

CHAPTER II

*Late Byzantine Alchemical Recipe Books
Metallurgy, Pharmacology, and Cuisine**Matteo Martelli***II.1 Introduction: Alchemy and the Circulation
of Recipes in Byzantium**

Like shifting atoms of knowledge, recipes have been disseminated in a variety of alchemical treatises of different genres (e.g. technical essays, commentaries, dialogues) or simply piled into collections of variable length, as either lists or more structured compilations. Byzantine alchemical anthologies are the main sources for these types of text, which share similarities with recipes pertaining to contiguous areas of expertise. Indeed, comparable sets of ingredients, tools, and operations appear in procedural texts that describe how to prepare a medicine, how to make a dyeing *pharmakon*, and, as we shall see, how to cook a cake. Moreover, a similar tension between tradition and innovation is detectable in both the medical and the alchemical traditions. Byzantine compendia of remedies include recipes ascribed to a wide array of authorities, from famous Graeco-Roman physicians, such as Archigenes and Galen, to Christian saints. Likewise, alchemical anthologies collect Graeco-Egyptian recipes along with later compilations.¹ The vernacular vocabulary of these compilations, which also include Arabic and Latin loanwords as the result of cross-cultural influences, did not prevent their compilers from relying on the authority of ancient and mythical authors, such as Isis or Cleopatra (see Section II.2).

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¹ For Aetios' *Medical Books*, for instance, see Ejik, Geller, Lehnhaus, Martelli, and Salazar (2015: 198–204).

Moreover, the lines of transmission of medical and alchemical recipes overlap at times. Medical manuscripts can also include technical recipes: for instance, MS Angelicus gr. 17 (fourteenth–fifteenth century), which transmits medical treatises by both ancient (Hippocrates and Galen) and Byzantine authors (e.g. Oribasios, Paul of Aegina, and John the Physician), also features recipes on the making of golden inks and purple dyes.² Conversely, alchemical manuscripts can incorporate medical prescriptions, as we shall see by analysing MS Vaticanus gr. 1174 (see 11.3).

Technical recipes are included in the earliest manuscript on alchemy that has come down to us: MS Marcianus gr. 299 (tenth–eleventh century). Kept at the Marciana National Library in Venice, where it belonged to the personal collection of Cardinal Bessarion (1403–72), this manuscript transmits a rich collection of Graeco-Egyptian, late antique, and early-middle Byzantine alchemical works, often in epitomised forms, which testifies to a 1,000-year-old written tradition.³ Along with the works attributed to the founders of alchemy, such as Pseudo-Democritus (first century AD) or Zosimus of Panopolis (third–fourth century), and the writings of more recent authors, such as Stephanos of Alexandria (seventh century) and the so-called philosopher Anepigraphos (eighth–ninth century),⁴ the Marcianus manuscript also includes clusters of recipes, often grouped according to their technical topics. One finds formulas transmitted under the names of mythical figures (e.g. Moses or Agathodaimon) as well as anonymous recipes that can be tentatively dated only on the basis of internal elements, such as linguistic marks, loanwords, and scanty historical references. A few Arabic names of ingredients, for instance, occur in two recipes on how to dye copper and quench iron (f. 108r–v):⁵ these loanwords have been read as evidence of an early influence of Arabic on Byzantine alchemical texts prior to the tenth century.⁶ At f. 106 r, a group of three recipes deals with the making of silver:⁷ the first describes how to whiten lead by treating the melted metal with a substance called

² Technical recipes edited in Schreiner and Oltrogge (2011: 51–2, 55, 57, 61–2, 64, 73); see also *CMAG* II.209. On the medical section see Sonderkamp (1987: 197–8) and Zipser (2009: 26–7).

³ The manuscript has been described in *CMAG* II.1–22 and Mioni (1981: 427–33); see also Mertens (1995: XXII–XXIX), Saffrey (1995), and, more recently, Roberts (2020), who emphasises the role of MS Marcianus as an important source for middle Byzantine intellectual history.

⁴ For an introduction to Graeco-Egyptian and early Byzantine alchemical authors see Letrouit (1995), Merianos (2017), Viano (2018), and Martelli (2019a: 45–118).

⁵ See ed. Berthelot and Ruelle (1887–8) II.346.10–11, which mentions a ‘red pastille’ (φοινικοπλάστιλλος) called *natēph* (‘νατήφ’) by the Arabs; II.347.10–11, that mentions the date palm (φοινικοβάλανος), called *elileg* (‘ἐλιλέγ’; also spelled ‘βελιλέγ’) in Arabic.

⁶ See Mavroudi (2002: 400–3); Roberts (2022: 568–70).

⁷ See ed. Berthelot and Ruelle (1887–8) II.36.19–37.16.

‘Cleopatra’s glass’ (*hyelos kleopatrinon*), an otherwise unknown ingredient whose name points to the famous Egyptian queen (see later in this chapter); the second recipe explains how to dye tin with bitumen and salt in order to make silver and use it in the church (*eis ergon ekklēsias*); the last one, which only specifies how much lead is necessary to produce ten librae of silver, is said to have been inscribed ‘on the upper column’ (*eis anōteran stēlēn*), in lines with the late Hellenistic *topos* of alchemical formulas hidden in Egyptian temples.⁸ Different historical layers seem to be detectable in these recipes, even though it is difficult to interpret them in isolation, detached from the fluid textual tradition that hands down these types of texts. A recipe might have been copied countless times over centuries: single elements could be easily inserted or left aside in the course of their transmission, and their language could be easily readjusted or updated in terms of grammar, syntax, or technical nomenclature.

Moreover, recipes were often collected and organised in different compendia, which could include texts coming from a variety of earlier sources. The number of these compendia dramatically increase in manuscripts dating between the thirteenth century and the fifteenth. For instance, MSS Parisini gr. 2325 (thirteenth century) and 2327 (copied in Crete by Theodoros Pelekanos in 1478) systematically expand the collection of alchemical writings already included in the Marcianus gr. 299, by adding a great variety of ‘new’ technical texts. We find recipes on how to make artificial gemstones and pearls, which feature various references to the Arabs along with Arabic loanwords.⁹ The description of a complex procedure to produce a round pearl (*chalaza*)¹⁰ is explicitly attributed to the ‘famous Arab Salmanas’, tentatively identified with Sālim al-Ḥarrānī, credited with alchemical works in Arabic sources.¹¹

⁸ See, for example, Pseudo-Democritus, *On Natural Secrets (Physika kai mystika)*, 3, in ed. Martelli (2013) 82–5; Zosimus, *Final Account*, 5, in ed. Berthelot and Ruelle (1887–8) II.242–3. Festugière (1950: 275–81, 362–8) published a more reliable edition and translation of Zosimus’ text and also discussed (1950: 319–24) late Hellenistic accounts on the discovery of hidden books.

⁹ See the recipe book *Deep Tincture of Stones, Emeralds, Rubies and Jacinths from the Bool Taken from the Sancta Sanctorum of Temples*, in ed. Berthelot and Ruelle (1887–8) II.350–64 and the various recipes on the making of pearls in ed. Berthelot and Ruelle (1887–8) II.364–71. The earliest witness of these collections is MS Parisinus gr. 2325 (ff. 152r–173v).

¹⁰ On this particular meaning of the term *chalaza* (‘χάλαζα’, ‘hailstone, pebble’) see Du Cange (1688: II.1724–5).

¹¹ Greek text in Berthelot and Ruelle (1887–8) II.364–7; see Kraus (1942: 39, n. 3) and Roberts (2022: 570–1). Kraus (1933: 11) identified our alchemist with Salm, director of the ‘House of Wisdom’ (*sāhib bayt al-hikma*) under the Abbasid caliph al-Ma’ mūn, who would have translated Aristotle’s books into Arabic. Ullmann (1972: 216–17), however, has questioned this hypothesis.

Metallurgy is certainly the most prominent field of expertise that emerges from the recipes included in alchemical manuscripts. In fact, metallurgical procedures – that is, a great variety of techniques aiming at dyeing metals and producing alloys that look like gold and silver – are described in voluminous compendia, such as the anonymous collection entitled *With God's Help, Explanation of the Most Noble and Illustrious Art of Goldsmiths*, which is preserved in two slightly different versions by MS Parisinus gr. 2327 (ff. 280r–289v) and MS 97 of the Saint Stephen's Monastery at Meteora (ff. 180v–202v).¹² Other collections are attributed to specific authors: the enigmatic figure of Cosmas the *hieromonachos* (lit. 'priestmonk') is credited with a collection of recipes *On Chrysopoia* (i.e. the making of gold), which includes formulas said to have been copied from the works of the ancients (in particular Zosimus of Panopolis) along with four recipes tacitly taken from Psellos' *Letter on the Making of Gold* (on Psellos see later in this chapter);¹³ the philosopher and physician Nikephoros Blemmydes (1197–1272) is presented as the author of a short recipe book entitled *On Egg-chrysopoia* (*ōchrysopoia*, i.e. making of gold through egg-based dyeing drugs) that focuses on the distillation of eggs.¹⁴

The earliest witness of Blemmydes' alchemical work is MS Parisinus gr. 2509 (ff. 137r–140v; fifteenth century), which mainly hands down astrological works.¹⁵ As already pointed out, collections of alchemical recipes, in fact, are also included in multi-text manuscripts that combine writings pertaining to different fields. Particularly rich in this respect are MSS Parisinus gr. 2419 and Holkhamicus gr. 109, both dating to the fifteenth century, which combine medical, astrological, and magical texts with two collections of alchemical recipes that partially overlap.¹⁶ These collections are all the more interesting since they feature recipes that depend on Latin

¹² Greek text edited in Berthelot and Ruelle (1887–8) II.321–37. On the two versions of this recipe book see Martelli (2018: 109–17).

¹³ The title reads: 'ἐρμηνεία τῆς ἐπιστήμης τῆς χρυσοποιίας ἱερομονάχου τοῦ Κοσμά' ('Explanation of the science of the making of gold, by the *hieromonachos* Cosmas'), ed. Colinet (2010) 66–76.

¹⁴ Text edited in Steiner (2022) 436–41. Blemmydes is also credited with a collection of alchemical excerpts attributed to Hermes, Democritus, Aristotle, and Cleopatra. However, only the title of this work is transmitted by MS Atheniensis EBE 1070, f. 224r (thirteenth–fourteenth century; see *CMAG* V.149): 'τοῦ σοφωτάτου καὶ πολυμαθεστά[του] Βλιμμιδ[ου] παρεκβο[λαί] ἐκ τῶν Ἑρμοῦ καὶ Δημοκρίτου. Ἀριστοτέ[λους] τε καὶ Κλεοπάτρας χρυσοουργιῶν. σαφῆν[ε]ι[α] καλλίστη καὶ θαυμασία'. I warmly thank Vangelis Koutalis for providing me with a digital copy of the manuscript.

