

RECONSTRUCTING MIDDLE BYZANTINE ARABO-GREEK ASTROLOGY FROM LATER GREEK MANUSCRIPTS

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Abstract

This paper sheds light on one aspect of the large-scale influx of Arabic scientific knowledge into Byzantium through an analysis of three Byzantine astrological compendia that contain texts originally written in Greek as well as those translated from Arabic to Greek. While written c. 1200–1400, each manuscript contains a compilation that was assembled in the eleventh and twelfth centuries. The paper first considers the dating of each of the three compilations and shows the utility in using these late Byzantine manuscripts to study Middle Byzantine astrology. Second, it analyzes the Arabic texts translated in these compilations and uses them to explain the chronology and the scale of the translation of astrological material from Arabic to Greek. Third, it considers how the Arabic and Greek material is combined within these manuscripts, and what the resulting synthesis says about Middle Byzantine astrology writ large.

Key Words

Astrology, Arabo-Greek, Byzantine manuscripts, translation movement, transmission of ancient science.



While the scholarly field of Graeco-Arabic studies has emerged as a substantial field dedicated to the study of the scientific works and achievements resulting from the large-scale ‘Abbasid Translation Movement centered in Baghdad from the eighth to tenth centuries, the subsequent translations from Arabic to Greek – and indeed the accomplishments of Byzantine scientists as a whole – have long been relegated to the dustbin of history. In recent decades, however, through labors spearheaded by Maria

Mavroudi, Arabo-Greek has begun to grow as a field, with scholars recognizing the persistent interest in Arabic knowledge in Byzantium in the Macedonian era, while attempting to insert Byzantium into modern narratives of medieval intellectual history that often omit it.¹ Starting in the tenth century, we begin to see the composition of Greek texts using Arabic sources and the translations of Arabic texts in part and as a whole, indicating awareness among Byzantines of a variety of genres of Arabic science.²

Based on the limited evidence of contact and influence in the ninth and tenth centuries, scholars have often explained this phenomenon as a result of diplomatic

¹ The foundational text of Arabo-Greek studies is the mammoth book of Mavroudi: MARIA MAVROUDI, *A Byzantine Book on Dream Interpretation: The Oneirocriticon of Achmet and its Arabic Sources*, Brill, Boston 2002. Mavroudi has further elucidated the historical accidents that have led to this differential treatment of medieval Greek, Latin, and Arabic science – and the relationships between them: MARIA MAVROUDI, « Translations from Greek into Latin and Arabic during the Middle Ages: Searching for the Classical Tradition », *Speculum*, 90/1 (2015), p. 28–59; MARIA MAVROUDI, « The Modern Historiography of Byzantine and Islamic Philosophy: A Comparison », *Al-Masāq* (2020), p. 1–18. Mavroudi is responding to arguments that portray Byzantium as historically relevant only insofar as it preserved the classical tradition, in contrast to how medieval Arabic intellectual history has been inserted into the narrative of Western Civilization via the Greco-Arabic translation movement and Arabo-Latin translation movement. She shows how negative assumptions about Byzantium derived from Gibbon and other eighteenth-nineteenth-century European scholars persist among scholars today. She disagrees particularly with the arguments of Dimitri Gutas that treat Byzantine philosophy as not worthy of being called philosophy (in opposition to Arabic philosophy), and the arguments of Anthony Kaldellis that separate Byzantine philosophy from theology in seeking to craft a secularized Byzantine philosophy free of Christian tarnish. These ideas about what Byzantine philosophy is and is not are well-represented in the contributions by Kaldellis, Siniosoglou, and Gutas in ANTHONY KALDELLIS, NIKETAS SINIOSGLOU (eds.), *The Cambridge Intellectual History of Byzantium*, Cambridge University Press, Cambridge 2017.

² PAUL MAGDALINO, « The Road to Baghdad in the Thought-World of Ninth-Century Byzantium », in LESLIE BRUBAKER (ed.), *Byzantium in the Ninth Century: Dead or Alive? Papers from the Thirtieth Spring Symposium of Byzantine Studies*, Birmingham, March 1996, Ashgate, Brookfield 1998 (Society for the Promotion of Byzantine Studies, 5), p. 195–213; MAVROUDI, *A Byzantine Book on Dream Interpretation*, p. 392–429; PAUL MAGDALINO, *L'orthodoxie des astrologues: la science entre le dogme et la divination à Byzance, VII^e–XIV^e siècle*, Lethielleux, Paris 2006, p. 55–107; DAVID PINGREE, *From Astral Omens to Astrology: From Babylon to Bīkāner*, Istituto Italiano per l'Africa et l'Oriente, Rome 1997, p. 63–77; CHARLES BURNETT, « Astrological Translations in Byzantium », in MARTIN HAUSER, IOANA FEODOROV, NICHOLAS V. SEKUNDA, et al. (eds.), *Actes du Symposium internationale. Le livre. La Roumanie. L'Europe*, vol. III: *Latinité orientale*, Biblioteca Bucureștilor, Bucarest 2012, p. 178–183. Dimitri Gutas has recently published a catalogue of translations made from Arabic to Greek that is a good starting point, but is incomplete and must be used with scrutiny: DIMITRI GUTAS, « Arabic into Byzantine Greek: Introducing a Survey of the Translations », in ANDREAS SPEER, PHILIPP STEINKRÜGER (eds.), *Knotenpunkt Byzanz: Wissensformen und kulturelle Wechselbeziehungen*, De Gruyter, Boston 2012 (*Miscellanea mediaevalia*, 36), p. 246–264.

contacts between Byzantium and Islamic polities, as the intervention of peculiar figures like Leo the Mathematician and Stephen of Alexandria, and as Byzantine responses to the 'Abbasid translation movement and the concurrent Islamic claims to the inheritance of the Greek past and to cultural supremacy over Byzantium.³ However, even if there was some scholarly contact that impacted the course of Baghdadi Greco-Arabic translation, there is extremely limited evidence of Arabo-Greek activity in the ninth or early tenth century. I argue that Byzantine Arabo-Greek began in earnest only in the later tenth century and accelerated after the turn of the millennium, as a result of a historical contingency that has not yet been given its proper due: the integration of large numbers of Arabic-speaking Eastern Christians into the Byzantine polity due to the expansion of the Byzantine eastern frontier, culminating in their reconquest of Antioch (969).⁴ It is no coincidence, I contend, that Arabo-Greek translation took off in this period, when bilingual Melkite scholars were likely the prime transmitters of Arabic scientific texts into Byzantium.⁵ The Arabic texts which these bilingual scholars began to render into Greek were ideally suited for Byzantine consumption, as they had been based on a similar ancient and late antique textual tradition (translated into Arabic) as that current in Byzantium (extant in the

³ MAGDALINO, « The Road to Baghdad in the Thought-World of Ninth-Century Byzantium »; DIMITRI GUTAS, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbasid Society (2nd-4th/8th-10th centuries)*, Routledge, London–New York 1998, p. 175–186; MAVROUDI, « Translations from Greek into Latin and Arabic »; COLEMAN CONNELLY, « Contesting the Greek Past in Ninth-Century Baghdad », Ph.D. Diss., Harvard University 2016.

⁴ Mavroudi is more concerned with arguing for Byzantine contact with Islamicate scholarship contemporary to the Greco-Arabic translation movement in Baghdad (i.e., the ninth and tenth centuries). She sees eleventh and twelfth-century Arabo-Greek scholarship as growing from an already vibrant engagement with the Arabophone world in the ninth and tenth centuries: MAVROUDI, « Translations from Greek into Latin and Arabic »; MAVROUDI, *A Byzantine Book on Dream Interpretation*, p. 392–429. While Mavroudi often characterizes the *Oneirokritikon* of Pseudo-Aḥmad as if it were composed in the late ninth century, her dating of the work places it between Photios and the late eleventh century. Within this range, I find a late tenth or early eleventh-century date more likely. Indeed, the only Arabo-Greek scientific translations she points to as occurring before 1000 are those astrological translations discussed by Pingree, regarding which this paper argues *contra* Pingree that there is little evidence that they were completed by 1000, even if they began to be rendered into Greek at some time around then.

⁵ On the large-scale Greco-Arabic and Arabo-Greek translation activities in tenth and eleventh-century Byzantium, see Parts II and III, respectively, of my forthcoming dissertation. As in the case of Melkite Greco-Arabic and Greco-Syriac translation in the region of Antioch, the conquest of Antioch catalyzed nascent translation activity of Greek patristic works into a large-scale translation movement: see ALEXANDER TREIGER, « The Beginnings of the Graeco-Syro-Arabic Melkite Translation Movement in Antioch », *Scrinium*, 16 (2020), p. 306–332.

original Greek). As a likely extension of Antiochene Arabo-Greek, Antioch would also be an early important center of the transmission of Arabic knowledge into Latin in the early twelfth century, including works related to the astral sciences.⁶

In studying this Middle Byzantine Arabo-Greek phenomenon, this paper will focus on the filtration of Arabic astrological knowledge into Byzantium. Scholars have long recognized that in the tenth and eleventh centuries, bilingual intellectuals transmitted Arabic astrological knowledge into Greek both through Greek compositions that used Arabic sources and through their translations of Arabic astrological texts into Greek.⁷ However, our knowledge of this phenomenon remains hazy. Almost nothing is known about the translators, which texts were translated and to what extent, and the historical context in which translation occurred. I aim to show that even before philological studies on specific astrological translations occur, we can gain a better understanding of the chronology and scope of these translation projects by examining the manuscripts in which they are represented. In so doing, I hope to forge a path forward by which we can give historical context to Arabo-Greek astrological translation and to the afterlife of these translations as they were read and integrated into the Byzantine astrological canon.

In attempting to historicize Middle Byzantine Arabo-Greek astrological translation, we face an unfortunate issue: Greek astrological manuscripts are almost uniformly from the thirteenth-sixteenth centuries. Our only evidence that certain Arabic texts were translated in the middle Byzantine period rather than in the late Byzantine period comes in the form of late manuscripts that preserve compilations made earlier, including fragments of Arabic translations. Here, I discuss three of the most important such manuscripts, which were copied from the twelfth to fourteenth centuries but contain compilations put together in the eleventh and twelfth centuries. In

⁶ CHARLES BURNETT, « Antioch as a Link between Arabic and Latin Culture in the Twelfth and Thirteenth Centuries », in ANNE TIHON, ISABELLE DRAELANTS, BAUDOUIV VAN DEN ABEELE (eds.), *Occident et Proche-Orient: contacts scientifiques au temps des Croisades: actes du colloque de Louvain-la-Neuve, 24 et 25 mars 1997*, Brepols, Turnhout 2000, p. 1–78; CHARLES BURNETT, « The Transmission of Arabic Astronomy via Antioch and Pisa in the Second Quarter of the Twelfth Century », in JAN P. HOGENDIJK, ABDELHAMID I. SABRA (eds.), *The Enterprise of Science in Islam: New Perspectives*, MIT Press, Cambridge 2003, p. 23–51; DIRK GRUPE, « Stephen of Pisa's Theory of the Oscillating Deferents of the Inner Planets (1h. 12th C.) », *Archive for History of Exact Sciences*, 71/5 (2017), p. 379–407.

⁷ E.g., cf. PINGREE, *From Astral Omens to Astrology*, p. 63–77; ANNE TIHON, « Les textes astronomiques arabes importés à Byzance aux XI^e et XII^e siècles », in ANNE TIHON, ISABELLE DRAELANTS, BAUDOUIV VAN DEN ABEELE (eds.), *Occident et Proche-Orient: contacts scientifiques au temps des Croisades: actes du colloque de Louvain-la-Neuve, 24 et 25 mars 1997*, Brepols, Turnhout, p. 313–324; MAGDALINO, *L'orthodoxie des astrologues*, p. 91–107.

investigating their contents, I revise David Pingree's claim that a large group of translations can be dated to around the year 1000,⁸ arguing instead that these manuscripts indicate that, in the tenth-twelfth centuries, some Arabic texts were translated in full into Greek, others were translated as part of Arabic compilations, and still others were translated as particular excerpts. This redating has large implications on Middle Byzantine Arabo-Greek as a whole, since it is one of the few datable aspects of the phenomenon. I consider Arabo-Greek to primarily be a phenomenon of the late tenth to twelfth centuries, that is thus posterior to the Baghdad Greco-Arabic translation movement rather than contemporary with it.

While these astrological codices reveal only limited information about the process of Arabo-Greek translation, they are revealing about the inclusion of translations from Arabic into medieval Greek astrological compendia, where they were excerpted and put side-by-side with Greek texts written from antiquity through the Byzantine era. The resulting compilations that had been supplemented by Arabo-Greek material were aimed at Byzantine astrologers for their practical use. Rather than lamenting how these compendia fractured ancient and medieval texts, we should recognize how they were fundamentals of the Byzantine scientific tradition, which would then be transmitted to early modern Europe and serve as the basis for understanding the long history of Greek science.

Thus, in this paper, I pose and answer three questions. I first explain how three unique Byzantine astrological compilations can be used to discuss and date Middle Byzantine astrological translations from Arabic. Then I investigate which excerpts of Arabic texts are found in these manuscripts and what larger translation projects they hint at. Finally, I consider how works originally written in Arabic and Greek were integrated alongside one and other in these compilations, thereby forging a middle Byzantine astrology that synthesized texts composed in Greek and Arabic.

