

GREEK ALCHEMY FROM LATE ANTIQUITY TO EARLY MODERNITY

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edited by E. NICOLAIDIS

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BYZANTINE ALCHEMY IN TWO RECENTLY DISCOVERED MANUSCRIPTS IN SAINT STEPHEN'S (METEORA) AND OLYMPIOTISSA (ELASSONA) MONASTERIES

Matteo Martelli¹

The manuscript 97 in the library of Saint Stephen's monastery at Meteora and the manuscript 197 in the library of Olympiotissa monastery in Elassona rank among the earliest alchemical codices nowadays kept in Greece. These manuscripts were not taken into account by M. Berthelot and C.É. Ruelle in their pioneering edition of the Greek alchemical Corpus; neither were they described in the catalogue of the Greek alchemical manuscripts published between 1924 and 1932 under the aegis of the *Union Académique Internationale*.² In this chapter, after a short description of the two manuscripts, I shall compare their contents and focus on selected sections that, when necessary, will be illustrated by taking into account other important witnesses of the *Corpus alchemicum*: MSS *Marcianus* gr. 299 (10th century AD), *Parisini* gr. 2325 (13th c.) and 2327 (1478), and *Laurentianus* Plut. 86.16 (1492).³ Finally, special attention will be devoted to the last part of the Meteora manuscript, which includes a long Byzantine recipe book on the art of goldsmiths that was so far only known in the *recensio* of the *Parisinus* gr. 2327 (= CAAG II 321-337).

A Short Description of the Two Manuscripts

The MS Meteora, S. Steph. 97 is a small size paper codex (160 x 105 mm) that counts 203 folia.⁴ At fol. 203r, two colophons mention the name of its scribe and the year when he finished copying the manuscript:

(fol. 203r1-5; red ink) ἐτελειώθη τῷ παρῶν βιβλίων [*lege* τὸ παρὸν βιβλίον] διὰ χειρὸς κάμου Γεωργίου [*lege* Γεω-] ἐπὶ ἔτους ζβ´ (a second hand added: ἐν τοῦ Ἁγίου Στεφάνου) ἀθλήως Γεώργιος [*lege* ἀθλίως Γεώργιος] ὁ ξήσας ἐρμηνεία<v> περι χρυσοποιίας⁵
‘I Georgios finished handwriting myself this book in the year 7012, i.e. 1503/1504 AD [2nd hand; in Saint Stephen's (monastery)].

1. University of Bologna. This publication is part of the research project AlchemEast - Alchemy in the Making: From Ancient Babylonia via Graeco-Roman Egypt into the Byzantine, Syriac, and Arabic Traditions. The AlchemEast project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (G.A. 724914).

2. The fifth volume of the *Catalogue des manuscrits alchimiques grecs* is devoted to the manuscripts of Athens. In the introduction, Severyns (1928, 144) explains the difficulties he encountered in accomplishing his task of describing the alchemical codices outside Athens: “Devant le résultat de mes recherches à Athènes, j'avais d'abord formé le projet d'étendre mes investigations à tous les manuscrits conservés en territoire grec. Plusieurs raisons m'ont forcé à y renoncer. Etant donné le peu de temps dont je disposais, je ne pouvais songer à éprouver tous les catalogues imprimés ou manuscrits, non plus qu'à visiter les nombreuses bibliothèques de monastères [...]. D'un autre côté, l'expérience m'a appris qu'il est pratiquement impossible de faire venir à Athènes un manuscrit conservé en province.” This ambitious aim has been now achieved by the members of the DACALBO project, whom I warmly thank for the precious information they shared with me. I would also like to thank Gerasimos Merianos and Vangelis Koutalis for their precious advice and suggestions.

3. For an introduction to these manuscripts, see Martelli 2011, 3-54; Mertens 1995, xx-lxxviii.

4. Sophianos 1986, 305-309. I was able to study the manuscript in 2010, during a stay in Saint Stephen's monastery. I warmly thank the sisters of the monastery, who provided me with all the necessary help and support to carry out my investigation.

5. The second part of the sentence is written with a cryptographic alphabet: ελξβνθκελβ Δκβλιθω, that is, ἐρμηνεία περι χρυσοποιίας. A second hand added a partial solution above the line: ἐρμηνεία περι [*lacuna*]. Another anonymous copyist (the same who added ‘in Saint Stephen's monastery’ in the colophon) copied again the cryptography after the colophon (fol. 203v8; black ink). The system used to encode the information is quite simple and widespread in Byzantine manuscripts. The Greek letters were divided into three groups of nine letters (*stigma*, *koppa* and *sampi* included); in each group, the first letter corresponded to the last one, the second letter to the second last one, and so on. For instance, the first group includes α, β, γ, δ, ε, ζ, η, θ, where α = θ, β = η, γ = ζ, δ = ε, and ε = ε.

“Georgios who humbly wrote (lit. wretchedly scratched out) the explanation of the making of gold.”

A few lines above, less detailed information is given in a *monokondylion*:

(fol. 203r6-8) ἐγράφη τὸ παρ(ὸν) βιβλί(ον) [*lege* βι-] διὰ χειρὸς Γεωργίου [*lege* -γίου] περὶ Ⲙποιίας [*i.e.* χρυσοπ-] καὶ Ⲙποιίας [*i.e.* ἀργυροπ-].

“Georgios handwrote this book on the making of gold and on the making of silver.”

Regrettably, it is difficult to judge the reliability of the additional information provided by a second scribe (an anonymous reader?), who expanded the first colophon with a reference to Saint Stephen’s monastery as the place where the codex had been produced. If we rely on this information and infer that Georgios completed his work in the monastery, we might be tempted to identify the copyist with the homonymous Giorgios mentioned in one of the possession’s notes scattered in the manuscript.⁶ Many marginal notes, indeed, make clear that the codex was property of Saint Stephen’s monastery; among them, the note at the bottom of fol. 179v reads:

τὸ παρὸν βιβλίον [*lege* βιβλίον] τὸ ἀφιέρωσεν [*lege* -ωσεν]⁷ ὁ πα(πᾶς?) Γιώργιος ἤς [*lege* εἰς] τὸν ἅγιον Στέφανον, καὶ ὅπ(ο)ίος το ἀποξηνόσε [*lege* -ξένωσε] ἀπὸ τὴν μονὴν ταύτην ἔστω ἀφορισμένος καὶ νὰ κόνη ὁ θ(εὸς) τὴν ζοην [*lege* ζοήν] του. Ἀνάθεμά τον, ἀμήν.

“Father Giorgios offered this book to Saint Stephen’s (monastery); whoever takes it away from this monastery, may he be damned! May God cut his life short! May he be cursed! Amen.”

On the other hand, we must note that an almost identical note (but written by a different hand) occurs in the flysheet of the manuscript, where the patriarch of Constantinople (rather than the priest Giorgios) is mentioned as the donor of the codex.⁸ Regrettably, the other possession’s notes do not add further information about the exact time or the specific circumstances under which the manuscript entered the library of the monastery, so that it remains difficult to understand whether the book was originally produced in the monastery or was given by a later possessor.

The MS Elassona, Olymp. 197 is a paper codex (145 x 100 mm) written by three different copyists. It currently counts 105 folia, but a few original pages or quires went probably missing. The 18th century priest Margarites transcribed the first section of the codex (fol. α-ζ), as clearly recorded in a short note at fol. 1r:

ὑπαρχὴ τοῦ Μαργαρίτη ἱερέως x 1741,

“The opening section is by the priest Margarites, (year) 1741.”

This first part includes short texts dealing with various topics related to alchemy, medicine, and natural philosophy, such as the seven planets and the zodiac (fol. α),⁹ the association between seasons, human humours, and natural elements (see fol. β),¹⁰ the correspondences between planets and metals (fol. στ), and the seven ages of human beings (fol. γ-δ).¹¹ Margarites also copied the last part of the codex (fol. 104r-110v).

6. See Sophianos 1986, 308-309, where all the possession’s notes are recorded.

7. The first segment of the sentence (τὸ παρὸν βιβλίον τὸ ἀφιέρωσεν) occurs twice in this folium; it was first written by Georgios, who copied down the rest of the folium (containing a list of alchemical signs); then a second scribe wrote the sentence again and completed the note in the form reported above.

8. At the bottom of the flysheet the following note is transcribed: τὸ παρὸν βιβλίον ταφιέρωσεν (*sic*) ὁ μακάριος πατριάρχης ἀπὸ κοσταντινόπολη (*sic*) κτλ.

9. The MS, fol. ar1-2 reads (a diplomatic transcription is provided): Περὶ τὸν ἐπτά πλανήτων καὶ τῆ ζῳδία ἔχουν.

10. The MS, fol. βr1-2 reads (a diplomatic transcription is provided): Περὶ τῶν τεσσάρων κερῶν τοῦ χρόνου καὶ τὰ στυχεῖα τοῦ ἀνθρώπου πῶς εἶναι.

11. For instance, fol. γv9 reads (a diplomatic transcription is provided): ἐπτά ἡσὶν καὶ ἡ ηλικίε· τοῦ σωματος τοῦ ἀνθρώπου· ἕως το γύρας.

These two parts somehow enclose the earlier section of the manuscript, which counts 66 folia progressively numbered from 1 to 103. It is evident that some folia went lost, probably after that the current foliation had been introduced (in each folium, the *recto* is marked by an Arabic number and the *verso* by the correspondent Greek number).

This earlier section was copied by two anonymous scribes in the 16th century. The first scribe finished copying the first part (fol. 1-98r) in 1507, as a short note at fol. 98r reports: after the *explicit* of the chapter Περὶ λευκώσεως (*On Whitening*, fol. 98r4-14), someone recorded the date 1507 in Greek (i.e. ,αφζ') and Arabic numbers. A second, contemporary copyist wrote the second part (fol. 98v-103v).

