Stephanos of Alexandria: A Famous Byzantine Scholar, Alchemist and Astrologer

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INTRODUCTION

Understanding the intellectual profile of a famous scholar who lived in the remote past can be a complicated task; in the case of Stephanos of Alexandria the problem is compounded by the limited surviving biographical information and the fact that early tradition attributes to him activities and compositions which, according to our modern standards, belong to very different disciplines. Stephanos of Alexandria is a late-sixth/early-seventh-century Byzantine scholar known as a commentator of Plato and Aristotle; astronomical, astrological, alchemical and medical works are also attributed to him.[1] It is generally accepted that he was a well-known and eminent scholar in Alexandria before moving, by 617, to Constantinople,

[1] H. Hunger, *Die hochsprachliche profane Literatur der Byzantiner*, 2 vols. (Munich, 1978), I, 26–7, 30, 63, 291–2, 300–301, 305, 310; 2: 231–32, 280. K. Vogel, 'Byzantine Science', *The Cambridge Medieval History*, IV, 2 (Cambridge, 1967), 264–305, esp. 267–8, 297.

where he collaborated with the emperor Heraclius (610–641) and taught the *quadrivium*.[2]

Byzantine sources designate him as "practical philosopher" and "philosopher and œcumenical teacher"[3] most likely in order to present him as the ideal accomplished intellectual of his time. Since philosophy, the arts, and technology in the past were not separated by clear boundaries in the way they are today, Stephanos' intellectual profile could be best understood if we paid attention to the interrelations, instead of the dividing lines, among these disciplines and the various scholarly activities attributed to

[2] H. Usener, 'De Stephano Alexandrino', in *Index scholarum quae summis auspiciis regis augustissimi Guilelmi imperatoris Germaniae in Universitate Fridericia Guilelmia Rhenana per menses aestivos anni 1880 a die 21 mensis aprilis publice privatimque habebuntur. Praefatus est Hermannus Usener De Stephano Alexandrino* (Bonn, 1881); repr. in idem, *Kleine Schriften*, III (Leipzig and Berlin, 1914), 247–322; Kl. Oehler, *Antike Philosophie und byzantinisches Mittelalter* (Munich, 1969), 19, 276; W. Wolska-Conus, 'Stéphanos d'Athènes et Stéphanos d'Alexandrie. Essai d'identification et de biographie', *Revue des études byzantines* 47 (1989), 5–89. On the astronomical association of Stephanos with Heraclius, see most recently A. Tihon, 'Le calcul de la date de Pâques de Stéphanos-Héraclius', in B. Janssens, B. Roosen and P. Van Deun, eds., *Philomathestatos. Studies in Greek Patristic and Byzantine Texts Presented to Jacques Noret for his Sixty-Fifth Birthday* (Leuven, Paris, and Dudley, Mass., 2004), 625–46.

[3] In most MSS, works are attributed to him as follows: Στεφάνου Ἀλεξανδρέως φιλοσόφου καὶ οἰκουμενικοῦ διδασκάλου (Stephanos the Alexandrian philosopher and œcumenical master), Στεφάνου Ἀλεξανδρέως φιλοσόφου (Stephanos the Alexandrian philosopher), Στεφάνου φιλοσόφου (Stephanos the philosopher), Στεφάνου Ἀλεξανδρέως (Stephanos the Alexandrian), Στεφάνου (Stephanos), ὁ ἐπιστήμων Στέφανος (Stephanos the scientist), Στεφάνου φιλοσόφου καὶ μεγάλου διδασκάλου (Stephanos philosopher and great master), Στεφάνου φιλοσόφου Ἀλεξανδρέως (Stephanos the Alexandrian philosopher), Στεφάνου μεγάλου φιλοσόφου τοῦ Ἀλεξανδρέως καὶ καθολικοῦ διδασκάλου (Stephanos the great Alexandrian philosopher and general master) [in MSS *Laurent. Plut.* 28, 13, fol. 240; *Laurent. Plut.* 28, 14, fol. 169v. *Laurent. Plut.* 28, 33, fol. 105; *Marc. gr.* 324, fol. 147v, 231; *Marc. gr.* 336, fol. 266v; *Marc. gr.* 335, fol. 25; *Mediol.* B 38 sup., fol. 49v; *Taurin.* C, VII, 10 (B, VI, 12), fol. 29; *Vat. gr.* 1056, fols. 193v, 203v, 206; *Vat. gr.* 1059, fols. 123, 524, 529v; *Angelicus* 29 [C. 4,8], fols. 54v, 236v; *Vindob. phil. gr.* 108, fol. 292v; *Vindob. phil. gr.* 262, fol. 151v; *Monacensis* 105, fol. 223; *Paris. gr.* 2419, fol. 72]. On the meaning of these titles attributed to Stephanos, see F. Fuchs, *Die höheren Schulen von Konstantinopel im Mittelalter* (Amsterdam, 1964), 12–16; *ODB*, s. v. PATRIARCHAL SCHOOL, PHILOSOPHER.

Stephanos. Moreover, modern criteria used to differentiate between 'science' and 'occult science' (our "scientific principles") are largely based on quantitative (and therefore measurable) relations between things or substances and are sharply distinguished from philosophical ideas. On the contrary, in Antiquity the Stoic doctrine of "sympathy" implied unity of the world and interaction between its parts; further, it offered a basis for understanding the world both as a whole and as a composite entity made up of various parts with specific functions that continuously interact with each other.

The role and influence of alchemy and astrology on both state and individual affairs during the Late Antique and Byzantine period can be properly understood only by taking into consideration their wider philosophical context. Even so, the attitude of Roman and Byzantine emperors towards alchemy and astrology was ambivalent: for example, the emperor Diocletian decreed the burning of "books on making gold and silver" in Egypt.[4] Despite such episodes of deliberate destruction, a great number of Greek alchemical and astrological manuscripts dating from the Byzantine period do survive.[5]

ASTROLOGY AND ALCHEMY IN LATE ANTIQUITY AND THE BYZANTINE PERIOD

Among all divinatory arts invented by man in order to foretell the future, astrology was the most sophisticated in terms of the philosophical background and astronomical techniques required for casting a horoscope. These techniques were particularly refined in Alexandria, an important and flourishing centre of Greek science—

[4] See the *Suda*, s. v. Διοκλητιανὸς and Χημεία in *Suidae Lexicon*, ed. A. Adler, 5 vols. (Leipzig, 1928–38), II, 104–5; IV, 804. This information refers to the occupation of Alexandria by Diocletian in the year 296/297, brought about by his campaign to put down the revolt of Lucius Domitius Domitianus. As a result of his presence in Egypt, Diocletian instituted a number of changes in the local system of administration and taxation, including monetary and calendrical reforms; he also suppressed Egypt's privileges (*Kleines Pauly,* II, s. v. DIOCLETIANUS).

[5] *Catalogue des Manuscrits Alchimiques Grecs* (= *CMAG*), 8 vols. (Brussels, 1924–32); *Catalogus Codicum Astrologicorum Graecorum* (= *CCAG*), 12 vols. (Brussels, 1898–1953).

especially mathematics and astronomy—and a crossroads of various cultures and religions. A considerable number of surviving horoscopes[6] provide excellent primary source material for researching the connection between astrology and medicine; indeed, already in antiquity the combination of the two led to the creation of a special discipline, "iatromathematica" (i.e. medical astrology),[7] a fact that enhanced astrology's prestige, widened its influence, and may partially explain its survival during the Late Antique and Byzantine periods in spite of the strong polemics against it.[8]

We also know that throughout the Roman imperial period astrology was considered the most reliable method of divination. Any emperor, therefore, would feel obliged or at least tempted to use it in order to uncover future dangers to himself or the empire and to pacify the excited minds of his opponents by withholding from them the stimulus of astrological predictions, while reserving for himself the counsel of his court astrologers. It seems quiet likely that astronomy and astrology were taught at the Athenaeum (an institution that in modern terms could be understood as the Roman state university) from its beginnings in 134 because its founder, the emperor Hadrian (117–138), was a firm believer in astrology as well as a practicing expert. On the other hand, from the death of Ceasar (44 B.C.) until that of Marcus Aurelius (180 A.D.) at least eight expulsion decrees were issued against astrologers, all meant as temporary measures. For this reason astrologers were allowed to stay in Rome as long as they did not practice their art. In the year 294, the emperor Diocletian (284–305) was the first to replace the usual regional ban on astrology with one valid throughout the empire and including all divinatory activities considered dangerous for the government. His edict had the same temporary character as

[6] O. Neugebauer and H. B. Van Hoesen, *Greek Horoscopes*. Memoirs of the American Philosophical Society 48 (Philadelphia, 1959).
[7] Ptolemy, *Tetrabiblos,* I.3, ed. and tr. W. G. Waddell (Cambridge, Mass., 1940; repr. 1964), esp. 30, 32 (text), 31, 33 (translation).
[8] M. Papathanassiou, 'Iatromathematica (medical astrology) in Late Antiquity and the Byzantine period', *Medicina nei secoli* 11.2 (1999), 357–76.

former regional edicts. Only later did Christian emperors make these edicts permanent for religious reasons.[9]

Many well-known astrologers were active during Late Antiquity[10] and a large number of horoscopes cast during this period are preserved in papyri and later Byzantine manuscripts. L. G. Westerink's detailed study of an ancient commentary on Paul of Alexandria's astrological work (ca. 378)[11] reveals favorable conditions for teaching astrology in sixth-century Alexandria. Westerink showed that the materials of the commentary come from a series of lectures delivered in Alexandria during May–June of the year 564 either by Olympiodorus or one of his disciples who taught mathematics or astrology. Accordingly, Westerink thought it likely that in the sixth century astrology could still be an important part of the *quadrivium* and therefore of the whole teaching philosophy curriculum.[12] Based on this evidence, Stephanos of Alexandria (who lived in the late sixth/early seventh century, was invited by emperor Heraclius to Constantinople, and cast both a personal horoscope for the emperor, as well as a horoscope to predict the future of Islam) must have studied astrology in Alexandria.

Christian emperors were interested in consulting astrologers for both their personal and state affairs. Modifications of the relevant legislation were always possible depending on the circumstances. For example, a comparison of laws issued from the eighth to the

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[9] F. H. Cramer, *Astrology in Roman Law and Politics* (Philadelphia, 1954; repr. Chicago, 1996), 232ff., 247ff., 281.

[10] E. g. Vettius Valens, Critodemus, Antigonus of Nicaea, Palchus, Rhetorius, Eutocius, and above all Paul of Alexandria; see Paul of Alexandria, *Eisagogika; Elementa Apotelesmatica,* ed. Ae. Boer (Leipzig, 1958); also Heliodoros [attributed to], *Heliodori ut dicitur in Paulum Alexandrinum commentarium,* ed. Ae. Boer (Leipzig, 1962). The famous astrologer Hephaestio of Thebes (born on 26 November 380) refers to and cites whole passages from the work of earlier astrologers, especially Ptolemy and Dorotheos of Sidon: see Hephaestio of Thebes, *Apotelesmatica,* ed. D. Pingree, 2 vols. (Leipzig, 1973 and 1974).

[11] L. G. Westerink, 'Ein astrologisches Kolleg aus dem Jahre 564', *BZ* 64 (1971), 6–21; idem, *The Greek Commentaries on Plato's Phaedo,* I: *Olympiodorus,* Verhandelingen der Koninklijke Nederlandese Akademie 92 (Amsterdam, 1976), esp. 20–27.

[12] Westerink, 'Ein astrologisches Kolleg aus dem Jahre 564', 6, 18–21.

tenth century shows that legislators of the Macedonian dynasty were more actively against magic than the Isaurian emperors had been. In its turn, Isaurian legislation was more forgiving, when compared with the corresponding laws of the sixth-century Codex Justinianus.[13] Consequently, it seems possible that the religious politics of the Isaurian dynasty did not destroy astrology and therefore no restoration of it was necessary in later centuries.