¹⁵ *CMAG* I.131–2.

¹⁶ The two recipe books are edited in Colinet (2010) 1–64. For a description of the two manuscripts see *ibid.*

sources, which were probably translated into Greek during the Palaiologan period.¹⁷

All these manuscripts are witnesses to a widespread interest towards a rich array of technical texts: despite their different origins and multilingual sources, these formulas and procedures were considered pieces of a long-lasting tradition that could accommodate recent collectors of recipes along with the mythical fathers of alchemy.

11.2 Isis, Orpheus, and Cleopatra: Late Byzantine Alchemy in Disguise

Parisinus gr. 2314 manuscript is a composite codex assembled by joining formerly independent codicological units – that is, a quire or a discrete number of quires written by different copyists which originally were not meant to be bound together. Texts of different genres are collected in the manuscript, such as a long monolingual lexicon of Greek words (ff. 167r–269v),¹⁸ commentaries on the works of Church Fathers (ff. 289r–317v), and an anonymous treatise, *On the Mystery of the Alphabet* (ff. 323r–343v).¹⁹ The first part (ff. 1r–166v; fourteenth–fifteenth century) is mainly medical and preserves extended excerpts from a large therapeutic book in at least eight tomes,²⁰ which includes a rich selection of recipes (at f. 1r the first formula recorded is for an eye salve attributed to a certain Maximianos). In this part we also find the third *recensio* of the Byzantine handbook on regimen usually referred to as Hierophilus' *Dietary Calendar* (ff. 87r–93v, line 10)²¹ along with an anonymous synopsis on pulses (ff. 93v, line 10–97r). More importantly for our inquiry, folia 274r–278v – an

¹⁷ See Colinet (2010: XLVII–CIV).

¹⁸ We must note that f. 199 (written by another hand who copied medical recipes) does not belong to this unit and that many folia in this section are misplaced. The Parisinus MS also preserves two medical lexica of plants at ff. 280r, line 10–281v, line 33 and ff. 283r, line 1–288r, line 12, respectively edited in Delatte (1927–39) II.450–4 and 331–9.

¹⁹ This last text is edited in Bandt (2007) 101–205. On this Parisinus MS see pages 90–1; the codex was described by Omont (1888: 235).

²⁰ At f. 11r, line 10 the incipit of the third tome is recorded ('Ἀρχὴ τοῦ τρίτου τόμου'), followed by its table of contents (with 35 chapters); at ff. 45r, line 16–50v, line 5, we find a detailed table of contents of the sixth tome ('κεφάλαια τοῦ ἕκτου τόμου', including 155 chapters), whose incipit is recorded at f. 50v, line 6 ('Ἀρχὴ τοῦ 6^{ου} τόμου'); at f. 123v, line 10 we read 'Beginning of the second tome' ('Ἀρχὴ τοῦ δευτέρου τόμου'), but at f. 127r, line 10 we have 'End of the third tome' ('τέλος τοῦ 3^{ου} τόμου'), followed by the incipit 'Chapter(s) of the fourth tome' ('κεφάλαιον τοῦ τετάρτου τόμου'). The last folium of this part (166r–v) lists the chapters of the eighth tome ('κεφάλαια τοῦ ὀγδόου τόμου'). Some folia are clearly missing or misplaced.

²¹ See ed. Romano (1999). The third recension of this Byzantine calendar on regimen was edited by Delatte (1927–39) II.455–66. On this text see also Delacenserie (2014).

independent codicological unit dating to the fourteenth–fifteenth century – preserves a remarkable alchemical recipe book that, though known to seventeenth-century scholars, has not attracted the interest of modern philologists or historians of Byzantine science.²² This short collection of recipes is here edited and translated for the first time (see the chapter's appendix).

The recipe book was mentioned by the French philologist Charles du Fresne du Cange (1610–88) in his lexicon of medieval Greek, where it is referred to as 'Orpheus' and Cleopatra's (al)chemical book' (*Liber chymicus Orphei & Cleopatrae*).²³ Du Cange's Latin description clearly mirrors the heading that introduces the alchemical text in the Paris manuscript (f. 274r, lines 1–2): 'Findings from the alchemical book on the making of gold by Isis (?), Orpheus and Cleopatra'. However, in Du Cange's scanty references to our text, only Orpheus and Cleopatra are mentioned, while the name of Isis is left aside. Indeed, the presence of the Egyptian goddess in the title is uncertain since, instead of her name (*Isis* ^{Ἰσις} or *Isidos* ^{Ἰσιδος} at the genitive), we read the rather obscure form *khryth* (χρύθ) in the manuscript. The term is a *hapax* which does not occur in other classical or Byzantine texts. Perhaps in order to cope with this difficulty, the copyist wrote *mouh* (μουῦθ) in the margin, which might be interpreted as an attempt to explain or correct the otherwise unintelligible term occurring in the title. The form *mouh*, in fact, surprisingly corresponds to one of the Egyptian names that Plutarch attributed to Isis in his treatise *On Isis and Osiris* (56, 374B3–8):

Isis is sometimes named *Mouth* and sometimes *Athyri* and *Methyer*. The first name means 'mother', the second 'the cosmic house of Horus', or as Plato also says (*Tim.* 52D–53A), 'the place and receptacle of creation'; the third is a compound of 'full' and 'good' etc.²⁴

The name *mouh* (from the ancient Egyptian *mw*, 'mother') does not occur in any alchemical treatise,²⁵ so the proposed identification remains a tentative hypothesis. We must observe, however, that Isis does appear as the author of an alchemical recipe book in other late Byzantine

²² This recipe book was not included in Berthelot and Ruelle's (1887–8) pioneering edition of the Greek alchemical writings; it has been mentioned, however, by Lebègue in *CMAG* I.130.

²³ See Du Cange (1688) I.197, s.v. βίσισιον; II.1333, s.v. σαραντάρι; II.168, s.v. σατουνίτζιν.

²⁴ Translation by Gwyn Griffiths (1970: 209). On the Egyptian terms used by Plutarch see Gwyn Griffiths (1970: 101–10) and Froidefond (1988: 305).

²⁵ We must note, however, that, according to the *Chronography* of Synkellos, ed. Mosshammer (1984) 14.5, a treatise attributed to Zosimos of Panopolis was entitled *Imouh* (Ἰμουῦθ), usually interpreted as a Greek transcription of Imhotep: see Mertens (1995: XCIII–XCVI).

manuscripts, such as MS Parisinus gr. 2327 (ff. 256r, line 12–258r, line 16), where she delivers to her son Horus a set of procedures described as secret instructions for the ‘preparation of gold and silver’ (*kataskewē chrysou kai argyrou*).²⁶

A fictional Egyptian framework for our recipe book handed down in MS Parisinus gr. 2314 is confirmed by the other two figures mentioned in its title: Orpheus and Cleopatra. The Ptolemaic queen Cleopatra, renown for her expertise in fields such as cosmetics and gynaecology,²⁷ was also credited with at least two technical writings included in Byzantine alchemical collections: a short text, *On Weights and Measures*, which largely overlaps with the tenth chapter of a longer treatise on the same topic attributed to Galen;²⁸ an alchemical dialogue with the ‘philosophers’ (i.e. the alchemists), among whom the Persian magus Ostanēs, alleged master of Democritus, stands out.²⁹ On the other hand, Orpheus’ alchemical expertise is confirmed by a short text that a few fifteenth-century manuscripts transmit under the title of ‘Agathodaimon’s collection (?) and commentary on the oracle of Orpheus’.³⁰ This short exegetical work is interestingly presented as a letter that the mythical Agathodaimon addressed to the Egyptian god Osiris, Isis’ husband and father of Horus. Moreover, its Egyptian setting is further confirmed by other details scattered through the text: Memphis is mentioned as the place where Agathodaimon was at work, where two Egyptian months (*mechir* and *pharmouthi*)³¹ represent the best moment to carry on the preliminary treatment of the ores used for the dyeing procedures. Orpheus is here presented as the author of an alchemical oracle (*chrēsmos*) that, despite its emphasis on making gold, was actually devoted to making silver as well. Agathodaimon explains, in fact, that both yellowing (i.e. how to make base metals yellow and thus transform them into gold) and whitening (i.e. how

²⁶ See ed. Berthelot and Ruelle (1887–8) II.28–33. See also Martelli (2014: 8–9).

²⁷ See, for instance, Marasco (1998) and Totelin (2017: 114–18).

²⁸ Cleopatra’s text is edited in Hultsch (1864) I.253–7; Ps-Galen’s text in Kühn (1821–33) XIX.748–81. See Martelli (2019b: 578–80).

²⁹ Greek text edited in Reitzenstein (1919: 14–20). We must note that another alchemical text, usually referred to as the *Teaching of the Philosopher Komarios to Cleopatra*, features the Egyptian queen as a main character: see Reitzenstein (1919: 23–5) and Lagercrantz (1934: 400–3).

³⁰ See ed. Berthelot and Ruelle (1887–8) II.268–71. The title reads: ‘Ἀγαθοδαίμων, εἰς τὸν χρῆσμον Ὀρφέως συναγωγὴ καὶ ὑπόμνημα’. The earliest witness of this short text is MS Parisinus gr. 2327, ff. 262r–264r.

³¹ Memphis is mentioned in Berthelot and Ruelle (1887–8), II.268.8; the two Egyptian months (‘μεχίρ’ and ‘φάρμουθί’) in II.270.3. These months are also referred to by the alchemist Olympiodorus in his commentary on Zosimus’ alchemical work: see, for example, Berthelot and Ruelle (1887–8) II.69.15 and 72.1.

to whiten base metals and transform them into silver) were dealt with by Orpheus.