The Contents of the Two Manuscripts: A Comparison

The contents of the Meteora manuscript largely overlap with the contents of the earliest section of the Ellassona manuscript (in particular, fol. 1-98r). In both codices, two anonymous short passages serve as introductory texts to a similar alchemical collection, which opens with the lectures (πρᾶξεις) by Stephanus of Alexandria (7th c. AD).¹² The Meteora manuscript hands down ten lectures: the first one without title, the following five lectures progressively numbered from 2 to 6,¹³ and the last four lectures numbered from 6 (again!) to 9. The loss of some quires (fol. 9-51) in the Ellassona manuscript does not allow us to see whether it followed the same order: in fact, it only preserves the first two lectures and the last one, which lacks of title and *incipit*. The selection attested in the Meteora manuscript differs from what we find in the other known testimonies of Stephanus' work, in particular MSS *Marcianus* gr. 299 (= **M**), *Parisinus* gr. 2325 (= **B**), *Parisinus* gr. 2327 (= **A**) and *Laurentianus* Plut. 86.16 (= **L**). All these manuscripts preserve nine *praxeis* and a letter addressed to a certain Theodoros, whereas the Meteora manuscript hands down ten *praxeis*.¹⁴ Their titles in the different manuscripts read as follows:

First text = II 199-202 Ideler

MS Meteora, S. Steph. 97 (1v9-7r4) = MS Ellassona, Olymp. 197 (1v1-4r14): *Sine titulo*

Other MSS: (**M**) Στεφάνου Ἀλεξανδρέως οἰκουμενικοῦ φιλοσόφου καὶ διδασκάλου τῆς μεγάλης καὶ ἱερᾶς ταύτης τέχνης περὶ χρυσοποιίας. πρᾶξις σὺν θεῷ πρώτη; (**BAL**) Στεφάνου Ἀλεξανδρέως οἰκουμενικοῦ φιλοσόφου περὶ τῆς ἱερᾶς καὶ θείας τέχνης τῆς τοῦ χρυσοῦ ποιήσεως· πρᾶξις πρώτη

Second text = II 203-208,3 Ideler

MS Meteora, S. Steph. 97 (7r5-15v15): Στεφάνου σὺν θεῷ πρᾶξις β' = MS Ellassona, Olymp. 197 (4r14-8v): πρᾶξις β' (in mg. Στεφάνου)

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου σὺν θεῷ πρᾶξις δευτέρα

Third Text = II 208,4-34 Ideler

MS Meteora, S. Steph. 97 (15v15-17r11): τοῦ αὐτ(οῦ) Στεφάνου, πρᾶξις ἐνύλου κόσμ(ου) σὺν θεῷ τρίτ(η)

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου ἐπιστολὴ πρὸς Θεόδωρον

Fourth Text = II 209-213,6 Ideler

MS Meteora, S. Steph. 97 (17r11-24v1): τοῦ αὐτ(οῦ) Στεφάνου φιλοσόφου διὰ τὸ κατενέργειαν (*sic*) τῆς θείας καὶ ἱερᾶς τέχνης· πρᾶξις σὺν θεῷ δ'

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου περὶ τοῦ ἐνύλου κόσμου πρᾶξις σὺν θεῷ τρίτη

12. An uncritical edition of Stephanus of Alexandria's alchemical lectures is available in Ideler 1842, 199-253. A few lectures has been reedited by Taylor 1937 (*Lectures* 1-2) and 1938 (*Letter to Theodoros + Lecture* 3). On Stephanus, see Papathanassiou 2006.

13. The Meteora manuscript introduces here three different works – one by Pelagius and two by Zosimus (see below).

14. On the structure of Stephanus' lectures in these manuscripts, see Papathanassiou 1996.

Fifth text = II 213,7-219,14 Ideler

MS Meteora, S. Steph. 97 (24v2-34r4): τοῦ αὐτοῦ Στεφάνου σὺν θεῶ πρᾶξις ε΄

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου εἰς τὸ κατ' ἐνέργειαν· πρᾶξις σὺν θεῶ τετάρτη

Sixth text = 219,15-223,19 Ideler

MS Meteora, S. Steph. 97 (34r4-40v7): τοῦ αὐτοῦ Στεφάνου εἰς τὸ κατενέργ(ε)ϊαν (*sic*) τῆς θείας καὶ ἱερᾶς τέχνης· πρᾶξις σὺν θεῶ στ΄

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου εἰς τὸ κατ' ἐνέργειαν τῆς θείας τέχνης· πρᾶξις σὺν θεῶ πέμπτη

Seventh text = II 223,20-231,5 Ideler

MS Meteora, S. Steph. 97 (57v9-70v11): τοῦ αὐτ(οῦ) Στεφάνου πρᾶξις σὺν θεῶ στ΄¹⁵ ἔρμου· (*sic*) ἀγαθοδαίμονος

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου φιλοσόφου πρᾶξις σὺν θεῶ ἕκτη

Eighth text = II 231,6-237 Ideler

MS Meteora, S. Steph. 97 (70v12-80v): τοῦ αὐτ(οῦ) Στεφάνου σὺν θεῶ πρᾶξις ζ΄

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου φιλοσόφου πρᾶξις σὺν θεῶ ἑβδόμη (**M**; ζ^η **A**)

Ninth text = II 238-242 Ideler

MS Meteora, S. Steph. 97 (81r1-88r): τοῦ αὐτοῦ Στεφάνου πρᾶξις σὺν θεῶ η΄· περὶ τομῆς τῆς ἱερᾶς τέχνης

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου οἰκουμηνικοῦ φιλοσόφου πρᾶξις ὀγδόη περὶ τομῆς τῆς ἱερᾶς τέχνης.

Tenth text = II 243-253 Ideler

MS Meteora, S. Steph. 97 (88v-107v) [= MS Ellassona, Olymp. 197, fol. 52r-60v; *titulum et incipit deficient*]: τοῦ αὐτοῦ Στεφάνου διδασκαλία πρὸς Ἡράκλειον τὸν βασιλέα· πρᾶξις σὺν θεῶ θ΄

Other MSS (**MBAL**): τοῦ αὐτοῦ Στεφάνου φιλοσόφου διδασκαλία πρὸς Ἡράκλειον τὸν βασιλέα· πρᾶξις σὺν θεῶ ἑνάτη.

After Stephanus' lectures both the Meteora and the Ellassona manuscripts hand down Synesius's commentary on Ps.-Democritus alchemical books (4th century AD),¹⁶ two works by the so-called Philosopher Anonymous (8th-9th century AD),¹⁷ and a selection of excerpts attributed to the Graeco-Egyptian alchemist Zosimus of Panopolis (3rd-4th century AD). A summary of the overlapping sections is given in the following synoptic table:

	Meteora MS		Ellassona MS
Fol. 1r	Short passage from Psellus (red ink)	Fol. 1r	Short passage from Psellus
1v	Title of a recipe book (red ink) = <i>CAAG</i> II 220, 11-16		Title of a recipe book = <i>CAAG</i> II 220, 11-16
2r-17r	Stephanus, <i>Lectures I-II</i> = II 199-208,3 Ideler	1v-8v	Stephanus, <i>Lectures I-II</i> = II 199-208,3 Ideler

15. This lecture bears the same title 'sixth lecture' as the previous one.

16. On Synesius, see Martelli 2013, 52-56.

17. According to Letrouit (1995, 63-65), two different authors may be recognized behind the general 'title' of philosopher Anonymous, both active in the 8th-9th century. Letrouit distinguishes between 'le philosophe anépigraphé 1,' who composed a long work (without title) that Berthelot-Ruelle published in different sections of their edition (i.e., *CAAG* II 433,11-436,18 + 219,13-220,10 + 436,20-441,25), and 'le philosophe anépigraphé 2', who composed the two works handed down in the Meteora and the Ellassona manuscripts.

17r-88r	Stephanus, <i>Lectures III-VI</i> = II 208,4-223,19 Ideler Pelagius, <i>On this Divine and Holy Art</i> = CAAG II 253-262 Zosimus, <i>On Virtue</i> = X 39-42 Mertens Zosimus, <i>On Lime</i> = XIII 48-49 Mertens Stephanus, <i>Lectures VI-VIII</i> = II 223,20-237 Ideler		Lacuna fol. 9-51 went missing
88v-107v	Stephanus, <i>Lecture IX</i> = II 238-242 Ideler	52r-60v	Stephanus, <i>Lecture IX</i> (Lacking of title and <i>incipit</i>) = II 238-242 Ideler
108r-114v	Synesius, <i>On Democritus' Book</i> (1 st part = CAAG II 56,20-63,21)	61r-68v	Synesius, <i>On Democritus' Book</i> (Complete = CAAG II 56,20-69,11)
114v-117r	Anonymous, <i>On the Whitening of Sulphur Water</i> = CAAG II 421,6-424,2	68v-69v	Anonymous, <i>On the Whitening of Sulphur Water</i> = CAAG II 421,6-424,2
117r-122v	Synesius, <i>On Democritus' Book</i> (2 nd part = CAAG II 63,21-69,11)		
122v-132r	Anonymous, <i>On the Making of Gold</i> = CAAG II 424,3-433,10 ^a	70r-75r	Anonymous, <i>On the Making of Gold</i> = CAAG II 424,3-433,10

a. On this treatise and its tradition, see Lagercrantz 1927, 18-19 and Letrouit 1995, 64.

The text of Synesius' commentary on Ps.-Democritus alchemical books deserves particular attention, since some discrepancies are detectable in the two manuscripts. Whereas the Ellassona manuscript accommodates Synesius' commentary between Stephanus' last lecture and an alchemical work ascribed to the so-called philosopher Anonymous, the Meteora manuscript splits Synesius' treatise in two parts, which are divided by the insertion of philosopher Anonymous's work.

Synesius' treatise is a dialogue between the philosopher Synesius and Dioscorus, a priest of the Alexandrian temple of Serapis. The main topic of their conversation is the alchemical teaching of Democritus, which they effort to interpret by commenting on a selection of passages taken from the four books on dyeing, which the alchemical tradition ascribes to the atomistic philosopher. In both manuscripts the dialogue is introduced by the title:

(MS Meteora, S. Steph. 97, fol.108r1-3 = MS Ellassona, Olymp. 197, fol. 61r1-3) Συνεσίου φιλοσόφου πρὸς Διόσκορον εἰς τὴν βύβλον [*sic* MSS; *lege* βιβλὸν] Δημοκρίτου ὡς ἐν ἀγαλίοις [*sic* MSS; *lege* σχολίοις]. Διοσκόρω ἱερεῖ τοῦ μεγάλου Σεραπίδος [*sic* MSS; *lege* Σαράπιδος] τοῦ ἐν Ἀλεξανδρείᾳ θεοῦ τε ἀεὶ εὐδοκοῦντος Συνέσιος ὁ φιλόσοφος χαίροι.

In the central part of the dialogue, Synesius explains to Dioscorus the nature of quicksilver (ὕδραργυρος), its main properties, and the role it plays in the dyeing processes. Whereas the Ellassona manuscript preserves this section without any gap, in the Meteora manuscript the discussion between the two characters suddenly breaks off, since we find the philosopher Anonymous' work *On the Whitening of Sulphur* in the middle of the following passage (= Syn. § 11,174-182 Martelli = CAAG II 63,18-64,1; I marked the interruption we find in the Meteora MS with the sign †):

Διόσκορος. Μὴ ἄρα τοῦτο ἔλεγεν ὁ φιλόσοφος· ὃ φύσεις οὐράνιοι φύσεων δημιουργοί, ταῖς μεταβολαῖς νικῶσαι τὰς φύσεις;

Συνέσιος. Ναί, διὰ τοῦτο εἶρηκεν· εἰ μὴ γὰρ ἐκστραφῆ, ἀδύνατον γενέσθαι τὸ προσδοκώμενον καὶ μάτην κάμνουσιν¹⁸ ἢ οἱ τὰς ὕλας ἐξερευνῶντες καὶ μὴ φύσεις τῶν σωμάτων μαγνησίας ζητοῦντες. Ἐξεσσι γὰρ τοῖς ποιηταῖς καὶ συγγραφεῦσι τὰς αὐτὰς λέξεις ἄλλως τε καὶ ἄλλως σχηματίζειν. Σῶμα οὖν μαγνησίας εἶρηκε, τουτέστιν τὴν μίξιν τῶν οὐσιῶν κτλ.

