

THE IMPORTANCE OF PTOLEMY AND THE *ALMAGEST* IN THE WORK OF THE TRANSLATORS OF ARABIC SCIENCE IN THE MIDDLE AGES

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ABSTRACT

The evolution of medieval European science goes with the discovery of Ancient Greek works, such as Aristotle's or Ptolemy's ones, through the numerous translations from Arabic which were particularly carried out in Peninsula since the twelfth century. In this paper we will tackle the role played by Ptolemy and his works in the translations and how its finding and dissemination, now in Latin, impacted on the European science.¹

KEYWORDS

Ptolemy, Almagest, Medieval Latin translations, Arabic medieval works.

CAPITALIA VERBA

Ptolemaeus, Almagestum, translationes Latinae mediaevales, opera mediaevalia Arabica.

Ptolemy, Claudius Ptolomaeus Preludiensis, *Princeps Alexandrinus astronomorum*, was the most important astronomer of the Roman Empire. Between the first and the sixteenth century his works on astronomy, astrology, and geography were models for imitation, resources for new work, and targets of criticism. The reactions to Ptolemy from his own times to ours show the complex processes by which an ancient scientist and his work gained, and subsequently lost, an overreaching reputation and authority.²

Ptolemy's real name was Claudius Ptolemaeus. He worked as an astronomer at the Museum of Alexandria under government sponsorship, using the roof of the temple of Sarapis as his observatory. He made his observations between 127 and 141 A.D. Ptolemy's place of birth is not known, although he may have been born in Canopus near Alexandria in Egypt. His scientific activity, works and astronomical observations spanned the period from 125 A.D. until well into the reign of Marcus Aurelius (161-180), and he is believed to have lived from around 100 until 165 A.D. Ptolemy was the author of numerous scientific treatises, some of them authentic such as the *Almagest*, *Tabulae manuales*, *Tetrabiblos (Quadripartitum)*, *Planetary Hypotheses*, *Phaseis*, *Analemma*, *Planispherium*; and others pseudepigrapha such as *Centiloquium*, *De astrolabio*, *Iudicia*, *Liber Ptholomei regis Egiptii*, *De imaginibus super facies signorum*, and *Liber de natiuitatibus hominum*,³ and he also left a list of several astronomical observations made between 127 and 141 A.D. The results were written up in the *Almagest*, which was published around 150 A.D.⁴ and which was of enduring importance in later Islamic and European science.

In fact, the *Almagest*, or the *Megale Syntaxis Mathematike*, was the culmination of Greek astronomy. It was unrivalled in Antiquity as an example of how a large, important class of natural phenomena could be described in mathematical terms in such a way that their future course could be predicted with reasonable precision. It taught scientists of many ages how geometrical and kinematical models could be constructed and, by means of empirical data derived from careful observations, could be made to simulate nature in a way which came to influence the scientific method until the present day.

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2. Jones, Alexander, ed. "Ptolemy", *Ptolemy in Perspective: Use and Criticism of his Work from Antiquity to the Nineteenth Century*. New York: Springer, 2010: 232. See also the important Project "Ptolemaeus Arabus et Latinus (PAL)" dedicated to the edition and study of the Arabic and Latin versions of Ptolemy's astronomical and astrological texts and related material. The project is supervised by Prof. Dr. Dag Nikolaus Hasse with Dr David Juste and Dr. Benno van Dalen (<https://ptolemaeus.badw.de>).

3. Heiber, Johan Ludwig, ed. *Claudii Ptolomaei opera quae exstant omnia; volumen 1: Syntaxis mathematica*. Leipzig: Teubner, 1898-1903; Boer, Emilius, ed. *Claudii Ptolomaei opera quae exstant omnia, vol. III 2, Karpós, Pseudo-Ptolomaei Fructus sive Centiloquium*. Leipzig: Teubner, 1961.

4. Neugebauer, Otto. *A History of Ancient Mathematical Astronomy*. Berlin: Springer, 1975; Pedersen, Olaf. *A Survey of the Almagest, with Annotation and New Commentary by Alexander Jones*. New York: Springer, 2011: 12 <<https://books.google.es/books?id=8eaHxE9jUrwC&pg>> (Consulted 27th January 2016).



In compiling his work on astronomy, Ptolemy selected material from earlier studies, especially from Hipparchus' synthesis of predominantly Greek and Babylonian astronomy published in Rhodes in 127 B.C. The basis of Hipparchus' work was the cosmological system devised by Aristotle, who had been tutor to Alexander the Great—a distinction which lent considerable prestige to his many books and ensured their lasting influence.

The *Almagest* was as important to ancient science as Newton's *Principia* was to the seventeenth century. There is no question that it was a greater scientific achievement than *De revolutionibus*, even though Copernicus' work eventually surpassed it, and even though Copernicus enjoys a greater reputation than Ptolemy as an astronomical genius.

Over the centuries many commentaries on the *Almagest* were written. In the Hellenistic Age, Pappus the mathematician (300 A.D.) wrote the first work on Ptolemaic astronomy. The Alexandrian Theon wrote another commentary, and Hypatia, Theon's daughter, also wrote about Hipparchus and Ptolemy's *Almagest*. The last Greek commentary was written by Proclus (410-485), some time before the closing of Plato's Academy in 529 A.D.⁵

1. The *Almagest* in the Middle Ages

In the early Middle Ages, scholars in Latin Europe had no access to the *Almagest* but they were growing increasingly aware of its importance and of the need to read it. Up until the twelfth century, Ptolemy was known in the Latin world only thanks to some brief references to his name in the encyclopaedias of Pliny the Elder and Isidore of Seville, which in fact confused him with Ptolemy, king of Alexandria. Like most of classical Greek science, however, Ptolemy's work was preserved in Arabic manuscripts and was then translated into Latin.

The ancient Arabic astronomers were influenced by Hindu astronomy and their astronomical tables. The influence of the Hindus is evident in the work of al-Khwarizmi, before the Muslims became familiar with Ptolemy. Along with other works of Greek philosophy and science it is very likely that the *Almagest* was translated into Syriac in the fifth or sixth centuries, but it is difficult to know with certainty when the Muslim astronomers first found an Arabic translation of Ptolemy's major work.

The possibility exists that an anonymous translation of the *Almagest* based on the Greek text was in circulation, because an Arabic manuscript of this version is preserved in the University of Leiden.⁶ There is a record of another translation based on a Syriac text in Baghdad in 829-830. Already in the ninth century, Arab

5. Pedersen, Olaf. *A Survey...*: 13-14.

6. Pedersen, Olaf. *A Survey...*: 15; Kunitzsch, Paul. *Der Almagest. Die Syntaxis Mathematica des Claudius Ptolemäus in arabischer-lateinischer Überlieferung*. Wiesbaden: O. Harrassowitz, 1974.



astronomers referred to this work using the Greek superlative term *Megiste*, which, when the definite article *al* was prefixed to it, became *Almagest*, the name by which it is generally known today. Finally, the most widely used Arabic version was by Ishaq ibn Hunain (d. 910/911) and revised by Thabit ibn Qurra. This version, which spread throughout the Arab world, was eagerly sought by Christians and translated into Latin under the name *Almagestum*.

