

Ptolemy's Science of the Stars in the Middle Ages edited by David Juste, Benno van Dalen, Dag Nikolaus Hasse, and Charles Burnett

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Volume 3, numéro 1, 2022

URI : <https://id.erudit.org/iderudit/1107161ar>

DOI : <https://doi.org/10.33137/aestimatio.v3i1.41825>

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Éditeur(s)

Institute for Research in Classical Philosophy and Science

ISSN

1549-4470 (imprimé)

1549-4497 (numérique)

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Citer ce compte rendu

Hamm, E. (2022). Compte rendu de [Ptolemy's Science of the Stars in the Middle Ages edited by David Juste, Benno van Dalen, Dag Nikolaus Hasse, and Charles Burnett]. *Aestimatio*, 3(1), 176–181.

<https://doi.org/10.33137/aestimatio.v3i1.41825>

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Ptolemaeus Arabus et Latinus. Turnhout: Brepols Publishers, 2020. Pp. x + 463. ISBN 978-2-503-58639-7. Cloth €100.00. ISBN 978-2-503-58947-3. eBook Open Access: <https://www.brepolonline.net/doi/epdf/10.1484/M.PALS-EB.5.120189>

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This exciting collection of articles was a result of a 2015 conference by the same name, “Ptolemy’s Science of the Stars in the Middle Ages”, sponsored by the Ptolemaeus Arabus et Latinus (PAL). Like the entire PAL project, this work highlights Arabic and Latin scholars’ criticisms of, inquiries into, and refutations of, the Ptolemaic corpus and astrological conceptions of the universe. Consisting of 15 articles organized into three sections—“The Greek and Near Eastern Traditions”, “The Arabic Tradition”, and “The Latin Tradition”—this collection is comprehensive. It features novel, important research on Ptolemy’s works and the influence of Ptolemaic thought by top scholars in the field. The volume will be of particular value to specialists but is accessible to others interested in the history of astronomy and mathematics.

1. The Greek and Near Eastern traditions

The first section contains articles by Alexander Jones, Nathan Sidoli, Paul Hullmeine, and Bojidar Dimitrov. Both Jones’ and Sidoli’s essays examine works by Ptolemy himself, while Hullmeine and Dimitrov explore the reception and influence of Ptolemy’s ideas.

Jones’ article establishes the authorship of the works attributed to Ptolemy, resolving debates about at least one work in which Ptolemy’s authorship had previously been disputed. Jones identifies a number of phrases and words that appear nowhere in the entire Greek corpus, which is searchable

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in the *Thesaurus Linguae Graecae* database, except in Ptolemy's works or those of much later authors who were heavily influenced by Ptolemy. Jones argues that assessing both style and specific phrases offers a secure test of authorship. He establishes Ptolemy as the author of *On the Criterion*, a text attributed to Ptolemy but whose authorship has at times been in doubt. This is an important point, and he clearly lays out the evidence for Ptolemy's authorship. He discusses texts that have come down to us as partial Greek texts or as Arabic or Latin translations and texts that have been lost altogether but are known through references by Ptolemy or other authors. Finally, he discusses the order and dating of Ptolemy's works, specifying what can be firmly and tentatively dated.

Sidoli explores the mathematical methods used in Ptolemy's *Analemma*. This text offers a way of representing the position of the Sun, a three-dimensional problem, on a plane diagram, which can be used to make computations. For Ptolemy, Sidoli concludes, the model itself became the object of investigation, and he applied geometrical discoveries about the model to the natural world.

Hullmeine traces the origins of the ninth sphere, which some believed to be a starless sphere located beyond the sphere of the fixed stars. This sphere is part of the medieval, Arabic, Latin, and Hebrew traditions and is often associated with Ptolemy's cosmos. Hullmeine argues that Ptolemy did not establish a cosmos with a ninth sphere, but that John Philoponus (sixth century AD) was the first thinker to attribute a ninth sphere to Ptolemy. Moreover, he shows that al-Biruni was the first to note that John Philoponus was the source of this misattribution.