“Dioscorus. Did not the philosopher say these words: ‘O celestial natures, artificers of natures, which conquer natures with your transformations’?”

Synesius. Yes, he did, and that is why he said: ‘if you do not turn (the natures) inside out, it will be impossible to reach what is expected; ἢ those who examine the matter and do not investigate the natures of the bodies of *magnēsia* wear themselves out in vain.’ Indeed, poets and prose-writers are allowed to fashion the same speeches using different figurative expressions. Therefore he said: ‘the body of *magnēsia*,’ that is, the mixing of the substances” (Transl. by Martelli 2013,137).

In order to better illustrate the situation in the two manuscripts, I provide a transcription of the passage quoted above as it stands in the two witnesses:

MS Meteora, S. Steph. 97	MS Ellassona, Olymp. 197, fol. 64v22-65r10
<p>(fol. 114v5) δ διόσκορος· μὴ ἄρα τοῦτο ἔλεγεν ὁ φιλόσοφος· ὃ φύσεις οὐρανίοι φύσεων δημοιουργοί, ταῖς μεταβολαῖς νικῶσα τὰς φύσεις;</p> <p>συνέσιος· καὶ διὰ τοῦτο εἶπεν· εἰ μὴ διαστραφῆναι δύναται γενέσθαι τὸ προσδοκούμενον καὶ μάτην ἐνοῦσιν.</p> <p>[note in red ink] ἐνοῦσιν ζῆται κατὰ ἁρμονίαν τοῦ λόγου· τὸ εἰς τὰς ὕλας ἐξερευνόντ¹⁸· ἔνθα καὶ τὸ τίμιον τόδε.✠</p> <p>✠ Ἀνεπιγράφου φιλοσόφου περὶ θείου ⚡ τῆς λευκόσεως·~</p> <p><i>inc.</i> (fol. 114v14) καθόσον καὶ ἡ χρεία καλεῖ τοσοῦτον προδίδεται κτλ.</p> <p>....</p> <p><i>expl.</i> (fol. 117r9-10) νῦν καὶ ἀεὶ καὶ εἰς τοὺς αἰῶνας τῶν αἰώνων ἀμήν.</p> <p>[red ink] οἱ τὰς ὕλας ἐξερευνῶντες καὶ μὴ φύσεις τῶν σωμάτων. x μ [black ink] ζητοῦντες· ἐξεσσι γὰρ τοῖς ποιηταῖς, συγγραφεῦσιν τὰς αὐτὰς λέξης ἄλλως τε καὶ ἄλλως σχηματίζειν· σῶμα οὖν μαγνησίας εἶρηκεν τουτέστιν τὴν μίξιν τῶν οὐσιῶν</p>	<p>δ· διόσκορος· μὴ ἄρα τοῦτω ἔλεγεν ὁ φιλόσοφος· ὃ φύσεις οὐρανίων [s.l. -ε] φύσεων [s.l. -ω] δημοιουργέ, ταῖς μεταβολαῖς νικῶσα τὰς φύσεις;</p> <p>συνέσιος· καὶ διὰ τοῦτω εἶπεν· εἰ μὴ διαστραφῆναι, οὐ δύναται γενέσθαι τὸ προσδοκούμενον καὶ μάτην ἐνοῦσιν. [here a marginal note is introduced: ἐδῶ ἔγραφεν τι ἀφιβόλη· καθόσον καὶ χρείας καλεῖ τοσοῦτον π(..) ☺] οἱ τὰς ὕλας ἐξευρῶντες καὶ μὴ φύσεις τῶν σωμάτων. x μ [s.l. μαγνησίας] ζητοῦνταις· ἐξεσσι γὰρ τοῖς ποιηταῖς συγγραφεῦσιν τὰς αὐτὰς λέξεις ἄλλως τε καὶ ἄλλως σχηματίζην· σῶμα οὖν μαγνησίας εἶρηκεν τὴν μίξιν τῶν οὐσιῶν</p>

In the Meteora manuscript a note in red ink is introduced after the point in which the first part of Synesius’ treatise suddenly stops (i.e. after καὶ μάτην ἐνοῦσιν). The note reads:

ἐνοῦσιν ζῆται κατὰ ἁρμονίαν τοῦ λόγου· τὸ εἰς τὰς ὕλας ἐξερευνόντ¹⁸· ἔνθα καὶ τὸ τίμιον τόδε.✠
✠ Ἀνεπιγράφου φιλοσόφου περὶ θείου ⚡ τῆς λευκόσεως

18. The Ellassona and Meteora manuscripts read καὶ μάτην ἐνοῦσιν.

“According to the sequence of the argument, the term ‘ἐνοῦσιν’ seeks for (i.e. is connected with) the expression ‘εἰς [lege οἱ] τὰς ὕλας ἐξερευνόντ^α [lege -ῶντες].’ Here there is this precious (treatise?)¹⁹: the Philosopher Anonymous, *On the Whitening of Sulphur Water*.²⁰”

The copyist of the Meteora manuscript (or an anonymous reader who annotated its antigraph) was aware of the fact that Synesius’ treatise continued with the words οἱ τὰς ὕλας ἐξερευνῶντες,²¹ which are precisely the words by which the second part of Synesius’ treatise is opened at fol. 117r11. On the other hand, the copyist of the Ellassona manuscript added a marginal note after the expression καὶ μάτην ἐνοῦσιν, in which he claims:

“here something confusing is written: καθόσον καὶ χρείας καλεῖ τοσοῦτον π(..).”

These Greek words correspond to the *incipit* of the philosopher Anonymous’ treatise, which the Meteora manuscript hands down between the first and the second part of Synesius’ treatise. Moreover, after this marginal note, the copyist of the Ellassona manuscript adds the sign ∟ (i.e., a stroke with two dots above), which is used to refer to the philosopher Anonymous’ treatise *On the Whitening of Sulphur Water*. The same sign, in fact, occurs at the margin of fol. 68v3-4, where we find the *incipit* of the philosopher Anonymous’ treatise in the Ellassona manuscript:

[in the left margin: ∟] Ἀνεπιγράφου φιλοσόφου περὶ θείου ∟ ὁ τῆς λευκόσ(εω)ς.
(inc.) Καθόσον καὶ χρεία καλεῖ τοσοῦτων προδήδωτε (sic)

It seems quite clear that the scribe of the Ellassona manuscript copied from an antigraph, which had the treatise *On the Whitening of Sulphur Water* in the same position that it occupies in the Meteora manuscript. We may wonder whether the Meteora manuscript itself may be identified with the source of the Ellassona manuscript. Probably only a complete collation of the two manuscripts will allow us to answer this question. For the moment, we can certainly draw the preliminary conclusion that the Ellassona manuscript is based on an antigraph that followed the same order of treatises that we find in the Meteora manuscript.

Further evidence, in fact, can be provided to confirm this point. In the Meteora manuscript the two treatises by the philosopher Anonymous do not appear one after the other. After the above mentioned work *On the Whitening of Sulphur Water* (fol. 114v-117r9), one finds the second part of Synesius’ dialogue, and then the philosopher Anonymous’ second work *On the Making of Gold*:

MS Meteora, S. Steph. 97, fol. 122v14-17:
[explicit of Synesius’ commentary] θ<εο>ῦ δὲ βοηθοῦντος ἄρξομαι ὑπομηματίζειν.
[title of the second treatise by the philosopher Anonymous] ἀνεπιγράφου φιλοσόφου κατὰ ἀκουλουθείαν χρίσεως ἐμφενῶν τὴν τῆς Ἀποιίας συνεπηγμένους σὺν θεῷ

On the contrary, the Ellassona manuscript hands down the two works by the philosopher Anonymous one after the other. However, some evidence suggests that the copyist of the Ellassona manuscript relied on a source, where the philosopher Anonymous’ treatise *On the Making of Gold* followed Synesius’ commentary (i.e., the same position attested in the Meteora manuscript). The copyist, in fact, added an interesting marginal sign at the end of Synesius’ treatise:

MS Ellassona, Olymp. 197, fo. 68v1-2:
[explicit of Synesius’ commentary] Θεοῦ (with the sign ⊕ above the line) δὲ βοηθοῦντος ἄρξομαι ὑπομηματίζειν (sic)

19. The exact meaning of the sign ∟ after τὸ τίμιον τὸδε is not evident. It does not seem to correspond to an alchemical ingredient (it is not recorded in the explanatory table at fol. 177v-179v of the Meteora manuscript). It could be interpreted as a reference to the following treatise by the philosopher Anonymous.

20. The expression ‘sulphur water’ is rendered in the manuscript with the alchemical signs: ∟ (i.e. ‘sulphur’) and ∟ (i.e. ‘water’).

21. That is, ‘those who investigate the matter’, who are the subject of the verb ἐνοῦσιν.

This *explicit*, introduced by the same marginal sign (⊕) is copied again at fol. 70r1, in the upper margin above the *incipit* of the philosopher Anonymous' treatise *On the Making of Gold*:

MS Ellassona, Olymp. 197, fol. 70r1-3:

[upper margin: ⊕ θεοῦ δὲ βοηθοῦντος ἄρξομαι ὑπομνηματίζην] ἀνεπιγράφου φιλοσόφου κατὰ ἀκολουθείαν χρίσεως ἐμφερῶν τὸν τῆς Ἀποείας συνεπιγμένους σὺν θεῷ

The repetition of the *explicit* of Synesius' commentary and the use of the same marginal sign ⊕ clearly show that the copyist of the Ellassona manuscript was reading a source, in which Synesius' commentary and philosopher Anonymous' treatise *On the Making of Gold* were one after the other.