Gerard of Cremona translated the Arabic *Almagest* into Latin in Toledo in *circa* 1175. The translator came to Toledo *amore Almagesti*, driven by the desire to study and understand Ptolemy's work.⁷ His version reached a wide readership and was used until the sixteenth century. David Juste notes 57 existing manuscripts and one edition.⁸ There are also many references in mediaeval authors.⁹

Haskins wrote that:

With the translation of Ptolemy's *Almagest* into Latin the fullness of Greek astronomy reached western Europe. The *Mathematiké Sintaxis* of Ptolemy was for all subsequent times the most important work of ancient astronomy, summing up, as it did, the labours of Ptolemy and his Alexandrine predecessors in systematic and comprehensive form, and in the Middle Ages it possessed supreme authority as the source of all higher astronomical knowledge. In 827 it was translated into Arabic, and among the Saracens it passed as a divine and preeminent book, about which there grew up a large body of explanatory literature.¹⁰

We know of three other possible full or partial translations of the *Almagest*. The earliest known version, little used, was by an anonymous translator in Sicily from the Greek (*circa* 1160). A new anonymous version, made in Spain in the thirteenth century, is extant in fragments. Another anonymous, partial version of the first four books of the *Almagest* in Mscr. Dresd. Db. 87, *circa* 1300, traditionally associated with Antioch and Stephen the Philosopher, was long believed to have been translated

7. Martínez Gázquez, José; Ruiz-Doménech, José Enrique. *La ignorancia y negligencia de los latinos ante la riqueza de los estudios árabes*. Barcelona: Real Academia de Buenas Letras de Barcelona, 2007: 48-49.

8. Juste, David. "Ptolomaeus Latinus: Texts and Manuscripts", *Ptolemy's Science of the Stars in the Middle Ages (Warburg Institute, 5-7 November 2015)*, forthcoming.

9. The best known in the *Speculum Astronomie*, attributed to Albert the Great, who says that the *Almagest* is a good introduction to astronomy: *Sed quod de hac scientia utilius inuenitur, est liber Ptolomaei Preludensis, qui dicitur Graece megasti, Arabice almagesti, Latine minus perfecti, qui sic incipit: Bonum fuit scire, etc. quod tamen in eo diligentiae causa dictum est prolixo*. Magni, Alberti. *Opera omnia*. 21 vols., ed. Peter Jammy. Lyon: Sumptibus Claudii Prost, Petri & Claudii Rigaud, frat., Hieronymi de la Garde, Ioan. Ant. Huguetan, filii, 1651: V, 656 and following. In: Pedersen, Olaf. *A survey...*: 17.

10. Haskins, Charles. *Studies in the History...*: 191-193. Perhaps it is related to Eugenius of Palermo, which is discussed by: Lemay, Richard, "De la Scolastique à l'Histoire par le truchement de la Philologie: Itinéraire d'un Médiéviste entre Europe et l'Islam", *La diffusione delle scienze islamiche nel medio evo europeo (Roma, 2-4 Ottobre 1984)*. *Convegno internazionale promosso dall'Accademia Nazionale dei Lincei, Fondazione Leone Caetani e dall'Università di Roma 'La Sapienza'*, Biancamaria Scarcia Amoretti, ed. Rome: Accademia nazionale dei Lincei - Fondazione Leone Caetani - Università di Roma, 1987: 432-462.



from the Greek, but recent investigations have shown the translation to be the work of Thabit ibn Qurra from an Arabic original.¹¹

Al-Farghani had produced a summary of the *Almagest* in the ninth century, and a new version with a critical commentary was made around 1140 by Jabir ibn Afflah (known to the Latins as Geber).¹² These works were translated into Latin and helped to spread the *Almagest* throughout the Christian world.

In the early thirteenth century, the *Almagestum parvum*, a summary of Ptolemy's *Almagest* written around the year 1200, provided a new stylistic framework for the content of the *Almagest*'s first six books. The author of the *Almagestum parvum* used types of mathematical writing and principles listed at the beginning of each book with propositions and demonstrations. These and similar changes in this work reveal the author's desire to connect Ptolemaic astronomy with the "mathematics" available in the Middle Ages. Indeed, the *Almagestum parvum* was an influential part of a broader attempt to understand Ptolemaic astronomy in a non-Ptolemaic style.¹³

Ptolemaic astronomy in the Middle Ages served practical and pedagogical ends rather than theoretical ones; scholars wished to design tables and instruments rather than to carry out systematic observations in order to articulate and improve the system. At that time, only astrologers had a real need for astronomy, in order to be able to determine the positions of the planets regardless of the weather and of their geographical location. Versions of other astrological works by Ptolemy were translated into Latin before the version of the *Almagest*. In 1138, Plato of Tivoli translated Ptolemy's *Tetrabiblos*, and Herman of Carinthia translated the *Planispherium* in 1143. Eugenius of Palermo translated the *Optics*.

The scholars of the twelfth century were immediately aware of the importance of the acquisition of these scientific works: by posing problems of a physical nature and formulating a new conception of man and of the world, the new science challenged certain intellectual positions held by the traditionalists. Throughout Latin Europe,

11. *Explicit primus sermo libri mathematice Ptolomei, qui nominatur megali sintaxis astronomie translacione dictamine philophonia wintomiensis ebdelmessie*. Sächsische Landesbibliothek —Staats— und Universitätsbibliothek. Mscr. Dresd. Db. 87, f. 15v. Burnett, Charles. "Antioch as a Link between Arabic and Latin Culture in the Twelfth and Thirteenth Centuries", *Occident et Proche-Orient: contacts scientifiques au temps des croisades*, Anne Tihon, Isabelle Draelants, Baudouin van den Abeele, eds. Turnhout: Brepols, 2000: 21-13 [reprinted with corrections in: Burnett, Charles. *Arabic into Latin in the Middle Ages: The Translators and their Intellectual and Social Context*. Aldershot, Ashgate, 2009]; Burnett, Charles. "The Transmission of Arabic Astronomy via Antioch and Pisa in the Second Quarter of the Twelfth Century", *The Enterprise of Science in Islam: New Perspectives*, Jan P. Hogendijk, Abdelhamid I. Sabra, eds. Cambridge (Mass.): The MIT Press, 2003: 23-51; Grupe, Dirk. "The 'Thābit version' of Ptolemy's *Almagest* in MS Dresden Db.87". *Suhayl*, 11 (2012): 147-53; Grupe, Dirk. *The Latin Reception of Arabic Astronomy and Cosmology in mid-Twelfth-Century Antioch: The 'Liber Mamonis' and the Dresden Almagest*. London: University of London (PhD Dissertation), 2013; Grupe, Dirk. "Thabit ibn Qurra's Version of the *Almagest* and its Reception in Arabic Astronomical Commentaries", *Ptolemy's Science of the Stars in the Middle Ages (Warburg Institute, 5-7 November 2015)*, forthcoming.