Dimitrov edits the Syriac translation of the *Tetrabiblos* and compares it to Greek, Latin, and Arabic versions, giving scholars the opportunity to examine the history of the Syriac translation for the first time. The article compares a number of significant readings and establishes that the Syriac remains closer to the Latin and Greek than to the Arabic, thus revealing valuable information about the history of the transmission of the *Tetrabiblos*.

2. The Arabic tradition

The research on Islamic thinkers on the Ptolemaic corpus is a signal strength of this collection of essays. Careful and detailed analysis of different commentaries and translations provides a view of how Ptolemy's work was read by astronomers from varying time periods and cultures and offers insight into the transmission history of certain texts. Each of the authors—Johannes Thomann, Dirk Grupe, Y. Tzvi Langermann, José Bellver, and Josep

Casulleras—provides careful textual and linguistic analysis to reveal and establish how different Islamic thinkers engaged with Ptolemaic thought. These articles all make tangible and important contributions to the study of ancient Greek and medieval Arabic astronomy and reveal the history of textual transmissions as well as the influence of specific critiques of, commentaries on, and corrections of Ptolemaic thought. They also identify new and fruitful avenues for future scholarship.

Thomann focuses on Ibn al-Ṣalāḥ's critique (12th century) of al-Fārābī's commentary on the *Almagest*. This critique, which was directed at al-Fārābī (10th century) and not at Ptolemy, was believed to be lost, but a manuscript was found in Tehran in 2011. The beginning of this manuscript is missing and, consequently, it was transmitted anonymously. However, the manuscript was identified as Ibn al-Ṣalāḥ's critique after al-Fārābī's commentary was studied for the first time. Thomann compares text from the Greek and Arabic translations by the anonymous author, Al-Ḥajjāj, and Ishāq/Thābit. The anonymous translation differs more from the other two Arabic translations, and Thomann proposes that the anonymous text is an earlier translation, possibly from the ninth century AD. Based on the translations that Ibn al-Ṣalāḥ used in his other works, Thomann suggests that the anonymous text could be the translation by al-Ḥasan ibn Quraysh, which offers a small intact passage of a translation that was previously lost.

Grupe reveals the importance of Thābit ibn Qurra's version of the *Almagest*. This version, which Grupe himself recently established as Thābit's, was used by many prominent Islamic astronomers, and Grupe demonstrates the significance of this work by showing that some of Thābit's ideas were widely referenced and taken up by other Islamic astronomers.

Langermann offers a close analysis of Ptolemy's Greek text compared to commentaries by Ibn al-Haytham, Jābir ibn Aflaḥ, and Abū Rayḥān al-Bīrūnī's al-Qānūn al-Mas'ūdī. Langermann's comparison focuses on Ptolemy's argument in *Almagest* 1.3 that the heavens move like a sphere, and he examines how Islamic thinkers treated Ptolemy's arguments. Langermann concludes that commentaries by Islamic thinkers did not aim at criticism but explicating and elucidating issues. Yet, in practice, there was indeed criticism and attempts to "tidy up Ptolemy's presentation" [159, 178].

Bellver carefully explores the different versions of Jābir b. Aflaḥ's *al-Kitāb fī l-Hay'ā*. He examines four Arabic manuscripts, focusing on the authorship and establishing the chronological order of these works [181].

Finally, Casulleras examines astrological concepts and computations that were incorrectly ascribed to Ptolemy or Hermes by medieval Arabic authors. These concepts and computations were, Casulleras argues, probably attributed to Ptolemy and Hermes to give prestige to these practices.

3. The Latin tradition

The section devoted to the Latin tradition contains articles by Henry Zepeda, Carlos Steel, Jean-Patrice Boudet, Michael Shank, H. Darrel Rutkin, and Richard L. Kremer. This is the largest section of the collection in terms of the number of both articles and pages. All of the articles in this section offer close analysis of Ptolemaic ideas within the works of medieval astronomers and practitioners.