Finally, in the section after the treatise *On the Making of Gold*, it is possible to find further correspondences between the two manuscripts. The Meteora manuscript, however, seems to preserve a richer and more complete selection of texts. Both manuscripts hand down some writings attributed to Zosimus of Panopolis, but the Ellassona manuscript omits a few technical sections that are available in the Meteora manuscript:

	MS Meteora, S. Steph. 97		MS Ellassona, Olymp. 197
132r-157r	Zosimus, <i>On Virtue and Interpretation</i> = CAAG II 118,13-138,4 + 263,3-267,15 ^a	75r-90r	Zosimus, <i>On Virtue and Interpretation</i> = CAAG II II 118,13-138,4 + 263,3-267,15
157r-159v	Zosimus, <i>On the Evaporation of Sulphur Water</i> = CAAG II 138,5-140,8 ^b	90r-91v	Zosimus, <i>On the Evaporation of Sulphur Water</i> = CAAG II 138,5-140,8
159v-163r	(<i>sine titulo</i>) <i>inc.</i> Take eggs etc. = IX 1-81 Mertens	91v-93v	(<i>sine titulo</i>) <i>inc.</i> Take eggs etc. = IX 1-81 Mertens
163v-165r	<i>On the Composition of Waters</i> = X 1-16 Mertens	94r	<i>On the Composition of Waters</i> = X 1-16 Mertens
163v-165r	<i>On Fires</i> = CAAG II 144,10-145,14	94r-95r	<i>On Fires</i> = CAAG II 144,10-145,14
165r-169v	<i>On the Making of Glasses</i> = CAAG II 348-350,3 + 250,13-252,21	95r-98r	<i>On the Making of Glasses</i> = CAAG II 348-350 + 250,13-252,21
169v	<i>On Whitening</i> = CAAG II 211,3-12 ^c	98r	<i>On Whitening</i> = CAAG II 211,3-12
169v-171r	<i>Tinctures Discovered by the Persians</i> = CAAG II 346,1-347,7		
171v	Originally blank [a later hand added two texts on the tincture of iron]		
172r-173r	<i>Thus Did the Ancients Speak about Eggs</i> = CAAG II 18-19,17 ^d	98r	<i>Thus Did the Ancients Speak about Eggs</i> (lacking of the end) = CAAG II 18,1-6

a. This work ascribed to Zosimus represents the second part of the philosopher Anonymous' treatise *On the Making of Gold*; see Lagercrantz 1927, 18-19.

b. The last paragraph of the text (CAAG II 140,9-20) is omitted in the Meteora and Ellassona manuscripts.

c. This section is probably part of Synesius' treatise; see Martelli 2013,150-151.

d. §§ 11-13 of the text in Berthelot's edition (CAAG II 19,18-20,15) are omitted in the Meteora manuscript.

The final part of the last excerpt on eggs is missing in the Elassona manuscript. This omission is not easily understandable: a mechanical loss of folia or quires (although not to be excluded) does not seem to provide a sufficient explanation for the incompleteness of this excerpt. A second scribe, in fact, started copying a new section on fol. 98v, which had been probably left blank by the first copyist. In any case, after the excerpt on eggs, the two manuscripts preserve two different selections of texts. In the Elassona manuscript (fol. 98v-103) we find a short collection of pharmaceutical and magical recipes. On the contrary, the Meteora manuscript includes a rich selection of alchemical texts:

	MS Meteora, S. Steph. 97
173r-175v	<i>On the Making of Quicksilver</i> = CAAG II 220,17-222,17
175v-177r	<i>On Measures and Weights</i>
177v-179v	<i>Alchemical Signs</i> = CAAG I 104 and 108
180r-180v	<i>List of Alchemists</i> = CAAG II 25,5-26,6
180v-202v	Collection of recipes ≈ CAAG II 321-337 ^a

a. See below, § 4.

The Two Introductory Passages in the Meteora and Elassona Manuscripts

The opening sections of the two manuscripts deserve closer attention, since they preserve an interesting selection of passages serving as introductory texts. Both manuscripts, in fact, hand down two short texts that seem to provide the reader with a preliminary description of the contents of the collection of alchemical writings copied in the two codices. The first passage does not occur in any other alchemical manuscript known so far:

[MS Meteora, S. Steph. 97, fol. 1r1-13 (red ink) = MS Elassona, Olymp. 197, fol. 1r1-9]²² Θαυμάζω τοὺς εὐρόντας τὰ γράμ(μ)ατα καὶ τοὺς κτισαμένους τὰς τέχνας ἀσπάζομαι, καὶ φιῶ τοὺς ἀγαπόντας αὐτά. Ἐπαινετὴ δὲ ἡ ἑλικοειδῆς γραφὴ τῆς μεταλλικῆς τέχνης, ἐπεὶ ἡ ἀρχὴ τοῦ συγγράμματος τοῖς ἑλικοῖς ἔοικεν ὄφρασιν· οὗτοι τε γὰρ τὴν κεφαλὴν εἰσὼ τῆς πύρας [sic MSS; lege σπείρας cum Psello]²³ καταλύποντες, τὸ λοιπὸν σῶμα προβέβληνται, καὶ τὸ βιβλίον τῆς [τοῖς Olymp.] τοιτωθέσεως εἰσβαλὴ [sic MSS; lege τὴν τῆς ὑποθέσεως εἰσβολὴν cum Psello] ἐν μέσῳ διολισθήσασ<αν> ὥσπερ [κλήρω] κληρωσάμενον [τὴν] ἀρχὴν πεποιήται τὴν μεσότητα.

“I admire people who discovered these writings and I kindly welcome who laid the foundations of these techniques, and I like people who love this topic. We must praise this writing on the metallic art which has a spiral form: in fact, the beginning of the writing resembles coiled snakes; they conceal their head inside the coils and thrusts the rest of their body forward; so the book makes a beginning of its middle, and the onset of the story, which it has, so to speak, inherited, slips through (to end up) in the middle.”

22. It is worth mentioning that both the manuscripts hand down the following note in the upper margin: ἀρχὴ τῆς ἱερᾶς καὶ θείας τέχνης.

23. On Psellus, see below.

The anonymous author refers to a book on μεταλλική τέχνη ('the art of metals'), an expression that seems to summarize the contents of the collection of texts copied in the two manuscripts. He focuses his attention on the structure of this collection, which is described as a 'spiral-shaped writing' (έλικοειδής γραφή). The expression introduces the reader to the second part of the passage, which clearly echoes the words used by Psellus to praise the plot-construction of the Hellenistic novel *Aethiopica* in his essay on Heliodorus' and Achilles Tatius' literary works. In the short treatise *What is the Difference between the Novels which Deal with Chariclea and Leucippe?* (Τίς ἡ διάκρισις τῶν συγγραμμάτων, ὧν τῷ μὲν Χαρίκλεια, τῷ δὲ Λευκίππη ὑποθέσεις καθεστήκατον;), Psellus takes part in the contemporary debate on the artistic merits of the two novels²⁴ and defends the value of the *Aethiopica*, whose stylistic features are highlighted in different respects. The first point made by the Byzantine scholar deals with the plot of the story: Heliodorus did not only open his tale *in medias res*, but he also constructed a complicated plot, in which the prior events are revealed only in the middle of the story. In order to emphasize the merits of such a sequence of events, Psellus introduces the comparison with a coiled snake, which reads as follows (p. 92, ll. 24-28 Dyck):

Καὶ αὐτὴ δὲ ἡ ἀρχὴ τοῦ συγγράμματος ἔοικε τοῖς ἔλικτοῖς ὄφεσι· οὗτοι τε γὰρ τὴν κεφαλὴν εἴσω τῆς σπειρας κατακαλύψαντες, τὸ λοιπὸν σῶμα προβέβληται, καὶ τὸ βιβλίον τὴν τῆς ὑποθέσεως εἰσβολὴν ἐν μέσῳ διολισθήσασαν ὥσπερ κληρωσάμενον ἀρχὴν πεποιήται τὴν μεσότητα.

"The beginning of the work itself resembles a coiled snake: the snake conceals its head inside the coils and thrusts the rest of its body forward; so the book makes a beginning of its middle, and the onset of the story, which it has, so to speak, inherited, slips through (to end up) in the middle."²⁵

The link between such a stylistic analysis and the structure of an alchemical compendium is not completely transparent. We may certainly suppose that the anonymous writer of the above-mentioned introductory passage wanted to emphasize the difficulty of the alchemical *opus*, which could be accomplished only after a deep investigation on the copied treatises. Not only the opening treatises had to be read, but a full-scale inquiry was required to fully understand the core of the preserved alchemical teaching. On the other hand, the choice of the anonymous author could depend on the authority that Psellus had gained in the field of alchemy. Many alchemical collections, in fact, include a short treatise that the Byzantine scholar wrote on the art of gold-making.²⁶ His reputation as an alchemist could have led the anonymous author to look at other Psellus' writings, in order to find "alchemically oriented" passages.

Moreover, we must note that the expression μεταλλική τέχνη is rare in the collection of Greek alchemical texts. It is therefore noteworthy that it also occurs in the second introductory text preserved by the Meteora and the Ellassona manuscripts, which reads:

[MS Meteora, S. Steph. 97, fol. 1r13-1v8 = MS Ellassona, Olymp. 197, fol. 1r10-21] Βίβλος μεταλλ(λ)ικὴ καὶ χυμειτικὴ περὶ χρυσοποιίας [Αποιίας MSS], ἀργυροποιίας [Cποιίας MSS], ὕδραργύρου [D MSS] πήξεως – ἔχων (*lege* ἔχουσα) αἰθάλας [ΘΓΘ] MSS], βαφῆς καὶ φρούμας [*sic* MSS; *lege* φούρμας] ἀπὸ βροντησίου – ὡσαύτως καὶ λίθων πρασίνων, καὶ λυχνίτων, καὶ ἐτέρων παντίων [*sic*] χρωμάτων, καὶ μαργάρων καὶ δερμάτων ἐρυθροδανώσεως [*lege* ἐρυθροδανώσεως] βασιλικῶν. Ταῦτα δὲ πάντα γίνονται ὑπὸ ὕδατων θαλασσίων [≈ MSS], ὧν [ΘΘ MSS], διὰ τέχνης μεταλλ(λ)ικῆς.

"Book on metals and alchemy dealing with the making of gold, the making of silver, the solidification of mercury – it includes also vapours, dyes, and the hollow moulds made of copper – as well as green stones (emeralds), and rubies, and all the other colours, and pearls, and the red dyeing of imperial leathers. All these (techniques) are based on sea waters, on eggs, according to the art of metals."

24. See Dick 1986, 83 and McLaren 2006, 74ff.

25. Translation by Dyck 1986, 93.

26. See Bidez 1928, 1-47; Katsiampoura 2008.

This passage is preserved in other alchemical manuscripts as well: it seems to work as an erratic textual block moving in different positions across four different collections. In MSS *Parisinus* gr. 2327 (fol. 240r24-240v5) and *Laurentianus* Plut. 86.16 (fol. 219v8-17) – that are, the oldest manuscripts that preserve this short text – it is copied immediately after an excerpt from the work of the above-mentioned philosopher Anonymous (*CAAG* II 436,19-437,13). In their edition, Berthelot-Ruelle arbitrarily published this passage within the section devoted to Zosimus’ writings (*CAAG* II 220,11-16). However, in a footnote, Berthelot suggested identifying the text with either the title or the preface of a Byzantine handbook of practical chemistry dating between the eighth and the tenth century (which probably included several recipes on a wide set of techniques, such as gold-making, silver-making, the making of precious stones, and so on).²⁷ The opening position of this passage in the *Meteora* and *Elassona* manuscripts seems to confirm this interpretation: in the two manuscripts, the text summarises the technical information preserved in the collection, whose structure was praised in the previous passage slightly adapted from Psellus. The two introductory texts seem to complement each other, providing a general description of the structure and the practical contents of the alchemical ‘book’ that was copied down in the two manuscripts.