Before beginning, I should give two disclaimers: first, because these manuscripts are massive and complex compilations full of texts that are unedited and often unattributed, this is still a work in progress. My research is ongoing, and my conclusions are tentative.⁹ Second, I approach this topic as a historian of medieval

⁸ This thesis, found across his articles with reference to most Arabic texts in the three manuscripts I am discussing today, is explained best in PINGREE, *From Astral Omens to Astrology*, p. 66–74.

⁹ Because this article takes a macro perspective, I can only give concise analyses of specific texts and issues. I hope to follow this introductory article with studies that analyze, edit, and translate texts and sections from these manuscripts and others mentioned here that are relevant to Arabic influence on Middle Byzantine astrology. Thus, the reader will note several occasions where I point to further work that I aim to accomplish.

Arabic and Greek intellectual history rather than as a historian of astrology. This was a period of intensive Greco-Arabic contact as a result of the Byzantine reconquest of Syria, in which the patriarchate and monasteries of Antioch played host to a massive translation movement of the Greek patristic canon into Arabic, while Arabophone scholars living in Antioch like Yaḥyā al-Anṭākī, Ibn Buṭlān, and Symeon Seth marketed their knowledge of Arabic science and medicine in Antioch and Constantinople. I contend both here and in my larger work that the Arabo-Greek astrological translations and Christian Greco-Arabic translations were related intellectual movements.¹⁰

I. How can later Greek astrological manuscripts inform us about the eleventh century?

An advantage of studying astrological texts is that their very nature enables us to contextualize them, as dates and other information can be gleaned from horoscopes and tables. Following on the work of the editors of the *Catalogus Codicum Astrologorum Graecorum* (i.e., the CCAG), Pingree argued that certain Palaiologan manuscripts contain compilations that were made in the eleventh or twelfth centuries, because they contained grouped dated examples from that era.¹¹ Here, I focus on three such manuscripts that are vital witnesses to twelfth-century Arabo-Greek astrology: MS Vatican City, BAV gr. 1056 (V), MS Paris, BNF gr. 2425 (P₁), and MS Paris, BNF gr. 2506 (P₂).

I.1 A *Magnum Opus* of Middle Byzantine Arabo-Greek Astrology: MS V

V, perhaps the most important manuscript for understanding Arabic influence on middle Byzantine astrology, is a complex compilation of texts in 244 folios made by a number of different scribes who fill the main text and margins with collated excerpts. Much of it deals with interrogational astrology, and likely represents the oldest Byzantine interrogational collection.¹² Scholars have long labeled this manuscript a fourteenth-century compilation based on a twelfth-century exemplar because of the presence of materials dated to the tenth-twelfth centuries and the lack of texts

¹⁰ I address this topic in my forthcoming dissertation. Furthermore, see MAVROUDI, « Translations from Greek into Latin and Arabic ».

¹¹ PINGREE, *From Astral Omens to Astrology*, p. 66–74.

¹² ANNE-LAURENCE CAUDANO, « Astrological Practices in the Handbooks of the Komnenoi Period », in MICHAEL GRÜNBART (ed.), *Unterstützung bei herrscherlichem Entscheiden: Experten und ihr Wissen in transkultureller und komparativer Perspektive*, Vandenhoeck & Ruprecht, Göttingen 2021 (Kulturen des Entscheidens, 5), p. 48–49.

present in the manuscript written after 1200.¹³ Fol. 52v contains a version of the Horoscope of Constantinople, cast c. 990 in Constantinople, perhaps by the astrologer Demophilos.¹⁴ Two chapters from the *Methods of Computing Various Astronomical Hypotheses*, a late eleventh-century Greek text that uses Arabic sources,¹⁵ are written in the margin of 15r. A short text on 32r that gives the coordinates of certain stars that have astrological impacts is attributed to « that Seth »; this is likely excerpted from a work of the late eleventh-century astrologer Symeon Seth.¹⁶ Star lists on 30v–33r are dated to 1155/1156 and 1160/1161.¹⁷ On fol. 6v and 7r, V contains horoscope charts that give the dates of the proclamations of the Komnenian emperors Alexios I and Manuel I, and references to Manuel Komnenos's death in 1180.¹⁸ This and a single folio (23r–v) of an astrological poem written by the twelfth-century John Kamateros, are the latest identifiable works in the manuscript.

While these datable examples make it clear that the compilation come together in a Komnenian context, it is additionally likely that V was written in the twelfth century, rather than being an apograph of a manuscript from that time. The fact that these eleventh-twelfth century materials are written by a multiplicity of hands, rather

¹³ CCAG V.3, no. 20 (p. 7–64). PINGREE, *From Astral Omens to Astrology*, p. 67–71; TIHON, « Les textes astronomiques arabes importés à Byzance aux XI^e et XII^e siècles », p. 321–322.

¹⁴ DAVID PINGREE, « The Horoscope of Constantinople », in YASUKATSU MAEYAMA, WALTER G. SALTZER (eds.), *Prismata: Naturwissenschaftsgeschichtliche Studien. Festschrift für Willy Hartner*, Steiner, Wiesbaden 1977, p. 305–315.

¹⁵ ALEXANDER JONES, *An Eleventh-Century Manual of Arabo-Byzantine Astronomy*, J.C. Gieben, Amsterdam 1987 (Corpus des astronomes byzantins, 3). See below for a further discussion of this text.

¹⁶ The editor of the compilation explains that he only lists from Seth nine stars that are not found in Abū Ma'shar's star catalogues which are found alongside it in V. The text was originally edited as Appendix 11 in DAVID PINGREE, « The Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts », *Viator*, 7 (1976), p. 192. Magdalino made some editorial changes and translated it as Appendix III in PAUL MAGDALINO, « The Byzantine Reception of Classical Astrology », in CATHERINE HOLMES, JUDITH WARING (eds.), *Literacy, education and manuscript transmission in Byzantium and beyond*, Brill, Boston 2002, p. 53–54.

¹⁷ ANNE TIHON, « Tables Islamiques à Byzance », *Byzantion*, 60 (1990), p. 405–410; PAUL KUNITZSCH, « Die arabische Herkunft von zwei Sternverzeichnissen in cod. Vat. gr. 1056 », *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, 120/2 (1970), p. 281–287.

¹⁸ DAVID PINGREE, « Gregory Chionides and Palaeologan Astronomy », *Dumbarton Oaks Papers*, 18 (1964), p. 138 fn. 29. While other sources indicate that Manuel died in 1180, the forecast gives a date for September 24, 1179; this can be explained, perhaps, by the fact that the maker of this forecast was using a calendar year that started October 1st rather than September 1st, as various Eastern groups including Melkites do, and thus may indicate that the maker of this horoscope was not a Byzantine Roman. On Melkite calendars, see JOSEPH NASRALLAH, « La liturgie des patriarchats melchites de 969 à 1300 », *Oriens Christianus*, 71 (1987), p. 169. V also contains a chart for the death of Alexander, which has not yet been successfully dated or identified.

than a single later copyist, make it even more plausible that the manuscript was produced in the earlier era.¹⁹ It is plausible that this manuscript was the product of the efforts of multiple twelfth-century scribes working together, with later scribes adding supplementary material. As the hands change throughout the codex and its margins, the table of contents, written by two of the main hands present in the manuscript's main text, gives order and numbering to texts that occur throughout the first 200-plus folios.²⁰ With all this said, we cannot say for certain whether the manuscript was produced in the twelfth, thirteenth, or fourteenth century before V receives a proper codicological and paleographical study.²¹ Nevertheless, whether the manuscript is a Komnenian original or a later apograph, its source material was compiled in the Middle Byzantine period. That this manuscript represents a late Komnenian compilation provides the *terminus ante quem* for a large swath of Arabo-Greek astrological translation, for as discussed below, V is one of the most important witnesses of Arabo-Greek astrological material.

While the compendium inset within this manuscript was meant to be consulted for specific chapters, its compiler also intended it to make an overarching argument: that Arabic astrology was not only acceptable according to Byzantine Christian dogma, but was beneficial and thus needed to be taught and practiced. The compilation begins with a text attributed to Stephen the Philosopher, *On the Mathematical Art*.²² This

¹⁹ E.g., (i) the hand of the Table of Contents (fol. 2r–6r) that also begins the main text from fol. 8r; that of the horoscopes (fol. 6v–7r); that which adds notes to the Table of Contents and writes chapters from the *Methods* on fol. 15r; that of the Kamateros excerpt (fol. 23r–v); that found on fol. 24r–27v. Numerous hands appear and return throughout the manuscript. Detailed study of this manuscript will hopefully distinguish the hands and establish how the codicology of the manuscript relates to the paleographical variation.

²⁰ Further indeed, materials in the manuscript are related to each other, such as the tables for the *klima* of Rhodes (fol. 36–38) referred to by the author of the treatise on the astrolabe translated from Arabic: ΤΙΗΟΝ, « Tables Islamiques à Byzance » p. 410.

²¹ Unfortunately, due to the COVID-19 pandemic, I did not have the opportunity to study the manuscript in person in the writing of this article. I hope that my colleague Luca Farina, who intends to study the materiality of this codex in detail, will be able to determine when the manuscript was produced.

²² The text is found on V, fol. 8r–11r. Although the folia between the end of the table of contents and this text contain horoscopic diagrams (fol. 6v and 7r), it is clear that *On the Mathematical Art* was intended as the beginning of the manuscript: it is written in the same hand as the main hand within the table of contents, where it is also placed first. The full title of this work is simply the titles of its chapters joined together, is *On the Mathematical Art and on Those Heathens using it; to those who say that it is sinful; about the fact that the one who does not accept it, sins; about its usefulness, and about the fact that it is more honorable than all other arts*. The text has been edited by Franz Cumont from MS Venice, Biblioteca Marciana gr. Z. 335 in CCAG II, p. 181–186, where it is given the title « Stephani philosophi de arte mathematica ». Cumont's transcription of the Marciana manuscript does not take the older

treatise makes an argument about the usefulness of astrology that is remarkable by Byzantine standards. Stephen says that he has come to Constantinople from Persia (i.e., the 'Abbāsīd Caliphate), where the ancient practice of astronomy and astrology was carefully cultivated. He was disappointed to find these scholarly fields in Byzantium utterly lacking, a problem he attributed to the difficulty in establishing astronomical tables and the perception that it was sinful. So, Stephen says that he created new tables for the *klima* of Constantinople that take into account the displacement of the sun in the heavens over the centuries since Ptolemy's tables, and that use the Byzantine calendar, rather than the ancient Egyptian one used by Ptolemy or the Islamic calendar used by the *neoterōi*, i.e., Islamicate scholars.²³

Most of the treatise revolves around Stephen's arguments in favor of Christians studying the heavens. He explains that the association of the « mathematical art » with contemporary Muslims need not disqualify its study, as the discipline had been passed to them through a long line of caretakers: Romans, Greeks, Egyptians, Persians, and Chaldaeans, who had begun the study of the stars through the influence of Seth, the biblical patriarch and son of Adam.²⁴ He argues that the study of this art is essential for all other sciences, and eminently useful for a variety of human endeavors, providing prognostic information for subjects like when and how to deal with runaway slaves, illnesses, waging war, or going on journeys.²⁵ It should be noted that it is precisely these sorts of questions for which the interrogational astrological compendium in codex V provides methods.²⁶ Yet most importantly, he contends that

recension provided in V into account, which in addition to textual differences, contains additional sentences at the conclusion of the final chapter. I hope to publish an edition, translation, and study of this intriguing text rectifying this situation. For present purposes, I will reference this text both by referring to CCAG II and to the relevant folio in V. Though the treatise has not yet been edited or translated in full, Paul Magdalino's discussion of it paraphrases or translates the transcription from the CCAG: MAGDALINO, *L'orthodoxie des astrologues*, p. 19–22.

²³ CCAG II, p. 181–82; V, fol. 8r–v.

²⁴ CCAG II, p. 82; V, fol. 8v. Since Josephus (*Jewish Antiquities*, 2.3), Adam's son Seth was typically regarded as the father of astrology; Stephen was not alone among Byzantine authors in using Seth to establish the biblical pedigree for the study of the heavens; see WILLIAM ADLER, « Did the Biblical Patriarchs Practice Astrology? Michael Glykas and Manuel Komnenos I on Seth and Abraham », in *The Occult Sciences in Byzantium*, La Pomme d'or, Geneva 2006, p. 245–263. Pingree has pointed out that Abū Ma'shar gives a similar genealogy of astrological knowledge but without Seth in his *Mudhākarat*, as present in its Greek translation – which is also present on V, fol. 193v–221v: DAVID PINGREE, « Classical and Byzantine Astrology in Sassanian Persia », *Dumbarton Oaks Papers*, 43 (1989), p. 227, 339.

²⁵ CCAG II, p. 184–185; V, fol. 9v–10r.