The survival and continuity of astrology in the Byzantine Empire is evident in a long letter of emperor Manuel Komnenos (1143–1180) addressed to a monk of the Pantokrator monastery, in which Manuel defends astrology.[14] One of the emperor's arguments was that Constantine the Great (307–337) after consulting the best astrologer of his time, Valens, waited fourteen years for the most favorable date for the inauguration ('dedicatio') of Constantinople.[15] He concludes: "If Constantine and other pious emperors and prelates had considered astrology as heretical knowledge, they would not have used it." He also points out that, contrary to what his correspondent had claimed, the use of astrology on appropriate occasions is not an expression of impiety because astrology "simply foretells by taking into account the powers, temperaments, and qualities of the stars as bestowed on them by God".[16] He further explains that "the stars are not a creative cause because their bodies are irrational and insensitive. Therefore, we do not ask them in

[13] S. Troianos, 'Zauberei und Giftmischerei in mittelbyzantinischer Zeit', *Fest und Alltag in Byzanz*, in G. Prinzing and D. Simon, eds. (Munich, 1991), 37–51, 184–88, esp. 38: "Aber wie sich aus dem Vergleich der Gesetzbücher des 8. und 9./10. Jh. ergibt, hat sich der Gesetzgeber unter den Makedonen viel intensiver mit der Bekämpfung der Zauberei befaßt, als unter den Isauriern, deren (Isaurier) Gesetzbuch eine Verbesserung des Cod. Justinianus im Sinne größerer Milde ausgibt."

[14] *Imperatoris Manuel Comneni et Michael Glycae disputatio*, ed. F. Cumont and F. Boll, *CCAG*, V.1, 108–25 (Manuel's letter) and 125–40 (reply by Michael Glykas)]. On this dispute see also W. Adler, below, and works cited.

[15] Manuel cites the information, which appears in Byzantine chronicles from the 10th c., that on the fourth day of the "dedicatio" of Constantinople, Constantine the Great ordered Valens, τῷ τῶν μαθηματικῶν τότε πρωτεύοντι, to cast the horoscope of the city and to predict its future (*CCAG*, V.1, 118, 14–119, 22). This was done in the year 5838 from the beginning of the world (330 A. D.), on Monday 11 May, in the second hour [of the day] and 26 minutes (MS *Vat. gr*. 191, fol. 397).

[16] *CCAG*, V.1, 112, 2–6.

expectation of an answer but, knowing by observation their nature and hence their temperament, as well as the configuration [of the planets] which reveals all this, we infer present and future events from there".[17] The emperor distinguishes between astrologers and those who invoke and talk with the stars and explains that the latter are the reason why astrology is misunderstood and astrologers are named magicians.[18]

Consequently, the flourishing of astrology during the reign of later Byzantine dynasties (the Komnenoi,[19] Angeloi, and Palaiologoi[20]) and the considerable number of astrological manuscripts belonging to the private libraries of state and church figures suggests that many Byzantine scholars and intellectuals had reconciled their Christian faith with astrology.

The case of alchemy is considerably different because its techniques, closely related to those of the goldsmiths, had many applications to the art of jewelry-making and the luxurious decoration of palaces and churches. We are told that Byzantine emperors and Arab caliphs competed with each other in displaying the wealth of their respective states. The report of 'Umāra ibn-Ḥamza (d. 814/815), the ambassador of caliph al-Manṣūr (754–775) to the Byzantine court, evokes the alchemical interests of emperor Constantine V Kopronymos (741–775). He reportedly conducted two experiments in the ambassador's presence and transmuted lead into silver and copper into gold.[21] According to G. E. von Grunebaum, these experiments would have excited the caliph's

[17] *CCAG*, V.1, 112, 22–31.
[18] *CCAG*, V.1, 112, 6–9.
[19] P. Magdalino, 'The Porphyrogenita and the Astrologers: A Commentary on *Alexiad* VI.7.1–7', in C. Dendrinos et al., eds., *Porphyrogenita. Essays on the History and Literature of Byzantium and the Latin East in Honour of Julian Chrysostomides* (Aldershot, 2003), 15–31; idem, *L'Orthodoxie des astrologues*, chapters 4 and 5.
[20] F. Jürss, 'Johannes Katrarios und der Dialog Hermippos oder über die Astrologie', *BZ* 59 (1966), 275–84, esp. 282; A. Tihon, in this volume.
[21] G. Strohmaier, ''Umāra ibn Ḥamza, Constantine V, and the invention of the elixir', *Graeco-Arabica* 4 (1991), 21–4; idem, 'Al-Manṣūr und die frühe Rezeption der griechischen Alchemie', *Zeitschrift für Geschichte der arabisch-islamischen Wissenschaften* 5 (1989), 167–77, esp. 172–3.

interest in alchemy.[22] The survival of alchemy in the Byzantine Empire in the eighth and later centuries[23] argues against Usener's opinion that alchemy was "forbidden" and that emperor Heraclius would not have been interested in it for this reason. Owing to its philosophical background, alchemy was consistently related to philosophical ideas on the composition and structure of matter and was understood as "practical philosophy" whereby "practical philosophers" could achieve the transmutation of matter.

THE ALCHEMICAL WORK

Authorship and significance of the work

According to tradition, Stephanos of Alexandria is the author of the work *On the Great and Sacred Art of Making Gold*,[24] originally organized as a series of lectures (πράξεις).[25] First H. Usener (1880)

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[22] G. E. von Grunebaum, *Der Islam im Mittelalter* (Zürich, 1963), 453, note 76.

[23] See Michael Psellos, Letter on *chrysopoeia*, ed. J. Bidez, *CMAG*, VI, 1–47, text 26–42. Hunger, *Die hochsprachliche profane Literatur der Byzantiner,* II, 281. D. Pingree, 'Michael Psellus', *Dictionary of Scientific Biography,* XI, 182–86. Also *Collection des anciens alchimistes grecs,* ed. M. Berthelot and Chr. Ruelle, 3 vols. (Paris, 1888), esp. II, 452–9: Περὶ τῆς ᾠοχρυσοποιίας ἧς μετῆλθεν ὁ σοφώτατος ἐν φιλοσόφοις κύριος Νικηφόρος ὁ Βλεμμύδης καὶ ηὐμοίρισε τοῦ σκοποῦ τῇ συνεργείᾳ τοῦ πάντα ἐξ οὐκ ὄντων εἰς τὸ εἶναι παραγαγόντος Χριστοῦ τοῦ ἀληθινοῦ Θεοῦ ἡμῶν, ᾧ πρέπει δόξα εἰς αἰώνας αἰώνων· ἀμήν. Also ibid., 442–46: Ἑρμηνεία τῆς ἐπιστήμης τῆς χρυσοποιίας ἱερομονάχου τοῦ Κοσμᾶ. In addition, the oldest surviving Greek alchemical codex, MS *Marc. gr.* 299 (10th–11th century), belonged to Cardinal Bessarion (1402–72).

[24] Stephanos of Alexandria, *Στεφάνου Ἀλεξανδρέως οἰκουμενικοῦ φιλοσόφου καὶ διδασκάλου τῆς μεγάλης καὶ ἱερᾶς τέχνης. Περὶ χρυσοποιίας,* ed. J. L. Ideler, *Physici et medici graeci minores,* 2 vols. (Leipzig, 1841–42; repr. Amsterdam, 1963), II, 199–247, 23 (= Ideler). Stephanos' text stops on p. 213, 6 because a gap in the binding of MS *Marc. gr.* 299 resulted in the loss of the end of the work; see H. D. Saffrey, 'Historique et description du manuscrit alchimique de Venise *Marcianus Graecus* 299', in D. Kahn, S. Matton, eds., *Alchimie: art, histoire et mythes* (Paris and Milan, 1995); for other editions of Stephanos' work, see also F. Sherwood Taylor, 'The alchemical works of Stephanus of Alexandria' [only three out of nine lectures], *Ambix* 1 (1937), 116–39 [lectures I and II] and *Ambix* 2 (1938), 38–49 [Letter to Theodorus and lecture III].

[25] A detailed study of the work reveals that the text was originally organized in seven lessons, but some time earlier than the date of MS *Marc. gr.* 299 was

and, following him, K. Krumbacher and K. H. Dannenfeld, questioned Stephanos' authorship of the work and viewed it as the composition of a later writer because the tenth-century Arabic bibliographic compilation *Kitāb al-Fihrist* by Ibn al- Nadīm refers to "Stephanos the older, who translated alchemical and other works for the prince Khālid ibn-Yazīd (d. 704 A. D.)."[26] On the other hand, a number of researchers looked favorably upon Stephanos' authorship, as for example M. Berthelot, E. O. von Lippmann, I. Hammer-Jensen, F. Sherwood Taylor, R. Vancourt, A. Lumpe, A. J. Festugière, O. Neugebauer, and H. Hunger.[27] Yet a third group of modern scholars, including L. G. Westerink, P. Lemerle, E. Chauvon, H. D. Saffrey, and G. Fowden, agree that the present documentation does not allow firm conclusions, a state of affairs that could definitely be improved with the appearance of critical editions publishing all the works that the manuscript tradition occasionally or consistently attributes to Stephanos.[28] W. Wolska-

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redistributed into nine lectures and a short letter to Theodorus; the proposed original division (and its correspondence with the division found in the manuscript tradition and Ideler's edition) is the following: 1st Lesson (MSS and Ideler: Lectures I and II), Letter to Theodorus (: Letter to Theodorus and Lecture III), 2nd Lesson (: Lecture IV), 3rd Lesson (: Lecture V), 4th Lesson (: Lecture VI), 5th Lesson (: Lecture VII), 6th Lesson (: Lecture VIII), 7th Lesson (: Lecture IX); see M. Papathanassiou, 'Stephanus of Alexandria: On the structure and date of his alchemical work', *Medicina nei secoli* 8.2 (1996), 247–66, esp. 251–7.

[26] Usener, 'De Stephano Alexandrino', 256. K. Krumbacher, *Geschichte der Byzantinischen Literatur* (Munich, 1897), 621. K. H. Dannenfeldt, 'Stephanus of Alexandria', *Dictionary of Scientific Biography,* XIII, 37–38.

[27] M. Berthelot, *Les origines de l'alchimie* (Paris, 1885), 100, 200. E. O. von Lippmann, *Entstehung und Ausbreitung der Alchemie* (Berlin, 1919), 104; I. Hammer-Jensen, 'Die älteste Alchymie', *Kongelige Danske Videnskabernes Selskab*, Historisk-filologiske Meddelelser 4.2 (Copenhagen, 1921), 146, 148; F. Sherwood Taylor, 'The alchemical works of Stephanus of Alexandria', *Ambix* 1 (1937–8), 116–39, esp. 116–17 and *Ambix* 2 (1938), 38–49; R. Vancourt, 'Les derniers commentateurs Alexandrins d'Aristote; L'école d'Olympiodore, Étienne d'Alexandrie' (Thèse, Lille 1941), 30; A. J. Festugière, *La révélation d' Hermès Trismégiste*, 4 vols. (Paris, 1944), esp. I, 239f.; A. Lumpe, 'Stephanos von Alexandrien und Kaiser Heraclius', *Classical and Mediaeval Dissertationes* 9 (1973), 150–9, esp. 158–9; O. Neugebauer, *A History of Ancient Mathematical Astronomy*, 3 vols. (Berlin, 1975), esp. II, 1050, 1051 n. 53, 54; Hunger, *Die hochsprachliche profane Literatur der Byzantiner,* II, 280.

[28] L. G. Westerink, *Anonymous Prolegomena to Platonic Philosophy* (Amsterdam, 1962), XXV; idem, *The Greek Commentaries on Plato's Phaedo*, I, 22; E. Chauvon, 'Étude sur le Commentaire astronomique de Stephanos d' Alexandrie' (Mémoire de

Conus carefully researched the personality and activities of Stephanos of Alexandria or Stephanos of Athens[29] and pointed out that Byzantine historians associate the alchemical, astrological, and astronomical activity of Stephanos with the patronage of emperor Heraclius; we should not overlook this evidence and reject the possibility that Stephanos was active as teacher in Constantinople.[30]

Problems of authorship aside, many scholars have misunderstood and underestimated the importance of *On the Great and Sacred Art of Making Gold*. For example, M. Berthelot considered its scholarly significance to be minor; consequently, he did not include it in his *Collection des anciens alchimistes grecs* (= *CAAG,* 1888) and gave only a brief summary of the subjects treated in it. Modern scholars have also criticized it negatively on account of its rhetorical style and the absence of original scientific ideas. However, as commentary on selected passages of earlier alchemical texts, the work in fact presented its author with an opportunity to demonstrate wide rhetorical prowess, extensive learning, and a significant breadth of philosophical understanding. The author dislikes the whole chemical apparatus and polemicizes against those who pursue the art of making gold in order to become rich. In spite of these features, the manuscript tradition of the work clearly indicates that it was greatly appreciated: it survives in fifty-three manuscripts, forty-seven of which are in Greek, two in Greek with Latin translation, and four in Latin; with the exception of six manuscripts produced between the eleventh and the fifteenth centuries, the rest were

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Licence, Université Catholique de Louvain, 1979–80), 18; P. Lemerle, *Le premier humanisme byzantin. Notes et remarques sur l'enseignement et culture à Byzance des origines au X^e siècle* (Paris, 1971) [Greek tr. Athens, 1985; English tr. Canberra, 1986], chapter 4, n. 29; Saffrey, H. D., 'Presentation du tome I des Alchimistes grecs par R. Halleux', *Papyrus de Leyde. Papyrus de Stockholm. Fragments de recettes,* ed. R. Halleux. Les alchimistes grecs, I (Paris, 1981), XII-XIV; G. Fowden, *The Egyptian Hermes* (Cambridge, 1986), 178.