The Recipe Book in the *Meteora* Manuscript

Some of the techniques mentioned in the introductory passages quoted above (especially in the second one) are clearly described in the long collection of recipes, which is handed down in the last part of the *Meteora* manuscript. This collection largely overlaps with the recipe book published in *CAAG* II 321,1-337,13. Berthelot-Ruelle’s edition is based on MS *Parisinus* gr. 2327, which hands down fifty-seven metallurgical recipes under the general heading: ἐρμηνεία σὺν θεῷ τῆς τιμιωτάτης καὶ πολυφήμου χρυσοχοικῆς, “With the help of God, explanation of the most noble and illustrious art of goldsmiths.” A few of these recipes are preserved in a third manuscript as well, the *Laurentianus* Plut. 86.16 (= **L**), fol. 253v-256r and 286v-290v.²⁸ The first section in the *Laurentianus* includes two recipes that correspond with *CAAG* II 336,12-337,9 (= **L**, fol. 253v1-254r12 ὕδωρ πιστῆς οἰκονομίας) and *CAAG* II 337,10ff. (= **L**, fol. 254r12-256r9 καὶ ἄλλος φησίν); the second section includes fifteen recipes, six of which coincide with six recipes edited in *CAAG*:

- (1) **L**, fol. 286v1-16, ἄλλη μέθοδος μυστικῆ = *CAAG* II 332,1-11
- (2) **L**, fol. 286v17-187r20 ἕτερον ὕδωρ θείου = *CAAG* II 332,12-333,6
- (3) **L**, fol. 287r20-287v12 ὕδωρ ἵνα ἐκβάλῃς χρύσομαν ἀπὸ ἀσήμην = *CAAG* II 333,7-17
- (4) **L**, fol. 287v12-288r3 ἕτερον ὠσαύτως = *CAAG* II 334,18-27
- (5) **L**, fol. 288r3-12 λαγάρισμαν χρυσαφίου = *CAAG* II 333,28-334,6
- (6) **L**, fol. 288r12-288v3 περὶ τοῦ ποιῆσαι γράμματα χρυσά = *CAAG* II 334,22-335,2.

The remaining nine recipes of this section (**L**, fol. 288v3-290r16) have not been edited so far.²⁹

Against this picture, the *Meteora* manuscript stands out as the testimony that includes the richest selection of recipes, which is opened by five recipes (not grouped under any general heading) that are not handed down in the *Parisinus* and that only in one case overlap with the selection preserved in the *Laurentianus*. A preliminary edition of these five texts is provided below:

27. See *CAAG* III 360.

28. See Mertens 1995, xl-xli.

29. For an introduction to this section, see Hammer-Jensen’s preliminary description in Zuretti 1927, 57-58: (1) **L**, 288v3-10 περὶ τοῦ ποιῆσαι κόλιν καλῆν; (2) 288v10-13 ἄλλον; (3) 288v13-289v3 ἕτερον; (4) 289r3-17 ἕτεροι κόλιν; (5) 289r18-289v3 ἕτερον; (6) 289r3-10 ἕτερα κόλιν; (7) 289v10-21 ἐρμηνεία τῆς ἐλαϊκοκίας; (8) 289v21-290r16 ἄλλον; (9) 290r9-16 ἄλλον.

(1) MS Meteora, S. Steph. 97, fol. 180v10-181r4: Περί χρυσογραμμίας σιδήρου Μελάνησον <έν> ἀρχῆ³⁰ τὸ σίδηρον· πύρωσον αὐτὸ καὶ τρίψον τὸ σίδηρον μετὰ στέατι αἰγείῳ· καὶ ἄλειψον αὐτὸ μὲ χριστέλαιον· καὶ γίνεται μελανόν· εἴθ' οὕτως σκίασον κλαδὴν ἢ γράμματα καὶ καθάρισαι αὐτὰ μετὰ τὸ ὑπερον· καὶ στυνάσσον τὰ γράμματα με τὴν στύνψιν· εἴθ' οὕτως χρῖσον [χρῦσον MS] αὐτὰ ὡσπερ τὸ ἄσημιν μὲ τὸν ὑδρᾶργυρον καὶ ἄκρως πύρωνε· καὶ βουρτζίζε·³¹ καὶ χρῦσωνε.³²

“How to write golden letters on iron

First make the iron black: set it on fire, break iron into pieces with fat of goats, and anoint it with the olive oil,³³ and it will turn black. Then use it to sketch a twig³⁴ or letters and cleanse them (the letters?) with a pestle; treat the letters with a mordant;³⁵ then smear mercury on them as you do for silver; set (them) on an intense fire, brush and gild (them).”

(2) 181r5-181v2 ἐρμηνεία τῆς λυκο[...]ας = Laur. Plut. 86.16, fol. 289v10-21 (ἐρμηνεία τῆς ἐλαιωκό-
v<ι>ας)³⁶

Λαβὼν ἄσβεστον ὅσον κρίζης· θές αὐτὴν εἰς σκάφην [σκάνφην MS]³⁷, καὶ βα<μ>βάκην στιβασμένον [? sic L : στουβακτόνον MS] καὶ λινέλι· καὶ δέρνε [δύρε MS]³⁸ τὸ ὅσον νὰ γένη ζυμάριν· ἐπ<ε>ιτα ἄλειψον τὰς μάζας τῶν μαρμάρων· εἴθ' οὕτως θές ὕδωρ [sic L: ὕδατι MS] ἐν λέβητι, καὶ τὸν ἀπέσω φλοῦν τοῦ πελαία<ς> [φθέ- MS], καὶ κριθαριν, καὶ λινόσπερμα καὶ ἅς βράσουν καλῶς· ἐπ<ε>ιτα ἔπαρον τὸν χύλον καὶ μίξον καὶ ἄσβεστον καὶ μὲ κεραμίδιον τετριμμένον καὶ κοσκινισμένον, καὶ μὲ φὸν ὀρνίθειον καὶ κὰν<ν>αβιν ἢ λύων [?; λύον L; ft. λίνον], καὶ μίξας ὁμοῦ τὰ πάντα· εἴθ' οὕτως ἄλειψον καὶ μυστροσθλίβωσον [μυστροκλήβωσον MS]³⁹ παρὰνω μὲ λινέλιον.

30. The manuscript reads μελάνησον ἀρχῆ. The standard meaning of μελανίζω in classical Greek is ‘to be black or blackish’ (LSJ⁹ 1095). In Byzantine and Modern Greek, it acquires both a passive and an active sense (see Trapp 991, s.v. μελανίζομαι, Dimitrakos 4540, and Kriaras X, 15-16).

31. Trapp 292, s.v. βουρτζίζω, ‘(ab)bürsten’; DuCange I 222, s.v. βουρτζίζειν, *polire*; see CAAG II 329,19: θές εἰς ὕδωρ ψυχρὸν καθαρὸν καὶ βουρτζίζον, “mets dans l’eau froide et brosse” (CAAG III 315); CAAG II 331,23: ἔπειτα τὸ ἄσπρισον καὶ βουρτζίζον τὰ ἀχείροτα (sic), “ensuite, blanchis et polis ce qui n’a pas été travaillé” (CAAG III 317).

32. The forms πύρωνειν and χρῦσώνειν are Byzantine (and modern Greek) equivalents for πύρωω and χρῦσώω (see Colinet 2010, xxxvii). The MS reads πύρωνε and χρῦσωνε; the spelling with omicron is maintained by Berthelot in his editions of late alchemical texts: for πύρωνειν, see CAAG II 392,15 (cf. DuCange I 1277, s.v. πύρωνειν, *urere*); for χρῦσώνειν, see CAAG II 328,4 and 10; 329,1 and 10.

33. On oil in Byzantine alchemical literature, see Merianos 2014.

34. On this practice, see below, recipe n. 20 (= CAAG II 327,26): Περί τοῦ χρυσῶσαι ζῶα εἰς κούπαν ἢ κλαδὴν ἢ ἄλλον ἕτερον καὶ τὸ ἄλλον ἀχρῶστον, to be translated as suggested by Stephánidès 1922, 307: “Sur la manière de tracer dans une coupe des animaux ou un rameau ou toute autre chose dorée et de laisser le fond non doré”; recipe n. 37 (in CAAG II 331,6-7): ἔπειτα τὸ ποιῆσαι συρῆς καὶ φύλλα καὶ κλαδία καὶ ἄστροι κτλ., “puis, fais-en des fils, des feuilles, des rameaux, des étoiles, etc.” (CAAG III 316).

35. In late alchemical texts, στύνψις is often used to refer to the astringent substance itself (see Colinet 2010, 140, s.v. στύνψις).

36. The term ἐλαιοκονία refers to a ‘plaster made from lime and oil’ (LSJ⁹ 527), which is mentioned by Zosimus among other substances used to seal the different parts of distillatory devices (Zos. IX 13 Mertens). Stephanos too mentions this compound in his commentary on Hippocrates’ *Aphorisms* (in *Aph.* IV 1 = II 208,24-26 Westerink): οὕτως οὖν <καί> οἱ ὑδραγωγοὶ ποιούσιν· τοὺς γὰρ σωλῆνας κατασφραλίζουσι καὶ ἐμποτοῦσιν αὐτοὺς ἐλαιοκονία ἢ κηρομαρμάρω καὶ τοῖς τοιοῦτοις, ἵνα μὴ ἀπόληται τὸ ὕδωρ, “Hydraulic engineers do the same: when connecting water-pipes, they caulk them with a mixture of oil and lime, or wax and ground marble, etc., so that no water is lost.” A Graeco-Latin glossary records the term ἐλαιοκονίον, which is interpreted as *malta* (II 294 Löwe-Goetz).

37. In this passage **L** reads εἰς κάφην.

38. The same reading occurs in **L** (δύρε). My correction (δέρνε; see Trapp 348, s.v. δέρνω, ‘schlagen, peitschen’) is based on the comparison with the recipe 11 of the MS *Holkhamicus* 109 (Colinet 2010, 44, H11, § 3, ll. 15-17): καὶ δέρνε το καλὰ ἕως ὅτου νὰ γένη ὡσαν ζυμάρι, “et battez bien le mélange jusqu’à ce qu’il se forme une sorte de pâte.”

39. In this passage, **L** reads μυστροστήβωσον. I suggested reading the verb μυστροσθλίβω, from μύστρον, ‘spoon’, and σθλίβω, ‘to rub’ (see LSJ⁹ suppl. 274, s.v. σθλίβω; DuCange II 1363, s.v. σθλίβειν). For σθλίβω, see, e.g., CAAG II 323,4: εἴθ' οὕτως σθλίβωσον αὐτὸ μετὰ ἐλιάκοκον, “et frotte avec de la cendre d’olivier” (CAAG III 307); CAAG II 323,17: καὶ σθλίβωσον μετὰ κάλαμον, “puis frotte avec une plume” (CAAG III 310); CAAG II 334,26: σθλίβωσον με λιθάριν ἢ με λυκουδόντι, “polis avec une petite pierre ponce, ou une dent de loup” (CAAG III 320).

“Explanation of (how to prepare) a plaster made of lime and oil

Take as much lime as you need; put it in a washbasin along with cotton – which has been pressed to the bottom – and linseed oil, and pound it until it becomes a mush; then anoint the lumps of marble. Then put water in a pan, along with the internal bark of elm, barley, and linseeds, and make them boil well. Take this decoction and mix lime with crushed and sifted bricks, with hen eggs, and hemp or flax (?),⁴⁰ and mix well all the ingredients together. Then anoint (them?) and use a spoon to rub the surface with linseed oil.”