Both dyeing procedures are explored in the recipe book of MS Parisinus gr. 2314, which is divided in two parts, each including five recipes. In fact, despite the explicit mention of *chrysopoia* ('the making of gold') in the title, only the second part, introduced by the subtitle 'On Gold' (*Peri chrysou*), is devoted to this topic. The first part, on the contrary, deals with the making of silver, which is referred to at the end of each recipe included in this section. This gives to our text a clear-cut structure, different from other late Byzantine alchemical recipe books, such as the aforementioned 'Explanation of the most noble and illustrious art of goldsmiths', which tends to accumulate a larger number of recipes without organising them according to transparent criteria. In a way, the recipe book ascribed to Isis, Orpheus, and Cleopatra is closer in structure to the earliest alchemical works, such as Pseudo-Democritus' four books on dyeing: the first book, in fact, was entirely devoted to the making of gold, and the second to the making of silver. Our recipe book reverses this order, starting from the less precious metal. A certain debate on the correct sequence of the alchemical procedures and their description in alchemical writings already emerges in late antique authors, such as in Synesius' commentary on Pseudo-Democritus' alchemical work (fourth century). Framed as a dialogue between the master Synesius and his pupil Dioscorus (a priest of the *Serapeion* in Alexandria), the work features the following discussion:

(DIOSCORUS) . . . What is the first operation of the Art, whitening or yellowing?
 SYNESIUS. Whitening, to be sure.
 DIOSCORUS. So why did he (i.e. Democritus) first speak about yellowing?
 (SYNESIUS) Because gold is more valued than silver.
 (DIOSCORUS) So must we work following this order, Synesius?
 (SYNESIUS) No, Dioscorus, but he (i.e. Democritus) chose this order with the intent of training our mind and intellect etc.³²

Pseudo-Democritus decided to open his work by dealing with the most precious metal, namely gold. However, according to a correct understanding of the alchemical art, any practitioner was expected to start with the making of silver (by whitening base metals), and then to change it into gold (by dyeing silver yellow). This whitening-yellowing sequence is classical, so to speak, and was encapsulated in a short precept attributed to the mythical Agathodaimon in MS Marcianus gr. 299 (f. 95v): 'after purifying,

³² See Synesius alch., *Notes on Democritus' Book*, 8, in ed. Martelli (2013) 132.7–8.

blackening and, at last, whitening copper, then there will be a stable yellowing'.³³ This 'rule' was often repeated, with slight variations, by Byzantine authors, such as Stephanos of Alexandria and the philosopher Christianos,³⁴ and it seems to have been followed by the compiler of our recipe book ascribed to Isis, Orpheus, and Cleopatra.

On the other hand, if these elements anchor our short text to an ancient and well-established tradition, the language of the recipes, in terms of grammar, syntax, and nomenclature, clearly points to a quite later date of composition. Our recipe book, indeed, is quite similar to the aforementioned late Byzantine alchemical compendia, such as the collections included in MSS Parisinus gr. 2419 and Holkhamicus gr. 109 recently edited by Colinet (2010).³⁵ Moreover, the described procedures sometimes also overlap. For instance, our compendium ascribed to Isis, Orpheus, and Cleopatra is opened by a recipe on the making of silver, which makes use of a specific device: the dyeing substances are put in a closed vessel that has been pierced on the top; the vessel is set on fire and a metal knife covers the hole so the alchemist can check the state of the 'reaction' by looking at the chromatic transformations of the knife exposed to the vapours of the dying ingredients (especially mercury). The same technique is described in a recipe of Cosmas' *On Chrysopoia*, which is preserved in two slightly different versions in Byzantine manuscripts.³⁶ Furthermore, the recipe book handed down in MS Holkhamicus gr. 109 prescribes squill to dye copper:³⁷ likewise, in our text ascribed to Isis, Orpheus, and Cleopatra, the same ingredient is used to treat tin (rec. 2). Among plants, our recipe book also mentions laserwort (*silphion*; rec. 5 and 8), which rarely enters alchemical procedures. Other techniques, on the other hand, involve various minerals as main dyeing ingredients that were added to different melted metals.

After the last recipe on the making of gold, a second contemporary copyist added a detailed description of how to prepare a *glykysma*, a kind of dessert or cake, in our case prepared with green walnuts and honey as its main ingredients. The recipe seems to respond to a purely gastronomical

³³ See ed. Berthelot and Ruelle (1887–8) II.115.7–8: 'Μετὰ τὴν τοῦ χαλκοῦ ἐξίωσις καὶ μέλανσιν καὶ εἰς ὕστερον λεύκωσις, τότε ἔσται βεβαία ξάνθωσις.'

³⁴ See Stephanos alch., *The Great Art*, 2.68–9, in ed. Papanthassiou (2017) 163.9–10; for Christianos, *On Chrysopoia* see ed. Berthelot and Ruelle (1887–8) II.417.21–2. On the still debated chronology of Christianos see Letrouit (1995: 62) and Martelli (2019a: 11–12).

³⁵ Specific terms and grammatical/syntactical features are discussed in the footnotes to the Greek text and translation in the appendix.

³⁶ See Cosmas, *On Chrysopoia*, rec. 10, in ed. Colinet (2010) 71–4.

³⁷ See Rec. H2, in ed. Colinet (2010) 21–2 (see note 51).

interest and its inclusion in the recipe book is difficult to account for apart from the traditional links between alchemical practices and cooking techniques.³⁸ If we take into account the second recipe of the section on silver making, the use of sea squills to be filled in was probably known in Byzantine kitchens (where, however, we may presume that minerals and metals were not the usual filling!). However, this recipe with walnuts, the *glykysma*, is not included in other (published) Byzantine sources, such as the *Geoponika* or dietary treatises approaching food from a medical perspective. On the other hand, we must observe that different types of *glykysma* feature prominently in the medical dispensatory of Demetrios Pepagomenos,³⁹ physician of Manuel II Palaiologos (1391–1425) and copyist of MS Parisinus gr. 2256, a massive anthology of medical texts including, among others, works by Hippocrates, Aetios of Amida, and John Zacharias Aktouarios.⁴⁰

11.3 Medicine and ‘Chemistry’: Cross-Contamination in Manuscripts

The Parisinus gr. 2256 manuscript does not include alchemical sections. Technical recipes, on the contrary, are embedded in an almost contemporary medical manuscript, MS Bononiensis 1808 (fourteenth–early fifteenth century),⁴¹ which belonged to another physician working at the court of Manuel II Palaiologos: Nikephoros Doukas Palaiologos Malakes. His exchange of letters with Manuel Holobolos, court secretary of the emperor, closes the satirical dialogue usually referred to as *Mazaris’ Journey to Hades* (AD 1414–15), where Demetrios Pepagomenos is mentioned as well, mocked as a ‘certified killer’.⁴² Nikephoros Malakes signed folio 301r of the Bologna manuscript and left a few scattered marginal

³⁸ See, for example, Leontsini and Merianos (2016: 215–22).

³⁹ See Demetrios Papagomenos, *Medical Dispensatory* (*recensio L*), chapters 21, 32, 45, 74–5, 78, 103, and so forth, in ed. Capone Ciollaro (2003) 54–6, 59, 66–8, 75, and so forth. On the interrelationship between food and medicines with a focus on Arabic cookbooks and pharmacopoeias see Chipman (Chapter 10) in this volume. In Byzantine medical recipe books the term ‘γλυκύσματ’ is also used for sweet pharmaceutical dosage forms, usually potions (the equivalent Greek term for the Arabic *أجوارشن* *jawārishn*). See Bouras-Vallianatos (2021: 1000, n. 188). I thank Petros Bouras-Vallianatos for pointing this meaning out to me.

⁴⁰ *RGK II*, n. 133. On Demetrios Pepagomenos see also Lazaris (2006: 252–6).

⁴¹ This massive pharmacological compendium has not attracted the attention of many scholars since Alessandro Olivieri described it: see Olivieri and Festa (1895: 389–96); De Gregorio (2019: 252–3).

⁴² *Mazaris’ Journey to Hades*, ed. Barry, Share, Smithies, and Westerink (1975) 40.23–4 (see also 34.26). On the satire against doctors in this text see Garland (2007: 199–200). The identification of Mazaris has been much debated; Krallis (2016: 90–1) has recently argued that Nikephoros Malakes himself might have been the real author of the dialogue.

notes:⁴³ in particular, at folio 54r, he both wrote ‘with saffron, galbanum’ (upper margin) and copied (right margin) a recipe that already occurs in a section on saffron-based medicines of Aetios’ medical encyclopaedia, book 12 (chap. 27).⁴⁴

Aetios of Amida (sixth century) indeed represents an important source of the pharmacological collection handed down in the Bologna manuscript,⁴⁵ which also includes excerpts from later medical writings, such as the epitomes of a dispensatory (*De remediis*; ff. 1r–4v) and of a handbook on therapeutics (*De curatione morborum*; f. 69r–v), both compiled by the Byzantine physician Theophanes Chrysobalantes (tenth century).⁴⁶ Sandwiched between a lexicon of plants (ff. 38r–41v)⁴⁷ and a treatise on weights and measures (ff. 63v, line 7–66r), folia 42r–63v transmit hundreds of recipes that also feature the description of ten procedures for making metallic, black, and coloured inks, a field of expertise often associated with alchemy in the many premodern collections preserved in different languages (Greek, Syriac, Latin).⁴⁸ This section of the Bologna manuscript is mainly medical. It is opened by three recipes of medicinal ‘salts’ (f. 42r, line 1–42v, line 19), some of which also occur in various manuscripts of book 9 of Aetios’ encyclopaedia; at the end, a section is devoted to digestive medicines.⁴⁹ However, these recipes were not included in Zervos’ edition of Aetios’ book, where we only find a short reference to ‘salts’ (*halatia*) at the very end of chapter 24: ‘It (i.e. an oxymel-based medicine) is suitable for

⁴³ See MS Bononiensis 1808, f. 301r (upper margin): ‘† νίκηφόρος δούκας ὁ μαλάκης’ (*Nikephoros Doukas ho Malakēs*); see Cataldi Palau (2010: 370, n. 15). In the same folium Nikephoros also wrote a cursive sigma inscribed in an omicron, perhaps a kind of ex-libris. On Nikephoros Doukas Malakes see *PLP* VII, n. 16454.

⁴⁴ See MS Bononiensis 1808, f. 54r (upper margin): ‘† τὸ διὰ κρόκου· χαλβάνης’; (right margin): ‘κρόκ(ου) < 1ς’, ἀμμωνιακοῦ θυμαμάτου < μη’, κηροῦ < 2ς’, πίσης ξηρᾶς < φος’, ἐλαίου ῥοδίνου < μη’, ὄξους λευκοῦ δριμυτάτ(ου) κοτύλ(ας) α’’, (‘saffron, 36 drachmae; incense of ammoniac gum, 48 drachmae; wax, 96 drachmae; dry pitch, 576 drachmae; rose oil, 48 drachmae, very sharp white vinegar, 1 *kotylae*’). See Aetios of Amida, *Medical Books*, 12.27, 33–8, in ed. Kostomoiris (1892) 51.10–14. Marginal notes by Nikephoros also occur at folios 209r and 332v.