[29] Wolska-Conus, 'Stéphanos. Identification'; eadem, 'Stéphanos d'Athènes (Stéphanos d'Alexandrie) et Théophile le Prôtospathaire, commentateurs des Aphorismes d'Hippocrate sont-ils indépendents l'un de l'autre?', *Revue des etudes byzantines* 52 (1994), 5–68.

[30] Wolska-Conus, 'Stéphanos. Identification', 17.

copied between the sixteenth and the nineteenth centuries.[31] The *On the Great and Sacred Art of Making Gold* greatly influenced the socalled poet-alchemists (Heliodoros, Theophrastos, Hierotheos and Archelaos) as is evident from several passages in their texts.[32] In the Arabic tradition, the name and work of Stephanos (Isṭafānūs) is associated with emperor Heraclius (Hiraql).[33] The Arabic alchemical corpus attributed to Jābir ibn Ḥayyān cites passages from Stephanos' work or uses analogous terminology without making direct reference to the Greek source.[34] As far as alchemy in Latin is concerned, the *Turba philosophorum* and *Rosinus* quote passages (short phrases or even whole pages) lifted from the Greek alchemical texts that were translated verbatim (through Arabic) into Latin, while the author of the *Rosarium philosophicum* (a mid fourteenth-century ompilation) cites nd comments on Stephanos.[35] In the early modern period, the work of Stephanos is included in Dominicus Pizimentius' 1573 printed edition of Greek lchemists in Latin translation,[36] as well as in later

[31] M. Papathanassiou, 'Stephanus von Alexandreia und sein alchemistisches Werk' (Ph. D. diss., Humboldt Universität zu Berlin, 7. Dezember 1992), esp. Teil II (Handschriften des alchemistischen Werkes).

[32] Texts in Ideler, II, 328–35 (Theophrastos), 336–42 (Hierotheos), 343–52 (Archelaos); 'Heliodori carmina quattuor ad fidem codicis casselani', ed. G. Goldschmidt, *Religionsgeschichtliche Versuche und Vorarbeiten,* XIX.2 (Giessen, 1923), 26–34. G. Goldschmidt, 'Heliodors Gedicht von der Alchemie', in J. Ruska, ed., *Studien zur Geschichte der Chemie, Festgabe Edmund O. v. Lippmann zum 70. Geburtstage* (Berlin, 1927), 21–27.

[33] The name of the emperor Heraclius is included in the catalogue of alchemists provided in the 10th-century bibliographical compilation by Ibn al-Nadīm, *Kitāb al-fihrist*, ed. G. Flügel (Leipzig, 1871), 353, 24ff; tr. B. Dodge, *The Fihrist* (New York, 1970), 849–50. Ibn al-Nadīm mentions the *Kitāb Hiraql al-akbar* (=*Book of Heraclius the Great*) in 14 books (*Fihrist,* ed. Flügel, 354, 27; tr. Dodge, 853); this seems to be the Arabic translation of the Κεφάλαια περὶ τῆς τοῦ χρυσοῦ ποιήσεως ιδ΄, a work included in the table of contents in MS *Marc. gr.* 299 but otherwise missing from the volume; see M. Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden, 1972), 189–90; M. Berthelot, *La chimie au Moyen Age*, 3 vols. (Paris, 1893; repr. Osnabrück, 1967), esp. III *(Essai sur la transmission de la science antique au Moyen Age),* 243, 255, 257.

[34] Berthelot, *La chimie au Moyen Age,* III, *L'alchimie arabe,* 20–21, 52, 78, 80, 168. See also *Le livre des soixante-dix,* in vol. I, esp. 325, 332, 341.

[35] Berthelot, *La chimie au Moyen Age*, I, 234, 253, 261, 262, 264, 267, 274–77.

[36] Berthelot, *Les origines de l'alchimie*, 105 considers it a "paraphrase".

editions.[37] Last but not least, about one tenth of the books owned by Isaac Newton (1643–1727) were alchemical, while nine out of eighty-four titles recorded in his autograph manuscript *De scriptoribus chemicis* refer to the Latin translation of works by Greek alchemists, Stephanos included.[38]

Since modern criteria regarding what constitutes 'science' differ greatly from those of the Middle Ages, uncovering the larger 'scientific' principles underlying the work of Stephanos is a challenging but necessary task, without which it would be impossible to adequately comprehend the work, intellectual profile, and activities of Stephanos.[39]

Generally speaking, the loose structure of Stephanos' lectures *On making gold* should not be attributed to his penchant for a personal rhetorical style. Rather, it is the result of his effort to synthesize various ideas originating in a wide array of disciplines into a logical

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[37] *Democritus Abderita, De arte magna, sive de rebus naturalibus, necnon Synesii, et Pelagii, et Stephani Alexandrini, et Michaelis Pselli in eundem commentaria,* Dominico Pizimentio Vibonensi Interprete (Patavii apud Simonem Galignanum, 1573) (the work of Stephanos is found on fols. 23r–61r). *Philosophus. Lectio prima περί χρυσοποΐας.* Graece et latine cum notis crit. primus ed. Ch. Gf. Gruner, Jenae 1777, in: J. G. Th. Graesse, *Trésor de livres rares et précieux*, 8 vols. (Dresden, 1859–69), esp. VI (1865), 492.

[38] J. Harrison, *The Library of Isaac Newton* (Cambridge, 1978), 59. K. Figala, J. Harrison and U. Pezold, 'De Scriptoribus Chemicis: sources for the establishment of Isaac Newton's (al)chemical library', in P. M. Harman and A. E. Shapiro, eds., *The investigation of difficult things. Essays on Newton and the history of the exact sciences in honour of D. T. Whiteside* (Cambridge, 1992), 135–79, esp. 136–7, 140–141, 166 no. [15], 167 no. [25], 168 no. [36], 169 nos. [46]-[48] and [50]-[51], 171 no. [72]. As an example of Newton's study of Greek alchemical works, I refer to his description of a method for refining gold by heating it with antimony: "Newton then attributed that knowledge to the 'Anciens,' in accord with his belief that all wisdom was anciently held by at least some wise men", in B. J. T. Dobbs, *The Foundations of Newton's Alchemy* (Cambridge, 1975, repr. 1984), 154. But Newton was right in attributing this method to the 'Ancients' because, as we have shown, MS *Paris. gr.* 2327, copied in 1478 by Theodoros Pelekanos, includes two recipes for refining gold and silver by heating them with antimony (*Collection des anciens alchimistes grecs*, ed. Berthelot and Ruelle, II, 333, 28– 334, 11), in M. Papathanassiou, 'Νεύτων καὶ ἀλχημεία', *Ούτοπία* 16 (1995), 69–78.

[39] M. Papathanassiou, 'Stephanus of Alexandria: pharmaceutical notions and cosmology in his alchemical work', *Ambix* 37.3 (1990), 121–33 esp. 125ff.; *Ambix* 38.2 (1991), 112 (addenda).

sequence and fashion them into a whole. This, says Stephanos, is exactly the research method of the philosopher; it is clearly his own method, too. His intention to unify various philosophical theories under the umbrella of a single theory able to account for all phenomena observed in the universe seems very modern. Though Stephanos promises to clarify everything, he in fact says nothing that could be clearly and immediately understood. According to L. G. Westerink,[40] the lack of clarity and logical sequence in combining ideas also characterizes Stephanos' commentary on Book III of Aristotle's *De anima*,[41] an observation that furnishes an additional argument in favour of Stephanos' authorship of the alchemical work. Further corroboration for this hypothesis is supplied by H. Blumenthal's statement that "a curious mixture of Neoplatonic aims and Aristotelian content emerges from Stephanos' theoria" in his commentary on Book 3 of Aristotle's *De anima*.[42]

Relations between microcosm, macrocosm and chemical operations

A detailed study of the alchemical work demonstrates that Stephanos' principles on "practical philosophy" are deeply rooted in Neoplatonism and especially Damascius' *De principiis*. These principles refer to the structure and transformations of matter, the One and Many in the world and his theoretical approach to the riddle of the philosophers,[43] i.e. the secret name of the philosophers' stone.[44] Stephanos proves his extensive knowledge of Greek philosophy and science by using ideas both well-known and new

[40] Westerink, *Anonymous Prolegomena to Platonic Philosophy*, esp. Introduction, XXIV–XXV.
[41] Published as the third book of Ioannes Philoponos, *In Aristotelis de anima libros commentaria,* ed. M. Hayduck, Commentaria in Aristotelem Graeca XV (Berlin, 1897), 446–607.
[42] H. Blumenthal, 'John Philoponus and Stephanus of Alexandria: Two Neoplatonic Christian Commentators on Aristotle?' D. J. O'Meara, ed., *Neoplatonism and Christian Thought* (Norfolk and Albany, 1982), 54–63, notes 244–47, esp. 55–56.
[43] Ideler 225,9–14.
[44] M. Papathanassiou, 'L'œuvre alchimique de Stéphanos d'Alexandrie: structure et transformations de la matière, unité et pluralité, l'énigme des philosophes', in C. Viano, ed. *L'alchimie et ses racines philosophiques. La tradition grecque et la tradition arabe* (Paris, 2005), 113–33.

(i.e. introduced by himself), especially in what he writes regarding the relation among various parts of the macrocosm, microcosm, and the philosophers' stone.[45] These relations may be outlined as follows:

The secret name of the philosopher's stone comprises nine letters forming four syllables (ἑπτὰ γράμματα ἔχω, τετρασύλλαβός εἰμι) and, according to Stephanos, corresponds to τετρασωμία ("four bodies", namely the four primary cosmic elements as solid bodies: fire-tetrahedron, air-octahedron, water-eicosahedron and earth-cube) and to the alloy of four metals involved in chemical operations. In Greek medicine, these elements correspond to the four humours of the human body (blood, yellow bile, black bile and phlegm). Stephanos draws further correspondences between the four humors and chemical substances. He explains that

> blood composed of air is warm and humid and is like quicksilver. Yellow bile composed of fire is warm and dry and is like copper. Black bile composed of earth is dry and cold and is like the dross of both [quicksilver and copper]. Phlegm composed of water is cold and humid and is like the vapours of a watery solution of gold (ὕδατι χρυσῷ) which are the souls of copper.[46]

Stephanos uses the word "key" (κλείς) to denote the passage from one element to another that has opposite qualities; he gives examples for three of them as follows:

> Fire-quicksilver is united with water through earth-dross like blood is united with phlegm through black bile; this is the first

[45] Ideler 220, 13–223, 15; 244, 31–245, 12. Also Papathanassiou, 'Stephanus's Cosmology', 127.

[46] The English translation follows the Greek text from the forthcoming edition by Papathanassiou, 3: 3: Ἐκ μὲν ἀέρος τὸ αἷμα θερμὸν καὶ ὑγρὸν ἔοικε τῇ ὑδραργύρῳ, ὑπάρχει γὰρ θερμὴ καὶ ὑγρά· ἐκ δὲ πυρὸς ἡ ξανθὴ χολὴ θερμὴ καὶ ὑγρὰ ἔοικε τῷ χαλκῷ ὑπάρχοντι θερμῷ καὶ ξηρῷ. Καὶ ἐκ μὲν γῆς ἡ μέλαινα χολὴ ἔοικε τῇ σκωρίᾳ τῶν ἄμφω· ὑπάρχει γὰρ ξηρὰ καὶ ψυχρά. Ἐκ δὲ ὕδατος τὸ φλέγμα ψυχρὸν καὶ ὑγρὸν ἔοικε τῷ ἀνερχομένῳ ὕδατι χρυσῷ, ὅπερ ἐστιν αἱ ψυχαὶ τοῦ χαλκοῦ· ὑπάρχει γὰρ ψυχρὸν καὶ ὑγρόν. The corresponding passage in Ideler 220, 18–24, presents significant textual differences.