²⁶ On runaway slaves, V, fol. 77v–79r; on illness, fol. 72r–73v; on waging war, fol. 86r–89v; on journeying, fol. 92v–94r.

astronomy and astrology are branches of Christian wisdom that are not only acceptable for the Orthodox to participate in, but actually inappropriate to deny. Stephen intersperses references to the bible,²⁷ and contradicts arguments that astrology is sinful and deterministic, saying that because God created the heavens and manages their movements by his will for the benefit of his animal creations, especially man. He goes so far as to say that astronomy is the noblest art (*techne*), and that one who does not accept this art, commits the gravest sin, as he denies God's creation and his foreknowledge (*pronoia*), and thus « he would immediately become a denier of the wisdom of God ».²⁸

While I have thus far treated *On the Mathematical Art* as a composition of Stephen the Philosopher, its authorship and time of composition both deserve scrutiny. Scholars have attributed it to Stephen because it was thus labeled in MS Venice, Biblioteca Marciana gr. Z. 335, the fourteenth/fifteenth-century manuscript from which Franz Cumont published the text in the CCAG. However, in the older codex V, the main scribal hand that wrote this text, the table of contents, and that can thus be associated with this Komnenian compilation, ascribed it to an anonymous « certain most wise man, » while the name of Stephen the philosopher is only scrawled in V by a later hand.²⁹ The identity of Stephen the Philosopher – and his connection with Stephen of Alexandria (or Athens), the famous polymath from the time of Heraclius³⁰ –

²⁷ He makes two references the Synoptic Gospels: one to the Parable of the Talents (CCAG II, p. 182; V, fol. 8r; Matthew 25:25), and the other to Christ's statement that blasphemy against the Holy Spirit is an unforgivable sin (CCAG II, p. 184; V, fol. 9r; Matthew 12:31 / Luke 12:10).

²⁸ Greek: « εὐθὺς τῆς τοῦ θεοῦ σοφίας ἀρνητῆς γίνεται » (CCAG II, p. 183; V, fol. 9r).

²⁹ Greek « σωφωτάτου τινὸς » (V, fol. 2r, 8r). The later attribution to Stephen is found only after the title of the text on 8r, not in the table of contents.

³⁰ Scholars have long pointed to the large number of texts across genres like astronomy, alchemy, and medicine attributed to philosophers named Stephen often said to be from Alexandria or Athens. I will only weigh in on this debate here to say that *On the Mathematical Art* was likely pseudonymously attributed to Stephen of Alexandria – and to the « Stephen the Philosopher » who after 775 authored the horoscope of Islam published by Hermann Usener. On the writings attributed to Stephen of Alexandria, see HERMANN USENER, *De Stephano Alexandrino*, A. Marcum, Bonn 1880; PINGREE, « Classical and Byzantine Astrology in Sassanian Persia »; WANDA WOLSKA-CONUS, « Stephanos d'Athènes et Stephanos d'Alexandrie: Essai d'identification et de biographie », *Revue des études byzantines*, 47/1 (1989), p. 5–89; TTHON, « Tables Islamiques à Byzance »; MARIA PAPATHANASSIOU, « Stephanos of Alexandria: A Famous Byzantine Scholar, Alchemist and Astrologer », in PAUL MAGDALINO, MARIA V. MAVROUDI (eds.), *The Occult Sciences in Byzantium*, La Pomme d'or, Geneva 2006, p. 163–203; JEAN LEMPIRE, « D'Alexandrie à Constantinople: le commentaire astronomique de Stéphane », *Byzantion*, 81 (2011), p. 241–266; MOSSMAN ROUECHÉ, « Stephanus the Philosopher and Ps. Elias: A Case of Mistaken Identity », *Byzantine and Modern Greek Studies*, 36/2 (2012), p. 120–138; STEPHEN OF ALEXANDRIA, *Le commentaire*

is disputed. Pingree suggested that he was a Christian astrologer named Stephen active c. 800, who was a student of Theophilus of Edessa who brought his teacher's texts and ideas about political astrology and astrological history to a receptive Byzantium. He assigns *On the Mathematical Art* and two other texts attributed by manuscripts to Stephen of Alexandria that show knowledge of the Islamic world – one of which can be dated to the late eighth century – to this Stephen the philosopher, whom he suggests may have also been from Alexandria.³¹ While some have accepted Pingree's distinction of these two distinct astrologers named Stephen of Alexandria, others have convincingly argued against the assignation of this text to this second Stephen, or even the existence of such a figure, saying that the enduring fame of Stephen of Alexandria caused scribes to pseudonymously attribute to him anonymous occult and scientific texts.³²

I contend that doubt in Stephen's authorship of *On the Mathematical Art* is warranted, as it was likely an anonymous text later attributed to Stephen in MS Venice, Biblioteca Marciana gr. Z. 335 and by a late hand in V, after Stephen of Alexandria had become (pseudonymously) well-known for his knowledge of Islam. Anne Tihon, Paul Magdalino, and Jean Lempire have alleged that *On the Mathematical Art* was written in the eleventh century rather than c. 800, as this would better fit the five-degree displacement of the sun from the tabulated calculations of the ancients,

astronomique aux Tables faciles de Ptolémée attribué à Stéphanos d'Alexandrie, ed. and trans. JEAN LEMPIRE, Peeters, Louvain-La-Neuve 2016 (Publications de l'Institut orientaliste de Louvain, 68).

³¹ PINGREE, « Classical and Byzantine Astrology in Sassanian Persia »; PINGREE, *From Astral Omens to Astrology*, p. 59–66; DAVID PINGREE, « From Alexandria to Baghdād to Byzantium. The Transmission of Astrology », *International Journal of the Classical Tradition*, 8/1 (2001), p. 12.

³² Many scholars accept some version of this second Stephen's existence and his authorship of this text, e.g., WOLSKA-CONUS, « Stephanos d'Athènes et Stephanos d'Alexandrie », p. 12–15; GUTAS, *Greek Thought, Arabic Culture*, p. 180–186. With that said, doubts have been raised on different points, e.g., philological arguments that point to their different word choices and Greek styles, or internal criteria that place *On the Mathematical Art* in the eleventh century rather than c. 800: ANNE TIHON, « L'astronomie à byzance à l'époque iconoclaste (VIII^e–IX^e siècles) », in PAUL LEO BUTZER, DIETRICH LOHRMANN (eds.), *Science in Western and Eastern civilization in Carolingian times*, Birkhäuser Verlag, Basel–Boston 1993, p. 183–190; MAGDALINO, « The Road to Baghdad in the Thought-World of Ninth-Century Byzantium », p. 210–213; MAGDALINO, *L'orthodoxie des astrologues*, p. 19–25; LEMPIRE, « D'Alexandrie à Constantinople: le commentaire astronomique de Stéphanos », p. 261–262; ROUECHÉ, « Stephanus the Philosopher and Ps. Elias: A Case of Mistaken Identity ». None of these scholars, however, have connected their doubts about *On the Mathematical Art* to the fact that the earliest witness to this text, V, only contains the name Stephen in a later hand. This sort of pseudonymous attribution to a famous scientist is unsurprising, particularly in the occult sciences; e.g., the attribution of the Arabo-Greek *Oneirokritikon* to Aḥmad ibn Sirīn: MAVROUDI, *A Byzantine Book on Dream Interpretation*, p. 32–41.

and as it appears to describe a well-developed Islamic astrological context.³³ While astrology was still a novel Arabic discipline c. 800, by the eleventh century, Arabic was undoubtedly the major language of astrology in the Mediterranean, as made clear in the multitude of translations of eighth to tenth-century Arabic astrological texts found in V. Stephen's labeling of Arabic scholars as *neoteroi* would be the earliest known attestation of this term by centuries, but fits well within an eleventh-century context.³⁴ Magdalino was hesitant to place *On the Mathematical Art* in eleventh-century Byzantium because Pseudo-Stephen claimed to be renewing Byzantine astrology according to Arabic norms – a project that Magdalino considered to better fit the iconoclast era.³⁵ However, I consider this rhetoric of scholarly reformation based on an improved source base to be typical of Byzantine intellectualism of the era: e.g., Psellos's arguments that he was renewing philosophy, the claims of John Mauropos and Emperor Constantine Monomachos to be reforming Byzantine legal practice by revitalizing Roman legal education, or Symeon Seth's invocation of eastern source material to advance Byzantine pharmacology.³⁶ Indeed, Seth also furnished a defense

³³ Pingree read Pseudo-Stephen's mention of the five-degree solar displacement that resulted from Byzantine usage of ancient tables, in relation to his desire to make new tables that used the Byzantine era rather than the Egyptian calendar, as Byzantines were forgetting to include the five epigonal days of the Egyptian calendar that have to be added to each solar year. Tihon finds Pingree's explanation an unsatisfactory attempt to date this text c. 800, and argues that it was likely written later: PINGREE, « Classical and Byzantine Astrology in Sassanian Persia », p. 238; TIHON, « L'astronomie à byzance à l'époque iconoclaste (VIII^e–IX^e siècles) », p. 183–190. Magdalino argues for an eleventh-century date, but hedges his discussion and does not firmly conclude when to date it. Lempire used the *Devplo* program developed by Raymond Mercier to calculate the solar displacement, stating with assurance that a five-degree displacement fits the eleventh century but not the eighth century: MAGDALINO, *L'orthodoxie des astrologues*, p. 19–25; LEMPIRE, « D'Alexandrie à Constantinople: le commentaire astronomique de Stéphane », p. 261–262.

³⁴ Although Caudano points out that references to the *neoteroi* occur commonly in the eleventh and twelfth centuries but not before, she does not question the dating of *On the Mathematical Art* to the eighth century in her discussion of the usage of the term *neoteroi*: CAUDANO, « Astrological Practices in the Handbooks of the Komnenoi Period », p. 40–44.

³⁵ MAGDALINO, *L'orthodoxie des astrologues*, p. 23–24.

³⁶ On Psellos, e.g., ANTHONY KALDELLIS, *Hellenism in Byzantium: The Transformations of Greek Identity and the Reception of the Classical Tradition*, Cambridge University Press, New York 2007, p. 191–224; STRATIS PAPAIOANNOU, *Michael Psellos: Rhetoric and Authorship in Byzantium*, Cambridge University Press, Cambridge 2013, p. 29–50; DAVID JENKINS, « Michael Psellos », in ANTHONY KALDELLIS, NIKETAS SINIOSOGLOU (eds.), *The Cambridge Intellectual History of Byzantium*, Cambridge University Press, Cambridge 2017, p. 447–461. On this eleventh-century reformation of law, ZACHARY CHITWOOD, *Byzantine Legal Culture and the Roman Legal Tradition, 867–1056*, Cambridge University Press, Cambridge 2017, p. 150–203; SPYROS TROIANOS, « Η Νεαρά Κωνσταντίνου του Μονομάχου: ἐπὶ τῇ ἀναδείξει καὶ προβολῇ τοῦ διδασκάλου τῶν νόμων », *Byzantina Symmeikta*, 22 (2012), p. 243–263; LUDWIG BURGMANN, « Die

of the astral sciences, whose argument bears remarkable similarity to *On the Mathematical Art*; like Pseudo-Stephen, Seth employs his knowledge of Arabic apologies for astrology in *On the Utility of the Heavenly Bodies*, while arguing in a Christian guise that the heavens illustrate the providence inherent in God's creation.³⁷ In the eleventh century, Pseudo-Stephen would be one of a number of Arabophone Christians marketing Islamicate scientific knowledge to Greek-speaking Byzantines.³⁸

On the Mathematical Art was an ideal introductory text for codex V, presenting the Arabs as the modern caretakers of the useful discipline of astrology, from whom it was an Orthodox responsibility to learn as much as possible about God's creation. It leads ideally into the proceeding text – a treatise on how to use an astrolabe taken from a « Saracen writing » that I discuss below – and into the codex's proceeding astronomical tables and interrogational astrology compendium that draws heavily and openly on Arabic sources. Indeed, it functions in a remarkably similar way to the apology for astrology placed at the end of the introduction of the *Book of Nine Judges*, an influential Latin astrological compilation made in Aragon whose Arabic source base bears remarkable similarity to that of V.³⁹ Like V, the *Book of Nine Judges* was a twelfth-

Gegenwart der Vergangenheit im byzantinischen Recht », in *Ideologie e pratiche del reimpiego nell'alto Medioevo*: 16–21 aprile 1998, Centro italiano di studi sull'alto Medioevo, Spoleto 1999 (Settimane di studio del Centro italiano di studi sull'alto Medioevo, 46), p. 591–612. On Seth's *On the Faculties of Foods*, see FREDERICK LAURITZEN, « Between the Past and the East: Symeon Seth's Nutritional Advice to Michael VII Doukas », in BRIGITTE PITRAKIS (ed.), *Hayat kisa, sanat uzun: Bizans'ta şifa sanatı = Life is Short, Art Long: The Art of Healing in Byzantium*, Pera Museum, Istanbul 2015, p. 124–134; GEORG HARIG, « Von den arabischen Quellen des Simeon Seth », *Medizinhistorisches Journal*, 2/3–4 (1967), p. 248–268; MARC-ÉMILE-PROSPER-LOUIS BRUNET, *Siméon Seth médecin de l'empereur Michel Doucas, sa vie, son oeuvre*, Faculté de médecine et de pharmacie de Bordeaux, Bordeaux 1939.

³⁷ Edited in SYMEON SETH, « Syméon Seth: Conspectus rerum naturalium; De utilitate corporum caelestium », in ARMAND DELATTE (ed.), *Anecdota atheniensi*, Bibliothèque de la Faculté de Philosophie et Lettres, Liège 1927 (Bibliothèque de la Faculté philosophie et lettres de l'Université de Liège, 88/II), p. 1–127. While this text has been the subject of very little study, its argument – and source material – is the topic of Chapter 9 of my dissertation.

³⁸ For further discussion of this, see Part III of my dissertation.