⁴⁵ For instance, at f. 61r, we read the heading: ‘Various medical treatments from Aetios’ medical book’ (‘Ἐκ τῆς ἱατρικῆς βίβλου τοῦ αἰτίου ἱατρῆται διάφοροι’). Excerpts from Aetios have been detected in Olivieri and Festa (1895: 389–96).

⁴⁶ Sonderkamp (1987: 90–1). On the relationships between Aetios’ medical books and Theophanes’ writings see Capone Ciollaro and Galli Calderini (1999). On *De remediis* see also Felici (1981–2).

⁴⁷ See Touwaide (1999: 215). For other examples of similar dictionaries of *materia medica* see Delatte (1927–39): II.272–454, and Bouras-Vallianatos (2018) with further up-to-date bibliography.

⁴⁸ The recipes of inks have been recorded by Zuretti in *CMAG* II.143–4.

⁴⁹ For instance, MS Laur. Plut. 75.2 (ff. 32v–33r, twelfth century) hands down recipes of salts attributed to King Ptolemy and to Iamblichus along with the formula of the ‘twelve gods’ salt; this selection is expanded in MS Parisinus suppl. gr. 631 (f. 133r–133v, fourteenth century), which adds salts attributed to the apostle Luke and the prophet Elijah. I owe this information to Dr Irene Calà, whom I warmly thank for her help. On Luke’s salt see Ideler (1841: I.297).

such cases, as well as the great remedy that lasts for years, Archigenes' remedies with citron and wine from Skybela, and the salts, whose preparations will be explained in a moment.⁵⁰

Then the Bologna manuscript describes a medical treatment for those who have accidentally swallowed gold, copper, iron, or similar substances (f. 43r, line 1–43v, line 2), who were prescribed to take evacuating drugs according to the instructions of the physician Antyllos (second century AD). In all likelihood, the text is taken from Aetios' book 9, chapter 42, where the Byzantine physician deals with the same topic.⁵¹ Aetios' *Medical Books* also represent the main source for the next recipes on the uses of various medicinal plants (ff. 43v, line 2–46r, line 19).⁵²

Two recipes on silver writing – that is, on the making of silver inks prepared either with or without the precious metal – seamlessly follow the aforementioned medical prescriptions:

f. 46v, lines 1–4: Περὶ ἀργυρογραφίας. Ἀργυρογραφίας ἐπιστήμη· λαβὼν ῥίνισμα ἀργύρου, τρίψον μετὰ ὕδραργύρου εἰς θυϊαν ψήφινον· καὶ μίξας κόμμι ἀρκοῦν γράφε.

On writing in silver letters. Explication of how to write in silver letters. Take silver filings and grind with mercury in a marble mortar; then mix enough Arabic gum and write.

f. 46v, lines 4–6: Ἀργυρογραφίας ἐπιστήμη. Τοῦ μολίβδου τὸ ἀπόκαυμα λαβὼν ὡοῦ τὸ λευκὸν (λεπτὸν cod.) βρέξας καὶ τρίψας γράφε.

Explication of how to write in silver letters. Take calcined lead, wet with egg white and grind, then write.

Recipes on the making of metallic inks are scattered through Byzantine manuscripts, especially recipes on chrysography.⁵³ Less frequent are formulas for the preparation of silver inks (argyroglyphy), which often occur in collections traditionally linked to alchemy, in particular the so-called *Leiden papyrus* (third–fourth century AD), the *Mappae clavicula* identified with the Latin translation of a (lost) Greek alchemical recipe book, and the collection of recipes that opens the Syriac alchemical manuscript Mm. 6.29

⁵⁰ See Aetios of Amida, *Medical Books*, 9.24.114–17, in ed. Zervos (1911) 324.32–325.3: ‘Ἐπιτήθειον δὲ ἔστι τοῖς τοιοῦτοις, τὸ τε μέγα πολυετές καὶ τὸ διὰ κιτρίου καὶ τὸ διὰ σκυβελίτου Ἀρχιγένους καὶ τὰ ἀλάτια, αἱ δὲ συνθέσεις αὐτῶν μετ’ οὐ πολὺ ῥηθῆσονται.’

⁵¹ See Aetios of Amida, *Medical Books*, 9.42.282–93, in ed. Zervos (1911) 387.6–18.

⁵² The recipes are taken from Aetios of Amida, *Medical Books*, 3.19 (‘Ἰσχαμιον’); 3.22 (‘Περὶ βδελλῶν’); 1.89 (‘Δάφνης κτλ.’); 1.145 (‘ἔρεβινθος’) and 1.146 (‘ἔρπυλλος’). See ed. Olivieri (1935–50) I.276.3–8; I.277.19–29; I.51.16–20; I.71.23–72.19.

⁵³ See Alexander (1964); Schreiner and Oltrogge (2011).

(fifteenth century, Cambridge University Library).⁵⁴ In this last witness a recipe points to the close link between silver and golden inks: in order to write with silver letters, it prescribes mixing silver filings with mercury and proceeding as has been already explained for gold.⁵⁵ The addition of mercury probably facilitated the grinding of the silver, which then was to be mixed with a glue such as Arabic gum. The use of lead, on the contrary, seems less frequent in Latin and Syriac sources, where tin is rather preferred.⁵⁶ In one case, lead is melted with tin: the alloy is then ground and mixed with a glue.⁵⁷

After these two technical recipes we have a section entitled *On Husbandmen* (*Peri gēponōn*; ff. 46v, line 7–47r), which includes the description of four methods to farm and treat grapevines (*ampelos*) as well as a section on how to protect them against grasshoppers (*akrides*). If these texts pertain to agriculture, medicine is again the main interest of the next recipes, which are grouped in short paragraphs, each introduced by general headings loosely arranged in alphabetical order: a group of three recipes *On Scurf* (*Peri achōras*, f. 47r, line 15–47v, line 3) opens the section, which is closed by four recipes on chrysography (f. 54v, lines 1–14): golden inks are prepared by grinding various metals (iron, lead, electrum) and minerals (mainly orpiment). Then come chapters on hunting and fishing (ff. 54v, line 15–56r, line 13): apples filled with soda (sodium carbonate), for instance, are used to hunt boars and deer. Among these texts we also find a recipe on how to prepare a black paint (f. 56r, line 13–56v).⁵⁸ Finally, after a few chapters on various animals (e.g. bees or mice) and many medical recipes, folio 62 features recipes on chrysography as well as the preparation of yellow vegetal paints (*barzion*) and red paints (*lacha*).⁵⁹

A certain interest in practical applications of the properties of natural substances seems to hold together all these short texts and recipes dealing with an intriguing variety of subjects, from medicine to agriculture, from hunting to ink and paint making. A compilation that somehow reminds of

⁵⁴ See *Leiden papyrus*, rec. 60, 77, in ed. Halleux (1981) 99, 102; see also *Mappae clavicula*, rec. 82–3, 103–9, in ed. Baroni, Pizzigoni, and Travaglio (2013) 132–4, 146–9. On the origins of *Mappae clavicula* see Halleux and Meyvaert (1987); Syriac collection, rec. 24–8 (unedited), partially translated in Berthelot and Duval (1893) 207.

⁵⁵ Mm. 6.29, f. 8v.

⁵⁶ See *Mappae clavicula*, rec. 83, 103, 108, in ed. Baroni, Pizzigoni, and Travaglio (2013) 134.

⁵⁷ See *Mappae clavicula*, rec. 109, in ed. Baroni, Pizzigoni, and Travaglio (2013) 148.

⁵⁸ See also Schreiner and Oltrogge (2011: 43).

⁵⁹ The recipes on *lacha* (λαχᾶ) have been edited in Benedetti (2014: 452–4).

Iulius Africanus' *Cesti*, which combined chemistry, agriculture, medicine, and warfare and gained great popularity in Byzantium.⁶⁰

On the other hand, sometimes medical recipes were also copied in manuscripts mainly devoted to alchemy. This is the case with MS Vaticanus gr. 1174 (fourteenth–fifteenth century), which transmits a rich anthology of alchemical texts.⁶¹ Indeed, on folio 49v (left blank by the first copyist), a second scribe interestingly combined a short alchemical recipe book with the formula for a medicinal salt:

Περὶ κιμίας κατασκευή.

Ἴνα ποιήσης ἄργυρον (C cod.). Λαβὼν ὑδράργυρον ὅσον βούλ(ει) καὶ θεῖον ἄπυρον τὸ ἴσον βάλε αὐτὰ εἰς ἄγγειον χων(ίον) καὶ θές εἰς πῦρ πραέον ὅσον τὴν θέρμην τοῦ ἡλίου (D cod.) καὶ σάλευε αὐτὸ συχνάκις καὶ μετὰ τὸ λαβεῖν τῆς ἐνώσεως τὴν πῆξιν καὶ στεγνώσαι, λαγάρισον αὐτὸ μετὰ τοῦ μολίβδου, καὶ γίνεται ἄργυρος (C cod.) λαμπρός. Καὶ ἔαν ἔστι σκληρὸς καὶ θέλεις μαλακίσαι, ῥίψον εἰς τὸ χων(ίον) χάλκανθον Ἀλεξανδρινόν.

Εἰς τὸ ποιῆσαι χρυσόν (D cod.) λευκόν· θεῖον ἄπυρον πότισον μετὰ ἐλαίου ἐρυθροῦ τῶν ὠῶν καὶ ποιήσον αὐτὸ κατὰ τοὺς (τάς s.l.) ἄνωθεν διδασκαλίας καὶ ποιήσον χρυσόν (D cod.) λαμπρόν.

Εἰ δὲ βούλει ποιῆσαι τὸν χρυσόν (D cod.) τὸν κοινὸν ἐρυθρόν· τρίψον ὄστρακον ἐρυθρόν καὶ βράσον μετὰ ὕδατος τοῦτον καὶ λαμπρυνθήσεται.

Ἐὰν δὲ καὶ τὴν σελήνην (C cod.) τὴν νοθευομένην βούλει λαμπρῦναι καὶ γενέσθαι σελήνην (C cod.) εἶδος καθαροῦ, τρίψον στύψιν καὶ σὺν ὕδατι βράσον, καὶ λευκανθήσεται ὁ κίβδηλος.⁶²

Σκευασία ἄλατος σκευασθεῖσα ὑπὸ τοῦ ἀγίου Γρηγορ(ίου) τοῦ θεολόγου.