12. Vernet, Juan. "L'astronomie dans l'Islam Occidental". *Archives Internationales d'Histoire des Sciences*, 64 (1963): 223-40; Pedersen, Olaf. *A Survey*...: 15.

13. Haskins, Charles. *Studies in the History*...: 104; Zepeda, Henry. "Euclidization in the *Almagestum parvum*". *Early Science and Medicine*, 20/1 (2015): 48-76.



new horizons were opened up and the thirst for knowledge expanded throughout the continent. The most famous of the century's popularisers of clerical learning, Honorius of Autun (1090-1152), summarised the situation in a striking aphorism: *Exsiliium hominis ignorantia; patria est sapientia*.¹⁴

Unable to fulfil their desire for knowledge at home, scholars left England, Paris, or Italy and set off in pursuit of the learning of the Arabs. They found it in the Iberian Peninsula, in Barcelona, Tarazona, Toledo and Murcia, as the Christian Reconquest advanced. Although Sicily and southern Italy became important centres of Arabo-Latin translation, they never equalled Spain in this respect, probably because they had not had an Islamic culture as vigorous as that of Spain. Muslim Spain (al-Andalus) had an ample supply of Arabic texts for translation, Arabic versions of Greek originals, the works of the great mathematicians, astronomers, and physicians of the Arabic east, and scientific works produced in al-Andalus.¹⁵

Christian scholars were especially keen to find astronomical and astrological texts. Robert of Ketton and Herman of Carinthia (*quos in Hispania circa Iberum astrologicae arti studentes inveni*),¹⁶ as Peter the Venerable would call them. The same Robert of Ketton testified in the preface to his Latin translation of the Koran his main interest in this study, *Istud quidem tuam minime latuit sapientiam, que me compulit interim astronomie geometriqueque studium meum principale premittere*.¹⁷ As we noted above, Gerard of Cremona came to Toledo *amore Almagesti*.

2. The memory of Ptolemy in the Middle Ages

The *Corpus operum de scientia stellarum* was a body of works on the astrolabe, astronomy and astrology which was in use in the late tenth and the early eleventh century. This corpus contained a *Preceptum canonis Ptolomei* associated with Abbo of Fleury.¹⁸ This work presents a set of astronomical tables and the rules for their use based on the *Tabule manuales Ptolomei* and other Greek texts, and had been put together in Rome in 535. This was the only set of astronomical tables available in the Latin West before Petrus Alfonsi and Adelard of Bath translated the tables of al-Khwarizmi in the early twelfth century.¹⁹ *Quod opusculum, cuilibet uelit complicare*

14. "Man's exile is his ignorance, his homeland is science". Augustodunensis, Honorius. "De animae exsilio et patria", *Patrologiae. Cursus completus*. Paris: J. P. Migne editorem, 1854, CLXXII, col. 1243.

15. Lindberg, Davis C. "The Transmission of Greek and Arabic Learning to the West", *Science in the Middle Ages*, David C. Lindberg, ed. Chicago: University of Chicago Press, 1978: 59.

16. Venerabilis, Petrus. "Epistola de translatione Alcorani", *Patrologiae. Cursus completus*. Paris: J. P. Migne editorem, 1854, CLXXXIX, col. 650.

17. Cecini, Ulisse. *Alcoranus latinus: eine sprachliche und kulturwissenschaftliche Analyse der Koranübersetzungen von Robert von Ketton und Marcus von Toledo*. Berlin: Lit, 2012: 94.

18. Juste, David. *Les Alchandreana primitifs: étude sur les plus anciens traités astrologiques latins d'origine arabe (X^e siècle)*. Leiden: Brill, 2007: 26.

19. Burnett, Charles. "King Ptolemy and Alchandreus the philosopher: the earliest texts on the astrolabe and Arabic astrology at Fleury, Micy and Chartres". *Annals Science*, 55 (1998), 326-68 [reprinted with



*libro siue canonibus Ptolomei siue Vitrubio quia ipse affluenter descriptiones horologium assequitur, sapientium commendo censure, dum illud sancte ecclesie representasse sufficiat.*²⁰

The Prologue *Ad intimas* in the eleventh-century manuscript, Munich, Bayerische Staatsbibliothek, Clm 560, also associated with Fleury at the time of Abbot Abbo, praises Ptolemy for the invention of the astrolabe:

Inter omnes precipue Ptolomeus hac claruit disciplina. Qui sicut studio clarior, ita etiam hans sententiam luculentius posteris tradidit. Nam inter cetera huius artis insignia ab ipso sumministrata adiumenta quoddam instrumentum et utilimum discentibus et magnummiraculum considerantibus adinuenit. Quo quidem inter omnia inuenta nil prestantius ad intimas doctrinarum indagaciones et matheseos artes nihilque utilius ad totam illam supernam machinam inuestigandam et ad omnia astronomica studia atque geometricalem scientiam. Est autem Wazzalchora diuina mente comparata, quod Latine sonat plana sphaera, quae etiam alio nomine astrolapsus Ptolomei.²¹

2.1. Stephen the Philosopher (floruit 1127)

Stephen, the translator of the *Liber Mamonis in astronomia*, accused the doctors of Christendom of holding back the cultural development of Europe, *unde factum est ut que fere plenitudinem posset habere artium, nunc ceteris gentibus Europa uideatur humilior.*²² He also compared their ignorance in matters of astronomy to the illuminating teachings of Ptolemy, *in astronomia magnificus.*²³

The author's intention is to explain the circles of the heavenly spheres and their number and order, so as to help others to understand Ptolemy's *Almagest*.²⁴

corrections in: Burnett, Charles. *Arabic into Latin in the Middle Ages: The Translators and their Intellectual and Social Context*. Farnham: Ashgate, 2009: 339]; Pingree, David. *Preceptum Canonis Ptolomei. Corpus des astronomes byzantins*. Louvain la Neuve: Academia Bruylant, 1997.

20. Millàs i Vallicrosa, Josep Maria. *Assaig d'Història de les idees físiques i matemàtiques a la Catalunya medieval*. Barcelona: Edicions Científiques Catalanes, 1931: 275; Burnett, Charles. "King Ptolemy...": 336.