³⁹ CHARLES BURNETT, « A Hermetic Programme of Astrology and Divination in mid-Twelfth-Century Aragon: The Hidden Preface in the *Liber Novem Iudicum* », in CHARLES BURNETT, WILLIAM F. RYAN (eds.), *Magic and the Classical Tradition*, Warburg Institute-Nino Aragno Editore, London–Turin 2006 (Warburg Institute Colloquia, 7), p. 99–118; BURNETT, « Astrological Translations in Byzantium ». *The Book of Nine Judges* uses al-Kindī, Sahl ibn Bishr, Abū Ma'shar, Māshā'allāh, 'Umar ibn al-Farrukhān, Abū 'Alī al-Khayyāt, and Dorotheos (in his Arabic form), in addition to the mysterious figure George and pseudonymous judgments to Aristotle. On the latter, see CHARLES BURNETT, « Aristotle as an Authority on Judicial Astrology », in JOSÉ FRANCISCO MEIRINHOS, OLGA WEIJERS (eds.), *Florilegium mediaevale: études*

century compilation that treated these Arabic astrological authorities as hallowed figures in the astrological pantheon, equal to the ancients, whose techniques thus ought to be followed.

I.2. P₁ and P₂: Two Middle Byzantine Arabo-Greek compendia in Paris

Two fourteenth-century manuscripts in the BNF reproduce compilations assembled in the eleventh century. MS Paris, BNF gr. 2425 (P₁), a fourteenth-century apograph of what appears to be an eleventh-century manuscript,⁴⁰ is divided into six books: the first four are Ptolemy's *Tetrabiblos*, Book Five is what Pingree has labeled Epitome III of the *Treasuries* of Antiochos made by Rhetorios in the early seventh century, while Book Six contains additional material of Rhetorios that was edited and supplemented c. 1000, perhaps by Demophilos.⁴¹ An addendum to Book Six comprises a series of astronomical tables and the only complete version of the aforementioned Arabo-Greek *Methods of Computing*.⁴² This treatise was written by an anonymous astronomer in Constantinople in the 1060s and 1070s using Arabic sources like the *Zīj al-Dimashqī* of Ḥabash al-Ḥāsib (d. 869) and the *Zīj al-Sindhī* of al-Khwārizmī (d. c. 850), a translation of which he quoted without citation in chapters 60–61 on solar eclipses.⁴³ The fact that this text represents one of the foremost datable examples of eleventh-century Arabo-Greek astrology renders this manuscript essential for historicizing the impact of Arabic sources in Byzantine astrology.

offertes à Jacqueline Hamesse à l'occasion de son éméritat, Fédération Internationale des Instituts d'Études Médiévales, Louvain-la-Neuve 2009 (Textes et études du moyen âge, 50), p. 39–62.

⁴⁰ CCAG VIII.4, no. 82 (p. 22–42). The manuscript is written by a single hand. It was dated to this period by Alexander Jones, who noticed datable watermarks on the codex's paper, as it had previously been dated to the fifteenth century: JONES, *An Eleventh-Century Manual of Arabo-Byzantine Astronomy*, p. 20.

⁴¹ See DAVID PINGREE, « Antiochus and Rhetorius », *Classical Philology*, 72/3 (1977), p. 203–223; PINGREE, « From Alexandria to Baghdād to Byzantium. The Transmission of Astrology ».

⁴² The scribe restarted his chapter numbering to write out this last major section of the manuscript. The tables are numbered as Chapters 4–27 (fol. 238v–257v) and the 42 chapters of the treatise are numbered 28–69 (fol. 257v–280r). While this is the only complete version of the treatise, its chapters are somewhat out of order and certain chapters are added that do not belong to the treatise; e.g., Chapters 46–48 and 49–50 ought were likely switched in the original text, based on the dates given within the examples; see JONES, *An Eleventh-Century Manual of Arabo-Byzantine Astronomy*, p. 14–15.

⁴³ OTTO NEUGEBAUER, *Commentary on the Astronomical Treatise Par. gr. 2425*, Palais des Académies, Brussels 1969 (*Mémoires de la Classe des lettres* 59/4); JONES, *An Eleventh-Century Manual of Arabo-Byzantine Astronomy*. He appears to mention the former by name in chapter 36, calling it the table of *Chaspe* (κανών τοῦ Χασπέ). For a discussion of the direct quotation from al-Khwārizmī, see JONES, *An Eleventh-Century Manual of Arabo-Byzantine Astronomy*, p. 165–167.

A second fourteenth-century manuscript from Paris, MS Paris, BNF gr. 2506 (**P**₂), has been identified as an eleventh-century compilation because of the late tenth and early eleventh century horoscopes it contains,⁴⁴ which show their author to have been a politically astute observer of his contemporary Constantinople. Chapter 219 of the compilation gives a forecast taken for a bishop of the city of Euripos in Euboea from 21 September 1001.⁴⁵ The astrologer's analysis explains why the bishop was exiled to Italy seven years later on 18 April 1009, before seeking asylum in Hagia Sophia for two years and only then being allowed return to his diocese.⁴⁶ Chapter 236 contains a horoscope of the famous general and rebel against Basil II, Bardas Phokas.⁴⁷ Unfortunately, this text has been corrupted in transmission into the fourteenth-century **P**₂: the date of the original forecast according to the Byzantine era given is incorrect by exactly a century, giving the date as 7 May 1077, if the horoscope can be calculated to fit 7 May 977, according with when Phokas was recalled from exile.⁴⁸ A further textual issue makes it difficult to date the second horoscope given in the text, i.e., the omission of a line that contained the fourth-to-tenth places within the zodiac. As a result, it is difficult to understand what the astrologer was arguing based on his comparison of these two horoscopes that doubtless corresponded to historically significant moments.⁴⁹ Nevertheless, we see clearly here the political role being played

⁴⁴ CCAG VIII.1, no. 10 (p. 74–115); PINGREE, *From Astral Omens to Astrology*, p. 66–67; HEPHAESTIO OF THEBES, *Apotelesmaticorum Epitomae Quattor*, ed. DAVID PINGREE, vol. II, De Gruyter, Berlin–Boston 1974 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana), p. v–viii. As Pingree notes, this eleventh-century compilation may only include the first 148 folios, especially seeing as a fragment from John Kamateros appears as Chapter 500 on fol. 192r. Nevertheless, even if the final recension of this manuscript was made in the Komnenian age like codex V, there seems to be an eleventh-century compilation set within it.

⁴⁵ The chapter is entitled « How it is necessary to prove annual inquiries in forecasts » and is found on fol. 74. The author gives the date according to the Byzantine calendar, and produces a corresponding horoscope which matches the disposition of the heavens at that time within a few degrees.

⁴⁶ This forecast is transcribed from **P**₂ in CCAG VIII.1, 253–255.

⁴⁷ The chapter is entitled « On the good fortune of different people », and is found on fol. 84r.

⁴⁸ Pingree mentions the date of this horoscope, but gives no further information and does not discuss the interesting historical context, associating it with chapter 235 rather than 236: ABŪ MA' SHAR, *De revolutionibus nativitatum*, ed. DAVID PINGREE, B. G. Teubner, Leipzig 1968 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana), p. viii, fn. 3. However, since he correctly gave the year as 977 rather than 1077, he must also have calculated the date of the horoscope and preferred it to the date written in the manuscript. This example was also copied from **P**₂ onto MS Paris, BNF gr. 2424, fol. 95v. See CCAG VIII.1, 69–70.

⁴⁹ The horoscope thus only gives the location of Saturn, the Lot of Fortune, and the Midheaven, and contains no corresponding Byzantine date. My attempt to date it based on these features have thus far proven fruitless. Though further textual difficulties render the interpretation of the text

by this astrologer in contemporary Byzantine politics, a role which accords with Skylitzes's report that astrological predictions were circulating that one of the Bardases (Phokas or Skleros) would successfully rebel against Basil II.⁵⁰ Chapter 335 is a rare Byzantine *dodekaëteris*, i.e., a prediction of a twelve-year cycle of climactic variations, dated 996.⁵¹ While its date makes this clearly the work of a Byzantine author, his technique in formulating this text, while ultimately based on Mesopotamian precedents that associated the places of the zodiac with each year in a fashion similar to the Chinese zodiac calendar, clearly comes from a Julio-Claudian source, as made clear by the names of the months (e.g., Ἀγρίππαιος, Νερώναιος, Δρούσαιος, and Ἀλλίσαιος).⁵² It is worth noting in relation to this text that P₁ contains a description of a *dodekaëteris* attributed to an Egyptian (Erimarabos), and an Indian (Phoredas), which may have come from an Arabic substrate.⁵³

Based on these and other datable exempla from the late tenth/early eleventh century, Pingree attributed the first 148 folios of the compilation in P₂ to Demophilos, active c. 1000.⁵⁴ However, because the manuscript contains two horoscopes taken in

uncertain for now, I hope to try to solve some of them in future work on P₂. I thank Dave Jenkins and Darin Hayton who have worked through some of this with me.

⁵⁰ JOHN SKYLITZES, *Ioannis Scylitzae Synopsis historiarum*, ed. HANS THURN, Walter De Gruyter, Berlin–New York 1973 (*Corpus Fontium Historiae Byzantinae*, 5), p. 338–339; JOHN SKYLITZES, *A Synopsis of Byzantine History, 811–1057*, trans. JOHN WORTLEY, Cambridge University Press, Cambridge 2010, p. 320–321. On the importance of political astrology in this period in Byzantium, see PAUL MAGDALINO, « The Year 1000 in Byzantium », in PAUL MAGDALINO (ed.), *Byzantium in the year 1000*, Brill, Boston 2003 (*The Medieval Mediterranean*, 45), p. 233–270.

⁵¹ P₂, fol. 129r–132r. This text deserves a great deal of further study. A version of the text found in manuscripts associated with the later school of John Abramios from MS Venice, Biblioteca Marciana gr. Z. 324 and MS Paris, BNF gr. 2420, is discussed and edited in CCAG II, p. 139–150.

⁵² Franz Boll discusses this calendar – and its dating – in his introduction to his edition of it (CCAG II, p. 138–144). On the *dodekaëteris*, see FRANZ BOLL, « Dodekaeteris », in GEORG WISSOWA (ed.), *Paulys Realencyclopädie der classischen Altertumswissenschaft*, vol. V.1, J. B. Metzlersche Buchhandlung, Stuttgart 1905, p. 1254–1255. Magdalino has argued that the crafting of this particular *dodekaeteris* at this time ought to be viewed in relation to apocalyptic prognostications about the millennium: MAGDALINO, « The Year 1000 in Byzantium », p. 261–262.

⁵³ P₁, fol. 222r, edited by Franz Cumont in CCAG VIII.3, p. 91–92. While, as Pingree notes, the story given in the text was likely somewhat mythical, it is nevertheless probable that this was an Arabic story based on Sasanian sources, both because of its purported knowledge of Indian astronomy and because of its place within this particular manuscript: PINGREE, « The Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts », p. 169–170.

⁵⁴ Other examples of given dates are fol. 77r (October 11, 984) and fol. 80v–81r (September 15, 1006). See PINGREE, « The Horoscope of Constantinople »; PINGREE, « Antiochus and Rhetorius », p. 222; PINGREE, « From Alexandria to Baghdād to Byzantium. The Transmission of Astrology », p. 11–12.

1064 and 1065, the latter of which is attributed to a Theodosios known only through this text, Pingree considers this Theodosios the final compiler of Demophilos's compilation.⁵⁵ Regardless of whether Demophilos or Theodosios did work to make these compilations,⁵⁶ these compendia show the burgeoning practice of astrology in the tenth and eleventh centuries in which a number of astrologers were participating. For example, though Pingree assumes Theodosios wrote the horoscope for 1064 as well as that for 1065, we know that Symeon Seth and the compiler of the Arabo-Byzantine *Methods* text were active at this time in Constantinople. Like the eleventh-century compiler behind **P**₁, both were very familiar with Arabic source material.⁵⁷ Though **P**₂ does not attribute any of its chapters to Arabic authors, it includes Arabic source material, as discussed below, it includes chapters from Abū Ma'shar's *Book of Judgments* and chapters attributed to Arabic authors in the fourteenth-century compilations of Eleutherios Zebelenos.

In summary, both **P**₁ and **P**₂ contain compilations that contain Arabic translations that appear to have been partially formulated around the turn of the millennium and again, in the 1060s–1070s, and **V** contains a compilation from the twelfth century. While Pingree may be correct that Abū Ma'shar's *Book of Judgments* was translated c. 1000,⁵⁸ little evidence points to that date as the time by which other Arabic

⁵⁵ These are found on fol. 95v and 57r respectively; the text written by Theodosios is also found in MS Venice, Biblioteca Marciana gr. Z. 334, fol. 64v and MS Venice, Biblioteca Marciana gr. Z. 335, fol. 193v, from which it is edited in *CCAG* II, p. 213.

⁵⁶ Pingree credits Demophilos with most astrological activity during the reign of Basil II. However, Magdalino rejects Pingree's association of dated astrological texts from the reign of Basil II with Demophilos, pointing to the unlikelihood of this classicizing name in this era and the possibility that Demophilos was simply the name of another antique astrologer excerpted in the compilation: MAGDALINO, *L'orthodoxie des astrologues*, p. 88; PINGREE, « The Horoscope of Constantinople ». The name of this astrologer is not of the greatest concern to my work because, regardless, the compilation was clearly edited or supplemented by an astrologer working in this period.

⁵⁷ At many times in dealing with these manuscripts, we are faced with the unfortunate problem that our many anonymous examples could either have been written by one individual or a number of individuals. Philological study of these passages may make the identification of these authors possible, through the detection of the style and word choices used by specific authors. This tactic also should be used to identify Arabo-Greek translators.