Ἰσώπου Κρητικοῦ οὐγγίας δ', σκαμμωνίας οὐγγίαν α' καὶ ἡμισυ, ἀμμωνιακοῦ οὐγγίας β', κυμίνου, σκίλλης, ζιγγιβέρεως, πεπέρεως, σελίνου, ἀνὰ οὐγγίαν α', γλήχωνος ὀρεινοῦ οὐγγίας γ', σμύρνης, σιλφίου οὐγγίαν α', ἄλατος κοινοῦ οὐγγίαν α', φύλλ(ου) οὐγγίας γ'.

On the preparation of alchemy.

In order to make silver. Take as much mercury as you want and unburnt sulphur, the same quantity, put them in a vessel, [i.e.] a crucible, and set on a gentle fire as warm as the heat of the sun and stir it often; after reaching the solidification of the mixture and letting it get dry, purify it with lead and it will become shining silver. If it is hard and you want to soften it, throw Alexandrian vitriol in the crucible.

To make gold white. Moisten the unburnt sulphur with red oil of eggs and proceed according to the instructions given above; make gold shining.

⁶⁰ For a recent analysis of the extant fragments of the *Cesti*, edited and translated, see Wallraff, Scardino, Mecella, and Guignard (2012).

⁶¹ See *CMAG* II.61–8; Colinet (2010: CXXXIV); Martelli (2011: 46–54).

⁶² A preliminary transcription of these alchemical recipes is provided by Heiberg in *CMAG* II.332.

If you want to make the common gold red, grind a red potsherd, boil it in water and it will be polished.

If you want to polish the adulterated silver [lit. moon] so that the silver becomes a kind of pure (silver), grind alum, boil with water, and the adulterated coin will become white.

Preparation of the salt prepared by Saint Gregory the Theologian.

Cretan hyssop, 4 unciae; scammony, 1 uncia and a half; ammoniac salt, 2 unciae; cumin, squill, ginger, pepper, celery, 1 uncia each; pennyroyal of the mountains, 3 unciae; myrrh, laserwort, 1 uncia (each); common salt, 1 uncia; dog's mercury, 3 unciae.

The first four recipes are mainly metallurgical and describe the treatment of various metals which were dyed with different ingredients. The text is opened by a short description on how to combine mercury and sulphur to make artificial cinnabar, a technique that was quite popular in Byzantium.⁶³ Pseudo-Democritus' alchemical book *On the Making of Gold* also includes a clear reference to how to solidify mercury and use it to make metals white and yellow.⁶⁴

Then the scribe added the formula for a medicinal salt. A similar recipe was already edited by Ideler⁶⁵ and is included in the first book of the *Dynameron*, an influential handbook of pharmaceutics by the Byzantine medical author Nicholas Myrepsos (fourteenth century).⁶⁶ The first book is divided into four sections describing uses and preparations of four types of remedies, whose names begin with the letter alpha. The section on 'salts' (*halatia*) features the recipe of Gregory the Theologian's *halation*, which is introduced by a short description of its medical applications: it was mainly used to treat eye diseases, preventing ophthalmia until old age and sharpening the sight.⁶⁷

Similar recipes, with slight variations in term of ingredients (both in their number and in their order of appearance) are scattered in various Byzantine manuscripts dating to between the fifteenth and sixteenth centuries, in particular therapeutic handbooks (the so-called *iatrosophia*).⁶⁸ Bononiensis 1808 includes Gregory's formula in its section on salts (f. 42r, line 13–42v, line 6); another fifteenth-century manuscript of

⁶³ Colinet (2010: LXXXIII–XCI).

⁶⁴ See Pseudo-Democritus, *On Natural Secrets (Physika kai mystika)*, 5, in ed. Martelli (2013) 86–7.

⁶⁵ Ideler (1841) I.297–8.

⁶⁶ His traditional identification with Nicholas *aktouarios*, a physician working at the court of Emperor John III Vatatzes (1222–54), is uncertain and has been questioned: see Ieraci Bio (2017: 301–2), Valiakos (2019: XLIX–L), and Bouras-Vallianatos (2020: 26, n. 156) with further bibliography.

⁶⁷ See Nicholas Myrepsos, *Dynameron*, 1.2 (*halatia*), rec. 14, in ed. Valiakos (2019) 234.1–12. On the *Dynameron* see Ieraci Bio (2017).

⁶⁸ On *iatrosophia* see Ieraci Bio (1982), Touwaide (2007), Valentino (2016: 15–18), and Zipser (2019).

the Bologna University Library (MS 3632) lists ‘the *halation* of Saint Gregory the Theologian’ as the first recipe of a section on the preparation of salts that features ten different prescriptions.⁶⁹ We also find salts ascribed to King Ptolemy and the apostle Luke.⁷⁰ Likewise, the *iatrosophion* of the Turin MS B.VII.18 (ff. 1r–67r, sixteenth century) includes a ‘salt prepared by the Saint Apostle Luke’ (rec. 250) followed by ‘another salt prepared by Saint Gregory the Theologian’ (rec. 251).⁷¹ Finally, Gregory’s formula was even put into verses in MS.MSL.60 (fifteenth century) held by the Wellcome Library.⁷²

These remedies were used to treat eye problems, and professional groups could also benefit from their applications. In the section on *halatia* Nicholas Myrepsos includes a recipe (n. 17) of a ‘marvellous salt that is used by copyists (*kalligraphoi*), when they become dim-sighted: in fact, it cleanses the vision and makes the sight sharp’.⁷³ It mainly includes the same ingredients mentioned in Saint Gregory the Theologian’s recipe. Moreover, earlier medical sources confirm that some recipes were targeted at specific groups of craftsmen. Goldsmiths, in particular, could benefit from eye salves (*kollyria*), as already emerges from Oribasios’ *To Eunapios* (fourth century AD). This pharmacological handbook describes preparations that are ranked among the easily available remedies or *euporista*: they were made of cheap and common ingredients, which were always at hand for laymen (with a very limited medical training) who, when travelling in the countryside, could not rely on the expertise of professional physicians.⁷⁴ In book 4 (chap. 24), Oribasios provides formulas for compound medicines against eye diseases, among which we also find the recipe of an eye salve called *oxyderkes*, which was particularly suitable for painters (*zōgraphoi*), engravers of gems (*daktyliographoi*), and goldsmiths (*chrysochooi*).⁷⁵

⁶⁹ MS Bononiensis 3632, f. 229r–v. The section is introduced by the general heading (in red ink) ‘On various salts’ (‘Περὶ ἄλατων διαφόρων’) and opened by the recipe of Saint Gregory’s salt (f. 229r–6) with the title (in red ink): ‘ἄλατιον τοῦ ἁγίου Γρηγορίου [sic] τοῦ θεολόγου’.

⁷⁰ MS Bononiensis 3632, f. 229r, lines 6–10 (title in red ink): ‘ἄλατιον ὃ προσήνεγκε Πτολωμαίῳ [sic] ὁ βασιλεὺς’ (‘Salt that was administered by the king Ptolemy’); 229r, lines 10–18 (title in red ink) ‘ἄλατιον τοῦ ἁγίου ἀποστόλου Λουκᾶ ὃ καὶ δωδεκάθεων [sic] λέγεται’ (‘salt of the Saint Apostle Luke, that is also called “of the twelve gods”’).

⁷¹ See Anonymous, *Iatrosophion*, rec. 250, in ed. Valentino (2016) 170. 13–172.2: ‘ἄλατιον σκευασθὲν παρὰ τοῦ ἁγίου ἀποστόλου Λουκᾶ’; rec. 251, in ed. Valentino (2016) 172.3–10: ‘ἕτερον ἄλατιον σκευασθὲν παρὰ τοῦ ἁγίου Γρηγορίου τοῦ Θεολόγου’.

⁷² Bouras-Vallianatos (2015: 293, 295).

⁷³ See Nicholas Myrepsos, *Dynameron*, 1.2 (*halatia*), rec. 17, in ed. Valiakos (2019) 235.3–8.

⁷⁴ See Eijk (2010: 529–32).

⁷⁵ See Oribasios, *Books to Eunapium*, 4.24, 8–11, in ed. Raeder (1926) 447.22–8.

The same formula is included in book 7 of Aetios' medical encyclopaedia, which is mainly devoted to ophthalmology.⁷⁶ In the same book Aetios also provides the recipe of an 'eye-salve called the goldsmith's testament': the medicine is said to have been called after a goldsmith, who, before dying, deposited its formula in the Ephesians' temple in order to help patients left untreated by professional physicians. Then the recipe – Aetios continues – was rediscovered by Emperor Hadrian (AD 76–138).⁷⁷ We cannot rule out that the salt of Saint Gregory the Theologian, as a medicine used to improve vision and prevent eye problems, was also particularly valued by craftsmen working with precious metals. For this reason, it might have been copied in MS Vaticanus gr. 1174 after a short recipe book on metallurgical alchemy.

Conclusion

The sources discussed so far point to a wide circulation of alchemical and technical recipes during the Palaiologan era. Recipe books were usually part of larger compendia of alchemical texts or, in some cases, they were included in less specialised anthologies. Medical or even cooking recipes could sometimes complement alchemical collections, thus revealing entangled trajectories of texts pertaining to various areas of expertise: these experts, indeed, despite the differences of their trade, shared tools, procedures, and habits of hands.

A certain interest in alchemical recipes is already well documented in tenth-century Byzantium, as emerges from the letter on the making of gold that the Byzantine scholar and natural philosopher Michael Psellos (1018–78) addressed to his patron, Michael I Keroularios, Patriarch of Constantinople (1043–59).⁷⁸ Psellos first frames alchemy as a set of techniques that can lead to marvellous achievements (the production of gold, gemstones, glass, and pearls), which, however extraordinary they may be, like natural wonders, do obey the transformations of the four elements.⁷⁹ Then he explicitly claims to narrow the scope of his inquiry to recipes for the making of gold: he collects eleven recipes on this topic, said to

⁷⁶ See Aetios of Amida, *Medical Books*, 7.101,4–14, in ed. Olivieri (1935–50) II.350.22–351.2.

⁷⁷ Aetios of Amida, *Medical Books*, 7.117,53–65, ed. Olivieri (1935–50) II 395.10–396.5. The recipe is introduced by the title 'κολλύριον ἢ διαθήκη ἐπικαλούμενον τοῦ Χρυσοχόου'. See also Nicholas Myrepsos, *Dynameron*, 9.60 (*kollyria*), in ed. Valiakos (2019) 679–80.