21. Millàs i Vallicrosa, Josep Maria. *Assaig d'Història...*: 274; Burnett, Charles. "King Ptolemy...": 340-41 and note 58. These words are echoed in the first words of Herman the Lame's description of the construction of the astrolabe: *In metienda igitur subtilissimae inuentionis Ptolomei waltalchora, id est, plana sphaera, quam astrolabium uocitamus*. Drecker, Joseph. "Hermannus Contractus über das astrolabe". *Isis*, 16 (1931): 200-19, especially 204.

22. Haskins Charles. *Studies in the History...*: 99.

23. Gregory, Tullio. "La nouvelle idée de nature et le savoir scientifique au XII^e siècle", *The Cultural Context of Medieval Learning*, John E. Murdoch, Edith Dudley Sylla, eds. Dordrecht: D. Reidel Publishing Company, 1975: 194; Martínez Gázquez, José. *The attitude of the Medieval Latin translators towards the Arabic Sciences*. Florence: Sismel-Edizioni del Galluzzo, 2016: 20-21; Burnett, Charles, "Antioch as Link between Arabic and Latin Culture in the Twelfth and Thirteenth Centuries", *Occident et Proche-Orient: contacts scientifiques au temps des Croisades. Actes du colloque de Louvain-la-Neuve, 24 et 25 mars 1997*, Isabelle Draelants, Anne Tihon, Baudouin Van den Abeele, eds. Turnhout: Brepols, 2000: 1-19; reproduced with corrections in: Burnett, Charles, *Arabic into Latin in the Middle Ages: The Translators and their Intellectual and Social Context*, Farnham: Ashgate/Variorum, 2009, chap. IV: 12-13.

24. Boudet, Jean-Patrice. *Entre science et nigromance. Astrologie, divination et magie dans l'Occident médiéval (XII^e-XV^e siècle)*. Paris: Publications de la Sorbonne, 2006: 35; Gregory, Tullio. "La nouvelle idée...": 194; Lindberg, David C. "The Transmission of Greek...": 58 and 36; Samsó, Julio. "Els inicis de la introducció



*Placet igitur celestium sperarum circulos, numerum, ordinem quo uerius potero quantumque humana patitur ratio aperire, ut qui a Ptholomeo in sua Sinthasi disponuntur circuli in speris etiam quomodo possint inueniri laborantius in hac arte uia teratur. In quo —nichil enim perfectum mihi uel cuiquam ad explicandum concessum arbitror— si quid pretermissum superflue positum fuerit, sapientium arbitrio corrigendum relinquo.*²⁵

2.2. Eugenius of Palermo (circa 1130 - circa 1202)

Eugenius of Palermo worked in his native Sicily translating texts from Greek and Arabic into Latin, particularly the works of Ptolemy. Eugenius translated Ptolemy's *Optics* from Arabic, a work which otherwise have been lost:

*Dehinc uero prefatum Ptolomei opus aggressus, expositorem propitium diuina michi gratia providente Eugenium uirum tam Graece quam Arabice linguae peritissimum, Latine quoque non ignarum, illud contra uiri discoli uoluntatem Latine dedi orationi.*²⁶

He speaks of the usefulness and necessity of his work and is well aware of the problems of translation:

*Cum considerarem Optica Tholomei necessaria utique fore sentiam diligentibus et rerum perscrutantibus naturas, laboris onus subire et illa in presenti libro Latine interpretari non recusauit. Verumptamen, quia uniuersa linguarum genera proprium habent idioma, et alterius in alterum translatio, fideli maxime interpreti, non est facilis.*²⁷

2.3. Hugh of Santalla (floruit 1151)

Hugh of Santalla dedicated this treatise on astrological aphorisms to Bishop Michael.²⁸ Like other works, this treatise underwent several translations. In the dedication of the prologue Hugh states that this important work of astrology comprises ten volumes and deals with the true substance of this science, its principles, and its applications. He has translated it from Arabic into Latin, because

de la ciència àrab a Europa a través de Catalunya", *La Ciència en la Història dels Països Catalans, I. Dels àrabs al Renaixement*, Joan Vernet, Ramón Parés, eds. Valencia-Barcelona: Universitat de València-Institut d'Estudis Catalans, 2005: 116 and 154-155; Samsó, Julio. "El procés de la transmissió científica al nord-est de la península Ibèrica al segle XII: els textos llatins", *La Ciència en la Història dels Països Catalans, I. Dels àrabs al Renaixement*, Joan Vernet, Ramón Parés, eds. Valencia-Barcelona: Universitat de València-Institut d'Estudis Catalans, 2005: 269.

25. Haskins Charles. *Studies in the History...*: 100.

26. Haskins, Charles; Lockwood Putnam, Dean. "The Sicilian Translators of the Twelfth Century and the First Latin Version of Ptolemy's 'Almagest'". *Harvard Studies in Classical Philology*, 21 (1910): 100.

27. Siculus, Eugenius. *L'Optica di Claudio Tolomeo da Eugenio Ammiraglio di Sicilia – Scrittore del Secolo XII*, ed. Gilberto Govi. Turin: Stamperia reale della ditta G. B. Paravia E C. di I. Viglari, 1855: 3.

28. Samsó, Julio. "El procés...": 276; Burnett, Charles. "The Translating Activity in Medieval Spain", *The legacy of Muslim Spain*, Salma Khadra Jayyusi, ed. Leiden: Brill, 1992: 1142.



of the abundance of famous masters (both Greek and Arab) who have studied it and whose authority vouches for its worth.

*Incipiunt fructus Ptolomei liber, scilicet, quem Grecorum quidam centum uerba appellant, Hugonis Sanctellensis translatus: Prologus eius dem ad Michaellem Tirassonem antistitem. De hiis que ad iuditorum ueritatem attinent, cum in illis totus astronomie consistat effectus secundum Arabice secte uerissimam inquisitionem et tam Grecorum quam Arabum qui huius artis habiti sunt professores famosissimi auctoritatem, uolumina decem in hiis de tam multimoda auctorum copia eligendis diutius obseruatus, ne tante expectationis fructus minor tantique laboris merces in aliquo deficere uideretur, de Arabico in Latinum translataui sermonem.*²⁹

Hugh of Santalla established a set of criteria to decide which authorities and works he should translate in order to satisfy Bishop Michael's curiosity. The works of Ptolemy were considered the most important in the field of astronomy. Alongside the *Almagest* and the *Quadripartitum*, the *Centiloquium* was one of Ptolemy's main astronomical works and so Hugh wants Michael to have this book which will help him to navigate the stormy seas of the acquisition of this important science.