> key and a separation of the humid from the dry, i.e. a separation of the souls of copper from the bodies, namely quicksilver.[47]

He goes on to explain the second and third keys:

> Earth-dross is united with air-gold through fire-quicksilver, in the same way that black bile is united with yellow bile through blood; this is the second key, the making of a mound (διάχωσις) of putrefied [substance], so that the dross is united with fire-quicksilver through sulfurous [divine] water (θεῖον ὕδωρ). Air-gold is united with earth-dross by water in the same way that yellow bile is united with black bile through phlegm. This is the third key, a union of air with earth, that is a resolution by putrefaction and boiling, i.e. by the seven conversions (ἀνακάμψεις), so that it becomes water and all is united in cinnabar.[48]

The number seven in the passage quoted above refers to the seven planets and their metals, as is evident from the correspondence that Stephanos draws between the four primary elements and the four fixed points of the Sun's annual path in the Zodiac which mark the beginning of the four seasons and their zodiacal signs. These points are the two equinoxes (vernal and autumnal) and the two solstices (winter and summer). He names the zodiacal signs "towers" and thus refers to the sacred art (of making gold) as having twelve towers (δωδεκάπυργος) and twelve signs (δωδεκάζῳδος) divided in four groups (seasons) of three towers (signs) each: vernal equinox

[47]Ed. Papathanassiou, 3:4: Οἷον τὸ πῦρ ὑδράργυρος ἑνοῦται τῷ ὕδατι διὰ τῆς γῆς, ἤγουν τῆς σκωρίας, ὥσπερ τὸ αἷμα ἑνοῦται τῷ φλέγματι διὰ τῆς μελαίνης χολῆς, ἥτις ἐστὶ πρώτη κλεὶς καὶ χωρισμὸς τῶν ὑγρῶν ἐκ τῶν ξηρῶν, τουτέστι χωρισμὸς τῶν ψυχῶν τοῦ χαλκοῦ ἐκ τῶν σωμάτων, ἤγουν τῆς χρυσαργύρου (corresponds to Ideler 220, 28–33).

[48] Ed. Papathanassiou, 3:6–7: Καὶ ἡ γῆ, ἤγουν ἡ σκωρία, ἑνοῦται τῷ ἀέρι χρυσῷ διὰ τοῦ πθρὸς ὑδραργύρου, ἤγου ἡ σκωρία ἑνοῦται τῷ ὕδατι χρυσῷ διὰ τῆς ὑδραργύρου. Ὥσπερ ἡ μέλαινα χολὴ ἑνοῦται τῇ ξανθῇ χολῇ διὰ τοῦ αἵματος, ἥτις ἐστὶ δευτέρα κλεὶς διαχώσεως τῆς σεσηπυίας, ὅπως ἑνωθῇ ἡ σκωρία τῷ θείῳ ὕδατι διὰ τοῦ πυρός, ἤγουν διὰ τῆς ὑδραργύρου. Καὶ ὁ ἀὴρ χρυσὸς ἑνοῦται τῇ γῇ, ἤγουν τῇ σκωρίᾳ, διὰ τοῦ ὕδατος, ἤγουν τοῦ ὑγροῦ, ὥσπερ ἡ ξανθὴ χολὴ ἑνοῦται τῇ μελαίνῃ χολῇ διὰ τοῦ φλέγματος, ἥτις ἐστὶ τρίτη κλεὶς ἕνωσις τοῦ ἀέρος μετὰ τῆς γῆς, ἤγουν λυομένης διὰ τῆς σήψεως καὶ ἐψήσεως, τουτέστι τῶν ἑπτὰ ἀνακάμψεων, καὶ γινομένης ὕδωρ καὶ ἑνουμένων πάντων ἐν τῷ ἅμα, ἤγουν γενομένων ἐν τῇ κινναβάρει (corresponds to Ideler 221, 2–12).

and signs-towers Aries, Taurus, and Gemini correspond to air; summer solstice and signs Cancer, Leo and Virgo correspond to fire; fall equinox and signs Libra, Scorpio and Sagittarius correspond to water; winter solstice and signs Capricorn, Aquarius and Pisces correspond to earth.[49]

Stephanos explains that the bodies and colours of the seven planets are precisely the seven bodies and colours of this composition, the tetrasomia. In the same manner that the seven planets pass through the signs of the Zodiac, the seven bodies and colors pass through (i.e. appear in) the composition made up of the four elements. According to Stephanos, the "*mysterion* of the philosophers" (where *mysterion* is a multi-valent word meaning "mystery, secret", but also "mystic rite", "an object used in magic rites, talisman" and "symbol") is carried out by means of the seven planets; the philosophers call it the "Egg of the philosophers which is not laid by a bird" (ᾠὸν τῶν φιλοσόφων, ὅπερ ὄρνις οὐκ ἐγέννησε).[50] By

[49] Ed. Papathanassiou, 3:9: Συναγόμενα οὖν πάντα γίνονται δώδεκα ἐν τέσσαρσι τριαδικῶς. Ὥστε οὖν δωδεκάπυργος ὑπάρχουσα ἡμῶν ἡ ἱερὰ τέχνη· τροπῶν τεσσάρων ἀνὰ τριῶν πύργων δωδεκάζῳδος λέγεται εἶναι, ἀνακυκλουμένη τὰς τροπὰς οὕτως· ἤγουν ἐαρινῆς, κριός, ταῦρος, δίδυμοι, ἀήρ· θερινῆς, καρκῖνος, λέων, παρθένος, πῦρ· μετοπωρινῆς, ζυγός, σκορπιός, τοξότης, ὕδωρ· χειμερινῆς, αἰγόκερως, ὑδροχόος, ἰχθύες, γῆ· ἅπερ συναγόμενα ὁμοῦ γίνονται τροπαὶ τέσσαρες· ἐαρινή, θερινή, μεθοπωρινή, χειμερινή, ἤγουν τέσσαρα στοιχεῖα· ἀέρος, πυρός, ὕδατος, γῆς (corresponds to Ideler 221, 24–34).

[50] The phrase is missing from MS *Marc. gr.* 299 (10th/11th century), where there is a gap in its place; it survives in MS *Paris. gr.* 2325 (13th century) and MS *Paris. gr.* 2327 (a. 1478); Ideler 222, 10 marks a gap and quotes a somewhat different (wrong) sequence of words. The full Greek text reads as follows (ed. Papathanassiou, 3:10): Ὡσαύτως πάλιν ἔχει τὰ σώματα καὶ τὰ χρώματα τῶν ἑπτὰ ἀστέρων τῶν λεγομένων πλανητῶν τῶν αὐτῶν εἰδῶν τε καὶ σχημάτων, ἅπερ εἰσὶ τὰ ἑπτὰ σώματα καὶ τὰ χρώματα τοῦ αὐτοῦ συνθέματος, ἅπερ γίνονται μετὰ τὴν τάξιν τῶν ἑπτὰ ἀστέρων. Ὥσπερ γὰρ οὗτοι οἱ ἑπτὰ ἀστέρες, ἤγουν οἱ πλανῆτες, εἰσερχόμενοι ἐν τοῖς ἀπλανέσι δώδεκα ζῳδίοις καὶ ἐξερχόμενοι φαίνονται μὲν γινόμενοι καὶ ἀπογινόμενοι, οὕτως καὶ ταῦτα τὰ ἑπτὰ σώματα καὶ τὰ χρώματα φαινόμενα μὲν γίνονται καὶ ἀπογίνονται ἐν τῷ αὐτῷ συνθέματι τῷ ἐκ τεσσάρων στοιχείων ἐκτεθέντι, ὡς διὰ τῶν ἑπτὰ ἀστέρων τῶν λεγομένων πλανητῶν καὶ δώδεκα ἀπλανῶν ζῳδίων τελεῖται τὸ τῶν φιλοσόφων ἀτρεκέστατον μυστήριον, ὅπερ κέκληται παρ'αὐτοῖς *ᾠὸν τῶν φιλοσόφων, ὅπερ ὄρνις οὐκ ἐγέννησε*, καθὼς ἔφασαν, ἀλλ' ὁ νοῦς τοῦ προφήτου ἐφεύρατο, ὅστις ὑπάρχει, οὕτως (corresponds to Ideler 221, 34–222, 12).

referring to the "body (alloy) of four elements (metals)" (τετραστοίχῳ σώματι) Stephanos means the cosmogonic Egg of Greek philosophy which, according to Orphic doctrine, "is older not only than the bird, but is older than anything in the world".[51] Consequently, this Egg is a dynamic image of the All represented by the two cosmic revolutions and should be identified with the Stone of the philosophers.

Stephanos continues by drawing correspondences between the primary elements on the one hand, and colors and parts of the human body on the other, as follows: Earth corresponds to white and to the part from feet to knees. Water is far-shining (τηλαυγὲς) and translucent (διαυγὲς) and corresponds to the part from knees to navel. Fire is yellow (ξανθὸν) and fiery (διάπυρον) and corresponds to the part from navel to heart. Air is saffron-coloured (κροκώδες) and corresponds to the part from heart to neck.[52] Why does Stephanos omit the head? Because, as is clearly stated in Plato's *Timaeus,* "the divine revolutions, which are two, [the gods] bound within a sphere-shaped body, in imitation of the spherical form of the All, which body we now call the "head," it being the most divine part and reigning over all the parts within us" (44D). Moreover, "[the gods] planted the mortal kind apart therefrom in another chamber of the body, building an isthmus and boundary for the head and chest by setting between them the neck to the end that they might remain apart" (69E).[53]

Stephanos says that the head regulates the change of humours in the human body exactly as the alternation of seasons regulates the

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[51] O. Kern, *Orphicorum Fragmenta* (Berlin, 1922), 143: (Plutarch, *Quaest. Sympos.* II 3,1 p. 636d) ἀείσω ξυνετοῖσι τὸν Ὀρφικὸν ἱερὸν λόγον, ὃς οὐκ ὄρνιθος μόνον τὸ ᾠὸν ἀποφαίνει πρεσβύτερον, ἀλλὰ καὶ συλλαβὼν ἅπασαν αὐτῷ τὴν ἁπάντων ὁμοῦ πρεσβυγένειαν ἀνατίθησι.

[52] Ed. Papathanassiou, 3:11: Ἐκ μὲν ποδῶν ἕως τῶν γονάτων τὸ τῆς γῆς στοιχεῖον ὑπάρχει καὶ ἐστὶ λευκὸν ὡσεὶ χιών· ἐκ δὲ τῶν γονάτων ἕως τοῦ ὀμφαλοῦ τὸ τοῦ ὕδατος στοιχεῖον ὑπάρχει τοῦ κατοχίμου καὶ ἐστὶ τηλαυγὲς καὶ διαυγὲς τῷ τε εἴδει καὶ τῇ θεωρίᾳ· καὶ ἐκ τοῦ ὀμφαλοῦ ἕως τῆς καρδίας τὸ τοῦ πυρὸς στοιχεῖον ὑπάρχει τοῦ κατοχίμου καὶ ἐστὶ ξανθὸν καὶ διάπυρον ὡς τὸ πῦρ· καὶ ἐκ τῆς καρδίας ἕως τοῦ αὐχένος τὸ τοῦ ἀέρος στοχεῖον ὑπάρχει καὶ ἐστὶ κροκῶδες (corresponds to Ideler 222, 12–20).

[53] Plato *Timaeus,* tr. R. G. Bury (Cambridge, Mass., 1929; repr. 1981), (44D) 98–9, (69E) 180–81.

change of juices in nature. But the alternation of seasons depends on the Sun's annual motion in the Zodiac (ecliptic); consequently, both the head and the Zodiac regulate all changes observed in the human body (microcosm) and the world (macrocosm). Finally, Stephanos says that the changes of the four primary elements into one another and the occurrence of natural phenomena are similar to what takes place in a chemical apparatus: the cover (φανὸς) of the earthen pot (κύθρα, λωπάς) looks like the sky that covers the earth; many changes occur in both the sky and the chemical apparatus as putrefaction and the dross of metals change by exhalation.[54]

An astronomical phenomenon recorded

In revealing the unity of the world, Stephanos related celestial and terrestrial phenomena to man in various ways. The well-known correspondence between planets and metals (Sun-gold, Moon-silver, Mercury-quicksilver, Venus-copper, Mars-iron, Jupiter-tin, Saturn-lead) and the observation of a particular planetary phenomenon at the time that he was writing his alchemical work stimulated his imagination and inspired him to include its allegorical description in his text.