⁷⁸ See ed. Bidez (1928) 26–43. See also Albini (1988).

⁷⁹ See Magdalino and Mavroudi (2006: 18); Katsiampoura (2018: 124–7).

summarise all the wisdom of Democritus, one of the founders of the alchemical art.⁸⁰

Without ever severing the bond with the ancient fathers of alchemy, Byzantine alchemical compilers did not avoid exploring more recent and multilingual sources of information. The number of Arabic, Latin, and even Italian loanwords scattered in late recipe books, such as the compendium ascribed to Isis, Orpheus, and Cleopatra discussed in this chapter, best exemplify this tension between tradition and innovation.⁸¹ Along with new terms, substances, and technologies, new texts expanded on the earlier tradition. For instance, an anonymous treatise usually referred to as *Work of the Four Elements* describes a fractional distillation of eggs believed to isolate the four elements.⁸² The described procedures heavily depend on the third book of the so-called *Book of Seventy* attributed to the famous Arabic alchemist Jābir ibn Ḥayyān (eight–ninth century).⁸³ Moreover, recipes based on Latin sources are scattered in alchemical manuscripts,⁸⁴ along with Greek translations of Latin alchemical treatises, such as Albertus Magnus' *Semita recta* and an excerpt from a treatise attributed to Arnaldus de Villanova.⁸⁵ These translations are macroscopic examples of much deeper and thorough influences which left their marks in each single recipe of compendia copied in fourteenth- and fifteenth-century manuscripts. These marks require our full attention as crucial pieces of evidence for the cross-cultural forces that shaped late Byzantine science and technology.

Appendix

Edition and translation of the recipe book in MS Parisinus gr. 2314, ff. 274r–278v

In editing the text, I have tacitly normalised the spelling of various words which feature many orthographical variations between long and short

⁸⁰ See Michael Psellos, *On the Making of Gold*, 14.1–2, in ed. Bidez (1928) 40.6–7.

⁸¹ On the use of terms of ingredients in various languages in the same text see also Käs (Chapter 1), Walker-Meikle (Chapter 3), and Mavroudi (Chapter 4) in the present volume.

⁸² Greek text edited in Berthelot and Ruelle (1887–8) II.337–42 under the general title of ‘Travail de quatre éléments’.

⁸³ See Kraus (1942: 39); Colinet (2000); Roberts (2022: 572–4).

⁸⁴ Colinet (2010: LXXXVII–XCI), for instance, has shown that a recipe on the making of artificial cinnabar edited by Berthelot and Ruelle (1887–8): II.383–4 from MS Parisinus gr. 2327 (f. 332r) depends on Latin sources, perhaps a recipe included in MS Sélestas, Bibliothèque Humaniste, 17 (ff. 24r and 213v).

⁸⁵ On Albertus Magnus' text, preserved in MS Parisinus gr. 2419 (ff. 279r–288v), see Colinet (2010: XV, CV); for Arnaldus' Greek text see Zuretti's transcription in *CMAG* V.95–6. On Albertus Magnus see also Rinotas (Chapter 12) in this volume.

vowels (e.g. *ο/ω* and *η/ε*) or vowels and diphthongs that had the same pronunciation (*η/υ/ι/ει*, *αι/ε*). For instance, the copyist writes ‘ἀσίμην’ for ‘ἀσήμην’, ‘χονεύω’ for ‘χωνεύω’, ‘χρύω’ for ‘χρίω’, and ‘χάλκομαν’ for ‘χάλκωμαν’. When noteworthy, I have recorded the spellings of the manuscript in brackets or discussed them in the footnotes.

[274r] Εὐρεσις (“Εβρεσις cod.) ἐκ τῆς χυμευτικῆς (χυμα- cod.) βίβλου τῆς χρυσοποιΐας τῆς χρύθ (*sic*, *μοῦθ* in marg.) καὶ τοῦ Ὀρφέως καὶ Κλεοπάτρας.

- (1) Λαβῶν ὑδράργυρον ὅσον θέλ(εις) βάλον (βαλλὸν cod.)⁸⁶ τοῦτον εἰς τζουκάλιν καινούργιον ἄθικτον· καὶ πλήρωσον αὐτὴν (i.e. τζουκάλην), τουτέστιν γέμισον ἐλαῖον καθαρὸν· καὶ χρίσον αὐτὴν ἄνωθεν μετὰ πηλοῦ ἄσπρου ὅπου ποιοῦσιν (ποιῶσιν cod.) τὰ χωνία καλὰ. ποιήσον δὲ ἅπάνω τρύπαν μικρὴν ὅσον βελόνην (-ώνιν cod.)· καὶ μετὰ τοῦτο (-ω cod.) σκέπασον ταύτην μετὰ μαχαιρίου ἢ ἐτέρου τινὸς σιδήρου καθαροῦ· καὶ βράσον καλῶς ἕως ἂν καῖ (-εῖ cod.) ὅλον τὸ ἔλαιον· σήκωνε (σίκοναι cod.) γοῦν τὸ σίδηρον καὶ βλέπε αὐτό· καὶ εἰ (ἡ cod.) μὲν ἐξέρχεται ὑγρώτης ποσός, καὶ ὑγραίνεται τὸ σίδηρον, ἄφες αὐτὸ καυθῆναι καλῶς. [274v] ἐπὰν δὲ ἴδῃς (εἶδῃς cod.) <ὄτι> εἶναι λευκός, οἶον (ἦον cod.) ὁ τόπος τοῦ μαχαιρίου ἢ τοῦ σιδήρου, ἐν ᾧ σκεπάζει (-η cod.) τὴν τρύπαν, τότε χρίσον καὶ αὐτὴν τὴν τρύπαν καλῶς ἐκ τοῦ αὐτοῦ πηλοῦ. Καὶ μετ’ ὀλίγον ἄνοιξον καὶ ἔχε τεάφην ἄσπρην τριμμένην καὶ ῥῖψον ἀπέσω· καὶ τάραξον αὐτὴν καλῶς· καὶ ἄφες αὐτὴν, ἵνα κρῶσῃ (κριῶσι cod.) καὶ οὕτως πηγνύει καὶ γίνεται (γύναισται cod.) ἀσήμην.
- (2) Ἄλλο. Κασ<σ>ίτηρον χώννευσον· εἶτα βάψον αὐτὸν εἰς ζουμίν, ὀπτοῦ μορίου καὶ εἰς ὄρον (ὄρος cod.) κυνὸς εἰκοσάκις· εἶτα σχίσας σχέλαν (i.e. σκίλλαν) ὃ ἐστὶν σκιλλοκρόμμιον (σκηλοκρόμιον cod.), ἔνθες ἔνδον αὐτὸ καὶ ἐπάνω μαρκάσιταν τριμ<μ>ένον, καὶ χρίσον (χρύ-cod.) τὴν σχέλαν μετὰ κο<κ>κίνου πηλοῦ, καὶ θές ταύτην εἰς μεγάλην ἀνθρακίαν, κείσθαι (κέεσθαι cod.?) ἡμέρας β’· καὶ εὐρήσεις (-ις cod.) ἀσήμην [275r] πλὴν ἢ ἐπιφάνεια ἔσται μέλαινα· κρούσας δὲ ταύτην μετὰ σφύρας, πεσεῖται τὸ μέλαν· ἔνδον δὲ ἔσται ἀσήμην καθαρὸν.
- (3) Ἔτερον [in marg.]. Νίτρον, ψιμίθιν καὶ γάλα, βράσον ὁμοῦ· εἶτα ἔπαρον σίδηρον καθαρὸν, καὶ βράσον ὁμοῦ καλῶς· καὶ βάψον εἰς τὸ αὐτὸ γάλα, σαραντάκις· εἶτα λαβῶν ἐξ αὐτοῦ ἐξάγιον ἕν, καὶ ἀσήμην καθαρὸν, ἐξάγιον ἕν, χώννευσον ὁμοῦ· καὶ χώννευσον ὁμοῦ καὶ χῦσον, καὶ ἔσται ἀσήμην καθαρὸν.

⁸⁶ The endings of present and second aorist imperatives can be either *-ον* or *-ε*; see Colinet (2010: XXXVII).

- (4) “Ετερον. Λαβών ἀρσενίκιν (-ην cod.) ἀναβασμένον ἐξάγιον ἔν· χάλκωμαν ῥιτισμένον, ἐξάγια ιε’ τρίβε τοῦτο μετὰ λευκοῦ λινελαίου (λυναιλαῖου cod.) καλῶς· καὶ πότιζε ἕως ἐπτάκις· εἶτα χώνευσον (χό- cod.) καὶ χῦσον· καὶ πάλιν χώνευσον καὶ χῦσον· [275ν] ἔνθες (ἐνθῆς cod.) καὶ ἀσήμιν, ἐξάγια ε’· καὶ ἔκτοτε πάλιν τοῦτο χῦσον, εὐρήσεις (εὐρίσις cod.) δοκιμώτατον ἀσήμιν.
- (5) “Ετερον [in marg.]. Σίλφιον, ἀμμωνιακόν (ἀμον- cod.),⁸⁷ χαλβάνην, καὶ ὑάλην βοράχην (βαρά- cod.), ἀνὰ οὐγγίαν μίαν· τρίψον ταῦτα μετ’ ὄξους καὶ λῦσον· καὶ λαβών χάλκωμα Ἰσπανικόν ῥιτισμένον, καὶ τουτίαν, ἀνὰ οὐγγίαν μίαν, καὶ σύκα λιπαρά, ζύμωσον ἅπαντα τὰ ῥηθέντα ὁμοῦ· καὶ βαλὼν ταῦτα ἐν χωνίῳ, σκέπασον αὐτὰ μεθ’ ἐτέρου χωνίου, καὶ χρίσον τὴν ἀρμογὴν αὐτῶν ἐν πηλῶ πυριμάχῳ· εἶτα λαβών ἐξ αὐτοῦ ἐξάγια ε’, καὶ ἀσήμιν καθαρὸν ἐξάγιον ἔν, χώνευσον ὁμοῦ καὶ χῦσον· καὶ ἔσται σοὶ καθαρὸς ἄσημος.