(3) 181v3-15 εἰς τὸ χρυσῶσαι γράμματα

Θές πάμπανυ πετάλην αἆραν· ξυλόκουκα γ' και ὑδάργυρον [ξυλόκουκον] α'· τρῖνον πρῶτον τὸ χρυσάφην εἰς μάρμαρον κοκκῖνον· και στάζε πρῶτον χριστέλαιον καθαρὸν ἄδολον [ἄδου- MS]· μία ἢ δύο σταλαγμούς· και ἔπειτα θές τὸν ὑδάργυρον και ἔνωσον ἅμα· και τρῖνον ἀμφότερα· πλὴν μετὰ προσοχῆς· και εἰς τόπον νὰ μηδὲν πνέει ἀήρ· θές δὲ και κρομμυδίου [κρομι- MS] ζωμόν· εἶτα βαλῶν ὅπου θέλεις θέσει· σύνασε⁴¹ αὐτὸ με πτερόν· και ὅταν θέλῃς γράφε και χρύσωνε.

“To gild letters

Set a leaf completely made of copper; silique, 3 parts and mercury, 1 part; first break the gold into pieces on a scarlet marble; and first drip (shed drop by drop) unadulterated pure olive oil, 1 or 2 drops; then set the mercury and amalgamate together; break both ingredients into pieces, but be careful, do not do it in an ventilated place. Put the juice of a small onion as well; place and apply it in the point (of the leaf) that you prefer, collect it with a feather and, when you want, write with golden letters.”

(4) 181v16-182v9 ἄλλον

Λαβὸν ἄσβεστον κίτρινον ὅσον θέλῃς· και ἅλας ἀμμωνιακόν· καμπάνου ἄλλον τόσον· και τρῖνον αὐτὰ λεπτῶς· και θές τα εἰς τζουκάλιν⁴² μικρόν· και σκέπασε τα με πηλὸν τῆς σοφίας· και θές ἐν φουρνε(λ) λίῳ και ἅς σταθῆ μίαν νύκταν· και τὸ πρῶι ἄρον αὐτὸν και ἔασον ἵνα [ἴνα MS] ψυχρανθῆ· και ἄρον ἐκ τὸ τζουκάλιν και ζύμωσε το· και πρόσθες ἅλας ἀμμωνιακόν τετριμμένον ἄλλον τόσον· και ποιήσε τὸ πάλιν ὡσπερ πρῶην με τὸν πηλὸν ἵνα μὴ εὐγῆ⁴³ οὐδεμία ἀτμίς [ὑδῆμαμης MS]· και πάλιν θές το ἐν τῷ φουρνε(λ) λίῳ· και οὕτως ποιήσε το πᾶσαν φορὰν ὡστε να στραφῆ εἰς τὸν καμπάνον τὸν πρῶτον· και τότε ἐξήβαλε και θές το εἰς ἀγγεῖον γύψινον νὰ (ἐ)ργ(άσης) [ναρ⁷ MS]· και θές το εἰς ἴσκιον νύκτα μίαν· και ἀπ' ἐκεῖνα τὰ νερά ρίξον⁴⁴ εἰς ἄργυρον ἀπάνω εἰς κάρβουνα· και ὅταν ἴδῃς ὅτι φουρῶν τὰ νερά, ρίξον νερὸν πλεότερον ὡστε να σκεπάσθῃ ὁ ἄργυρος· ὡστε να φυράσῃ τὸ νερὸν ὅλον· και ἔπειτα μῖξον τὸν [? πον MS] ἄργυρον με χάλκωμα καθαρὸν· και λῦσον αὐτὸ εἰς τὸ χωνίον ἐν τῷ ἅμα· και ἀνάδεξαι τα· και χῦσον αὐτὸ εἰς ῥυγλωχύτην⁴⁵· και θές και θέλει εἶσαι [ἴσαι MS] ὀκονομήμενον [οἰκ- MS] διὰ πᾶσαν ὑπόθεσιν.

“Another (recipe)

Take as much yellow lime as you want, and ammoniac salt, the same weight (?),⁴⁶ grind them finely; then put them in a small earthen pot; cover them with the *lutum sapientiae* and set them in a small furnace and left it there for a night. In the morning take it and let it get cold. Take (the substance) out of the pot and knead it, and add another equal amount of ground ammoniac salt; perform again the same operation you did earlier with the *lutum (sapientiae)*, so that no vapour gets out, and set again (the pot) in a small furnace; perform

40. The expression ἡ λύων [λύων L] seems to refer either to a different name for hemp or to an equivalent substance (substitute); many Byzantine lexica often link λίνον to κάνναβις; see Pollux, *Onom.* VII 72,6-7: και ἡ κάνναβις δ' ὁμοίον ἐστι λίνω; Hesych. κ 673,1: κάνναβις ἔστι δὲ φυτὸν τι λίνω ὁμοιον.

41. σύνασε as well as σύναζε are Byzantine forms for σύναγε.

42. The term (from Latin *zucca*) refers to an earthen pot; see DuCange II 1574, s.v. τζουκάλι (τζουκάλι, τζουκάλιον) *olla fictilis*; Colinet 2010, xlv.

43. See Trapp 430, s.v. ἐβγαίνω (εὐγαίνω <ἐκβαίνω) ‘herausgehen.’

44. This form is an aorist imperative from ρίχνω (DuCange II 1302), Byzantine cognate of ρίπτω, ‘to throw, to cast’ (Colinet 2010, xxvii). The form ρίξε occurs in an alchemical recipe preserved in MS *Holkhamicus* gr. 109 (H5 in Colinet 2010, 50, l. 7: και ρίξε τα μέσα εἰς τὸ ὑάλιν ὅπου ἔχει τὸ νερὸν τὸ καθαρὸν, “jetez-les dans le ballon qui contient le liquide pur”).

45. DuCange II 1292 records the form ῥυγλωχότης, “vas chymicum in regulae formam diductum, in quo liquatum metallum effunditur.” See also Trapp 1502, s.v. ῥηγλίον, ‘Stange, Leiste.’

46. On the meaning of καμπανός (*sic*) as ‘weight’ (ζυγαριᾶ), see Kriaras VII 321.

the entire process so that it turns to have the same weight (?). Then take it and put in in a vessel made of gypsum in order to work it; put it in shady place for a night, then pour part of these waters on silver (placed) on charcoals; when you notice that the waters evaporate,⁴⁷ pour more water so that the silver remains covered; (do it) until all the water has evaporated, then mix the silver with pure copper, and melt them together in a melting-pot; collect them and melt them in a ingot mould; take it and it will be suitable for any purpose.”

(5) 182v9-13 ἄλλον

λάβε κασσίτερον καὶ θές εἰς χωνίον ἐν τῇ πυρᾷ· καὶ ὅταν λυθῇ, χῦσον αὐτὸ εἰς χύλον πηγάνου· καὶ κάμνη ἀγάπη· ὁ νοῶν νοεῖτω.

“Another recipe. Take tin and put it in a melting-pot on fire; when it melts, pour it on rue juice; be patient. Word to the wise.”

After this point, fifty-nine recipes follow in the *Meteora* manuscript, which are grouped together under the general heading (fol. 183v13-15): ἐρμηνεία σὺν Θεῷ τῆς τιμωτάτης καὶ πολυφήμου χρυσοχοικῆς [χρῦσσοχοικῆς MS]. This recipe book substantially overlaps with the version edited by Berthelot-Ruelle, except for the omission of four recipes – namely, *CAAG* II 323, 19-26; 324,1-6; 336,15-337,9; 337,10-11 – and the inclusion of a few texts that are not in the *Parisinus*. I list below the titles of the recipes in the *Meteora* manuscript and provide a preliminary transcription of two complete recipes (rec. 3 and 29; their differences with respect to the versions edited by Berthelot-Ruelle are recorded in the footnotes).

(1) 182v15-183v3 · ἀρχ(ῆ) εἰς λαγάρισμα χρυσαφίου [χρυσοαφίου MS], “*Incipit*. To purify gold” (= Recipe 1 in *CAAG* II 321,3-322,3: Περὶ τοῦ λαγαρίσαι τὸ χρυσίον).

(2) 183v4-15 Εἰς τὸ λαγάρισμα τοῦ ἀσημίου [ἀσημείου MS], “To purify silver” (= Rec. 2 in *CAAG* II 322,4-10: εἰς τὸ λαγαρίσαι ἄργυρον).

(3) 183v16-184v4 ἐρμηνεία τοῦ χρυσώματος (= Rec. 3 in *CAAG* II 322,11-23: same title).

Λαβὼν χρυσάφιν⁴⁸ ἐξάγιον α΄, σφύρισον αὐτὸ ἐν τῷ ἄκμονι ὡσπερ λεπτόν, καὶ κατὰ κοπον, καὶ θές ἐν τῷ χωνίῳ ἐν τῇ πυρᾷ ὡστε ἐρυθριά.⁴⁹ Καὶ ἔκτοτε βάλε⁵⁰ μέσον τὸ χρυσάφιν⁵¹ νὰ ποιήσης <έ>ως ὄραν πατέρ ἡμῶν [παεριμοῦ MS]. Καὶ βάλλον διάργυρον εἰς τὸ χωνίον,⁵² καὶ μῖζον, καὶ ἄρον ἐκ⁵³ τοῦ πυρός· καὶ βαλὼν ὕδωρ εἰς χηβάδιν [χυ- MS], θές εἰς [ἦς MS] κάρβουνα ζωντανὰ μέσον· καὶ σβέσον αὐτά· εἴθ’ οὕτως [εἰλοῦτος MS] χῦσον τὸ χρυσάφιν μέσον τοῦ κο<γ>χυλίου ἢ εἰς τὸ χηβάδιν [χυ- MS]⁵⁴ καὶ ἄρον αὐτό, καὶ πλῦνον καλῶς ἐν τῇ χειρὶ σου· καὶ βαλὼν ὑδάργυρον ἕτερον, θές αὐτὸ εἰς τὸ ὕδωρ τοῦ κο<γ>χυλίου, καὶ διαργύρισον [-γύρησον MS: διαργύρωσον in *CAAG*] τὸ ἀσημιν [καὶ] μὲ νεράντζι.⁵⁵ Καὶ ἔκτοτε χρύσωσε⁵⁶

47. The verb *φυράω* (‘to knead’ in ancient Greek; see LSJ⁹ 1962) seems to overlap with *φυραίνω*, ‘to be reduced, decrease, diminish in size/weight’ (see Dimitrakos 7730); I translated it as ‘to evaporate’, thus following Colinet’s translation of rec. 2 of the MS *Holkhamicus* 109 (Colinet 2010, 21, ll. 8-9): καὶ τότε βράσε αὐτάς ἕως ὅτου νὰ φυράση τὸ ἦμισυ, “faites bouillir jusqu’à ce que la moitié du liquide s’évapore”. Lagercrantz (1924, 57) commented on *φυράση*: “‘abeat’, cf. ngr. *φυραίνω*: ἀπομειοῦμαι, ὑφίσταμαι ἀπομειώσιν φύρα ἐλάττωσι ποσοῦ, βάρους ἢ ἀξίας (Hépitès, *Lexicon*). Exemplum vetustius non novi.”