The following passage, if explained in astronomical terms, can be understood as describing the Constantinopolitan eastern sky near the horizon at dawn and may be used as a clue to aid the identification of its author and the date of its composition:[55]

> Again the [planet] of Venus attained the Persian dawn and precedes the rays of the Sun; again the [planet] of Mercury,

[54] Ed. Papathanassiou, 7:7: Ὥσπερ οὖν ἐκ τοῦ οὐρανοῦ καμαροειδῶς τῇ γῇ ἐπικειμένου ταῦτα πάντα εἰσιν ἐκ τῶν ἀναθυμιάσεων, οὕτως καὶ ἐκ τῆς κύθρας, ἤτοι λοπάδος, ὡς ἐκ γῆς καὶ ἐκ τοῦ ἐπικειμένου φανοῦ ὡς ἐξ οὐρανοῦ σφοδραὶ γίνονται οἱ μεταβολαί. Καὶ ὥσπερ αἱ τῆς γῆς σήψεις ἀναθυμιώμεναι μεταβάλλονται, οὕτως καὶ ὁ ἰὸς συμμεταβάλλεται ἀναθυμιώμενος. Τὸ δὲ αὐτὸ κατανοήσεις καὶ ἐπὶ τὴς τοὺ ἀνθρώπου κεφαλῆς, οἰκίας δίκην ἐπικειμένης τῷ σώματι καὶ τὰ ὑγρὰ μεταβαλλούσης τῷ ἐπικρατοῦντι πάθει ὡς αἱ τροπαί (corresponds to Ideler 245, 3–12).

[55] Papathanassiou, 'Stephanus of Alexandria: On the structure and date of his alchemical work', 258ff.

> under the rays of the Sun, is found in the subsequent [Zodiacal signs]; again the [planet] of Saturn is faintly discernible due to the steepness of its height; again the [planet] of Mars is preparing the burning cut; towards these [planets] comes the Moon dressed as a bride [and] takes up the towed ships of the nine parts; by means [of the Moon] the alloy that is in the process of mixing itself does so to perfection.[56]

This passage can be explained as follows: at dawn the Sun is under the horizon; "Mercury, under the rays of the Sun, is found in the subsequent [Zodiacal signs]" means that Mercury is also under the horizon and is therefore invisible. "Venus attained the Persian dawn and precedes the rays of the Sun" means that Venus is visible as "the morning star" near the eastern horizon at dawn. "Saturn is faintly discernible due to the steepness of its height" refers to Saturn's great distance from the Earth according to ancient cosmological models. "Mars is preparing the burning cut" means that Mars (understood by astrology as the ruler of Aries and related to violent activities, weapons, cuts, burns, and the metal iron) is preparing to pass from the last Zodiacal sign, Pisces (a watery sign), to the first one, Aries (a fiery sign). "The Moon comes dressed as a bride" towards these planets indicates that the Moon is about to come in conjunction with the Sun (new Moon), a phenomenon allegorically understood as their marriage, a *theogamia*. Consequently, after the full Moon, the Moon is now moving towards these planets and the Sun, without having yet been in conjunction with any one of them. As deduced from the author's poetic account of this particular planetary phenomenon, the order of the planetary positions from east to west is as follows: Mercury, Sun (invisible under the horizon), Venus, Saturn, Mars, Moon (visible above the horizon).

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[56] Ideler 225, 25–32: Πάλιν ὁ [ὅ correxi: ἡ MBA] τῆς Ἀφροδίτης τὴν περσικὴν λαχὼν [λαχὼν correxi: λαχοῦσα MBA] ἑῴαν προηγεῖται τὰς τοῦ ἡλίου αὐγάς· πάλιν ὁ τοῦ Ἑρμοῦ ὑπὸ τὰς τοῦ ἡλίου αὐγὰς ἐπὶ τὰ ἑπόμενα εὑρίσκεται· πάλιν ὁ τοῦ Κρόνου διὰ τὴν τοῦ ὕψους βαθύτητα ἀμυδρῶς προσφαίνεται· πάλιν ὁ τοῦ Ἄρεως τὴν πυρώδη τομὴν ἀπεργάζεται· ἐν οἷς ἡ νυμφικῶς διασκευασμένη προέρχεται σελήνη, τὰς ἐννέα τῶν τμημάτων ἀναλαμβάνει ὁλκάδας, δι' ἧς τὸ συγκιρνώμενον τελειοῦται κρᾶμα.

In the last sentence of the passage the author refers to "the alloy that is in the process of mixing itself"; this is the alloy composed of the metals that correspond to the planets mentioned earlier according to the Stoic principle of *sympathy* between all parts of the world, a principle which underlies the traditional correspondence between celestial bodies (planets), terrestrial things (metals, precious and semi-precious stones, plants, animals etc) and parts of the human body. This may be related to the subsequent passage:

> The whole operation includes three [bodies/ elements/ metals] and displays the tetrasomia [= the four bodies] as a fourth, proceeding in an orderly manner. And they [= the bodies/ planets] run about to serve the most pure one [= Moon], so that by means of the vigorous [conjunctions?] they spur [themselves?] on towards the rays of the Sun, so that what [comes] from something perfect and is perfect be combined with [other] perfect [things]. [57]

"The tetrasomia proceeding in an orderly manner" here signifies the four planets (apart from the Sun and the Moon) proceeding in order on the Zodiacal zone. The passage means the following: the Moon-silver comes in successive conjunctions with the four planets-metals of the tetrasomia, changes their colours by transmuting their substances and leads them towards the Sun as it (the Moon) is moving towards its conjunction with the Sun; in this way the Moon leads the four planets to their perfection through union with the Sun-gold.

The date of the work

If this passage really refers to a planetary phenomenon observed by Stephanos during the time that he was composing his alchemical work, one should be able to identify a great assembly of the Sun, the Moon, Mercury, Venus, Mars, and Saturn in a relatively narrow part of the sky, seen in the eastern sky at dawn during the reign of the

[57] Ideler 228, 28–32: … ἵνα τριῶν ὄντων τῆς καθόλου ἐργασίας, τετάρτην ἀναδείξει τὴν τετρασωμίαν βαδίζουσαν εὐτάκτως. Καὶ διατρέχουσι πρὸς ὑπηρεσίαν τῆς καθαρωτάτης, ἵνα διὰ τῶν εὐτονούντων κεντήσωσιν πρὸς τὰς τοῦ ἡλίου αὐγάς, ὅπως τὸ ἐκ τελείου τέλειον τελείοις συναφθῇ

emperor Heraclius (5 October 610–11 January 641) at Constantinople. The lack of any reference to Jupiter in the text evidently means that it was not visible.

According to calculations made on the computer with the program Voyager, during the reign of Heraclius there were 93 cases of great assemblies of the Sun, the Moon and four planets, independently of their order in the sky and their visibility; but only three of those (7 June 617, 11 March 636, and 19 February 638) fulfill most astronomical conditions described in the passage. Closer examination helps eliminate the conjunctions of 636 and 638, since the order of the visible planets (as seen successively in increasing height above the horizon) was Mars, Venus, and Saturn. This sequence is different from the one described in the text (Venus, Saturn, Mars). In addition, in both 636 and 638 Mars was in the Zodiacal sign of Aquarius; especially in February 638, it was very near the Sun and moving towards Capricorn (retrograde motion), i.e. in a direction away from Aries. Consequently, in neither case could Mars have been preparing the "burning cut" by entering Aries. After eliminating the years 636 and 638 from consideration, the astronomical conditions on 7 June 617 deserve closer examination:

Constantinople, 7 June 617, 04.15 am local time (02.15 UT)

Planet	*Rising*	*Setting*	*Zodiacal sign*
Sun	04:29 am	07:32 pm	17° 52' Gemini
Mercury	05:32 am	08:56 pm	04° 33' Cancer
Venus	03:54 am	06:42 pm	07° 51' Gemini
Mars	01:04 am	01:00 pm	01° 39' Aries
[Jupiter	*11:32 am*	*12:29 am*	*15° 18' Virgo]*

Saturn	03:21 am	05:32 pm	25° 33' Taurus
Moon	03:09 am	05:53 pm	22° 29' Taurus

If we were at Constantinople on that date and Stephanos invited us to admire with him the splendid view of the starry sky, he would first show us Mercury, visible in the twilight as an evening star low in the west; and next morning early at dawn (4:05 am local time, 24 minutes before sunrise) in increasing height from the eastern horizon he would show us Venus as a morning star very low in the east but visible because of its great brightness; a little higher than Venus, Saturn would be in conjunction with the crescent of the waning Moon, and finally red Mars high in the sky. The position of Mars in 1°39' Aries, a fiery Zodiacal sign and the first subsequent to the vernal equinox, explains why "Mars is preparing the burning cut": Stephanos must have been observing the planets for many days while this particular planetary phenomenon gradually evolved. Mars was moving straight forward (towards the subsequent zodiacal sign) through the last degrees of Pisces before entering Aries on 4 June. Meanwhile, the Moon, after the full Moon of 26 May, would come successively into conjunction with Mars (3 June), Saturn (7 June) and Venus (8 June), reaching its next conjunction with the Sun (new Moon) on 9 June 617. Stephanos does not mention the 3 June conjunction of Moon and Mars in Pisces, possibly because he wrote this lecture some time after 26 May 26 but before 3 June 617.

The astronomical method explained

A legitimate question may arise as far as this method of dating the alchemical work of Stephanos is concerned: if the single date fulfilling all astronomical conditions deduced from the text is found by searching only the astronomical phenomena that occurred during the forty years of Heraclius' reign, is this not a circular argument based on the assumption that the alchemical work is a genuine composition by Stephanos? If the attribution of the alchemical work to Stephanos is false, it could have been written any time between

Stephanos' lifetime in the early seventh century and the late tenth–early eleventh century, i. e. the date ascribed on the basis of paleography to MS *Marc. gr.* 299, the earliest among the manuscripts that contain the work. We should therefore check whether the astronomical phenomenon described in the alchemical work repeated itself at any other time during this four-century period.

Let us begin with the celestial phenomenon itself. It is true that such an astronomical phenomenon may occur several times during a given century because of the participation of the planets Sun, Mercury and Venus. As Plato says in his *Timaeus* (38D), "and the Morning Star [i.e. Venus] and the Star called Sacred to Hermes He [i. e. God] placed in those circles which move in an orbit equal to the Sun in Velocity, but endowed with a power contrary thereto; whence it is that the Sun and the Star of Hermes and the Morning Star regularly overtake and are overtaken by one another".[58] The Moon joins them every month but the order of its successive conjunctions with them differs from one month to the next. In our case a major differentiation in this "regular" phenomenon appears because of the participation of the planets Mars and Saturn whose sidereal periods of revolution around the zodiac are ca. two (1.88) years and ca. thirty (29.46) years respectively.[59] This means that we do not see every month an astronomical phenomenon in which all these planets are involved. Moreover, such phenomena are not always visible, as their visibility depends on the angular distances of the planets involved in relation to that of the Sun in the Zodiac. But even if such a phenomenon is visible, there are two opposite regions of the sky in which it may be observed: either in the eastern part of the sky at dawn (if Mercury or Venus or both are morning stars) or in the western part of the sky at twilight (if Mercury or Venus or both are evening stars). This condition further restricts the

[58] Plato, *Timaeus,* tr. Bury (38D), 79.

[59] The sidereal period is the time that a planet takes to complete one orbit relative to the fixed stars. The position of a given planet is measured on the ecliptic by using the coordinates of the ecliptic (ecliptic longitude, ecliptic latitude); we consider the point of the vernal equinox as point zero on the ecliptic. A planet makes a whole revolution around the zodiac (i.e. the ecliptic) when it returns to the point where it was when we begun observing it, i.e. to the same degree on the ecliptic (i.e. the same ecliptic longitude).

possibilities of when the astronomical phenomenon described in the alchemical text may have occurred.