⁵⁸ Pingree had two key pieces of evidence for dating Abū Ma'shar's *Book of Judgments* to that time: apparent references to it in dated materials c. 1015 in **P**₂, and references made to it by Eleutherios Zebelenos (b. 1040). However, Pingree later argued that Eleutherios Zebelenos was not born in 1040, but was actually identical with Eleutherios of Elis (fourteenth c.) and quoting an astrologer who was from the eleventh century. While Magdalino disagrees with this assessment, a horoscope attributed to Eleutherios does seem to give him a fourteenth-century date. Regardless, Pingree undercut one of his key pieces of evidence, and never actually proved the usage of the *Book of Judgments* by the

translations found in **P**₁, **P**₂, and **V** were translated. However, these manuscripts do give us a *terminus ante quem* of the Arabo-Greek translations found within them of between 1100 and 1200 depending on whether they are found in **V** or one of the Paris manuscripts. While Arabo-Greek translation may have occurred from the tenth to twelfth centuries, it seems likely that the eleventh century was the primary period, correlating with the time of Greco-Arabic translation in Antioch. As a result, by the time when **V** was compiled in the twelfth century, Arabic astrological translations were widely available. In the following section, I explore what these manuscripts reveal about the extent of Middle Byzantine translation of Arabic astrological works.

II. Understanding Middle Byzantine Translation from Arabic

It is notable that these manuscripts, especially **V**, integrate excerpts of translations from Arabic alongside texts originally written in Greek, indicating that the compilations were not translated as a whole from Arabic but were made by compiling Greek texts alongside already existent Greek translations of Arabic texts. Thus, the middle Byzantine Greek scribes who compiled these compendia were likely working with already translated Arabic texts of two sorts: (i) relatively complete versions of Arabic astrological texts, and (ii) translated compendia of Arabic astrology arranged according to topic.

One case where it is clear that these manuscript compilers excerpted a text that had already been translated can be found in the Greek translation of Abū Maʿshar's *Book of Judgments of the Revolutions of the Years of Nativities*.⁵⁹ **P**₂ contains two small fragments of the text, which are derived from different manuscript traditions of the Greek translation; one fragment is not attested in other manuscripts of the Greek translation, and the other provides readings superior to those preserved in more complete later witnesses.⁶⁰ Of the host of Arabo-Greek translations found in **V**, some are shared by other Greek manuscripts in more complete forms and some are unique to it. Pingree has argued that a compendium of sayings translated as part of the sayings of Abū Maʿshar in Latin, was translated from a Greek version that had been

astrologer working c. 1015 in a text that I hope to investigate in the future. See ABŪ MAʿSHAR, *De revolutionibus nativitatum*, p. VIII–IX; PINGREE, «The Horoscope of Constantinople»; MAGDALINO, *L'orthodoxie des astrologues*, p. 101.

⁵⁹ ABŪ MAʿSHAR, *De revolutionibus nativitatum*.

⁶⁰ ABŪ MAʿSHAR, *De revolutionibus nativitatum*, p. IX–XIII. These are found on fol. 156r–158v and 173v–175v respectively.

translated from Arabic, which is now only present in **V**.⁶¹ The Latin translation of the Greek text was already circulating by the 1260s, when Stephen of Messina used it.⁶² Pingree further pointed to the Greek translations of parts of what he concluded were three different texts of Māshā'allāh in this manuscript, which are only fractionally extant in Arabic and/or Latin.⁶³ **V** here either excerpts larger translations of these works, or draws from compendia of Arabic material translated into Greek; we will only determine which of these is the case through comparison of the fragments to other Greek manuscripts.

Indeed, numerous fragments ascribed to other Arabic authors are present in the main text and margins of **V**, **P₁**, **P₂**, and in other manuscripts like MS Venice, Biblioteca Marciana gr. Z. 335. Beyond the copious citations of Abū Ma'shar, Māshā'allāh, and the group of quotations from Sahl ibn Bishr, **V** features texts attributed to Ya'qūb ibn Ishāq al-Kindī,⁶⁴ Abū 'Alī al-Khayyāt,⁶⁵ 'Alī ibn Aḥmad al-'Imrānī,⁶⁶ Ibn Hibintā,⁶⁷

⁶¹ DAVID PINGREE, « The Sayings of Abū Ma'shar in Arabic, Greek, and Latin », in VALERIA SORGE, GIANCARLO MARCHETTI, ORSOLA RIGNANI (eds.), *Ratio et superstitio: Essays in honor of Graziella Federici Vescovini*, Brepols, Louvain-la-Neuve 2003 (Textes et Etudes du Moyen Âge, 24), p. 49–50. This text could not actually have been written by Abū Ma'shar, as it included a horoscope for the year 939 well after his death.

⁶² PINGREE, « The Sayings of Abū Ma'shar in Arabic, Greek, and Latin », p. 54.

⁶³ See DAVID PINGREE, « The Byzantine Translations of Masha'allah on Interrogational Astrology », in PAUL MAGDALINO, MARIA V. MAVROUDI (eds.), *The Occult Sciences in Byzantium*, La Pomme d'or, Geneva 2006, p. 231–244. Pingree here corrects some of his earlier conclusions expressed in DAVID PINGREE, « Māshā'allāh: Greek, Pahlavī, Arabic and Latin Astrology », in AHMAD HASNAWI, ABDELALI ELAMRANI-JAMAL, MAROUN AOUAD (eds.), *Perspectives arabes et médiévales sur la tradition scientifique et philosophique grecque. Actes du colloque de la SIHSPAI, Paris, 31 mars-3 avril 1993*, Peeters, Leuven 1997, p. 123–136. One of these texts, the bibliography written by Māshā'allāh which was attached to one of his lost works, is preserved only here and in the Latin *Liber Aristotilis: MĀSHĀ'ALLĀH, The Liber Aristotilis of Hugo of Santalla*, Warburg Institute, London 1997 (Warburg Institute Surveys and Texts, 26).

⁶⁴ **V**, fol. 76v, 110v, 111v, 158v, 171v, 172r, and 172v.

⁶⁵ **V**, fol. 1r, 147v, 171r, 211r, and 234v. He is called Ἀλεῖμ ὁ Υἱὸς τοῦ Ῥάπτου or ὁ Ῥάπτης in Greek, with *rhaptes* being a translation of *khayyāt*, meaning « weaver » as identified by Pingree: PINGREE, *From Astral Omens to Astrology*, p. 69–70.

⁶⁶ **V**, fol. 144v, 172r, 208v. GAS VII, 166. From his *nisba* – transliterated in Greek as Ἐμρένης, Ἐμβρε, and ἐν Μρένη – he was identified by PINGREE, *From Astral Omens to Astrology*, p. 70.

⁶⁷ From the name of his work, *Kitāb al-mughnī fī aḥkam al-nujūm*, he receives his name found in the Greek tradition, Μούγνης: PINGREE, « Classical and Byzantine Astrology in Sassanian Persia », p. 236. This large and important compilation contains among other materials, the only extant remnants of Māshā'allāh's astrological history: DAVID PINGREE, EDWARD S. KENNEDY, *The Astrological History of Māshā'allāh*, Harvard University Press, Cambridge 1971 (Harvard Monographs in the History of Science, 5).

‘Umar ibn al-Farrukhān,⁶⁸ and an as yet unidentified figure, Elioun the Jew.⁶⁹ The works and loci from which most translations were excerpted remain unidentified. Star tables within the manuscript depend on the *Zīj al-Mumtaḥan* of Yaḥyā ibn Abī Maṣṣūr, though the compiler mentions the *Zīj al-Jamī* of Kushyār ibn Labban, the *Zīj al-Ḥākīmī* of Ibn Yūnus, and a third text simply attributed to an Egyptian as his sources.⁷⁰

Other Arabic sources in V are not explicitly identified. At times the Arabic word for scholar, *‘ālim*, is translated into Greek as Ἀλείμ, providing a convenient way of referring vaguely to Arab scholars.⁷¹ Many of the opinions in the manuscript attributed to Egyptians, Babylonians, and Persians likely also derive from Arabic.⁷² About half of the texts excerpted in V have no attributed author. Some were likely translated from Arabic sources, especially those that match texts in other Arabic-heavy manuscripts like MS Venice, Biblioteca Marciana gr. Z. 335 and the codices associated with the school of John Abramios. A number of texts – both anonymous and attributed to Greek and Arabic authors – are said to have been extracted from « Saracen » books, i.e., from Arabic.⁷³

One such text is a unique anonymous treatise on the astrolabe, entitled, *Different Methods Extracted from a Saracen Book about Casting a Horoscope with an Astrolabe and the Remaining Places of the Thema, and to Understand All the Things Written on the Astrolabe*.⁷⁴ This as yet unedited work provides evidence of the Middle Byzantine interest in Islamicate astrolabe practice, providing context for the only dated Byzantine astrolabe from the time, one belonging to Sergios the Persian, *hypatos* and

⁶⁸ V, fol. 1r; the text is unfortunately fragmentary because the right side of the folio is missing.

⁶⁹ V, fol. 86r.

⁷⁰ KUNITZSCH, « Die arabische Herkunft von zwei Sternverzeichnissen in cod. Vat. gr. 1056 ».

⁷¹ This word can be confusing in Greek, as it may also be used to indicate the name ‘Alī or indeed, the scholar Ibn A‘lam (d. 985). When put with a Greek genitive, this also is used to figure an Arabic patronymic. On 31v, both usages of Ἀλείμ occur. See ANNE TIHON, « Sur l’identité de l’astronome Alim », *Archives internationales d’histoire des sciences*, 39 (1989), p. 3–21.

⁷² E.g., the compilation on fol. 151v–155r that likely represents a translation from Arabic that attributes opinions to these groups, discussed by Pingree: PINGREE, « The Sayings of Abū Ma‘shar in Arabic, Greek, and Latin », p. 49. Various opinions are attributed to Indians, e.g. on fol. 48v, 71v, and 72v: see PINGREE, « The Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts ».

⁷³ A non-exhaustive list of this usage occurs on V, fol. 83v, 84r, 106v, 154r, 172v, 173r, 235r.

⁷⁴ Greek text (V, fol. 15v): Παρεξεβλήθησαν μέθοδοι διάφοροι ἀπὸ βιβλίου Σαρακηνικῆς περὶ τοῦ ἐκβαλεῖν ἀπὸ τοῦ ἀστρολάβου ὠροσκόπον καὶ τοὺς λοιποὺς τοῦ θέματος τόπους. ἐπιγινῶνα δὲ καὶ τὰ γεγραμμένα ἐν τῷ ἀστρολάβῳ.

protospatharios, dated 1062.⁷⁵ While *Different Methods* is the only known Greek Astrolabe treatise since that of Philoponos and before the 13th century,⁷⁶ it seems to have been aimed at a Greek-speaking audience that already had an astrolabe in hand, and perhaps, was exposed to some level of instruction from contemporary Byzantine scholars in how to use it. In opposition to many other astrolabe treatises, *Different Methods* gives no description of the parts of an astrolabe or how to build one.⁷⁷ Additionally, in an effort to translate all Arabic words into Greek terms, it is replete with Hellenized vocabulary that do not always match the antique technical terms employed by Philoponos, but rather have more in common with other Arabo-Greek astrolabe treatises.⁷⁸ I hope soon to publish the first edition and translation of this

⁷⁵ ORMONDE M. DALTON, *The Byzantine Astrolabe at Brescia*, H. Milford, London 1926. For a survey of Byzantine treatises on the astrolabe including this one, see ANNE TIHON, « Traités byzantins sur l'astrolabe », *Physis*, 32/2–3 (1995), p. 323–357.

⁷⁶ Tihon mentions as chronologically prior to this the discussion of the astrolabe in John Kamateros's astrological poem, which is not an astrolabe treatise per se, and was likely composed later than or contemporary to the translating of *Different Methods*. See TIHON, « Traités byzantins sur l'astrolabe », p. 323–332.

⁷⁷ E.g., the treatises of John Philoponos, al-Farghānī, or Pseudo-Māshā' allāh: JOHN PHILOPONUS, *Traité de l'astrolabe*, ed. and trans. CLAUDE JARRY, Les Belles Lettres, Paris 2015 (Collection des universités de France. Série grecque, 512); JOHN PHILOPONUS, *De usu astrolabii eiusque constructione*, ed. ALFRED STÜCKELBERGER, de Gruyter, Berlin 2015 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana); AL-FARGHĀNĪ, *On the Astrolabe*, trans. RICHARD LORCH, Steiner, Stuttgart 2005 (Boethius, 52); PSEUDO-MĀSHĀ' ALLĀH, *Pseudo-Māshā' allāh, On the Astrolabe: A Critical Edition of the Latin Text with English Translation* [online], ed. and trans. RON B. THOMSON, Version 1.6, Toronto 2020, <<https://shareok.org/handle/11244/14221.2>>, (accessed October 2021). Notably, the Greek translation of Pseudo-Māshā' allāh also skips the portion of the text that explains how to construct an astrolabe, moving immediately into its use: PSEUDO-MĀSHĀ' ALLĀH, *Une version byzantine du traité sur l'astrolabe du pseudo-Messahalla*, ed. and trans. RÉGINE LEURQUIN, CLAUDY SCHEUREN, ANNE TIHON, Bruylant-Academia, Louvain-la-Neuve 2001 (Corpus des astronomes byzantins, 10).