Περὶ χρυσοῦ

- (6) [276r] Ὅξος ἐξάγια ν’, ἀρασοῦκτην, ἐξάγια ιε’, τρίψας καλῶς θές ὁμοῦ ἐν βικίῳ ὑαλίῳ· καὶ θές αὐτὸ εἰς ἥλιον δυνατὸν, ποιήσαι ἡμέρας ἐπτὰ· καὶ τοῦτο τάραττε ἐπτάκις τῆς ἡμέρας· μετὰ τοῦτο ἀνελόμενος, χῶσον αὐτὸ ἐπὶ κοπρέαν ἀλόγων θερμῆν· καὶ ἄς ἐνι (ἀσένι cod.) χωσμένον ἡμέρας (-αν cod.) κα’· καὶ μετὰ τοῦτο ἐκβαλὼν αὐτὸ, λάβε κινάβαριν, οὐγγίας ε’, καὶ τρίβων αὐτὴν πότιζε τοῦ ἐν τῷ βικίῳ κατολίγον, ἕως οὐ πίνει τὸ ὄλον τοῦ βικίου ἐν μίᾳ ἡμέρᾳ· εἶτα φρῦξον τοῦτο ἐπὶ ἥλιον θερμόν, ἀνέμου μὴ πνέοντος· τρίψας οὖν πάλιν ὡς ἄλευρον, ἔνθες ἐπὶ μολιβδίνου ἀγγίου καὶ φύλασσε αὐτὸ· καὶ ὁπότεν θελήσης (ὄποτα -σις cod.) [276ν] ποιήσαι μάλαγμα, λάβε ῥιτισμένον ἄσπρον χάλκωμαν καὶ ἐκ τῆς <σ>κευασίας (κεβα- cod.) ἐξίσου καὶ λύσας, ἔσται σοὶ καθαρὸν.
- (7) “Ετερον. Λαβών σατουνίτζιν (*lege* σαπου- ?), καὶ θεῖον, καὶ ἀρσενίκιν (-ην cod.) κό<κ>κινον, ἀνὰ οὐγγίας β’· ἐμβαλὼν εἰς ἄγγος ὕδωρ καὶ ἔλαιον καθαρὸν, καὶ βράσον ὁμοῦ τὰ ῥηθέντα· εἶτα λαβών ἄργυρον (€ cod.) οὐγγίας β’· πύρωνε⁸⁸ αὐτὸ, καὶ τὸ βάνε⁸⁹ εἰς τὸ βράσμα, καὶ τύπτε μετὰ σφύρας, καὶ οἶ⁹⁰ ἐξ αὐτοῦ πηδῶσαι (πηδοῦ- cod.) λεπίδες· ἀντισταθμήσας, ἔνωσον μαλάγματι ἐξίσου· καὶ λύσας τοῦτο διπλασιάσεις (-σις cod.).

⁸⁷ The MS reads ‘σίλφιον ἀμμωνιακόν· χαλβάνην κτλ.’ with no semicolon between the first two terms; however, I could not find other mentions of an ‘ammoniac laserwort’ in Byzantine literature. I have then interpreted ‘ἀμμωνιακόν’ as a second, distinct ingredient.

⁸⁸ From the Byzantine verb ‘πυρώνω’ (= πυρόω). ⁸⁹ From the Byzantine verb ‘βάνω’ (= βάλλω).

⁹⁰ On this form of the feminine article see Colinet (2010: XXX).

- (8) Ἔτερον. Λαβὼν χάλκωμαν Ἰσπανικὸν ῥιμισμένον, οὐργίας ὄσας θέλεις, καὶ τουτίαν ἴσην (ἦσιν cod.) · ἔτι τε καὶ σῦκα λιπαρά· κοπάνισον αὐτὰ ὑγραίνων (ὑγρένον cod.) τὸ κόπανον ἔλαιον καθαρὸν· ἐὰν (ἦν cod.) κοπανίσας,⁹¹ ἔνωσον μετὰ τῶν σύκων πάντα, καὶ βάλον (-ων cod.) εἰς χωνίον [277Γ] σκεπάσας αὐτὸ καλῶς εἰς τὸ μὴ ἐξατμίζειν (-τμήζην cod.) προσῶς (-ὄς cod.)· ἔνθες οὖν πρῶτον ἐπάνω αὐτῶν καὶ σίλφιον, καὶ χώνευσον· καὶ μετὰ τοῦτο ἐκβαλὼν αὐτό, καθῆς (καθῆν cod.) ἐν ἐτέρῳ χωνίῳ τὸ χωνευόμενον (χονεβό- cod.), νὰ ἔνη (ἔνι cod.) δὲ τὸ χωνίον πάνυ καθαρὸν· βάλον καὶ χρυσόν, ἐξάγιον ἕν, καὶ χύσας κάπνισον αὐτὸ τεάφην, καὶ ἔσται σοι χρυσὸς καθαρὸς (-ὸν cod.).
- (9) Ἔτερον. Ποίησον φοῦρνον, ὡς <τὸ> τοῦ ῥοδοστάγματος, καὶ λαβὼν βικίον (-ω cod.), χρῖσον αὐτὸ (χρύσον αὐτῶ cod.) μετὰ πηλοῦ τῶν χωνίων ἄχρι τῆς μέσης· καὶ ἔνδον βάλον τὸν χρυσόν, ὄνπερ ἐποίησας, καὶ λαβὼν χύτραν κενήν, βάλον (-ων cod.) ἐν αὐτῇ στάκτην, ἕως τὴν μήσην· καὶ ἐν αὐτῇ θῆς τὸ βικίον (-ήω cod.), καὶ αὐτὴν τὴν χύτραν θῆς μετὰ τοῦ βικίου ἐν τῷ τοῦ φούρνου στομίῳ, κάτωθεν δὲ τῆς χύτρας βαλὼν πῦρ ἰσχυρότατον [277ν]· καὶ χωνευθὲν (χονευθεῖς cod.) γενήσεται καθαρὸν μάλαγμα.
- (10) Ἔτερον. <Λ>αβὼν λινέλαιον, ἐξάγια μ', καὶ χάλκωμαν ῥιμισμένον, ἐξάγια ιε', ἔνθες καὶ βικίον (-ω cod.)· καὶ θάψον αὐτὸ (-ῶ cod.) εἰς κόπρον ἵππου νεαράν, καὶ ἄς π<ο>ιήση (-οι cod.) ἡμέρας μ'· εἶτα χώνευσον καὶ χῦσον, καὶ ἔσται σοι χρυσὸς καθαρὸς.

Σκευασία (σκεβα- cod.) καρυδίνου (καρι- cod.) γλυκύσματος (γλυκή- cod.)· ἠτινοζάω (? sic).⁹²

ἔπαρον τὰ κάρυα τρυφερά καὶ κόψον αὐτὰ ἀπὸ τὴν μύτην τρίγωνιν (?)⁹³ καθάρισον (-ω cod.) δὲ καὶ τὸ πιάδιν (?)⁹⁴ εἶτα ἔχε σουγλήν καὶ τρύπα αὐτὰ σταυροειδῶς καὶ βάλε εἰς τὸ ὕδωρ· καὶ ἄ<λ>λα<σ>σε τα (*lege* το ?)⁹⁵ ἡμέρας ἦ· ἐκ τοῦ ὕδατος ἐκβαλε ταῦτα καὶ καθάρισον αὐτὰ· ἔκτοτε πάλιν βάλο<ν> αὐτὰ εἰς ὕδωρ, καὶ ἄς ποιήσου<ν>⁹⁶ ἡμέρας ς· ἄ<λ>λα<σ>σον τὸ ὕδωρ· ἔπειτα βάνε εἰς τὰς τρύπας καρεόφαλον καὶ τζιτζίβερ· βράσον δὲ μέλι καὶ ἐξάφρισε το καὶ βάλε τὰ κάρυα μετ' αὐτό· ἔχε σπέτζαν ἐὰν (ἦαν

⁹¹ On 'ἐὰν' + participle see Colinet (2010: XLIV).

⁹² A slightly different title is copied again in the margin: 'σκεβασία τοῦ γληκῆσματος τ(ὸν)[?] καρηδῆον'.

⁹³ The text is conjectural (I am indebted to Petros Bouras-Vallianatos for this valuable conjecture); the MS reads: 'ἀποτ(ῆν) μὴ τῖν τρίγωνιν'.

⁹⁴ The MS reads: 'καθάρισω δὲ κετοπιάδιν'.

⁹⁵ I would have expected a pronoun that refers back to water (rather than to walnuts).

⁹⁶ Imperative form typical of modern Greek.

cod.) θέλης τριμ<μ>ένην· καὶ ὅταν τα ποιήσης (-σις cod.), να ἀλλάσσης τὸ μέλιν μέχρις ἄν [α]νοήσης ὅτι παντελῶς ἐξέλθη (-ήλθεν cod.) ἔξω του τὸ ὕδωρ· καὶ ἐν<ωθ>έν τὸ μέλιν παστι<λ>λόμενον εἰς αὐτά, τότε πάσον αὐτά τὴν σπέτζαν· ἔχε γοῦν μέλιν καλὰ παστι<λ>λόμενον καὶ βάλε τὰ κάρυα εἰς τζουκάλιν καὶ ἐπάνω τὸ μέλιν· καὶ σκέπασον μετὰ χάρτου.

Findings from the alchemical book on the making of gold by Isis (?), Orpheus, and Cleopatra.

- (1) Take as much mercury as you want and put it in a newly made, untouched vessel; fill it, I mean, make it full of pure oil, and smear its upper part with the white clay that is used to make good crucibles. Make a hole as small as a needle above, then cover it with a small knife or something else of pure iron. Boil it well until all the oil is burnt, lift the iron, and look at it. If a bit of humidity comes out and the iron is wet, let it burn well. If you see that it is white – I mean the part of the knife or of the iron object, which closes the hole – carefully smear this hole as well with that clay. Shortly after, open it, take ground white sulphur and throw it in the crucible. Stir it well, let it get cold: thus, it gets solid and becomes silver.
- (2) Another [recipe]. Melt tin, then dip it in a juice, if it is roasted [dip it] in serous milk of a dog for twenty times. Then chop a *schelan*,⁹⁷ that is a sea squill, put the tin in it with ground marcasite⁹⁸ on the top; smear the sea squill with red clay and set it on a big charcoal fire; let it rest for two days. You will find silver, except for its black surface. If you strike it with a hammer, it will lose its black colour: it will be pure silver inside.
- (3) Another [recipe]. Soda, white lead and milk, boil them together. Take pure iron and boil it well with these substances; dip it in that milk for seventy times. Then take 1 *exagion*⁹⁹ of it, 1 *exagion* of pure silver, and melt them together. Melt together and pour them: it will become pure silver.
- (4) Another [recipe]. Take distillate of orpiment, 1 *exagion*; copper filings, 15 *exagia*; grind them well with white linseed oil and moisten them up to seven times. Melt them and pour, then melt them again and pour; put silver as well, 5 *exagia*. Thereafter pour it again, and you will find the noblest silver.