48. *CAAG* II 322,11: χρυσίον.

49. *CAAG* II 322,13: ἐρυθρίαση.

50. *CAAG* II 322,13: τότε βάλλον.

51. *CAAG* II 322,13: τοῦ χρυσίου.

52. *CAAG* II 322,14-15: ἐν τῷ χωνίῳ.

53. *CAAG* II 322,15: ἀπό.

54. The sentence θές εἰς κάρβουνα — ἢ εἰς τὸ χηβάδιν is missing in *CAAG*; however in the MS *Parisinus* gr. 2325, fol. 280v, we read: θές εἰς κάρβουνα ζωντανὰ μέσον τοῦ κογγύλιου εἰς τὸ χηβάδιν. As a matter of fact, the MS *Parisinus* seems to omit only the words: καὶ σβέσον αὐτά· εἴθ’ οὕτως χῦσον τὸ χρυσάφιν.

55. *CAAG* II 322,18: τὸν ἄσημον καὶ μετὰ νεράντζιου. See Trapp 1075, s.v. νεράντζιον (< pers. *nārang*), ‘Pomeranze’. Berthelot-Ruelle translated: “et amalgame l’asèm jusqu’à ce qu’il prenne une couleur orangée” (*CAAG* III 309).

56. *CAAG* II 322,18-19: τότε χρύσωσαι αὐτό.

μὲ τὸ χρυσοπήριν. Καὶ βάλλων αὐτὸ ἐν τῇ πυρῶ⁵⁷ κατὰ πέντε καὶ ἕξη φοράς, καὶ ὅταν ἴδῃς τὴν χρῶαν ὅτι ἐξεβαίνει, πύρωσον πλέον, καὶ θές τῷ ὕδατι· εἶθ' οὕτως σθλίβωσον αὐτὸ [scripsi post CAAG; σκλήβωσον αὐτῷ MS], καὶ πάλιν πύρωσον,⁵⁸ θές ἐν τῷ ὕδατι.

“Explanation of (how to make) a gilt

Take gold, one exagion; hammer it on an anvil to make it thin, cut it into pieces and put it in a melting-pot on fire, so that it turns reddish. From this moment put the gold in the middle of the crucible, so that you work it for the time of a Pater Noster. Then add mercury in the melting-pot, mix, and take it away from the fire. Pour water in a container, place it on burning charcoals, and quench them. Then melt the gold in the shell or container. Remove it and wash it in your hands. Add further mercury, pour it in the water of the shell and apply this mercury on silver with an orange (?); then gild it with a gilding tool. After setting it on fire for five or six times, when you see that the color comes out, burn it a bit longer, then put it in water; then rub it, burn it again, and put it in water.”

(4) 184v5-185r2 χρύσομα [χρύσομα MS] ἄλλον κλαπωτόν⁵⁹ [κλαπόντον MS], “Another gilt suitable for gold wires” (= Rec. 4 in CAAG II 322,24-323,6: same title).

(5) 185r2-185v7 ἐρμηνεία εἰς τὴν ἔγκωψιν, “Explanation of an enameling technique” (= Rec. 5 in CAAG II 323,7-18: ἐρ. εἰς τὴν ἔγκωψιν)⁶⁰

(6) 185v7-18 ἔρμηνεία ἐτέρα τοῦ σαπουν(ίου), “Another explanation of (how to make) soap” (= Rec. 8⁶¹ in CAAG II 324,7-13: ἐρμηνεία ἐτέρου σαπουνίου).

(7) 186r1-9 ἐρμηνεία τῆς βασιλικῆς κολλήσεως⁶² [κόλλησις MS] τῆς χρυσοῦς, “Explanation of the imperial technique to solder gold” (= Rec. 9 in CAAG II 324,14-18: same title, except for the omission of τῆς χρυσοῦς).

(8) 186r10-186v2 περὶ τῆς βασιλικῆς κολλήσεως [κόλλησις MS] τῆς ἀργυρῆς [-εἰς MS], “On the imperial technique to sold silver” (= Rec. 10 in CAAG II 324,19-24: same title)

(9) 186v3-12 ἄλλη ἐρμην(εία) εἰς τὴν ἀργυροκόλλησιν [ἀργυροκόλλισιν MS], “Another explanation of how to sold silver” (= Rec. 11 in CAAG II 324,25 – 325,2: ἄλ. ἐρ. τῆς ἀρ.)

(10) 186v12-187r16 ἄλλη κόλλησις [κόλλισις MS] ἐργηγόρη [ἐγλη- MS]· ἡ ἀλαμάρσα, “Another quick soldering, the alamarsa” (= Rec. 12 in CAAG II 325,3-13 ἔτερα κ. ταχυτάτη, ἡ ἄλ.)

(11) 187r17-187v7 ἐρμηνεία νὰ ποιῆσῃς χρῶαν [χρῶαν MS] χρυσαφίου, “Explanation of how to produce the colour of gold” (= Rec. 13 in CAAG II 325,14-18: ἐρ. εἰς τὸ ποιῆσαι χρ. χρ.).

(12) 187v7-5 εἰς τὸ ποιῆσαι χρῶαν [χρῶαν MS] ἐν ἀργύρῳ σκεύει χρυσομ(ένην) [χρυσο- MS], “To give a golden colour to a silver object” (= Rec. 14/1 in CAAG II 325,19-24)

57. At this point the text as edited by Berthelot-Ruelle has a sentence that is missing in the Meteora manuscript: ἄρον αὐτὸ καὶ τρίγων μετὰ βρούτζον χοιρείαν. Καὶ πάλιν βάλων αὐτὸ ἐν τῇ πυρῶ, “take it away from the fire, and polish it with a brush of pig’s hairs; then set it again on fire.” The lacuna may be justified as an instance of *saut du même au même*.

58. CAAG II 322,23: πυρώσας.

59. See Trapp 835, s.v. κλαπωτός, ‘(gold)bestickt für Golddraht’; DuCange I 659.

60. *Parisinus* gr. 2325, fol. 281r14 reads τὴν ἔγκωψιν. In commenting on this recipe, Berthelot wrote (CAAG III 309, n. 3): “Il s’agit sans doute d’une operation d’émaillage, désignée par le mot ἔγκωψιν, ἔγκωψιν ou ἔγκαυσιν.”

61. Rec. 6 (CAAG II 323,19-26: ἐρμηνεία τοῦ σμάρδου) and rec. 7 (CAAG II 324,1-6: ἐρμηνεία τοῦ σαπουνίου) are omitted in the Meteora manuscript.

62. The genitive κολλήσεως would be possible as well, at least for the form κολλήση (Dimitrakos 4000, s.v. κόλλησις).

- (13) 187v15-188r3 εἰς τὴν ἔγκαψιν (-ην MS), “To enamel” (= Rec. 14/2 in *CAAG* II 325,24-26)
- (14) 188r3-7 εἰς τὸ γανῶσαι [τὸ λανεῖσε MS] ἄργυρον, “To polish silver” (= Rec. 15 in *CAAG* II 325,27-326,2: same title).
- (15) 188r7-16 σημείωσις [-εις MS], “Indication” (= Rec. 16 in *CAAG* II 326,3-7: same title)
- (16) 188r16-188v5 εἰς στάλαγμα,⁶³ “To produce a distilled substance” (= Rec. 17 in *CAAG* II 326,8-11: μυστικόν)
- (17) 188v5-189r13 νὰ ποιήσης [-εις MS] φουρμάς,⁶⁴ “To make hollow moulds” (= Rec. 18 in *CAAG* II 326,12-26: περὶ τοῦ ποιῆσαι φ.)
- (18) 189r13-189v7 Περὶ χρυσογραμμίας, “On gold writings” (= Rec. 19 in *CAAG* II 327,1-8: Π. χρ. ἕτερον)
- (19) 189v8-190v1 διήγησις νὰ ποιήσης [-εις MS] χρυσὰ κεφάλια(τα) εἰς βιβλίον, “Description of how to write gold capital letters in a book” (= Rec. 20 in *CAAG* II 327,9-25: Περὶ τοῦ ποιῆσαι χρ. κεφ. ἐν β.)
- (20) 190v2-10 διήγησις ὅταν θέλ(η)ς νὰ χρυσώσῃς<ς> ζῶα· ἢ κούπ(αν)· ἢ κλαδίην· ἢ ἄλλον ἕτερον· καὶ τὸ ἄλ<λ>ον ἀχρυσώτον, “Description of how to draw golden animals, or a (golden) cup, or a golden twig, or something else, without gilding the rest (of the object)”⁶⁵ (= Rec. 21 in *CAAG* II 327,26-328,4: περὶ τοῦ χρυσῶσαι ζῶα εἰς κόπαν κτλ.)
- (21) 190v10-11 Περὶ τῆς ἐγκαύσεως, “On enameling”⁶⁶ (= Rec. 22 in *CAAG* II 328,5-6: same title)
- (22) 190v12-191r1 εἰς τὸ χρυσῶσαι ζῶα εἰς κούπαν· καὶ ὁ κάμπος νὰ ἔναι ἄσπ(ρος), “To draw golden animals on a cup by leaving its bottom white” (= Rec. 23 in *CAAG* II 328,7-10: same title)
- (23) 191r2-5 εἰς τὴν χρυσὴν τὴν κόλλησιν [κώλυσιν MS], “To solder gold” (= Rec. 24 in *CAAG* II 328,11-13: εἰς τὴν χρυσοκόλλησιν)
- (24) 191r6-16 περὶ τοῦ χρυσῶσαι χαλκὸν μετὰ ἀσήμιν, “On how to gild copper with silver” (= Rec. 25 in *CAAG* II 328,14-20: Π. τ. χ. χ. μετὸν ἄσημον)
- (25) 191r17-191v11 εἰς τὸ χρύσωμαν τοῦ ἀέρος τοῦ μαλάγματος, “To (make) a gold object made of a amalgam of bronze (?)”⁶⁷ (= Rec. 26 in *CAAG* II 328,21 – 329,1: περὶ τοῦ χρυσώματος τοῦ ἀ. τοῦ μ.)
- (26) 191v12-192r3 κόλλησις [κώλυσιν MS] ἐὰν κοπῆ ρίνη [-οι MS], “Soldering if (??)” (= Rec. 27 in *CAAG* II 329,2-7: κόλλησις ἀνκοπύρινη)
- (27) 192r3-7 ὅταν χρυσώνης ἀσήμιν [-ήμιν MS] καὶ οὐδὲν πᾶν [-ει MS], “If you gild silver and nothing holds” (= Rec. 28 in *CAAG* II 329,8-10: no title)

63. The reading Στά# in the MS has been interpreted on the basis of the last sentence of the recipe, which reads: καὶ γίνεται ἀληθινὸν στάλαγμα (*CAAG* II 326,10-11 reads καὶ γίνεται ἀληθινὸν μάλαγμα).