⁷⁸ The translator of *Different Methods* predominantly uses standard Greek astronomical vocabulary, in addition to some of the same astrolabe-specific words employed by Philoponos: e.g., δίοπτρα (i.e., the alidade). However, he uses other terms like πέταλον (« plate ») and κάγκελον (« spider ») that differ from those used by Philoponos and by the translator of Pseudo-Māshā' allāh. See the glossaries of terms used by Philoponos and the Greek Pseudo-Māshā' allāh: JOHN PHILOPONUS, *Traité de l'astrolabe*, p. 59–63; PSEUDO-MĀSHĀ' ALLĀH, *Une version byzantine du traité sur l'astrolabe du pseudo-Messahalla*, p. 79–83. The thirteenth-century astrolabe treatise written by Shams al-Dīn al-Bukhārī (i.e., Siamps the Persian), however, does use the term πέταλον for plate in the introduction to his as yet unedited treatise: ELIZABETH A. FISHER, « Arabs, Latins and Persians Bearing Gifts: Greek Translations of Astrolabe Treatises, ca. 1300 », *Byzantine and Modern Greek Studies*, 36/2 (2012), p. 170. More study of the vocabulary employed in Arabo-Greek astrolabe translations, some of which I hope to produce in my study of *Different Methods*, will yield further fruitful points of comparison.

text, while also analyzing its Arabic source material and its relation to other astrolabe treatises in Arabic and Greek.⁷⁹

Some of the Arabic translations found in manuscripts connected to the group of fourteenth-century astrologers around Abramios reproduced Middle Byzantine translations also found in the three manuscripts under discussion, while others were made later.⁸⁰ The three-book *Apotelesmatic Mysteries of Knowledge of Abū Ma‘shar* in MS Rome, Biblioteca Angelica gr. 29, which Pingree associates with Abramios’s collaborator Eleutherios of Elis, contains a number of texts also found in **V**, like the Greek translation of Abū Ma‘shar’s *Mudhākarāt* in the recension of his student Shādhān.⁸¹ Some of the texts of Sahl, al-Kindī, al-‘Imrānī in **V** are also found in MS Angel. gr. 29 and other manuscripts associated with Abramios.⁸² Several anonymous chapters in **V** and **P**₂ are identical to those attributed by Eleutherios to Palchos⁸³ – i.e., either Abū Ma‘shar or another astrologer from Balkh – while several others in **P**₂ are identical to those attributed by Eleutherios to Aḥmad the Persian. Investigations into the substance – and Greek style – of these chapters may reveal if Palchos and Aḥmad

⁷⁹ I have not yet identified an Arabic source text for this translation from « a Saracen book ». It is quite likely that it is either no longer extant or not yet edited, as many treatises on astrolabes were written in the 8th–11th centuries CE; see FRANÇOIS CHARETTE, PETRA G. SCHMIDL, « Al-Khwārizmī and Practical Astronomy in Ninth-Century Baghdad. The Earliest Extant Corpus of Texts in Arabic on the Astrolabe and Other Portable Instruments », *SCIAMVS*, 5 (2004), p. 101–198; TARO MIMURA, « Too Many Arabic Treatises on the Operation of the Astrolabe in the Medieval Islamic World: Athir al-Din al-Abhari’s Treatise on Knowing the Astrolabe and His Editorial Method », *Medieval Encounters*, 23/1–5 (2017), p. 365–403; JOHANNES THOMANN, « Astrolabes as Eclipse Computers: Four Early Arabic Texts on Construction and Use of the Ṣafīḥa Kusūfiyya », in JOSEFINA RODRÍGUEZ-ARRIBAS, CHARLES BURNETT, SILKE ACKERMANN, et al. (eds.), *Astrolabes in Medieval Cultures*, Brill, Leiden 2018, p. 8–44. Though it is clearly a distinct text, *Different Methods* does have affinities with published Arabic astrolabe treatises such as those written by ‘Alī ibn ‘Īsā and al-Khwārizmī.

⁸⁰ Pingree associates a number of manuscripts with this manuscript tradition: MS Venice, Biblioteca Marciana gr. Z. 324, MS Rome, Biblioteca Angelica gr. 29, MS St. Petersburg (BAN) Inostrannykh rukopisej O N° 128, MS Torino C. VII. 10, (now lost in a fire), MS Florence, BML Plut. 28, 16, MS Florence, BML. Plut. 28, 14, etc. See DAVID PINGREE, « The Astrological School of John Abramius », *Dumbarton Oaks Papers*, 25 (1971), p. 189–215.

⁸¹ This text, found on **V**, fol. 194r–206v, matches the first part of Book 2 of the *Book of Apotelesmatic Mysteries of Knowledge of Abū Ma‘shar* PINGREE, « The Sayings of Abū Ma‘shar in Arabic, Greek, and Latin »; PINGREE, « Classical and Byzantine Astrology in Sassanian Persia ». As Pingree details in the tables spread across « The Sayings of Abū Ma‘shar », the text has been partially edited in the CCAG from both manuscript traditions.

⁸² PINGREE, *From Astral Omens to Astrology*, p. 74.

⁸³ E.g., texts on **V**, fol. 111v, 116r, 117v, 120r, 163r; **P**₂, fol. 57r–58v.

were fictitious fourteenth-century creations of Eleutherios, as Pingree suggests, or earlier identifiable Arabic authors.⁸⁴

I raised the question earlier whether the compilers of **V** translated excerpts piecemeal or excerpted them from already-made Arabo-Greek translations. The answer, unfortunately, depends on the text. Indeed, with regard to the dating and extent of the translation of works by Sahl ibn Bishr, an author well-represented in **V**, one could argue both sides. It is difficult to compare the Greek fragments of Sahl, found in **V** and other manuscripts, with the Latin and Arabic texts, since Sahl's texts in Arabic and their Latin translations still predominantly require critical editions, though both versions have recently been translated.⁸⁵ However, the version of Sahl quoted *in extenso* in **V** appears to come from a corpus of texts similar to the five-text corpus of Sahl translated into Latin c. 1200, though with a slightly different breakdown of the texts, as both Greek and Latin were clearly made from the Arabic.⁸⁶ The beginning of

⁸⁴ PINGREE, *From Astral Omens to Astrology*, p. 74–77. The fact that excerpts of the two compilations are present in **V** and **P**₂ indicates that at the very least, Eleutherios was not the author, but the editor of these texts.

⁸⁵ Stegemann discusses only certain sections in **V**, as his particular focus is on Sahl's *Introduction*, for which he provides what will be very useful analysis of the translation style for any future comparisons of the Greek and Latin translations: VIKTOR STEGEMANN, *Dorotheos von Sidon und das sogenannte Introductorium des Sahl ibn Bisr*, Orientalisches Institut in Prague, Prague 1942 (Monographien des Archiv orientáli, 11), p. 29–87. My working list of the extant fragments, are **V**, fol. 72v (marg.), 144r–145v; 145v (marg.); 146r–148v; 147v (marg.); 148v–149r; 149v–150r; 173r; MS Vienna, ÖNB phil. gr. 108, fol. 203r–204v (chapter 26); MS Florence BML Plut. 28, cod. 14, fol. 303; MS Venice, Biblioteca Marciana gr. Z. 324, fol. 316; MS Madrid, El Escorial I. R. 14, fol. 200vbis (as part of a diverse collection attributed to Theophilus of Edessa and others). Other manuscripts in this tradition include MS Rome, Biblioteca Angelica gr. 29, MS Paris, BNF gr. 2056, MS Paris, BNF suppl. gr. 1211, MS Milan, Biblioteca Ambrosiana B.38 supp., MS Madrid, El Escorial 1, R 11, MS Madrid, El Escorial 1, Φ, 5). See GAS VII for the Arabic texts. His *De Electionibus* has been edited in Arabic, Latin, and translated: CAROLE MARY CROFTS, « *Kitāb al-ikhtiyārāt 'alā l-buyūt al-itnai 'ašar* by Sahl ibn Bišr al-Isrā'īlī with its Latin translation *De Electionibus* », Ph.D. Diss., University of Glasgow 1985. *De interrogationibus* has not benefitted from the same treatment. The Arabic text has been translated from an impressive group of manuscripts, though unfortunately without a published Arabic edition: SAHL IBN BISHR, *The Astrology of Sahl B. Bishr, Volume I: Principles, Elections, Questions, Nativities*, trans. BENJAMIN N. DYKES, Cazimi Press, Minneapolis, Minnesota 2019. The five-book corpus has been translated into English from the 1493 incunabulum of the Latin translation published in Venice: SAHL IBN BISHR, *The Introduction to the Science of the Judgments of the Stars*, trans. JAMES HERSCHEL HOLDEN, American Federation of Astrologers, Tempe 2008. The Latin incunabulum is accessible online: <<https://data.cerl.org/istc/ip01089000>> (Accessed July 2021).

⁸⁶ FRANCIS J. CARMODY, *Arabic Astronomical and Astrological Sciences in Latin translation: A Critical Bibliography*, University of California Press, Berkeley 1956, p. 40–46; STEGEMANN, *Dorotheos von Sidon und das sogenannte Introductorium des Sahl ibn Bisr*, p. 26–34. Stegemann convincingly argues that neither the Greek nor Latin appear to depend on each other.

the large chunk of text from Sahl from fol. 144r–150r says that « these things were extracted from the second and third book of the wisest Jew, Sahl ibn Bishr ». These « second » and « third » books match the Latin *50 Precepts* and his *Book of Interrogations* respectively.⁸⁷

The word for « extracted » here, παρεξεβλήθη, is used in this aorist passive form nine times in **V**, in almost every case explicitly in reference to an excerpt from an Arabic text.⁸⁸ Texts were said to be extracted from « Saracen » texts, like the aforementioned astrolabe treatise, *Different Methods Extracted from a Saracen Book*. It is unclear whether the word παρεξεβλήθη is indicating that these were passages translated directly from Arabic manuscripts, or passages pulled out of already rendered Arabo-Greek translations. It is further still uncertain whether the compiler is drawing a distinction between these « extractions » and the numerous quotations from Arabic authors like Abū Maʿshar, Māshāʿallāh, or al-Kindī, where the Arabic author is explicitly quoted.⁸⁹ While it is possible that only excerpts of Sahl’s works were translated into Greek, perhaps for the express purpose of inclusion in the compilation represented by **V**, he was well known enough by the mid-twelfth century that John Kamateros made two different references to « the book of Sahl » in his more concise astrological poem, one of which specifically refers to Sahl’s expertise on the twelve houses, the subject of the *Book of Elections*, the fourth in his five-book corpus.⁹⁰ This, along with the fact that **V** includes excerpts from Sahl’s *Introduction*, the first of his five-book corpus, after the excerpts from book two and book three without

⁸⁷ Stegemann treats the *50 Precepts* as the second part of the first book in the Latin corpus – however, it is treated as the second book in Latin and Arabic texts: STEGEMANN, *Dorotheos von Sidon und das sogenannte Introductorium des Sahl ibn Bishr*, p. 29–34; SAHL IBN BISHR, *The Introduction to the Science of the Judgments of the Stars*; SAHL IBN BISHR, *The Astrology of Sahl B. Bishr, Volume I: Principles, Elections, Questions, Nativities*.

⁸⁸ These references occur on fol. 15v, 31v, 34v, 70r, 84r, 106v, 144r, 154r, and 155v. The only two which are not explicitly stated to be Arabic sources are fol. 34v and 70r, both of which, I think, do come from Arabic sources. The word παρεκβάλλω had a wide contemporary valence, that included both excerpting and commenting, e.g., in its usage by Eustathios of Thessaloniki: ATHANASIOS KAMBYLIS, *Eustathios über Pindars Epinikiendichtung: ein Kapitel der klassischen Philologie in Byzanz*, Joachim Jungius-Gesellschaft der Wissenschaften, Hamburg 1991 (Berichte aus den Sitzungen der Joachim Jungius-Gesellschaft der Wissenschaften Jahrg. 9/1), p. 14–18.

⁸⁹ In time, these questions may be answered as these instances – and the many quotations from Arabic authors that are spliced throughout **V** – receive serious scholarly investigation.

⁹⁰ In both cases he is called Σέλεχ, with the χ and λ switched as occasionally occurs in versions of his name in Greek manuscripts. See JOHN KAMATEROS, « Poèmes astronomiques de Théodore Prodrome et de Jean Camatère », ed. E. MILLER, *Notices et extraits des manuscrits de la Bibliothèque Nationale*, 23/2 (1872), p. 376 and 1149.

identifying the text indicates that, perhaps, Sahl's whole five-book corpus had been translated into Greek before the copying of **V**, from which passages were excerpted in a group in the manuscript.⁹¹ Further study of **V**'s compilation may help answer these questions.⁹²

To sum up, it is far from clear what Arabic texts the scribes of **V** could draw on, but it seems likely that they had access to a few different sorts of texts: (i) full translations of texts made from Arabic, like Abū Ma'shar's *Book of Judgments*; (ii) collections of excerpts on specific topics, like certain sources of **V** that grouped opinions of Arabic sages on topics within interrogational astrology; and (iii) Arabic texts which were translated expressly for inclusion in this compilation, like, perhaps, the text on the astrolabe « extracted » from an Arabic source. If the scribes included texts not yet translated into Greek, that means, of course, that at least one of them knew Arabic and had access to Arabic manuscripts. This, in turn, should lead us to question who these bilingual scribes were and where they had access to both Greek and Arabic astrological manuscripts; I suggest that the answer likely lies in bilingual Melkites educated in the Byzantine East, working in either Constantinople or Antioch. Scholars will have to establish the Arabo-Greek translation history of each text by (i) examining compiling practices in these manuscripts, (ii) comparing the Arabic fragments in the three

⁹¹ This passage, which goes from 148v–150r, discusses the twelve houses: STEGEMANN, *Dorotheos von Sidon und das sogenannte Introductorium des Sahl ibn Bisr*, p. 31; SAHL IBN BISHR, *The Astrology of Sahl B. Bishr*, vol. I: *Principles, Elections, Questions, Nativities*, p. 44.