*Quia ergo Ptholomeus inter ceteros astronomie professores precipuus habetur interpret et auctor post Almagesti et Quadripartitum hunc solum de iudiciis astrorum reliquit tractatum, ut tue, mi domine Tirassoniensis antistes, satisfiat iubsioni, eius translationis fructum ego Sanctelliensis adporto, hac uidelicet occasione compulsus ne dum in portu iuditorum nauigas in cimba locatus uaga saxosa formides et ne de tanti preceptoris operibus quippiam abesse queratis.*³⁰

2.3.1 *Commentum Ibn al Muthanna de Tabulis astronomicis al-Khwarizmi*

Hugh of Santalla worked for Bishop Michael, a man with a great interest in astrological and astronomical matters. He provided Michael with explanations and clarifications of all the texts that he translated. An example was Farghani's thorough summary of the *Almagest*, which was well known in the Middle Ages:

*Vel forsitam hic idem Alfargani, quod prudentioris cautele est, tante subtilitatis archana aggredi formidans difficillima pretermittens cetera reserauit. Nemo enim ad huius expositionis intelligentiam accedere potest nisi geometrie institutis et uniuerso mensurandi genere quasi ad manum plenissime instruatur. Ne itaque antiquorum uestigiis penitus insistens a modernis prorsus uidear dissentire, non per dialogum, ut apud Arabes habetur, uerum more solito atque usitato hoc opus subiciam. Ac deinceps non solum Quadripartiti atque Almaiezi ab Alkindio datam expositionem sed etiam quoddam Aristotilis super totam artem sufficiens et generale commentum, si uita superstes fuerit et facultas detur, te iubente aggrediar.*³¹

29. Haskins Charles. *Studies in the History...*: 69.

30. Haskins Charles. *Studies in the History...*: 69.

31. Martínez Gázquez, José. *The Attitude...*: 55.



2.4 Robert of Ketton (floruit 1141-1156)

Robert of Ketton undertook his translations and scientific works in conjunction with Herman of Carinthia. Robert dedicated his translation of al-Kindi's astrological work to his friend Herman, and as on other occasions, his underlying objective was to understand the *Almagest*, *unde commodior ad Almaiesti quo precipuum nostrum aspirat studium pateret accessus*, with the help of the expertise of his colleague and friend:

Iudicia Alkindi

*Incipiunt Iudicia Alkindi astrologi Rodberti de Ketene translatio. Prologus. Quamquam post Euclidem Theodosii cosmometrie libroque proportionum libentius insudarem, unde commodior ad Almaiesti quo precipuum nostrum aspirat studium pateret accessus, tamen ne per meam segnitiem nostra surdesceret amicitia, uestris nutibus nil preter equum postulantibus, mi Hermanne, nulli Latinorum huius nostri temporis astronomico sedere penitus parare paratus, eum quem commodissimum et ueracissimum inter astrologos indicem uestra quam sepe notauit diligentia uoto uestro seruiens transtuli, non minus amicitie quam peritie facultatibus innisus.*³²

2.5 Herman of Carinthia (floruit 1138-1143)

2.5.1 *Planispherium Ptolomei*

In the prologue to the Latin translation of the Arabic text of Ptolemy's *Planispherium*, a description of the principles of the construction of the astrolabe attributed in the manuscript to Maslama of Madrid, Herman of Carinthia set out his reasons for carrying out this work. He noted that Robert of Ketton translated Al-Battani, author of a set of astronomical tables in the Ptolemaic tradition:

*Quem locum a Ptolomaeo minus diligenter perspectum cum Albatene miratur et Alchoarismus, quorum hunc quidam opera nostra Latium habet, illius uero commodissima translatio Roberti mei industria Latinae orationis thesaurum accumulate.*³³

The reasons he lists are the importance of the work to the knowledge of astronomy, the presence of certain people who think they master this science but in fact do not know its true principles and do not study it by following the order of its teachings, and the need among the Christians for a major work to help them to understand this science of the heavenly bodies: Herman goes back to the origin of astronomy, when, after the flood, Noah's descendants began their astronomical speculations in Mesopotamia. The tradition was then continued by the Indians,

32. Haskins, Charles. *Studies in the History...*: 121-122; Burnett, Charles, ed. *Hermann of Carinthia De Essentiis*. Leiden: Brill, 1982: 5-6; Burnett, Charles. "Al-Kindi on Judicial Astrology: The Forty Chapters". *Arabic Science and Philosophy*, 3 (1993): 77-117; Thorndike, Lynn. *A History of Magic and Experimental Science*. 6 vols. New York-London: Columbia University Press, 1923: I, 773 and II, 215-217.

33. Thorndike, Lynn. *A History of Magic...*: II, 85.



Persians and Egyptians until the writings of Ptolemy, which were translated and completed by the Arab scholars Al-Battani and Abu Mas'har:

Quorum quoniam primi traduntur auctores Indi, Perse et Egyptii inuentionem secuti sunt, qui disciplina primis ordinauit gradibus. Idem ergo motus quoniam equabilis est circuli super centrum et axem immobilem omnia continentis spere, seorsum hunc scribendum duxit Ptolomeus quippe primum in ipso tamquam uestibulo astronomie quasi thema quoddam totius studii proponens, prout idem diuersi principium et equalitatem inequalitatis cardinem intellexit, non, oïnor, sine imiatiōne Abracaz, quem in omni celesti motu auctorem habet quemadmodum Sicheum in motus effectu. Ex quibus et duo Ionica lingua collegit uolumina, in primam Sintasim, in secundam Tetrastim —Arabice dicta Almagesti et Alarba, quorum Almagesti quidem Albeteni commodissime restringit, Tetrastim uero Albumasar non minus commode exampliat— in utroque et ipse et sequaces eius eas diuidentes ordinant. [...] Tertio uero ut, quoniam tanti uiri primum hoc opus celestisque scientie quasi clauem quandam labor noster nunc tandem Latio confert, antequam in profanas insidiantium manus incideret, tua sanctissima constaret auctoritate.³⁴

2.5.2 *De Essentiis Hermanni Secundi liber*

Herman of Carinthia not only translated Arabic scientific works and other texts on the Islamic-Christian controversy, but also wrote philosophical works of his own, drawing widely on the doctrines of the Greeks and the Arabs. The most important, his treatise *De essentiis*, was finished in Béziers in 1143. This work played a vital role in the introduction of Aristotelian theories into mediaeval philosophical thought, dominated at the time by Platonism. An original work of exceptional significance, *De essentiis* (1143) is an important astrological-cosmological treatise in which Herman offered an original synthesis of the Arabic Aristotelianism and Platonism of the Chartres school of philosophy. Transcribed during the Middle Ages, *De essentiis* bears witness to Herman's significance and his role in the intellectual revival of the West in the twelfth and thirteenth centuries. It is the best source for understanding Herman's philosophical and scientific teaching:³⁵

Sic enim et Theodosius in Spherica 'super hunc' inquit 'mouetur totum ipse uero immotus.' Quo facto, educit ex eodem centro in utramque partem lineam rectam usque in intrinsecaam