64. On the term φούρμα (and other Byzantine technical terms related to metallurgy), see Merianos 2014, 252, and Papathanassiou 2002, 123-125.

65. See above, n. 32.

66. See above, n. 60.

67. See Stéphanidès 1922, 308, who explains: “le ἀήρ μαλάγματος est le ἀήρ χρυσός (*CAAG* II 324, 22), c’est-à-dire des feuilles très minces (aériennes) d’or (l’oripeau).”

(28) 192r8-13 εις τὸ χρυσῶσαι ζῶα εις κούπαν· καὶ ὁ κάμπος ἀχρῦσωτος, “To draw golden animals in a cup and keeping its bottom not gilded” (= Rec. 29 in *CAAG* II 329,11-14: εις τὸ χρ. ζ. εις κάμπον κούπας καὶ ὁ κ. εἶναι ἀχ.)

(29) 192r13-192v5 εις τὸ δῶσαι χροῖαν [χρῶ- MS] εὐμόρφην (*sic*) εις ἄσημιν [-ήμην MS] χρυσώμενον (= Rec. 30 in *CAAG* II 329,15-19. περὶ τοῦ ποιῆσαι χροῖαν ὠραιστάτην εις ἄσημον χρυσώμενον)

Ἐπαρον τιάφην μέρη γ', καὶ τρυγίαν καθαρὰν ἀπὸ Μονοβασίας μέρη β', καὶ ἄλλας μέρος α', καὶ τρίγων καλῶς ἄς βράσουν καλῶς μετὰ ὕδατος. Εἴθ' οὕτως βάλε τὸ ἀσήμιν⁶⁸ μέσον [ἔσο MS] <ἔ>ως ὥραν πατέρ ἡμῶν [-οῦ MS]. Ἐπειτα ἐκβαλον τοῦτο, θές εις νερόν κρίον⁶⁹ καθαρόν, καὶ βούρτζισον [-ηζον MS].

To give a beautiful colour to gilded silver.

Take sulphur, 3 parts, pure lees of Monemvasian wine, 2 parts, and salt, 1 part; grind them well and boil them well in water. Then put silver in the middle and (keep it) for the time of a Pater Noster. Then remove it, put it in pure cold water, and brush (it).⁷⁰

(30) 192v5-13 ὅταν σκάζη [-ει MS] τὸ ἄσημιν [-ήμην MS], “If silver cracks” (= Rec. 31 in *CAAG* II 329,20-24: same title)

(31) 192v13-193r1 εις τὴν κόλλησιν [κόλυσιν MS] τοῦ σμάρδου,⁷¹ “To solder an enamel” (= Rec. 32 in *CAAG* II 329,25-28: same title)

(32) 193r1-7 εις τὸ ποιῆσαι σύρμαν [σή- MS] κούφιον, “To make a (metallic) wire hollow” (= Rec. 33 in *CAAG* II 330,1-5: Περὶ τοῦ π. σύρμαν κ.)

(33) 193r8-17 νὰ κάνης [-ις MS] ἔγκασιν, “To perform an enameling technique” (= Rec. 34 in *CAAG* II 330,6-11 (Περὶ τοῦ ποιῆσαι ἔγκασιν))

(34) 193r18-193v8 εις τὸ ποιῆσαι χροῖαν [χρω- MS] εὐμόρφον εις χρυσωμένον ἀσήμιν [-ήμην MS] “To give a good colour to gilded silver” (= Rec. 35 in *CAAG* II 330,12-17: Περὶ τοῦ ποιῆσαι χρ. εὐμόρφην εις χ. ἀσήμην)

(35) 193v8-17 εις τὸ ποιῆσαι κόλλησιν [κώλυσιν MS] τῶν κακαβίων εις λουτρὸν καὶ εις <σω>ληνάρια⁷² [λινάρια MS], “To solder small pots (to make) a washbasin and tubes” (= Rec. 36 in *CAAG* II 330,18-23: Περὶ τοῦ ποιῆσαι κόλλησιν κακαβίων καὶ εις σουλινάρια λούτρον)

(36) 193v18-194r4 εις τὸ λαμπρῶναι μαργαρίτην, “To make a pearl shiny” (= Rec. 37 in *CAAG* II 330,24-27: εις τὸ λ. μαργαριτάριν)

(37) 194r4-6 ἕτερον εις αὐτό, “Another recipe for the same purpose” (= Rec. 38 in *CAAG* II 330,28 – 331,2: ἄλλον)

(38) 194r7-195v3 ἐξήγησις τῆς τιμιωτάτης καὶ (ὕ)ψηλωτάτης [ψυ- MS] καὶ ἀχειροθέτου (? ἀχειρο⁷³ MS; perhaps ἀχειροτιμῆτου or -ποιήτου) τέχνης τῶν συρμάτων τῆς χρυσοχοικῆς τέχνης, “Explanation of the most precious and sublime and divine (i.e. not belonging to human beings) art of (making metallic) wires for the art of goldsmiths” (= Rec. 39 in *CAAG* II 331,3-28: Περὶ τῶν συρμάτων τῆς χρυσοχοικῆς τέχνης)

68. *CAAG* II 329,18: ἄσημον.

69. *CAAG* II 329,19: ὕδωρ ψυχρόν.

70. See Merianos 2014, 255.

71. See DuCange II 1404, s.v. σμάρδος, *encaustum, pigmentum metallicum*.

72. See DuCange II 1514, s.v. σωληναρίον (or σωλυ-), *tubus*.

- (39) 195v3-196r24 σμάρδωμαν ἄλλον, “Another enameling technique” (not included in *CAAG*)
- (40) 196r24-196v5 ἑτέρα δουλία, “Another work” (= Rec. 40 in *CAAG* II 332,1-11: ἄλλη μέθοδος μυστική)
- (41) 196v6-197v3 ἕτερον ὕδωρ ζ [i.e. θείου/θεϊόν], “Another (recipe for) sulphur/divine water” (= Rec. 41 in *CAAG* II 332,12 – 333,6: same title)⁷³
- (42) 197v4-198r4 ἕτερον ζ [i.e. θείου/θεϊόν] ὕδωρ· νὰ ἐ<κ>βάλης τὸ χρύσωμα [-ωμα MS] ἀπὸ τὸ ἄση(μιν), “Another sulphur/divine water to remove gilt from (gilded) silver” (= Rec. 42 in *CAAG* II 333,7-17: “Υδωρ ἵνα ἐκβάλης χρύσομαν ἀπὸ ἀσήμην)
- (43) 198r4-198v5 ἕτερον εἰς αὐτό, “Another recipe for the same purpose” (= Rec. 43 in *CAAG* II 333,18-27: ἕτερον ὡσαύτως)⁷⁴
- (44) 198v5-15 λαγάρισμα χρυσαφίου [-φήου MS], “Purification of gold” (= Rec. 24 in *CAAG* II 333,28-334,6: τὸ λαγάρισμαν χρυσαφίου)
- (45) 198v15-199r5 ὁμο(ῖον) εἰς ἄσημιν [-ήμην MS] χρυσώ<μενον> [χρυσῶ MS], “The same for gilded silver” (= Rec. 45 in *CAAG* II 334,7-11: ἕτερον ὁμοῖον εἰς ἄσημον)
- (46) 199r5-8 ὅταν σκάζη τὸ ἀσήμ(ιν) ἢ [εἶ MS] τὸ χρυσάφιν, “If silver or gold cracks” (= Rec. 46 in *CAAG* II 334,12-14: same title)
- (47) 199r9-13 τὸ πῶς νὰ σταγματίσης ἄργυρον, “How to harden silver” (= Rec. 47 in *CAAG* II 334,15-17: τὸ ποῦ σταμάτις ὑδραργύρου)
- (48) 199r13-199v3 ἄλλον, “Another (recipe)” (= Rec. 48 in *CAAG* II 334,18-21: same title)
- (49) 199v3-200r1 εἰς τὸ ποιῆσαι γράμματα χρυσά, “To make golden letters” (= Rec. 49 in *CAAG* II 334,22 – 335,2: περὶ τοῦ ποιῆσαι γρ. χρ.)
- (50) 200r2-13 εἰς τὸ ποιῆσαι ὠραῖον χαλκὸν ὥσπερ δ [i.e. χρυσόν], “How to make copper as beautiful as gold” (= Rec. 50 in *CAAG* II 335,3-10: περὶ τοῦ ποιῆσαι ὠραιόχαλκον ὥσπερ χρυσόν)
- (51) 200r13-16 ἕτερον εἰς τὸ σαπούνιον, “Another recipe for soap” (= Rec. 51 in *CAAG* II 335,11-12: Περὶ τοῦ σαπουνίου)
- (52) 200r17-200v2 ἄλλον, “Another recipe” (= Rec. 52 in *CAAG* II 335,13-14: ἕτερον)
- (53) 200v2-4 Τὸ ὑαλί [γεαλή MS], “Glass” (= Rec. 53 in *CAAG* II 335,15-16: ὁ ὕελος)
- (54) 200v4-201r7 εἰς τὸ λευκᾶν(αι) χαλκόν, “To whiten copper” (= Rec. 54 in *CAAG* II 335,17 – 336,3: Περὶ τοῦ λ. κασσίτερον)
- (55) 201r7-201v8 εἰς τὸ ποιῆσαι χαλκὸν⁷⁵ ὥσπερ δ [i.e. χρυσόν], “To make copper like gold” (= Rec. 55 in *CAAG* II 336,4-14: Περὶ τοῦ π. χ. ὡσ. χρ.).⁷⁶

73. On sulphur/divine water, see Viano 1997; Martelli 2009.

74. On recipes 42-43, see Halleux 1985, 56-57.

75. The alchemical sign of copper is hardly readable in the manuscript.

76. Rec. 56 (*CAAG* II 336,15-337,9: ὕδωρ πιστῆς οἰκονομίας) and rec. 57 (*CAAG* II 337,10-11: καὶ ἄλλος φησὶν) are omitted in the *Meteora* manuscript.

(56) 201v8-202r7 ἑτέρα ἐρμηνεία εἰς τὸ ἀξυγγοσάπουνον [ἀξυγγοσάπουνων MS],⁷⁷ “Other explanation for a fatty soap” (not included in *CAAG*)

(57) 202r7-202v6 εἰς τὸ ποιῆσαι φούρμας, “To make hollow moulds” (not included in *CAAG*)

(58) 202v7-12 Sine titulo (not included in *CAAG*)

(59) 202v13-17 Sine titulo (not included in *CAAG*).

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77. Ἀξυγγοσάπουνον is a *hapax* that is not recorded in the lexica. The term ἀξύγγυ/ἀξύγγιον (Byzantine spelling for ἀξούγγιον, ‘animal fat, tallow, grease’; see DuCange I 94) refers to the main ingredient of the soap (σάπων or σαπούνιον), whose preparation is explained in the recipe 8 (see also *CAAG* II 380).

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