⁹² Two passages in particular may weigh in on this discussion: on fol. 68v, the end of a text quoted from a Greek translation from Māshā'allāh cuts off and refers the reader to a chapter at the end of Māshā'allāh's work; the scribe of **V** follows this up by mentioning that he is leaving space to eventually copy this from the book of Māshā'allāh when he finds it – which he never seems to have: PINGREE, « Māshā'allāh: Greek, Pahlavī, Arabic and Latin Astrology », p. 131. Pingree assumes that this indicates that a larger Greek translation of Māshā'allāh was made c. 1000 and was available to the collator of the Komnenian compilation that **V** merely reproduces. However, it is also possible that the compiler of **V** (perhaps in the Komnenian era) was using a compilation which had only excerpted Māshā'allāh as part of a series of Arabic translations from interrogational astrology. This compilation could have been translated from Arabic to Greek, rather than full texts which were then excerpted in Greek. More research is required on this matter. A second passage, found on fol. 235r, says that « After Hellenizing from a Saracen [i.e., Arabic] book the figure of the house and this *apotelesma*, we find in another book in the Roman language [i.e., Greek] this figure of the house and we sketched this also here ». This is accompanied by a horoscopic figure. This scribe is different than the main one attested in the manuscript, though his hand is detectable elsewhere, e.g., on fol. 6v–7r, giving horoscopes relating to the emperors Alexios and Manuel Komnenos. On fol. 235r, the scribe seems to be indicating that he himself translated from Arabic – that is, unless he copied this whole statement from an earlier manuscript.

manuscripts under discussion alongside others, and (iii) working to identify translators based on their translation technique.

III. *The Integration of Greek and Arabic Materials in V, P₁, and P₂*

In the last section of my paper, I consider the Greek texts in these compilations, showing how translations from Arabic became integrated into the Middle Byzantine astrological canon. Far from purely being repositories of Arabic knowledge, these manuscripts are important witnesses to Greek astrological texts written from antiquity through the Middle Ages. Byzantine scholars were reading Arabic translations in concert with the Greek texts from which Arabic astrological knowledge had been built, in addition to texts written in Greek by intellectuals who knew Arabic, like Symeon Seth, Theophilus of Edessa, and Pseudo-Stephen the Philosopher.

References to renowned Greek astrological authorities are present across all three manuscripts in texts originally written in both Greek and Arabic.⁹³ Repeated references to Ptolemy in all three manuscripts – in addition to P₁'s complete recension of Ptolemy's *Tetrabiblos* that holds an important place within the text's stemma⁹⁴ – are accompanied by quotations from ancient and late antique astrologers like Maximus of Ephesus, Paul of Alexandria, Manetho, Anubio, Serapion, Hermes, and many others. It is remarkable how often these codices feature prominently in collections of the fragments of eminent ancient astrologers, as it is not uncommon for these manuscripts to provide the earliest witness of a text, or at least, of a particularly early tradition.⁹⁵ A particularly interesting example in V is found in a text attributed to a certain Dionysios writing to King Philip about measuring the time from the length of a shadow using shadow tables, a Hellenistic practice.⁹⁶ Some of these texts represent important fragments of these ancient scholars' works, while others are of doubtful authenticity, or indeed, were translated from Arabic. Regardless, Arabic authors were

⁹³ E.g., in V, Ptolemy is cited on fol. 99r and 157v; P₁, fol. 149v–150r and 154r; P₂, fol. 44r and 113v.

⁹⁴ It is referred to as codex Y; see PTOLEMY, *Apotelesmatika*, ed. WOLFGANG HÜBNER, B. G. Teubner, Stuttgart 1998 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana), p. XIX–XLII.

⁹⁵ E.g. see the Byzantine Paraphrases of Maximus (V and P₂) and Paul of Alexandria (both P₁ and P₂): MAXIMOS, *Le parafrasi bizantine del Περὶ καταρχῶν di Massimo: Introduzione, testo critico, traduzione e note di commento linguistico-filologico*, ed. PAOLA RADICI COLACE, Edizioni Dr. A. Sfameni, Messina 1988 (Letteratura e civiltà bizantina, 4), p. 17–53; PAUL OF ALEXANDRIA, *Eisagōgika. Elementa apotelesmatica*, ed. OTTO NEUGEBAUER, EMILIE BOER, B. G. Teubner, Leipzig 1958 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana), p. VII–XVI.

⁹⁶ V, fol. 44v; another text of this sort, attributed to Sextus the *horokrator*, is edited in CCAG VII, p. 187–190. On this genre, see OTTO NEUGEBAUER, *A History of Ancient Mathematical Astronomy*, vol. II, Springer-Verlag, New York 1975 (Studies in the History of Mathematics and Physical Sciences, 1), p. 737–746.

integrated in these compendia as part of a newly cultivated Byzantine astrological canon alongside texts written by and attributed to many of the greatest names in Greek astrology.

The presence of texts attributed to Dorotheos, Antiochos, and Valens in these manuscripts is particularly worthy of note as all three were bedrocks of Arabic genethliological and interrogational astrology, though the transmission of each into Arabic is a complex story involving late antique compilers.⁹⁷ The three manuscripts discussed here depend on versions of texts made by two compilers in particular, Hephaestio and Rhetorios. Pingree argued that the Greek compilations of Hephaestio and Rhetorios were important source bases for Arabic astrology, which were reinjected along with the Greek texts of Theophilus of Edessa by Stephen the Philosopher into Byzantine manuscripts c. 800.⁹⁸ While Stephen's role and dates have been rightly doubted by some – indeed certain of the texts attributed to him may actually have been written in the eleventh century as discussed above – we see in **V**, **P₁**, and **P₂** how Byzantine scholars worked to combine the Arabic and late antique Greek astrological traditions by adding Arabic sources to older compilations. **V** is the basis for the second Epitome of Hephaestio of Thebes, a widespread version of the text finalized in the eleventh or twelfth century.⁹⁹ Both Theophilus of Edessa and Māshā'allāh made use of a version of Rhetorios's aforementioned Epitome III of the *Treasuries* of Antiochos, copied as Book 5 in codex **P₁**. In addition to Antiochos, this Epitome collates excerpts attributed to Antiochos, Ptolemy, Dorotheos, Kritodemos, and Valens. **P₁**'s Book VI continues this collection,¹⁰⁰ adding in valuable texts from astrologers whose work is only preserved in fragments like Balbillus, Serapion, and Julian.¹⁰¹ The first 24 folios of **P₂** contain the prime version of Epitome IV of Antiochos's *Treasuries*, a tenth-century epitome drawing on many of the same late antique materials as Epitome III.¹⁰² While it is easy to get lost in these textual layers, it is

⁹⁷ PINGREE, « From Alexandria to Baghdād to Byzantium. The Transmission of Astrology »; PINGREE, « Classical and Byzantine Astrology in Sassanian Persia »; DAVID PINGREE, « The Byzantine Tradition of Vettius Valens's *Anthologies* », *Harvard Ukrainian Studies*, 7 (1983), p. 532–541; PINGREE, « Antiochus and Rhetorios ».

⁹⁸ PINGREE, « From Alexandria to Baghdād to Byzantium. The Transmission of Astrology ».

⁹⁹ Pingree argues this, showing two Horoscopes inset within the compilation, dated 1007 and 1106 respectively: HEPHAESTIO OF THEBES, *Apotelesmaticorum Epitomae Quattor*, p. XXI–XXIII.

¹⁰⁰ PINGREE, « Antiochus and Rhetorios », p. 210–212.

¹⁰¹ For this reason, a number of these texts are edited in the CCAG entry for this manuscript (CCAG VIII.4, p. 225–252). **P₂** likewise contains valuable fragments of Julian: LEVENTE LÁSZLÓ, « Julianus of Laodicea and His Astrological Fragments », *Mnemosyne*, 74 (2021), p. 1–20.

¹⁰² PINGREE, « Antiochus and Rhetorios », p. 216–219.

evident that the compilations in these manuscripts represent a Byzantine astrology that had learned from both the Greek late antique heritage and the Greco-Arabic translation movement. Greek astrological texts that were used by Islamicate scholars were placed side-by-side with Greek translations of the texts produced by those same Islamicate scholars.

As a consequence of the Arabic influence on Middle Byzantine astrology, we see not only a reinvigoration of interest in older Greek authors, but the spread of pseudonymous texts in their names, many of which come from Arabic. This phenomenon is particularly evident in V. A false horoscope attributed to Valens for the Prophet Muhammad on fol. 151v was actually translated from the Arabic *Kitāb al-mughnī* of Ibn Hibintā.¹⁰³ Excerpts of the *Karpos* pseudonymously attributed to Ptolemy, a text whose Arabic commentary by Aḥmad ibn Yūsuf – and indeed, perhaps even the text itself – was translated into Greek from Arabic, are present in two places within the manuscript; if this manuscript can be dated to the twelfth century, it would be the earliest attestation of this work in Greek.¹⁰⁴ Two short texts attributed to Euclid may also derive from Arabic translations as they match no known text of his in Greek.¹⁰⁵ While most references to Dorotheos in V come from Hephaestio, certain were translated from ‘Umar ibn al-Farrukhān’s Arabic translation of Dorotheos, made from an earlier Middle Persian translation.¹⁰⁶ This version of Dorotheos had been

¹⁰³ PINGREE, « Classical and Byzantine Astrology in Sassanian Persia », p. 236; PINGREE, « The Horoscope of Constantinople », p. 314.

¹⁰⁴ fol. 52r = Chapter 81; fol. 175r = Chapters 60, 19. The earliest known manuscript otherwise, according to the *Pinakes* database, is MS Oxford, Bodleian Auct. T. 5. 4, datable to the thirteenth century. Lemay argued that the text was originally composed in Arabic by Aḥmad ibn Yūsuf, though this is by no means certain: RICHARD LEMAY, « Origin and Success of the Kitāb Thamara of Abū Ja‘far Aḥmad ibn Yūsuf ibn Ibrāhīm: From the Tenth to the Seventeenth Century in the World of Islam and the Latin West », in AHMAD Y. AL-HASSAN, GHADA KARMI, NIZAR NAMNUM (eds.), *Proceedings of the First International Symposium for the History of Arabic Science, April 5-12, 1976*, vol. II, Aleppo University Press, Aleppo 1978, p. 91–107; JEAN-PATRICE BOUDET, « The Medieval Latin Versions of Pseudo-Ptolemy’s Centiloquium: A Survey », in DAVID JUSTE, BENNO VAN DALEN, DAG NIKOLAUS HASSE, et al. (eds.), *Ptolemy’s Science of the Stars in the Middle Ages*, Brepols, Turnhout 2020 (Ptolemaeus Arabus et Latinus – Tools and Studies, 1), p. 282–304. Regardless, the existence of the Arabic commentary that is present, e.g., in the Oxford manuscript, indicates that this text was at the very least reinterpreted under the influence of Arabic astrology in the Byzantine world. Hopefully the ongoing work on the *Karpos* by Maria Mavroudi and Darin Hayton may solve some of the issues related to this intractable text.

¹⁰⁵ These are on fol. 166v and 184v.

¹⁰⁶ It is explicitly stated that a saying of Dorotheos is excerpted « from a Saracen book » on fol. 154r. Pingree says that certain other texts attributed to him throughout the manuscript, both in the main text and the margins, were also translated from Arabic: PINGREE, *From Astral Omens to Astrology*, p. 69. This seems plausible, but requires further study. Particularly, scholars must weigh whether these

transformed in this complex transmission from describing astrological elections to Arabic-style interrogations.¹⁰⁷ Here, it should be noted that Arabo-Greek astrology necessarily contained Indian and Persian materials via quotations from astrologers like Māshā'allāh, al-Qabīṣī, Zoroaster, and Buzurgmihr, in addition to the Greek texts of Theophilus of Edessa. Pingree has pointed to various bits of Indian astrological knowledge in **V** that came from Arabic both via quotations of Arabic astrologers like Māshā'allāh and al-Qabīṣī¹⁰⁸ and of Indian astrologers like Buzurgmihr.¹⁰⁹ Likewise, from Theophilus of Edessa and texts written in Arabic, Middle Byzantine astrologers had access to other ideas of Persian astrologers, seen in the excerpts in **V** attributed to Anempodistos and Zoroaster.¹¹⁰

It is useful to consider how these layered compilations worked in practice. While **P**₂ was much less forthright in its usage of Arabic sources than either **V** or **P**₁, passages that appear to have come from an Arabic work are integrated into its eleventh-century compilation. Chapter 145 of the compilation, attributed to a certain Theodosios, explains how to predict the day on which someone will die, and contains an example dated 1065.¹¹¹ While the chapters before and after it do not bear the names of Arabic

quotations from Dorotheos that are interspersed throughout **V** alongside quotations from Arabic authors come from Greek translations of 'Umar's text or from Greek prose versions of it, like the *Apotelesmatica* of Hephaestio.

¹⁰⁷ CAUDANO, « Astrological Practices in the Handbooks of the Komnenoi Period », p. 46.