34. Vernet, Juan; Catalá, María Ángeles. "Las obras matemáticas de Maslama de Madrid". *Al-Andalus*, 30 (1965): 15-45 [reprinted in: Vernet, Juan. *Estudios sobre Historia de la Ciencia Medieval*. Barcelona: Universitat Autònoma de Barcelona, 1979: 241-271]; Kunitzsch, Paul; Lorch, Richard. *Maslama's Notes on Ptolemy's 'Planisphaerium' and Related Texts*. Munich: Verlag der Bayerischen Akademie der Wissenschaften-C.H. Beck, 1994: 121; Kunitzsch, Paul. "The Role of al-Andalus in the Transmission of 'Ptolemy's Planisphaerium and Almagest'". *Zeitschrift für Geschichte der arabisch-islamischen Wissenschaften*, 10 (1995-1996): 147-155 [reprinted in: Kunitzsch, Paul. *Stars and numbers: astronomy and mathematics in the medieval Arab and western worlds*. Aldershot: Ashgate, 2004]; Burnett, Charles. "Arabic into Latin in Twelfth Century Spain: the Works of Hermann of Carinthia". *Mittelateinisches Jahrbuch*, 13 (1978): 108-112.

35. Gázquez, Martínez. *The attitude...: 75*.



*planitiam spere, acutis hinc inde angulis —ut secundum ratosthenem Ptholomeus describit—
aad quadrantem ferme recti anguli.*³⁶

2.6. John of Seville (John of Spain) (floruit 1118-1142)

The personality, origin and work of John of Seville (or of Limia) have been widely discussed and related to other translators and authors and we are not yet in a position conclusively to determine the scope of his work. Charles Burnett has carried out exhaustive studies of this great translator, who worked with Dominicus Gundissalinus, and has published a broad overview of the current state of our knowledge.³⁷

2.6.1 *De differentiis tabularum*

In *De differentiis tabularum*, John of Seville explains the differences between the various astronomical tables used in his time. He adds that he composed several works explaining and glossing aspects of the astronomical problems that needed fuller explanation to enable Christian scholars to understand them. Among these works, Millàs discovered a treatise on doubts that emerge in the study of the astronomical tables and in the analysis of the rules that govern the equations, ascensions, and other aspects of the planets.

In the introduction, John of Seville stresses the importance of a prior knowledge of arithmetic for all those who wish to study astronomy. He declares his intention to compose a book dedicated especially to encouraging others to learn to use the Indian numerals introduced by al-Khwarizmi (whom he praises) and which are used by the Saracens in their treatises.

*Scire debes, karissime lector, quia oportebit te aliquos annos scire supra quos cursus planetarum ualeas ordinare, uel per quos possis [computare?] ordinatos cursus in libro quem ego Iohannes Ispanus interpress existens in Arabico in Latino transtuli. [...] et ut Ptolomeus refert CCC partes unius diei sicut ipse mirabili obseruatione inuenit. [...] Ptolomeus enim scripsit quod circulus ille mouebatur in C annis uno gradu [...] et peruenit usque ad xxiv gradus secundum relatum est an Indis, et similiter inuenit eum Ptolomeus xxiii gradus et li minuta et inuenerunt eum obseruatores sapientes [...] Sed Ptolomeus contradicit in libro suo [...] et idem inuenit Ptolomeus stellas fixas moueri per C annos i gradum [...] et quamuis dicat Ptolomeus quod impossibile sit nobis inuenire figuras celi ita ut sunt.*³⁸

36. Burnett, Charles. *Hermann of Carinthia...*: 28-29.

37. Martínez Gázquez, José. *The attitude...*: 82.

38. Millàs i Vallicrosa, Josep Maria. "Una obra astronómica desconocida de Johannes Avendaut Hispanus". *Osiris*, 1 (1936): 451-475 [Reprinted in: Millàs i Vallicrosa, Josep Maria. *Estudios sobre Historia*. Madrid: Consejo Superior de Investigaciones Científicas, 1949: 275, 277 and 282].



2.7 Gerard of Cremona (1114-1187)

Gerard of Cremona is the greatest of the scholars in the twelfth-century translation movement in science and philosophy. His attempts to make Arabic science accessible to the Christian world via translations into Latin were of vital importance.

The text of the *Vita Girardi Cremonensis*,³⁹ a eulogy written by his disciples shortly after his death and attached in an appendix to his last translation (of Galen's *Tegni*), highlights the main events in his life. On realising that Latin language and culture could not satisfy a Christian scholar's desire for learning, Gerard left Italy for Toledo. In one of the most genuine expressions of the *topos* of *Latinorum penuria* and *Arabum abundantia*, we are told that Gerard decided to go to Toledo in search of the *Almagest*, *amore tamen Almagesti, quem apud Latinos minime reperit, Toletum perrexit*.

Having decided to pursue his intellectual training in Toledo, from the moment of his arrival he was so fascinated by the opportunities the city offered him that he decided to stay there for the rest of his life and to devote himself entirely to the translation of the works that he found there. To do so, he learnt Arabic. Toledo granted Gerard the most sought-after gift of all, coveted by all Christian scholars of astronomy: he discovered the Ptolemy's *Almagest* there and produced a Latin version of the Arabic translation, a long technical work, which brought him everlasting fame. The list attached by Gerard's students to the eulogy contains 71 entries of translated works into Latin, although it is known to be incomplete. To quote Haskins: "Indeed, more of Arabic science in general passed into western Europe at the hands of Gerard of Cremona than in any other way".⁴⁰

Vita Girardi Cremonensis 213

*Et cum ab ipsius infantie cunabulis in gremiis philosophiae educatus esset et ad cuiuslibet partes ipsius notitiam secundum Latinorum studium peruenisset, amore tamen Almagesti, quem apud Latinos minime reperit, Toletum perrexit. Ubi librorum cuiusque facultatis habundantiam in Arabico cernens et Latinorum penurie de ipsis quam nouerat miserans, amore transferendi linguam edidit Arabicam.*⁴¹

2.8 Daniel of Morley (1140-1210)

Daniel of Morley, after passing through the University of Paris, compared the presumptuous and bookish culture of the masters of Paris with the *doctrina Arabum quae in quadriuo fere tota existit*, which he studied in Toledo, where classes were taught by the *sapientiores mundi philosophi*. In *Philosophia* or *Liber de naturis inferiorum et superiorum*, a treatise written on his return to England for John, Bishop of Norwich (1175-1200), Daniel records that he studied with Gerard of Cremona in the language of Toledo (probably a Romance language), and that Gerard clarified

39. Burnett, Charles. *The Coherence...*: 273-287.

40. Haskins, Charles. *Studies in the history...*: 15.

41. Martínez Gázquez, José. *The attitude...*: 90-91 and 188-189.



the doubts of his disciples. Daniel also confirms that Gerard of Cremona translated the *Almagest*—a feat to which they all aspired—and reported that in this task he was assisted by Galippo, probably a *Mozarab* from Toledo:

*Cum uero predicta et cetera talium in hunc modum necessario euenire in Ysagogis Iapharis auditoribus suis affirmaret Girardus Tholetanus, qui Galippo mixtarabe interpretante Almagesti latinauit, obstipui ceterisque, qui lectionibus assidebant, molestius tuli eique indignatus Homiliam Beati Gregorii, in qua contra mathematicos disputat, obieci.*⁴²

2.9 Michael Scot (d. 1236)

Michael Scot, one of the great translators of Arabic science, spent some years in Spain before his definitive departure for Sicily to serve Frederick II. In Toledo he met archbishop Rodrigo, whom he accompanied to the Fourth Council of the Lateran in Rome in 1215.⁴³ He was famous as a translator, *diuersorum idiomatum, Ebraici et Caldei, Arabici et Latini*, a man of eminent learning, philosopher and astrologer, but also as a magician and necromancer.

2.9.1 *De motibus celorum*

Michael translated the treatise on astronomy of the Hispano-Arabic philosopher and astronomer al-Bitruji (Alpetragius), entitled *De motibus celorum*,⁴⁴ a revision of Ptolemy's work. The translation is dated precisely and completed at Toledo 18th August 1217. The Levite Abuteo, who collaborated in the translation, appears in the historical record; he was a Jew who knew Hebrew, Chaldean, Arabic and Latin, and, after converting to Christianity and being christened with the name of Andrew, became canon of Palencia.

1 Sermo in erroribus radicum quas posuit Tholomeus. In nomine Domini nostri Ihesu Christi omnipotentis misericordis et pii, prolonget tibi Deus statum tuum in honore, frater. Detegam tibi secretum pectoris mei, et est ratio profunda que cecidit in imaginationem meam post multos errores, et consumpsi in eis maius uite mee. Et rogo te et inspectorem huius libri mei ut adornet hunc tractatum meum. 2 Et non properet ad reprehendendum meam diuersitatem ad sapientes antiquos et meam contradictionem contra famosos. Et nouit Deus quod non feci ut contradicerem, nec ad hoc fuit mea intentio; sed a pueritia, quando inspexi in quadriuiuio ad partem motus celestis, et prosecutus sum dicta antiquorum secundum quod posuit Tholomeus, qui fuit fundamentum huius scientie; et secuti sunt eum sequaces sapientes. 3 Et non diuersificati sunt aliqui ab eo preter Abu Isac Abraham ifn Yahya, notus

42. Maurach, Gregor. "Daniel von Morley, 'Philosophia'". *Mittellateinisches Jahrbuch*, 14 (1974): 244-245.

43. Haskins, Charles. *Studies in the History...*: 274-275; Burnett, Charles. "Michael Scot and the Transmission of Scientific Culture from Toledo to Bologna via the Court of Frederick II Hohenstaufen". *Micrologus*, 2 (1994): 101-126 [reprinted with corrections as chapter VIII in: Burnett, Charles. *Arabic into Latin in the Middle Ages: The Translators and their Intellectual and Social Context*. Farnham: Ashgate, 2009: 101-126].

44. Jourdain, Amable. *Recherches critiques sur l'age et l'origine des traductions latines d'Aristote*. Paris: Joubert, Libraire-Éditeur, 1843: 451-452.



*Azarkel, in motu spere stellarum fixarum, et Abu Mahomet Jeber Aven Aflah Ispalensis in ordinatione celi Solis et Veneris et Mercurii, et in locis particularibus sui libri in quibus accidit Tholomeo error; et sanauit ea Jeber et compleuit secundum radices quas posuit Tholomeus.*⁴⁵ [...] 53 *Perfectus est liber Auenalpetraug. Laudetur Ihesus Christus qui uiuit in eternum per tempora. Translatus a magistro Michaele Scotusto Tholeti in decimo octauo die Veneris augusti hora tertia cum Abuteo leuite, anno incarnationis Ihesu Christi 1217.*⁴⁶

2.10 Abraham Hebreo (circa 1264-1278)

Abraham Hebreo is also the translator into Castilian of a work by Ibn al-Haytham, later retranslated into Latin as *De configuratione mundi*, which describes the physical structure of the world. Abraham records the words of King Alfonso the Wise, who had the work translated, ordered, and illustrated *ut melius cognoscatur*. *De configuratione mundi* acknowledges the primacy of Ptolemy in the science of movement and the astrological firmament:

De configuratione mundi.

Capitulum primum. De prologo huius libri uerba Alfonsi regis Yspanie.

*Ptolomeus et multi alii sapientes qui fuerunt ante ipsum et alii post ipsum locuti sunt in scientia motuum et in firmamento celorum et composuerunt de ista materia libros multos; quidam uero probauerunt dicta sua per geometriam et alii posuerunt dicta sua sine probatione. Attamen qui melius locutus est et magis complete in hac materia fuit Ptolomeus in libro suo qui uocatur Almagesti. Et ipse et omnes alii qui locuti fuerunt in scientia ista non fuerunt locuti in corporibus celestibus sed in circulis ymaginatis, excepto eo qui edidit librum istum, quem nos fecimus transferri et ordinari. Vocabatur autem compositor huius libri Abulhazen Abnelaitam et quod equidem dixit in hoc libro fuit secundum intentionem Ptolomei. Et est imaginatus totum quod equidem est in corporibus celestibus uniuersaliter et in celis singulariter imaginatis. Et nos, respiciendo libri bonitatem et utilitatem quam inde homines assecuntur ad hoc, ut melius intelligatur, mandauimus magistro Abrache Ebreo quod transferret librum istum de Arabico in Hispanum et quod ordinaret modo meliori quam ante fuerat ordinatus et quod diuideret in capitula. Et mandauimus de unaquaque re de qua locutus est auctor propriam ponere figuram ad hoc ut melius intelligatur.*⁴⁷

45. Jourdain, Amable. *Recherches critiques sur l'age...*: 451-452.

46. Pérez Varas, F. "Sobre la recepción en el 'Parzival'", *Parzival. Reescritura y transformación*, Berta Raposo Fernández, coord. Karen Andresen, Hang Ferrer Mora, Isabel Guitérrez Koester, Frank Kasper, eds. Valencia: Universitat de València-Departament de Filologia anglesa i alemanya, 2000: 57.

47. Mancha, José Luis. "La versión Alfonsí del 'Fī hay'at al-'ālam (De configuratione mundi)' de Ibn Al-Haytham (Oxford, Canon. misc. 45, ff. 1r-56r)", 'Ochava Esfera' y 'Astrofísica'. *Textos y Estudios sobre las Fuentes Árabes de la Astronomía de Alfonso X*, Mercè Comes, Honorino Mielgo, Julio Samsó, eds. Barcelona: Agencia Española de Cooperación Internacional-Universitat de Barcelona, 1990: 143; Martínez Gázquez, José. *The attitude...*: 115-116.