Let us now further narrow our search by imposing an even more restrictive requirement: the order of the planets seen in the sky as compared to that described in the text. By moving continuously, the six celestial objects mentioned in the astronomical passage (Sun, Moon, Mercury, Venus, Mars, Saturn) keep changing their angular distances from one another and, in due time, also their order. Though there are many different ways in which we can combine and order six different objects, once a particular sequence and location on the sky relative to one another are required, possibilities become considerably more limited. The astronomical passage describes a concentration of the planets except Jupiter in a relatively small part of the sky, forming what in astrological terms is called a great assembly or great conjunction. For this reason, we may allow an angular distance of 48 degrees (equal to the greatest elongation of Venus from the Sun) for their positions on the ecliptic. The passage does not explicitly mention in which sign of the Zodiac the whole phenomenon occurred. However, it does provide us with a valuable piece of information, "Mars is preparing the burning cut" which, as we have seen, indicates the passage of Mars from Pisces (water) to Aries (fire). In the passage, Mars rises first and is followed by Saturn. Therefore, the key in searching for the occurrence of such a celestial phenomenon in the four centuries after the reign of Heraclius is to identify instances when Mars was in the last degree of Pisces and Saturn a few degrees further in the successive order of signs. A search in Owen Gingerich, *Solar and Planetary Longitudes for the Years –2500 to +2000 by Ten-Day Intervals* (Madison, 1963) yields thirty-two possible dates (beginning with 672, 674 and ending with 1086, 1088), as Saturn moves ca. two years in each sign and Mars can overtake him twice in the same or the next sign. These thirty-two possibilities were further explored by running a computer search with the help of the program Voyager, through which other parameters such as the order of the planets on the sky and their visibility on its eastern part at dawn can be taken into consideration. The computer search indicates that none of the conjunctions that occurred until 1088 A.D. fulfils the astronomical requirements deduced from our reading of the astronomical passage in the

alchemical work of Stephanos. If our allegorical interpretation of this passage is correct, the only viable celestial phenomenon it could be describing between the seventh and the eleventh centuries would be the one visible from Constantinople and evolving around 7 June 617.

This piece of evidence becomes particularly intriguing when we also take into consideration the fact that Stephanos of Alexandria is the author of a very important commentary on Ptolemy's *Handy Tables,* in which he gives his own examples explaining the use of Ptolemy's tables[60] for the calculation of solar, lunar and planetary positions, as well as solar and lunar eclipses calculated for the coordinates of Constantinople.[61] The dates of calculated examples in this commentary fall in the years 617–619.[62] his suggests that during this period Stephanos was in Constantinople and consistently observed and calculated the motion and position of the Sun, the Moon, and the other planets. Had he been not in Constantinople but Alexandria, he would have used the data of Ptolemy's tables as they are given for the geographic latitude of Alexandria without modifying them for Constantinople's coordinates. It seems that Stephanos, while systematically engaged with the observation of astronomical phenomena for the purposes of his commentary on Ptolemy, was also composing his alchemical work. The particular planetary phenomenon he observed around the beginning of June 617 impressed him so much that he decided to include its allegorical description in the alchemical work. By the beginning of the seventh

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[60] On Ptolemy's *Handy Tables*, see Neugebauer, *A History of Ancient Mathematical Astronomy*, II, 969–78.

[61] Στεφάνου, μεγάλου φιλοσόφου καὶ Ἀλεξανδρέως διασάφησις ἐξ οἰκείων ὑποδειγμάτων τῆς τῶν προχείρων κανόνων ἐφόδου τοῦ Θέωνος, in MS *Vat. Urbinas gr*. 80. Usener edited a few chapters of the work based on four MSS: "C cod. Cantabrigensis, cuius praesto mihi erat apographon Gottingense (cod. ms, philol. 67), D codicis Barocciani (an Cromwelliani?), U cod. Urbinas gr. 80 chart. s. XV, V cod. Vaticanus gr. 304 chart. s. XV." See Usener, 'De Stephano Alexandrino', 289–319 [289–295 commentary, 295–319 text].

[62] Neugebauer, *A History of Ancient Mathematical Astronomy,* II, 1045–50. E. Chauvon, 'Étude sur le Commentaire astronomique de Stephanos d' Alexandrie'; M.-Ch. Hugo, 'Stéphane d'Alexandrie: Calcul de l'éclipse de Soleil du 4 novembre 617' (Mém. de licence, Université Catholique de Louvain, 1987). Papathanassiou, 'Stephanos von Alexandreia', Teil I, 2.C. Kommentare zu den Handtafeln des Ptolemaios.

century, the correspondence of each planet to a metal was a long and firmly established occult tradition with which Stephanos was thoroughly familiar and to which he also refers elsewhere in his alchemical work, including an instance in the same lecture where the astronomical passage is contained.[63]

The evidence of the astronomical passage in the alchemical work that is datable to ca. 7 June 617, combined with the known astronomical observations and calculations by Stephanos in Constantinople on the one hand, and the attribution of the alchemical work to Stephanos of Alexandria in several instances recorded in Byzantine historiography and the Greek manuscript tradition on the other, indicate that this attribution must be accepted as genuine. H. Usener was the first who voiced doubts about it because he thought that alchemy was a forbidden subject in Byzantium. Usener launched a debate that still continues and may lead to a dead-end, especially if anyone's re-examination of the available evidence begins with the negative assumption that the various works attributed to Stephanos cannot have been written by the same author. Usener's view is predicated on the existence of an established split between "officially acceptable" or "canonical" and "forbidden" or "heretical" fields of knowledge during the Late Antique and medieval period. As a result, modern scholars have viewed the surviving written record of Stephanos' various interests and activities as the products of many different scholars (as many as the subjects treated in his surviving works), instead of a single one. However, if we allow the Byzantine evidence to speak, we may be able to appreciate how multi-faceted Stephanos' intellectual profile really is.

[63] E.g. Ideler 230, 24: Οὕτω δὴ λοιπὸν νόει καὶ τὸ χαλκόχρωον τῆς Ἀφροδίτης θερμὸν ὑπάρχει τῇ φύσει (So you should consider that the copper-colored body of Venus is warm by nature).

THE ASTROLOGICAL WORK

The problems with dating the Apotelesmatike Pragmateia and its attribution to Stephanos

A few pieces of surviving evidence suggest that Stephanos had indeed occupied himself with astrology during the reign of Heraclius, perhaps at the request of the emperor himself. The first piece of evidence is a tenth-century report by the biographer of the emperor Basil I that Heraclius had drained, filled in, and converted into a garden a cistern of considerable size situated in the imperial estates because Stephanos of Alexandria had cast the horoscope of the emperor and predicted that he would die by drowning; as a result, the emperor took special measures to protect himself from this danger.[64] Although Stephanos' predictions regarding Heraclius' death were wrong, the emperor's elaborate precautions can be taken as an indication that Stephanos may have had a certain amount of influence on him. That Heraclius had feared death from water is confirmed independently by the *Short History* of the patriarch Nikephoros.[65] No further information on the emperor's horoscope is available to us since neither a text nor a design for it survive.

A second piece of evidence that Stephanos of Alexandria had indeed written on astrology survives in Greek but goes back to a ninth-century Arabic source. At least two Greek manuscripts, MS *Angelicus* 29 of the year 1388 and MS *Vat. gr.* 1056 of the fourteenth century, contain the Greek translation of Arabic astrological texts, including a catalogue of astrological books found in the caliphal library the reading of which was forbidden. The catalogue is attributed to the famous ninth-century astrologer Abū

[64] *Theophanes Continuatus,* ed. I. Bekker, CSHB (Bonn, 1838), 338,10–12. G. Ostrogorsky, *Geschichte des byzantinischen Staates,* Handbuch der Altertumswissenschaften XII, 1–2, 3rd ed. (Munich, 1963), 77–93.

[65] Nikephoros, Patriarch of Constantinople, *Short History,* §§24–25, ed., tr., and comm. C. Mango, CFHB 13 (Washington, D. C., 1990), 72–5.

Ma'shar.[66] Whether the astrological book (*apotelesmatikon*) by Stephanos of Alexandria listed in this catalogue is the surviving *Apotelesmatike Pragmateia* or a different one can only remain an open question. However, by the tenth century, "Stephanos the Astrologer" (Στέφανος ὁ μαθηματικὸς) was recognized as the authority who had cast a horoscope pertinent to the early Islamic conquest, as is explicitly mentioned in the *De administrando imperio* (Chapter 16).[67] The *Apotelesmatike Pragmateia* by Stephanos of Alexandria is also mentioned by the eleventh–twelfth-century Byzantine historian Georgios Kedrenos;[68] both passages have already been identified and discussed by H. Usener.

In addition to these cursory references in Byzantine historiography, we also have the well-known and much-debated text of the *Apotelesmatike Pragmateia,* an astrological treatise that includes a horoscope of Islam. It has been edited by H. Usener as part of his article entitled 'De Stephano Alexandrino'.[69] Usener's edition is

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[66] *CCAG*, I, 83ff.: Περὶ τῶν ἀποκειμένων ποτὲ ἐν τῷ παλατίῳ βιβλίων μαθηματικῶν καὶ μὴ διδομένων: Εἶπεν αὐτὸς (sc. ὁ Ἀπομάσαρ) ὅτι τὰ ἀποτελεσματικὰ βιβλία τὰ ἀποκείμενα ἐν τῷ παλατίῳ καὶ μὴ διδόμενα τινὶ εἰς ἀνάγνωσιν ἀλλὰ κωλυόμενα εἰσὶ ταῦτα· Τὸ ἀποτελεσματικὸν τοῦ Στεφάνου τοῦ Ἀλεξανδρέως …

[67] Identified by Usener, 'De Stephano Alexandrino', 257 note*: "Constantin. Porphyrog. c. 16, p. 37 Menes. Ἐπῆλθον οἱ Σαρακηνοὶ μηνὶ Σεπτεμβρίῳ τρίτῃ ἰνδικτιῶνος δεκάτης εἰς τὸ δέκατον ἔτος Ἡρακλείου, ἔτος ἀπὸ κτίσεως κόσμου ϛρλ, νῦν δὲ ἐστὶ ϛωο ἰνδικτιῶνος δεκάτης πέμπτης, ὡς εἶναι ἀπὸ τότε ἕως νῦν χρόνους ψμ. Τὸ δὲ θεμάτιον τῶν αὐτῶν Σαρακηνῶν ἐγένετο εἰς μῆνα Σεπτέμβριον τρίτην, ἡμέρᾳ πέμπτῃ. Εἰς τοὺς αὐτοὺς χρόνους πρῶτος ἀρχηγὸς τῶν Ἀράβων Μουάμεθ ὁ καὶ προφήτης αὐτῶν χρηματίσας ἐκράτησε τῆς ἀρχῆς τῶν Ἀράβων ἔτη ἐννέα. [= Constantine Poprhyrogennetos, *De administrando imperio*, ed. and tr. Gy. Moravcsik, R. J. H. Jenkins, CFHB 1 (Washington, D. C., 1967, repr. 1993), 80–81]."

[68] Usener, 'De Stephano Alexandrino', 257: "(Cedrenus, *Hist.*, t. I, p. 717,7) τῷ ιβ΄ ἔτει (imp. Heraclii) ἤγουν τῷ ϛρλα΄ ἀπὸ κτίσεως κόσμου, μηνὶ σεπτεμβρίῳ γ΄, ἡμέρᾳ ε΄ ἐγένετο θεμάτιον τῶν Σαρακηνῶν παρὰ Στεφάνου Ἀλεξανδρέως τούτοις κανονίσαντος κρατῆσαι, ἐν ἰσχύει μὲν ἔτη τθ΄, ἐν δὲ τῇ συστροφῇ καὶ ἀκαταστασίᾳ καὶ συμφορᾷ ἑτέρᾳ ἔτη νς΄, ὡς εἶναι τὴν διακράτησιν αὐτῶν ἅπασαν εὐτυχοῦσαν δυστυχοῦσαν ἔτη τξε΄ … ἐὰν ἄρα καλῶς ἐθεμάτισεν ὁ ἀστρονόμος Στέφανος· ἀλλ' ὡς οἶμαι λεπτὸν παχὺ ἔλαθεν ἐκεῖνον."

[69] Usener, 'De Stephano Alexandrino', 247–89, 321–22 with two designs of the horoscope; ibid., 266, 17–20: Στεφάνου φιλοσόφου Ἀλεξανδρέως ἀποτελεσματικὴ πραγματεία πρὸς Τιμόθεον τὸν αὐτοῦ μαθητὴν, πρόφασιν

based on six Byzantine manuscripts dating from the fourteenth to the sixteenth centuries and containing two types of design for the horoscope.[70] As is the case with the alchemical work, Stephanos' authorship of this piece is also considered spurious.

Before discussing the problem any further, let us focus on certain aspects of the text based on Usener's edition.[71] The treatise can be divided into three parts. In the first,[72] the author refers to "the books of ancient wise men books on scientific initiation through astronomy" and explains the "introductory method" to them. Among other things, he also tries to offer his readers a clear knowledge "through the eventual and possible configuration of the stars" which God gave us to use "like a prophetess." The author piously points out that all natural phenomena and changes observed in the world as well as all political and social events, even a man's talents and status in society depend on God. In other words, everything depends on the "will and energy of the Creator, God of all, to whom alone belongs the creative causality." God uses the stars and their motions as simple instruments even though he could achieve his aims without the stars. The author asserts firmly that "perfect and true knowledge belongs to God, while men, making conjectures on the basis of the elements and the stars, in part know and in part predict." Consequently, both the extent of our knowledge

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μὲν ἔχουσαν τὴν νεοφανῆ καὶ ἄθεον νομοθεσίαν τοῦ Μωάμεδ, πολλὰ δὲ καὶ ἄλλα τῶν μελλόντων προαγορεύουσα. Horoscopes of Islam are also known in the Arabic astrological tradition (friendly communications by Prof. Dr. sc. G. Strohmaier, Berlin, and Maria Mavroudi).

