. 4–34.

GARCÍA AVILÉS 1996

García Avilés, Alejandro: 'Two astromagical manuscripts of Alfonso X'. *Journal of the Warburg and Courtauld Institutes* 59, 1996, pp. 14–23.

GARCÍA AVILÉS 1997

García Avilés, Alejandro: 'Alfonso X y el "Liber Razielis": imágenes de la magia astral judía en el scriptorium alfonsi'. *Bulletin of Hispanic studies*, vol. 74, 1, 1997, pp. 21–40.

GARCÍA AVILÉS 1999

García Avilés, Alejandro: 'Alfonso X y la tradición de la magia astral'. In: *Scriptorium alfonsi, de los libros de astrología a las Cantigas de Santa Maria*. Coord. by Ana Domínguez Rodríguez and Jesús Montoya Martínez. Madrid, Editorial Complutense 1999, pp. 83–104.

GARCÍA AVILÉS 2001

García Avilés, Alejandro: 'Mercurio en el Libro de astromagia: una iconografía de origen indio en el scriptorium de Alfonso X el Sabio'. In: *Imágenes y promotores en el arte medieval: miscelanea en homenaje a Joaquín Yarza Luaces*. Barcelona, UAB Servei de Publicacions 2001, pp. 391–406.

GARCÍA AVILÉS 2006–2007

García Avilés, Alejandro: 'La cultura visual de la magia en la época de Alfonso X'. *Alcanate* 5, 2006–2007, pp. 49–88.

GARCÍA AVILÉS 2007

García Avilés, Alejandro: 'Las moradas de los dioses'. In: *La miniatura medieval en la península Ibérica*. Coord. by Joaquín Yarza Luaces. Murcia, Nausicaá 2007, pp. 193–254.

GARCÍA SOLALINDE 1925

García Solalinde, Antonio: 'Intervención de Alfonso X en la redacción de sus obras'. *Boletín de Filología Española* II, 1925, pp. 283–288.

GONZÁLVEZ RUIZ 1997

González Ruiz, Gonzalo: *Hombres y libros de Toledo*. Madrid, Fundación Ramón Areces 1997.

GOUSSET 1985

Gousset, M. Therese: 'Le Liber de locis stellarum fixarum d'Al-Sufi, ms. 1036 de la Bibliotheque de l'Arsenal a Paris: une reattribution'. *Arte medievale* 2, 1985, pp. 93–108.

HERNÁNDEZ – LINEHAN 2004

Hernández, Francisco – Linehan, Peter: *The Mozarabic cardinal*. Florencia, SISMELE – Edizioni del Galluzzo 2004.

KUNITZSCH 1986

Kunitzsch, Paul: 'The Astronomer Abu'l-Husayn al-Sufi and his Book on the Constellations'. *Zeitschrift für Geschichte der Arabisch-Islamischen Wissenschaften* 3, 1986, pp. 56–81.

LIPPINCOTT 1985

Lippincott, Kristen: 'The Astrological Vault of the Camera di Griselda from Roccabianca'. *Journal of the Warburg and Courtauld Institutes* 48, 1985, pp. 42–70.

LIPPINCOTT

Lippincott, Kristen: *The Saxl Project*: <https://www.thesaxlproject.com/the-saxl-project/>

NOTHAFT 2015

Nothaft, Philippe E: 'Critical analysis of the Alfonsine Tables in the fourteenth century: the Parisian *Expositio tabularum Alfonsii* of 1347'. *Journal for the History of Astronomy* 46, 2015, pp. 76–99.

PALLOLI 1985

Paloli, Andrea P.A.: 'The Constellation Figures on the Smithsonian Globe'. In: Emilie Savage-Smith: *Islamicate Celestial Globes: Their History, Construction, and Use*. Washington, D.C, Smithsonian Institution Press 1985, pp. 99–113.

PINGREE 1981

Pingree, David: 'Between the "Ghāya" and the "Picatrix"'. *Journal of the Warburg and Courtauld Institutes* 44, 1981, pp. 27–56.

RICO Y SINOBAS 1863–1867

Rico y Sinobas, Manuel: *Libros del Saber de Astronomía, del Rey D. Alfonso X de Castilla*. Tomo I–V. Madrid, Tipografía de don Eusebio Aguado, Impresor de Cámara de S.M y de su Real Casa 1863–1867.

SÁNCHEZ-PRIETO 2014

Sánchez-Prieto Borja, Pedro (ed.): *Lapidario. Libro de las formas e imágenes que son en los cielos*. Madrid, Biblioteca Castro 2014.

SAVAGE-SMITH 1992

Savage-Smith, Emilie: 'Celestial Mapping'. In: *The History of cartography*. Volumen 2, Book 1. Ed. by J. Brian Harley and David Woodward. Chicago, The University of Chicago Press 1992, pp. 12–71.

SAVAGE-SMITH 2013

Savage-Smith, Emilie: 'The Most Authoritative Copy of 'Abd al-Rahman al-Sufi's Tenth-century Guide to the Constellations'. In: *'God is Beautiful; He Loves Beauty': The Object in Islamic Art and Culture*. Ed. by Sheila Blair and Jonathan Bloom. New Haven, Yale UP 2013, pp. 122–155.

SAXL – PANOFKY 1933

Saxl, Fritz – Panofsky, Erwin: 'Classical Mythology in Mediaeval Art'. *Metropolitan Museum Studies*, IV, 2 (1933), pp. 228–280.

SCHJELLERUP 1874

Schjellerup, Hans: *Description des étoiles fixes composée au milieu du dixième siècle de notre ère par l'astronome persan Abd-al-Rahman al-Sûfi*. Trad. littérale de deux ms. arabes de la Bibliothèque Royale de Copenhague et de la Bibliothèque Impériale de

St. Pétersbourg avec des notes par H. C. F. C. Schjellerup. St.-Pétersbourg, Eggers 1874.

SOUDAVAR 1999

Soudavar, Abolala: 'The concepts of "al-aqdamo asahh" and "yaqin-e säbeq" and the problem of semi-fakes'. *Studia Iranica* 28, 1999, pp. 255–273.

WARBURG 1966 [1920]

Warburg, Aby M.: *La rinascita del paganesimo antico*. Contributi alla storia della cultura. Firenze, La nuova Italia 1966. (Heidnisch-antike Weissagung in Wort und Bild zu Luthers Zeiten. Heidelberg, Winter 1920).

WELLESZ 1959

Wellesz, Emmy: 'An Early al-Sufi Manuscript in the Bodleian Library in Oxford: Study in Islamic Constellation Images'. *Ars Orientalis* 3, 1959, pp. 1–26.

WELLESZ 1964

Wellesz, Emmy: 'Islamic Astronomical Imagery. Classical and Bedouin Tradition'. *Oriental Art* X, 2, 1964, pp. 84–91.

WELLESZ 1965

Wellesz, Emmy: *An Islamic book of constellations*. Oxford, Bodleian Library 1965.