¹⁰⁸ Pingree discusses this phenomenon and **V**'s role in particular in transmitting Indian astrological ideas through Arabic translations passim PINGREE, « The Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts ».

¹⁰⁹ He is called in Greek Πορζοζόμχαρ, and the fragment attributed to him in the margin of **V**, 81v–82r is published by PINGREE, « The Indian and Pseudo-Indian Passages in Greek and Latin Astronomical and Astrological Texts », p. 187.

¹¹⁰ Anempodistos is not otherwise known but occurs as a name in Greek as one of the Persian martyrs (see *Oxford Dictionary of Byzantium*, s.v. « Akindynos, Pegasios, and Anempodistos »). The Middle Persian astrology text attributed to Zaradusht comes from the third century and was translated into Arabic c. 750 and was used, in part, in Greek works of Theophilus of Edessa: DAVID PINGREE, « The Šābians of Ḥarrān and the Classical Tradition », *International Journal of the Classical Tradition*, 9/1 (2002), p. 11–12; PINGREE, *From Astral Omens to Astrology*, p. 44–47; PINGREE, « Classical and Byzantine Astrology in Sassanian Persia », p. 236–237; PAUL KUNITZSCH, « The Chapter on the Fixed Stars in Zaradusht's *Kitāb al-Mawālid* », *Zeitschrift für Geschichte der Arabisch-Islamischen Wissenschaften*, 8 (1993), p. 241. It remains to be seen if the Greek texts attributed to Zoroaster derive from the Persian-to-Arabic translation made by Sa'īd ibn Khurāsānkhurra, if they represent the Greek text from which the Middle Persian was derived, or if they are unrelated. The lack of an edition of the Arabic translation (*Kitāb al-Mawālid*) renders a comparison difficult.

¹¹¹ This text is edited in *CCAG* II, p. 213, from on **P**₂ (fol. 57r) and MS Venice, Biblioteca Marciana gr. Z. 335, fol. 193v.

authors, a number of them are identical to those found in compilations made by the figure identified by Pingree as Eleutherios, and thus likely come from Arabic sources. For example, Chapters 146 to 149, all appear within Eleutherios's compilation attributed to Palchos.¹¹² Others, like Chapter 145, are found in other compilations made by Eleutherios, e.g., within his version of Abū Ma'shar's *Mysteria*, occasionally in adapted forms.¹¹³ Future scholars interested in the eleventh-century compilation of **P**₂ will have to study the fourteenth-century compilations associated with Eleutherios and the Abramios school in concert, to distinguish Arabo-Greek translations and later adaptations of texts translated from Arabic and originally written in Greek. While each astrological compendium is unique, their compilers often took from the source material, crafting comparable collections of passages – often stripped of their authors and contexts – as their aim was not historical preservation of a given author's oeuvre, but were practically aimed at indicating astrological techniques.

In contrast to **P**₂, the compilers of **V** were much more interested in the authority of the authors associated with each inserted passage, and were pleased to connect Greek and Arabic sages on the same topics, and openly advertise authors' Arabic origins. The main text of **V**, fol. 170v–171r, contains chapters five, six, and seven of Book III of Epitome II of Hephaestio of Thebes, three chapters entitled, « on shipbuilding », « on going abroad », and « on going abroad and otherwise in more detail », respectively.¹¹⁴ While Hephaestio had not been translated into Arabic, his main sources like Dorotheos and Valens were.¹¹⁵ Three marginal comments on 170v and six on 171r, relating to the

¹¹² While this whole section is included in both **P**₂ and the Palchos compilation, they are not in the same order in each. Chapter 146 (**P**₂, fol. 57r, « About discord, civil wars, and slaughter »), = MS Rome, Biblioteca Angelica gr. 29, fol. 126v (Chapter 93); Chapter 147 (**P**₂, fol. 57v, « About good fortune »), = MS Rome, Biblioteca Angelica gr. 29, fol. 126v (Chapter 92); Chapter 148 (**P**₂, fol. 57v, « About dignities, glory, and honor »), = MS Rome, Biblioteca Angelica gr. 29, fol. 127v (Chapter 102); Chapter 149 (**P**₂, fol. 57v, « About action »), = MS Rome, Biblioteca Angelica gr. 29, fol. 127v (Chapter 103).

¹¹³ An adaptation of Chapter 145 made by the figure identified by Pingree as Eleutherios has been published: PINGREE, « The Horoscope of Constantinople », p. 312. Chapter 141 (**P**₂, fol. 56r, « On hearing if [something is] true and if it is good or bad »), matches with slight differences the text found in Eleutherios's compilations in MS Rome, Biblioteca Angelica gr. 29, fol. 30v (Chapter 113) and MS Torino, Biblioteca nazionale universitaria C, VII, 10 (B, VI, 12), fol. 60 (MS no longer extant). It should be noted that the chapter in the Biblioteca Angelica manuscript is written in a different hand than the rest of the codex, and thus may not properly belong to the place within Abū Ma'shar's *Mysteria* where it is placed in the codex.

¹¹⁴ HEPHAESTIO OF THEBES, *Apotelesmaticorum Epitomae Quattor*, p. 100–103.

¹¹⁵ E.g. Chapter 5 = Dorotheos, Chapter 17: DOROTHEUS, *Carmen astrologicum*, ed. DAVID PINGREE, B. G. Teubner, Leipzig 1976 (Bibliotheca scriptorum Graecorum et Romanorum Teubneriana), p. 401. It is likely that the other two chapters were also derived from earlier Greek astrologers, though

topics discussed by Hephaestio, are attributed to Dorotheos, Abū Maʿshar, Theon of Alexandria, and al-Khayyāṭ. As neither the Dorotheos or Theon quotes are known otherwise, it is likely that both were translated from Arabic – especially since the continuation of chapter seven in the following folios’ margins contains two quotes from Dorotheos explicitly said to come from Arabic.¹¹⁶ These folios are additionally accompanied in the margins by excerpts attributed to Abū Maʿshar, al-Kindī, al-ʿImrānī, and Sahl.¹¹⁷

Here, we see how the Greek and Greco-Arabic astrological traditions come together: the compilers of **V** accompanied the epitome of Hephaestio’s Greek astrological compilation with supplementary texts that had been translated from Arabic. These included both Arabic scholars who were using the same Greek sources as Hephaestio, and new Greek versions of lost originally Greek sources made from Arabic. Thus, in Arabo-Greek translation, Byzantine astrology came full circle by integrating Arabic thinkers working in the Greek tradition, and reintegrating materials from Greek authors that were no longer extant in non-epitomized versions by the eleventh century. In these practically-minded compendia, we can catch a glimpse of how Middle Byzantine astrologers aimed their work at present circumstance, by borrowing from and building on forebearers whose works had been transmitted across the Greek and Arabic traditions.

Conclusions

I have argued against Pingree’s claim that many translations were produced around 1000, postulating instead that these three compendia show how a variety of Arabic astrological texts were translated into Greek in the late tenth through twelfth centuries in part, in whole, and *ad hoc*. This was part of a larger transmission of Arabic knowledge into Greek in this period, rendering Arabic scholarship that had been

Hephaestio’s sources here have not yet been identified. Elsewhere, the three chapters on fol. 175r from Book III of Epitome II of Hephaestio (Chapter 13–15), come from Dorotheos and Valens and were thus available in Arabic. For Chapters 13–14 (« on surgeries », « on vomit and cleansing » = 32 and 34), see *ibid.*, p. 419–420. For Chapter 15 (= and « on coming together [i.e. sexually] and about bearing male children and bearing female children »), see VETTIUS VALENS, *Anthologiarum libri novem*, ed. DAVID PINGREE, Teubner, Leipzig 1986 (*Bibliotheca scriptorum Graecorum et Romanorum Teubneriana*), p. 351–352.

¹¹⁶ These two quotes that are translated from the Arabic Dorotheos are found in the margins of **V**, fol. 173r and 173v.

¹¹⁷ Each author is quoted as follows: Abū Maʿshar (fol. 171v, 172r, 173r), al-Kindī (fol. 171v, 172r, 172v), al-ʿImrānī (fol. 172r), and Sahl ibn Bishr (fol. 173r).

produced in the wake of Baghdad's Greco-Arabic translation movement into Greek. These manuscripts illustrate extensive attempts to integrate preeminent 'Abbāsid astrological authorities who had often worked from translated versions of ancient and late antique Greek sources into the Byzantine canon. These Arabic astrological authors were no black sheep in comparison to older and greater Greek authorities. Far from it. In a similar manner to the Latin *Book of Nine Judges*, we see particularly in **V** how « the wisest » Abū Ma'shar, Māshā'allāh, and Sahl were referred to in the same breath as Ptolemy, Dorotheos, or Valens. Yet even as astrology thrived under eleventh and twelfth-century Byzantine imperial patrons, culminating in the court of Manuel Komnenos, it was challenged by those who were skeptical of its conformity with Byzantine Orthodoxy, claiming it to be deterministic.¹¹⁸ The consciously foreign wisdom encapsulated within astrological manuscripts both lent it authority and put it under more severe scrutiny for its apparent disagreement with Christian practice. In the three manuscripts considered here, we see different ways in which Arabic knowledge was integrated into Greek astrological compendia by different compilers: whether without mention of Arabic authors as in **P₂**, with some separation between originally Greek and Arabic texts as in **P₁**, or openly and proudly in conjunction with Greek authors as in **V**. It is not a coincidence that **V** was compiled at astrology's apogee in Middle Byzantium, in the late Komnenian period.

Though these manuscripts do not predominantly preserve full versions of Arabo-Greek translations, we should recognize that compilation was a feature – not a bug – of Byzantine intellectual practice. While certain texts of Arabic authorities like Māshā'allāh or Sahl may primarily have been available to eleventh-century Byzantines in epitomized or excerpted versions, the same was the case for Greek authorities like Dorotheos or Julian of Laodikeia. Rather than lamenting what is lost in transmission, we should view compilation as a productive way of organizing and canonizing knowledge to make it accessible to contemporary scholars. Both in Byzantium and in Early Modern Europe – where these manuscripts ended up – Arabic authors were read in Greek alongside Greek authorities they themselves had used. We should embrace the wealth of Byzantine scientific compilations for what they tell us about how texts and translations functioned in medieval intellectual culture.

¹¹⁸ MAGDALINO, *L'orthodoxie des astrologues*, p. 109–132; PAUL MAGDALINO, « Astrology at the Court of Manuel I Komnenos (1143–1180) », in MICHAEL GRÜNBART (ed.), *Unterstützung bei herrscherlichem Entscheiden: Experten und ihr Wissen in transkultureller und komparativer Perspektive*, Vandenhoeck & Ruprecht, Göttingen 2021 (Kulturen des Entscheidens, 5), p. 160–170; ANNE-LAURENCE CAUDANO, « An Astrological Handbook from the Reign of Manuel I Komnenos », *Almagest*, 3/2 (2012), p. 46–65; CAUDANO, « Astrological Practices in the Handbooks of the Komnenoi Period ».

In my larger work, I explore what this large-scale transmission of astrological ideas from Arabic to Greek means for the stories of Antiochene Greco-Arabica, Byzantine intellectual history, and intercultural contact between Greek and Arabic-speakers in the Byzantine Empire. This story fits into a larger attempt to transmit scientific knowledge from Arabic to Greek that took off in the tenth century in the wake of the Greco-Arabic translation movement and continued in waves for five centuries, until the fall of Byzantium, and needs to be looked at in a broader Mediterranean context. Arabo-Greek astrology bears remarkable similarities and connections to Arabo-Latin astrological translation, including the translations of similar texts and authorities and the production of similar Arabic-based astrological compendia.¹¹⁹ Moreover, some of the key early translators into Latin worked in formerly Byzantine contexts in Antioch and southern Italy.¹²⁰ While Arabo-Greek astrological translation does not seem to have become a translation movement to a similar extent as Arabo-Latin in crafting a corpus in the target language replete with complete astrological texts, nevertheless, as I hope to have shown, we still only have a miniscule idea of Arabo-Greek translation's extent and context. Translations must be catalogued, late manuscripts must be investigated for earlier layers they contain, and more work remains to be done.

¹¹⁹ On the translation of similar texts, see PINGREE, « The Sayings of Abū Maʿshar in Arabic, Greek, and Latin »; PINGREE, « Māshāʾallāh: Greek, Pahlavī, Arabic and Latin Astrology »; ABŪ MAʿSHAR, *The Great Introduction to Astrology*, ed. KEIJI YAMAMOTO, CHARLES BURNETT, DAVID PINGREE, Brill, Boston 2019 (Islamic Philosophy, Theology, and Science, 106). On comparable compilations, see BURNETT, « A Hermetic Programme of Astrology and Divination in mid-Twelfth-Century Aragon: The Hidden Preface in the *Liber Novem Iudicum* ».

¹²⁰ CHARLES BURNETT, « Translation and Transmission of Greek and Islamic Science to Latin Christendom », in DAVID C. LINDBERG, MICHAEL H. SHANK (eds.), *The Cambridge History of Science*, vol. II: Medieval Science, Cambridge University Press, Cambridge 2013, p. 341–364; BURNETT, « Antioch as a Link between Arabic and Latin Culture in the Twelfth and Thirteenth Centuries »; BURNETT, « The Transmission of Arabic Astronomy via Antioch and Pisa in the Second Quarter of the Twelfth Century »; GRUPE, « Stephen of Pisa's Theory of the Oscillating Deferents of the Inner Planets (1h. 12th C.) ».

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