Zepeda examines the glosses that medieval scholars added to the Latin manuscripts of lesser known commentaries of the *Almagest*. These glosses provide insight into what parts of the text were focused on, what questions medieval scholars were interested in, and how the *Almagest* was taught and understood. Zepeda reviews 45 manuscripts of Gerard Cremona's translation of the *Almagest*, 28 of which contained a significant number of glosses. He offers samples of glosses and shows that while such glosses can be challenging to understand, they provide insight into how practitioners understood and engaged the *Almagest*.

Steel analyzes Henry Bate of Mechelen's (1246–ca 1310) Latin translations of astrological works by the 12th-century Jewish scholar Ibn Ezra. Bate's translation of Ibn Ezra's *Book of the World* included a preface in which Bate defends Ptolemy against critiques by Ibn Ezra. Additionally, Bate discussed a method of approximation that offers a way to have a sound astronomical science, even though sense perception cannot produce observations as precise as one would like. Steel includes, as an appendix, an edition of the Latin text and a translation of Bate's preface.

Boudet discusses the pseudo-Ptolemaic text *Καρπός*, which is also known as *Kitāb al-thamara* in Arabic and *Liber fructus* or *Centiloquium* in Latin. This text contains hundreds of astrological propositions or aphorisms, and it was widely circulated in medieval Europe. Boudet provides a survey of the medieval manuscripts and compares selections. He argues that this work helped construct the Church's doctrinal norms concerning astrological causality.

Shank explores an important passage on the order of the planets in the *Defensio Theonis contra Georgium* by Regiomontanus. This passage focuses

on Ptolemy's discussion of the order of the planets in *Almagest* 9.1, and Shank explores the response by George of Trebizond (who, in 1451, translated the *Almagest* into Latin and wrote a commentary on it as well) and Regiomontanus' critique of George's commentary. Shank emphasizes that the critiques of planetary order are related to deeper questions about the size, ratio, and organizing principles of the cosmos.

Rutkin examines Giovanni Pico della Mirandola's *Disputations against Divinatory Astrology* (1496), focusing on explicit mentions of Ptolemy in Pico's attack of astrology. Rutkin argues that Pico's critique of astrology played an influential and significant role in the emerging view that astrology was no longer a legitimate source of knowledge.

Finally, Kremer discusses the practices surrounding the creation of the 1630 annual astrological prognostication. He examines how Lorenz Eichstad, a physician and calendar maker in Stettin, focused on predictive calculations, not geometric models, and employed multiple theories, including the "Keplerian calculation", the "Copernican calculation", and the "Longomontanian calculation". Kremer focuses on Longomontanus' models of Mars and shows that while Longomontanus mostly followed Ptolemaic ideas, he sometimes strayed. Kremer calls Longomontanus the "last astronomer to create a new theory in the Ptolemaic tradition" [440].

4. Conclusion

It is difficult to appraise a collection of essays of this size and caliber succinctly. The 15 essays each make notable contributions, and this collection stands out in its scope, originality, and depth of engagement. The articles do not always speak to one another, which is sometimes disappointing but perhaps not surprising given the breadth of chronology, topics, cultures, historical contexts, methodologies, and original languages. However, the research in this collection is groundbreaking and a welcome contribution. The articles demonstrate how careful considerations of Ptolemaic thought in the Greek, Near Eastern, Arabic, and Latin traditions allow scholars to understand the reception of Ptolemaic ideas and the spectrum of practitioners of astronomy and astrology across cultures and time periods. Many of the authors note the richness of the source material and identify new and promising avenues for future research.

It is useful to have this collection of articles in one text, making this work a valuable resource. It is also exciting to see this collection available as both an Open Access eBook, and a print version for those who prefer a printed format over an electronic one. Overall, this is a valuable and significant contribution

to the study of Ptolemy, the reception of Ptolemaic thought in Arabic and medieval sources, and the history of astronomy and astrology in general.