2.11 *Dalmau ses Planes (1360-1366)*

Dalmau ses Planes, the second of Peter the Ceremonious' astronomers who worked on the astronomical tables and the writing of their canons with the astronomers Pere Gilbert and the Jew Jacob Corsino,⁴⁸ also wrote an astronomical treatise in the form of an almanac covering the years from 1361 to 1433. Specifically, Dalmau presents a brief synthesis of the history of the astronomical tables and mentions Hipparchus and Ptolemy; he describes Ptolemy as King of Alexandria and *summus* author in astronomy:

Introductio canonum magistri Dalmacii Planes.

Ptolomeus uir in scientia stellarum peritissimus, exarator 'Centilogii sui propositione quinquagesima' [...] unde Ptolomeus dicti 'Centilogii propositione vii sic ait: 'Sol est origo uirtutis uitalis, Luna est origo uirtutis naturalis, Saturnus est origo uirtutis retentiue, Iupiter uirtutis crescentis, Mercurius uirtutis cogitationis, Mars uirtutis nascendi et attrahendi, Venus uirtutis appetitiue'. Et per consequens eorum opera non poterant sic cum ueritate sciri, licet ad hoc plures actorum dedissent efficacem prout longe ante aduentum Christi fuit Abraxis et paulo post Ptolomeus, ut quidam asserunt rex Egipti et in hac scientia summus, qui super hiis composuit tabulas et uolumina plura. [...] Hins ille astrologorum maximus Ptolomeus 'Quadripartiti sui libro primo capitulo 3' sic ait: Dicemus namque, inquit, quoniam si huius sciencie utilitatis quantitatem que ad animam pwrinetconsiderare uelimus' [...].⁴⁹

The prologue is similar to the one written by King Peter in the *Canones super tabulis Illustrissimi Regis Petri tertii nomine Regum, Rex Aragonum*, with expansions in some places: *Et nos sollicitauimus complere promissa et opinionem sapientis predicti et non inuenimus qui complere sciret opus nostrum nisi magistrum Dalmacium Planes scolaren dicti magistri Petri [...].⁵⁰*

3. Ptolemy in mediaeval scientific Latin manuscripts

References to the person and work of Ptolemy in mediaeval scientific Latin manuscripts are omnipresent. They highlight his theories, compare his data against other opinions, or directly praise his work. From the many possible examples, we highlight some passages which Millàs i Vallicrosa mentions in his study of the manuscripts of the Chapter of the Cathedral of Toledo.

On f. 67r. a. of manuscript 10023 (Biblioteca Nacional de España) he identifies an astronomical work attributed to R. Abraham ibn Ezra, and on f. 70 v. b. we

48. Comes, Mercè. "Mathematical Geography in the Lifetime of Omar Khayam". *Farhang. Quarterly Journal of Humanities and Cultural Studies, Iran*, 18/53-54 (2005): 348.

49. Millàs i Vallicrosa, Josep Maria. *Las traducciones orientales en los manuscritos de la Biblioteca Catedral de Toledo*. Madrid: Consejo Superior de Investigaciones Científicas, 1942: 87-90; Martínez Gázquez, José. *The attitude...*: 170-171.

50. Millàs i Vallicrosa, Josep Maria. *Las traducciones...*: 142.



find a geometrical example how to compare the tenets of Indian and Ptolemean astronomy, highlighting their similarities and differences:

*Philosophi indorum artem communem et subtilem tradiderunt qua poterimus inuenire quantum sit latus poligonie equilaterae circulo inscripte; inter artem eorum et Ptholomei nulla est differentia in latere trigoni uel quadrati uel pentagoni uel exagoni uel octogoni uel in figura 9 angulorum, sed in latere decagoni dissentiunt fre in 9 minutis sexagessimis quod parum nocet.*⁵¹

F. 50r of manuscript 10059 (Biblioteca Nacional de España) contains al-Hasan ibn al-Haytham's astronomical treatise, translated by an unknown author. After a detailed study, the author praises Ptolemy's opinions above all others:

*Omnis igitur motus omnium partium mundi, secundum quod intelleximus ex magno studio, secundum opiniones et considerationes quadriualium, et quidquid inuenitur per inductionem, et secundum quod peruenit inquisitio studentium in ista arte, et precipue Ptolomei [...].*⁵²

At the beginning of the *Tractatus primus* of his translation of *Liber Ali Filii Achamet, in electionibus horarum*, Plato of Tivoli translates the author's opinion of the treatise on Ptolemy's work as follows:

Differentia I, an sint electiones utiles.

*Opera iudiciorum astrorum certa esse a Ptolomeo rege patenti ratione probatum est. Et ego quidem addidi quasdam probationes in libro meo, dum uerba Ptolomei exponerem. Huius ergo partem sapientie, scilicet, electionum utilem esse necesse est, si concesseramus ipsum opus uerum esse.*⁵³

In conclusion, the Middle Ages cultivated Ptolemy's memory. He was recalled as an author *sapientissimus* and *summus* in his science, *inter omnes precipue Ptolomeus hac claruit disciplina* or *uir in scientia stellarum peritissimus*,⁵⁴ and *ille astrologorum maximus Ptolomeus*, exalted by legend as King of Egypt and Alexandria. His work, and above all the *Almagest*, was considered the greatest scientific achievement of Antiquity, and the translators of Arabic science made great efforts to find it and to translate it into Latin.

51. Millàs i Vallicrosa, Josep Maria. *Las traducciones...*: 193.

52. Millàs i Vallicrosa, Josep Maria. *Las traducciones...*: 311.

53. Millàs i Vallicrosa, Josep Maria. *Las traducciones...*: 328-329 (Appendix V. *Tratado astrológico de 'Aliben Ahmad al-'Imrani, según la traducción latina de R. Abraham bar Hiyya y Platón de Tivoli*, Ms. 10009, Biblioteca Nacional de España. f. 23v); *iubet rex Ptolomeus*. Millàs i Vallicrosa, Josep Maria. *Assaig d'Història...*: 322.

54. Also in Lemay, Richard, "De la Scolastique..." 434. *Nec enim tuum latet acumen quod omni sapienti liquet, numerorum mensurarumque scientiam ad eam que astrorum quasi quandam introductionis prestruere pontem. Huius uero partem que siderum motus speculatur ueterum lima, speculum modernorum Claudius Ptolomeus astrorum scientie peritissimus XIII perscripsit libris qui a Grecis quidem Mathematica seu Megisti Sintaxis, a Sarracenis uero Almagesti corrupto nomine appellatur.*