[70] Usener, 'De Stephano Alexandrino', 289: "In adnotatione critica opusculi apotelesmatici his librorum signis usus sum A *Laurent.* 28, 14 quo V. Rose exemplo usus est s. XIV chart.; B *Laurent.* 28, 13 et C *Laurent.* 28, 16 exempla s. XV a V. Roseo conlata; R apographon Valentini Rosei h. e. codices AB(C) consentientes cf. p. 258; M *Monacensis* n. 105 s. XVI; V *Vindob. phil. gr.* 108 s. XV." One type of design for the horoscope is preserved in the Florentine (Laurentiani) and Munich (*Monacensis*) MSS (Usener, 'De Stephano Alexandrino', 321); another type is drawn in the Vienna (*Vindob.)* MS (Usener, 'De Stephano Alexandrino', 322).

[71] M. Papathanassiou, 'Στεφάνου Ἀλεξανδρέως ἀποτελεσματικὴ πραγματεία ἢ ὡροσκόπιον τοῦ Ἰσλάμ', *Οἱ ἐπιστήμες στὸν ἑλληνικὸ χῶρο* (Athens, 1997), 107–17.

[72] Usener, 'De Stephano Alexandrino', 266, 5–271, 22.

and the accuracy of our predictions through the position of the stars are always restricted and subject to failure.[73] But Stephanos' lectures *On making gold* prove his great piety as they begin and end with prayers greatly influenced by the works of the early Christian fathers.

In the second part[74] the author explains for what reason and when he cast the horoscope of Islam and proceeds in a general analysis of it according to known astrological principles. He says that he was in the school's small garden with his students when he was visited by Epiphanios, a merchant who had just arrived from Arabia Felix (εὐδαίμων Ἀραβία). Upon entering, Epiphanios requested that Stephanos order one of his students to suspend the astrolabe and find the ascending degree of the ecliptic (ὡροσκοπικὴν μοῖραν), the planetary positions and the cardinal points of the horoscope, because of the importance of the news that Epiphanios was about to report; Stephanos ordered "his Sophronios" to do so. "While Sophronios was busy suspending the astrolabe and calculating the hour, Epiphanios began his narrative" regarding the appearance and activity of Muḥammad in Arabia.[75] Clearly, the numerical data taken by Sophronios and later studied by Stephanos are meant for a catarchic horoscope (καταρχήν), the kind cast at the beginning of an undertaking in order to predict its outcome. This is the reason why the astrolabe is raised at the very moment when Epiphanios begins his narrative about the inception of Muḥammad's movement. The third part includes the predictions about the events that will take place "during the dominion of this nation", i.e. the Muslims, both in general terms, following the characteristics of the planets found in each one of the horoscope's houses, and specifically during the reign of each one of Islam's future caliphs.[76]

The main argument against the authorship of the *Apotelesmatike Pragmateia* by Stephanos is that, in his predictions on how the polity of Islam will fare in the future, the author of the treatise

[73] Usener, 'De Stephano Alexandrino', 266, 5–7; 267, 10–15; 267, 24–268, 2; 268, 15–20; 270, 25–29; 271, 10–16, 19–21.
[74] Usener, 'De Stephano Alexandrino', 271, 23–279, 13.
[75] Usener, 'De Stephano Alexandrino', 271, 23–25; 272, 3–13.
[76] Usener, 'De Stephano Alexandrino', 279, 14–289.

demonstrates accurate knowledge of the events that transpired during the reign of the successive Arab caliphs from the beginning of Islam until the end of the eighth century; from that point on, the "predictions" are all wrong, which indicates that the work cannot have been written at the beginning of the seventh century and must have been put together, at least in the form that we have it, towards the end of the eighth century. David Pingree has argued that the author of the *Apotelesmatike Pragmateia* is well-informed both about the work of Stephanos on Ptolemy's *Handy Tables* and the methods of Sassanian political astrology described in treatises on catarchic horoscopes written by Theophilos, son of Thomas, a Maronite Syrian Christian who knew Greek and served as personal astrologer to caliph al-Mahdī (r. 775–785).[77]

The remainder of the present article will argue that at least the introduction to the *Apotelesmatike Pragmateia* does go back to a genuine astrological work by Stephanos written in the early seventh century; and that the time, place, and prosopographical data that frame the narrative around the horoscope of Islam reflect realities about the life, activities, and intellectual circle of Stephanos. Therefore, the portrait of Stephanos as an astrologer was not newly fabricated towards the end of the eighth century; rather, astrological expertise was attributed to him more than a century after his death because he was already known as an astrologer during his lifetime. Last but not least, the astronomical data of the horoscope of Islam will be examined in order to suggest that it might not have been calculated backwards (i.e. by a later forger) but may represent the result of a genuine observation of the heavens that took place exactly when the text says it did, on 1 September 621.

[77] D. Pingree, 'Classical und Byzantine Astrology in Sassanian Persia', *DOP* 43 (1989), 227–39, esp. 236, 238–39. See also G. E. von Grunebaum, *Der Islam im Mittelalter* (Zürich, 1963), 465 n. 58. Neugebauer, *A History of Ancient Mathematical Astronomy,* II, 1050.

Relations between the Horoscope of Islam and the alchemical work

Two short passages in the first section of the *Apotelesmatike Pragmateia* indicate that its author in addressing his students refers them to knowledge he had expounded earlier, evidently in other lectures he must have given. The meaning of these references becomes clearer if we read them in conjunction with the alchemical work by Stephanos. In the introductory section to the *Apotelesmatike Pragmateia*, the author reminds his student Timotheos and other auditors the content of his lectures and his teaching method:

> I have elucidated everything I taught you and your fellow-listeners, my students, by circumscribing it within the limits of philosophy and clarifying it through theories [so that it be] accurate and truthful not through persuasion [wrought] by the elegance of words but through natural and unexceptionable sequence; [I mean] the Platonic method of reasoning, Aristotelian physiology, geometric deliberations, arithmetic proportions, musical repetitions, (the alchemical allegories and impenetrable processes of thought, the astronomical critical points in human life and the notorious astrological predictions,) the Ptolemaic… *Syntaxeis* and his practical enchantments.[78]

The teaching program described above includes subjects that, in modern terms, would be labeled as both 'rational' (philosophy, geometry and arithmetic, music, and astronomy) and 'irrational' (astrology and alchemy). Astrology is covered both at the practical level ("notorious astrological predictions" and "practical enchantments") and in its theoretical foundation, since reference to

[78] Usener, 'De Stephano Alexandrino', 267, 3–10: σοί … τοῖς συνακουσταῖς σου καὶ ἐμοῖς φοιτηταῖς … καὶ ὅσα μὲν ὑπέδειξα ὑμῖν, ἐντὸς τῶν τῆς φιλοσοφίας ὅρων ἀποκλείσας ἀτρεκῆ τε καὶ ἀψευδέστατα ταῖς θεωρίαις διελεύκανα, οὐ πειθοῖ λέξεων κομψότητος, φυσικῇ δὲ καὶ ἀδιαβλήτῳ ἀκολουθίᾳ, τὰς Πλατωνικὰς ἐφόδους, τὰς Ἀριστοτελικὰς φυσιολογίας, τὰς γεωμετρικὰς περινοίας, τὰς ἀριθμητικὰς ἀναλογίας, τὰς μουσικὰς ἐπαναλήψεις, (τὰς χημευτικὰς ἀλληγορίας καὶ δυσευρέτους νοήσεις, τοὺς ἀστρονομικοὺς κλιμακτῆρας καὶ πολυθρυλλήτους ἀστρομαντείας,) τὰς Πτολεμαϊκὰς ** καὶ συντάξεις καὶ ὀργανικὰς αὐτοῦ μαγγανείας.

the Ptolemaic *Syntaxeis* (in the plural) must indicate not only Ptolemy or's major astronomical work, the *Megiste Syntaxis* (commonly known as the *Almagest*) but also his astrological one, the *Syntaxis Tetrabiblos*. The approach to alchemy seems to be mostly theoretical, since it is referred to as "allegorical" (χημευτικὰς ἀλληγορίας). This calls to mind both the general approach of Stephanos' alchemical work and a specific passage in his text, where he analyzes the concept of "allegorical alchemy" by distinguishing between "mythical" (μυθικὴ;) and "mystical and hidden" alchemy (μυστικὴ καὶ κρυπτὴ χημεία).[79] According to him, "mythical alchemy is confused due to the multiplicity of words; but mystical alchemy deals with the universe through deliberation on the creation, so that man who is God-minded and born-of-God learn through straight work and theological and mystical rationale."[80]

The second passage of the *Apotelesmatike Pragmateia* where its author most likely refers to his earlier teachings is as follows:

> Not only these and [other] such animals have had such a birth, but also many other forms are produced and made by means of putrefaction according to the differences of species and the position of the stars, like the metals, for example gold, silver, copper, iron, lead, the different stones, and whatever is like them. Those of us who *remember, understand* [the process of their birth] well.[81]

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[79] Papathanassiou, 'Stephanus of Alexandria: pharmaceutical notions and cosmology', 125.

[80] *Letter to Theodoros*, ed. Papathnanassiou, 5: Καὶ ἄλλο ἐστὶν ἡ μυθικὴ χημία, καὶ ἄλλο ἡ μυστικὴ καὶ κρυπτή. Καὶ ἡ μὲν μυθικὴ πολυπληθίᾳ λόγων συγχέεται, ἡ δὲ μυστικὴ λόγῳ δημιουργίας κόσμον μεθοδεύεται, ἵνα ὁ θεόφρων καὶ ὁ θεογενὴς ἄνθρωπος διὰ τῆς εὐθείας ἐργασίας καὶ θεολογιῶν καὶ μυστικῶν λόγων μάθῃ. Ideler 208, 28–34.

[81] Usener, 'De Stephano Alexandrino', 270, 5–10: οὐ μόνον δὲ ταῦτα καὶ τὰ τοιαῦτα ζῷα τοιαύτην ἔσχον τὴν γένεσιν, ἀλλὰ καὶ ἄλλα πλεῖστα τῶν εἰδῶν διὰ σήψεως γίνεται καὶ πεποίηται πρὸς τὰς τῶν γενῶν διαφορὰς καὶ τὴν ἀστρονομικὴν θέσιν, ὡς τὰ μεταλλικά, οἷον ὁ χρυσὸς καὶ ἄργυρος χαλκός τε καὶ σίδηρος καὶ μόλυβδος καὶ ἡ τῶν λίθων διαφορότης καὶ ὅσα τοιαῦτα. Καὶ τούτων μὲν τὴν γένεσιν οἱ ἐννοησάμενοι ἐπιγιγνώσκομεν.

True, the last sentence of the above passage (καὶ τούτων μὲν τὴν γένεσιν *οἱ ἐννοησάμενοι ἐπιγιγνώσκομεν*) could also be translated as "Those of us who *understand, know* [the process of their birth] well". Choosing between the two possibilities depends on how we interpret the verb ἐννοέω; among its various meanings is that of ἐνθυμοῦμαι (to remember). Therefore, it is likely that the past tense ἐννοησάμενοι refers to the author and his students, as also follows from the verb ἐπιγιγνώσκομεν. If this is so, the whole phrase would mean "we saw, learned, understood and now remember the birth of metals and stones by putrefaction." If indeed the author of this passage is Stephanos inviting his students to remember his earlier teachings, the reference to putrefaction should be made in his alchemical work. The *Apotelesmatike Pragmateia* includes the quoted passage at the end of a long paragraph which explains putrefaction (σῆψιν) as a natural procedure leading to the birth of various small animals and flowers. The phrase "[they] are produced and made by means of putrefaction" must refer to a technical procedure, as contrasted with the natural procedure described in the following words: "by means of putrefaction done into the marshes and the very wet locations … such animals and plants are born."[82] Even if these words evoke Platonic and Aristotelian ideas regarding the birth (γένεσιν) of metals and stones, putrefaction is a basic method of alchemy and pharmacy and is, indeed, mentioned by Stephanos in his alchemical work.[83]

Identification of Sophronios

As we have seen, the *Apotelesmatike Pragmateia* mentions by name at least three of the author's friends, students, or collaborators: Timotheos, to whom the text is addressed, the merchant Epiphanios, and Sophronios, the astrolabe reader. While neither Timotheos nor Epiphanios can be identified with any known personality on the basis of surviving evidence, we do have a few leads regarding the identity of Sophronios.

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[82] Usener, 'De Stephano Alexandrino', 269, 10–12; also 270, 4: διὰ σήψεως καὶ πεποίηται … σήψεως γεγενημένης ἔν τε τοῖς ἕλεσι καὶ τοῖς καθύγροις τόποις … ζῷά τε καὶ φυτὰ τοιάδε ἀναδίδονται.

[83] For example Ideler, 213, 3: σήπουσι πραοτάτῳ πυρί …

Wolska-Conus has already analyzed the appearance of Stephanos of Alexandria in the *Leimonarion* by John Moschos. Let us briefly review her conclusions here: Moschos reports that he and his friend, the sophist Sophronios, during their first residence in Alexandria between 581 and 584 attended lectures (πράξεις) at the home of Stephanos, a sophist and philosopher who resided in the building complex around the church of the Holy Theotokos of Dorothea, built by the orthodox patriarch Eulogios.[84] The medical knowledge that Sophronios displays in his collection of seventy miraculous healings written ca. 610 is compatible with the teachings of Stephanos the sophist mentioned by Moschos. It seems that Stephanos, the teacher of Sophronios, is identical with Stephanos of Athens or Stephanos of Alexandria, physician and philosopher, the only teacher of medicine in Alexandria at that time.[85] After leaving Alexandria to settle in Constantinople, Stephanos became a member of the intimate circle around patriarch Sergios and emperor Heraclius.[86]

One may build a little further on Wolska-Conus' reconstruction of the personal relation between Stephanos and Sophronios: though Wolska-Conus deliberately leaves this question aside because it is impossible to provide a definite answer,[87] it is conceivable that Sophronios, the student of Stephanos in Alexandria, is the same Sophronios who later became patriarch of Jerusalem (634–38); Stephanos' close contacts with high-ranking officials of the three patriarchates, Alexandria, Constantinople, and Jerusalem, may explain the existence of prayers at the beginning and end of his lectures on alchemy. In addition, his medical and philosophical knowledge as a known commentator of Hippocrates and Aristotle may also explain his references to medical and biological subjects

[84] Wolska-Conus, 'Stéphanos. Identification', 7, note 6: "*PG* 87, 2929D: Ἀπήλθομεν ἐν μιᾷ εἰς τὸν οἶκον Στεφάνου τοῦ σοφιστοῦ … ἵνα πράξωμεν … Ἔμενεν δὲ εἰς τὴν ἁγίαν Θεοτόκον, ἣν ᾠκοδόμησεν ὁ μακάριος πάπας Εὐλόγιος, τὴν ἐπονομαζομένην Δωροθέας… Ce passage omis par Usener, *De Stephano,* est cité à la reprise de son étude dans ses *Kleine Schriften,* p. 248, en note."

[85] Wolska-Conus, 'Stéphanos. Identification', 59.

[86] Wolska-Conus, 'Stéphanos. Identification', 68.

[87] Wolska-Conus, 'Stéphanos. Identification', 47.

in the alchemical work.[88] The author of the horoscope of Islam supposed that Sophronios, the friend of Moschos and patriarch Eulogios, had followed Stephanos from Alexandria to Constantinople and therefore could plausibly be placed in his teacher's garden in September 621.

I plan to revisit the much-debated question of the identities of Stephanos and Sophronios in a later article. For now, I would like to briefly discuss some technical aspects of the evidence contained in the *Apotelesmatike Pragmateia*.

The data of the horoscope

Let us now comment on the data of the horoscope of Islam as it is found in the text. We will attempt to determine the exact date for which it was cast, as well as compare its data with modern astronomical calculations. As reported in the text, Epiphanios visited Stephanos on Tuesday, 5 Thoth according to the Egyptians, in the third hour; at that time the Sun was in 9°5' in Virgo. Applying this to the astrolabe, he found the Ascendant in 20° Libra, the Descendant in 20°Aries, culminated above the horizon 22° Cancer and under the horizon 22° Capricorn.[89] Although no other data of the horoscope is mentioned in the text, more details can be found in the design of the horoscope that survives in the manuscripts.[90] This data concerns the position of the planets, the nodes of the Moon's orbit and the lot of fortune in the "houses" calculated according to the ascending and culminating degrees of the ecliptic, as follows:

The Sun and Mercury are in 9°5' Virgo in the twelfth house. The Moon is in 12°16' Capricorn in the fourth house. Venus is in 26°6' Leo, in conjunction with the ascending node of the orbit of the Moon in 19°50' Leo, both in the eleventh house. Saturn is in 23°30'

[88] Ideler, 203, 15–24 (on production of voice); 211, 16–25; 220, 13–221, 12; 222, 11–20; 229, 17–230, 23 (on σπερματικὸς γόνος); 245, 9–12 and 17–20 (the three qualities of the soul).
[89] Usener, 'De Stephano Alexandrino', 272, 21–24; 273, 10–15.
[90] Usener, 'De Stephano Alexandrino', 289, 321–22.

Cancer in conjunction with the upper culminating point of the ecliptic in the tenth house. Mars is in 2° Cancer in the tenth house. Jupiter is in 20°39' and the lot of fortune in 22°9' Capricorn, in conjunction with the lower culmination. The descending node of the orbit of the Moon is in 19°50' Aquarius in the fifth house.

We can immediately comment that while we are given the date of the month, the day of the week, and the hour at which Epiphanios visited Stephanos, no year is mentioned. H. Usener cites a passage from Kedrenos' *History,* according to which Stephanos of Alexandria cast the horoscope of Islam in the year 6131 from the beginning of the world, on Thursday 3 September in the twelfth year of the reign of the emperor Heraclius.[91] According to Usener, this is the year 6130 and not 6131, based on a passage from the *De administrando imperio,* a composition from the reign of Constantine VII Porphyrogenitus (912–959).[92] As for the astronomical data of the horoscope, it is obvious that Usener could not check their accuracy.

According to O. Neugebauer and H. B. van Hoesen, the horoscope was cast for 1 September 621, in other words the beginning of the Byzantine year towards the end of which the Hijra occurred (16 July 622). This deduction is based on the fact that the position of the Moon on 1 September, which corresponds to 4 Thoth, agrees with that in the horoscope (while September 3 and 5 of the year 621 do not); regarding the errors in the positions of Venus, Mercury, and the lot of fortune that are found in the manuscripts, Neugebauer and van Hoesen accept that the first two represent a misplacement of the data of the planetary positions in another sign in the diagram of the horoscope, while the third one, regarding Mercury, is a dittography of the Sun's position.[93]

If the horoscope of Islam and its astronomical data were indeed calculated backwards (i.e. by a later forger for a date at about a

[91] Usener, 'De Stephano Alexandrino', 257 note* (passage quoted above, note 67).
[92] Usener, 'De Stephano Alexandrino', 257 (passage quoted above, note 68).
[93] Neugebauer and Van Hoesen, *Greek Horoscopes,* 158–60. Also Usener, 'De Stephano Alexandrino', 273, 10–15.

century or two earlier than the time in which he lived), it would have required not only long-winded and laborious calculations stretching over several manuscript pages (a procedure that even modern researchers of ancient and medieval astronomy had to follow before the age of computers) but also profound mathematical expertise. It is unlikely that such a master would have perpetrated the mistakes evident in the text. Let us use modern methods to reconstruct the heavens as it looked from Constantinople on 1 September 621 and see if an alternative explanation for the mistakes is possible.

The planetary positions as calculated on the computer are as follows: [94]

Constantinople, 1 September 621 at 8:55 am (06:55 UT)

Planet	Zodiacal sign	Rising	Passage	Setting
Sun	10°51' Virgo	5:31 am	12:02 pm	06:32 pm
Mercury	26°52' Virgo	07:01pm	12:54 pm	06:48 pm
Venus	26°24' Cancer	11:51 pm	07:26 am	03:00 pm
Mars	03°05' Cancer	01:57 am	09:04 am	04:10 pm
Jupiter	22°38' Capricorn	04:11 pm	08:49 pm	01:32 pm
Saturn	25°38' Cancer	01:42 am	09:04 am	04:26 pm
Moon	11°08' Capricorn	03:26 pm	08:24 pm	12:34 am

[94] The positions of the Sun, the Moon and the five planets were determined on the computer with the astronomical programs VSOP 87 *(Variation Séculaire des Orbites Planétaires)* and ELP 2000/85 *(Ephéméride Lunaire Parisienne)* by Dr. Denis Savoie (Planetarium du Palais de la découverte, Paris). The program Voyager II was used for the calculation of other elements of the horoscope

Ascendant 20°07' (20°46' refracted horizon) Libra, Midheaven 23°38' Cancer. Longitude of the ascending node of the Moon's orbit 24°38' Leo and that of its descending node 24°38'Aquarius (according to Neugebauer and Van Hoesen, 23°40' Leo and 23°40'Aquarius).

As far as the visibility of the planets is concerned, Mars, Venus and Saturn were visible in the morning sky, while the Moon and Jupiter were visible in the evening sky. Especially Mercury (app. magnitude +1.7) was very low in the west and set down 16 minutes after sunset when the Sun's altitude under the horizon was only 3°43'. Stars of first apparent magnitude are visible only when the Sun's altitude under the horizon is equal or greater than 6°; consequently, Mercury was invisible because the twilight was still very bright. This suggests that whoever calculated the astronomical data for the horoscope of Islam was indeed observing the heavens on 1 September 621 and, because of Mercury's invisibility, may have thought that Mercury was in exact conjunction with the Sun. As a result, he did not calculate its position by means of the relevant astronomical tables. This would account for the great difference of 16° between Mercury's true position on the sky and that which we have in the horoscope's chart.

Since the implications of this observation cannot be discussed within the confines of the present paper, I plan to return to them in a future publication.

CONCLUSIONS

As Wolska-Conus has already shown, Stephanos of Athens should be identified with Stephanos of Alexandria. The designation "Alexandrian" does not indicate that this was his native city; it only indicates that, in moving his place of residence and activity to Constantinople, he did so from Alexandria. He was most likely born in Athens, but the period he spent in Alexandria was decisive for the course of his studies and his professional future. Already during his lifetime he was a reputable and famous scholar interested in philosophy, medicine, and science. His written output was both

variegated and prolific: Wolska-Conus has discussed his authorship of several works that we know either by title or because they still survive, including his introduction and adaptation of Theon's work on Ptolemy's *Handy Tables* and commentaries on Porphyry's *Eisagoge* and treatises of the Aristotelian, Hippocratic, and Galenic corpora. In the conclusions to her admirable essay, Wolska-Conus deduced that Stephanos' involvement in the doctrinal politics of his time (unavoidable for a leading philosopher and intellectual) and the serial transfer of his loyalties between the Chalcedonian, Monothelite, and Monophysite parties, cost him his reputation in posterity; regarded as a traitor by all, he was embraced by none. Wolska-Conus expresses scepticism regarding the reputation of Stephanos as alchemist and astrologer; mindful that it is recorded in relatively late Byzantine sources, she is inclined to interpret it as the posthumous medieval afterglow of his Late Antique stardom, the brilliance of which became tarnished already during his lifetime.

However, the evidence we have surveyed in the present essay indicates that Stephanos, the commentator on ancient philosophy, medicine, and astronomy, was also the author of the alchemical work and a practicing astrologer (as any astronomer could be at least as early as Ptolemy). Stephanos' reputation as astrologer in the Middle Byzantine period and beyond is primarily based on the *Apotelesmatike Pragmateia,* a work that includes at least an introduction based on a genuine work by Stephanos; its author did not invent Stephanos' astrological pedigree but exploited his existing reputation in this field of knowledge. This reputation may have been generated by emperor Heraclius' patronage of Stephanos' astrological activities. The tenth-century evidence from the life of Basil I suggests that Heraclius, appreciative of Stephanos' overall scholarly reputation, at some point asked him to cast his personal horoscope in order to find out about his own future; he may later have asked him to also cast a horoscope regarding the Byzantine military encounter with the early Muslim armies, since they presented such an imminent danger to his empire. The hesitation of modern scholars to accept Stephanos' alchemical and astrological activities as an integral part of his scholarly profile is not rooted in a proper grasp of seventh-century reality; rather, it is the result of anachronistically applying modern

criteria in order to understand the organization and transmission of knowledge during a much earlier and very different historical period than our own.