⁹⁷ Perhaps a late spelling for 'σκιλλά' ('squill'); see Colinet (2010: 22, n. 21).

⁹⁸ Du Cange (1688) I.879, s.v. μαρκασήτα. See the Arabic term *marqashithā* (مرقشيثا), with many Latin transliterations, such as *marc(h)as(s)ita*: Käs (2010: II.992–7). It also occurs in the fourteenth-century anonymous treatise on metals first discovered by Zuretti (the so-called *Anonimo di Zuretti*): see the *index verborum* in Colinet (2002: 361–2 and 409): μαρκασίθα, μαρκασίτα, μαρκεσίθα / *marcassita*, *marchasida*, *margasita*, and so forth.

⁹⁹ Unit of weight (from Latin *exagium*).

- (5) Another [recipe]. Laserwort, ammoniac salt, galbanum, and borax-glass, 1 uncia each; grind them with vinegar and make them liquid; take fillings of Spanish copper, cadmia,¹⁰⁰ 1 uncia each, and fatty [juicy] figs, knead all the ingredients mentioned above together, put them in a crucible, cover it with another crucible, and smear their joints with fire-proof clay. Take 5 *exagia* of this product, 1 *exagion* of pure silver, melt them together and pour; you will have pure silver.

On gold

- (6) Vinegar, 50 *exagia*; calcined copper,¹⁰¹ 15 *exagia*; grind them well and put them together in a glass vessel; expose it to strong sunlight, keep it for seven days and shake it seven times a day. Then collect it, cover it with warm dung of a horse, and keep it covered for 21 days. Then take it out and add cinnabar, 5 unciae; having ground the cinnabar, wet it with the content of the vessel little by little, so that it absorbs all the content of the vessel in a day. Then roast it by the heat of the sun, when no wind blows; grid it again like flour, put it in a lead vessel and keep it. If you want to make an alloy, take filings of bright copper and the same quantity of this preparation, and make it liquid: you will have it clean.
- (7) Another [recipe]. Take soap,¹⁰² sulphur, and red orpiment, 2 unciae each; pour water and clear vinegar in a bowl and boil the above-mentioned ingredients together; then take silver, 2 unciae, fire it and add it to the boiling matter; strike with an hammer, and [there will be] metal flakes peeling off from it; counterbalance [this loss?] and mix the same amount with the alloy; make it liquid and you will double it.
- (8) Another [recipe]. Take filings of Spanish copper, as many unciae as you want, and the same amount of cadmia, and even fatty [juicy] figs; pound them while watering the pestle with clear vinegar; after pounding, mix everything with the figs and put in a crucible, covering it well so that it will not evaporate in large quantities. First, put laserwort as well over these [ingredients] and melt; after this, cast it

¹⁰⁰ Zinc oxide; see Du Cange (1688) II.1592, s.v. τούτια. See the Arabic term *tūtīyā* (توتيا) from the Persian (توتيا), which was often transliterated in Latin as *t(h)utia*: Goltz (1972: 259–61); Käs (2010: 1,361–72).

¹⁰¹ See Cosmas, *On the Making of Gold*, rec. 9, in ed. Colinet (2010) 70–1. According to this Byzantine recipe book, after being calcined with sulphur in a closed earthen pot, copper becomes the so-called *rhasouktē* or *rhasoukhtē*. The term, of Persian origin, comes from the Arabic (*al-rūsakhtaj* (روسختج), ‘burnt copper’, also spelled *rāsukhtaj*: Goltz (1972: 262–3); Käs (2010: 1,594–7); see also Lagercrantz (1924: 33) and Colinet (2010: XLVI and 121 n. 35).

¹⁰² Du Cange (1688: II.168, s.v. σαπουνίτιν) argues to read ‘σαπουνίτιν’ (‘soap’).

out of [the crucible], and pour the melted [substance] in another crucible, so that the crucible is completely clean. Add gold as well, 1 *exagion*, melt while exposing it to the smoke of sulphur, and you will have pure gold.

- (9) Another [recipe]. Built an oven like the one [used to make] distillate of rose,¹⁰³ take a little jar and smear it with the clay of crucibles up to the middle [of the jar]; put the gold that you have prepared inside, and taking an empty earthen pot, fill half [the pot] with ashes. Lay the little jar on it [the pot] and put the pot with the jar in the mouth of the oven; make a very strong fire under the earthen pot. After melting, it will become a pure alloy.
- (10) Another [recipe]. Take linseed oil, 40 *exagia*; filings of copper, 15 *exagia*; also take a little jar, put it under fresh horse dung and keep it for 40 days. Then melt it and pour; you will have pure gold.

How to prepare a dessert of green walnuts or [?]¹⁰⁴

Take soft walnuts, cut off a little triangular piece from their top [?],¹⁰⁵ and also clean the *piadin* [?].¹⁰⁶ Then, take a skewer, pierce them like a cross, and put them in water; change it [the water] in the course of 8 days; remove from the water and clean them. Then, put them again in water, and let them stay for 6 days; change the water. Then, put clove and ginger¹⁰⁷ in their holes, boil some honey, remove its froth, and mix the walnuts with it.

¹⁰³ The term ‘ρόδοστάγμα’ refers to an extract of rose often mentioned in late antique and Byzantine medical texts; the production of distillates of rose is typical in Arabic and medieval alchemy and also appears in late Byzantine texts, such as the recipe books ascribed to Nikephoros Blemmydes or the fourteenth-century anonymous treatise on metals discovered by Zuretti (the so-called *Anonymous of Zuretti*): see, for example, Blemmydes, *On Egg-chrysopeia*, rec. 21, in ed. Steiner (2022) 440.13: ‘καὶ κτῖσον (*sic*) εἰς φουρνάκιον ὡς τὸ τοῦ ῥοδοστάγματος; see *Anonymous of Zuretti*, § 67, in ed. Colinet (2002) III.22 (and n. 473): ‘ποίησον κατασταλάξει ὡς ῥοδοστάμαν (*sic*)’.

¹⁰⁴ The manuscript reads ‘ἡτι^ν οὐζᾶω’, which I could not interpret properly. This corrupted form might refer to another name of the cake or its main ingredient.

¹⁰⁵ The Greek text ‘ἀπὸ τὴν μύτην’ is conjectural. The Byzantine term ‘μύτη’ means ‘nose’ and is also used to refer to the extremity (‘τὸ ἄκρον’) of objects, such as the sharp ending of a knife in alchemical recipes: see Colinet (2010: 135, s.v. μύτη). Our recipe describes how to prepare a dessert that is similar to the ‘γλυκὸ καρυδάκι’, a traditional Greek sweet: modern recipes prescribe to remove a small triangular piece from the top and the bottom of green walnuts before soaking them in water for eight days. See, for example, the section on local recipes in the Cyprus Tourism Portal (www.visitcyprus.com, accessed 15 March 2020).

¹⁰⁶ It is unclear to me whether the term refers to a part of the walnuts or to kitchenware – for example, a ‘πατί(ο)ν’ (‘dish’), or a πανί(ο)ν, ‘a cloth’. Traditional recipes for γλυκὸ καρυδάκι usually prescribe to peel the green walnuts (an instruction that does not seem to be mentioned in our recipe).

¹⁰⁷ On the various spellings of ‘καρεόφυλλον’ (such as ‘γαρόφυλλον’, ‘καρόφυλλον’ or ‘καρυόφυλλον’), see Trapp (1994–2017: 765, s.v. καρεόφυλλον); ‘τζιτζίβερ’ is a Byzantine spelling for forms such as ‘ζιγγίβερ’, ‘ζιζίβερ’, and ‘ζιγγίβερης’: see Trapp (1994–2017, s.v. ζιγγίβερ), Du Cange (1688: II.1571, s.v. τζιτζίπερ).

Also take some spice,¹⁰⁸ after grinding it if you prefer. When you have done this, rework [lit. change] the honey until you notice that the water has fully come out of it. When the honey made into a paste has been mixed with them, then springle the spice over them. Take then the honey well made into a paste, put the walnuts in a vessel¹⁰⁹ and [pour] the honey over them; cover with paper.

REFERENCES

- Albini, F. ed. 1988. *Michele Psello, la crisopea ovvero come fabbricare l'oro*. Genoa: Edizioni culturali internazionali.
- Alexander, M. 1964. 'Medieval Recipes Describing the Use of Metals in Manuscripts', *Marsyas* 12: 34–53.
- Bandt, C. ed. 2007. *Der Traktat 'Vom Mysterium der Buchstaben': Kritischer Text mit Einführung, Übersetzung und Anmerkungen*. Berlin: De Gruyter.
- Baroni, S., Pizzigoni, G., and Travaglio, P. eds. 2013. *Mappae clavicula: Alle origini dell'alchimia in Occidente*. Saonara: il Prato.
- Barry, J. N., Share, M. J., Smithies A., and Westerink, L. G. eds. 1975. *Mazaris' Journey to Hades: Or Interviews with Dead Men about Certain Officials of the Imperial Court*. Buffalo: State University of New York at Buffalo Press.
- Benedetti, L. 2014. 'Ricette bizantine del XII secolo per tinture e inchiostri', *Aevum*, 88: 443–54.
- Berthelot, M., and Duval, R. eds. 1893. *La chimie au Moyen Âge: 2. L'alchimie syriaque*. Paris: Imprimerie nationale.
- Berthelot, M., and Ruelle, C. E. eds. 1887–8. *Collection des anciens alchimistes grecs*. 3 vols. Paris: Georges Steinheil.
- Bidez, J. et al. 1924–32. *Catalogue des manuscrits alchimiques grecs*. 8 vols. Brussels: Union Académique Internationale (=CMAG).
- Bidez, J. ed. 1928. *Michel Psellus, Epître sur la Chrysope, opuscules et extraits sur l'alchimie, la météorologie et la démonologie (CMAG VI)*. Brussels: Lamertin (Union Académique Internationale).
- Bouras-Vallianatos, P. 2015. 'Greek Manuscripts at the Wellcome Library in London: A Descriptive Catalogue', *Medical History* 59.2: 275–326.
- Bouras-Vallianatos, P. 2018. 'Enrichment of the Medical Vocabulary in the Greek-Speaking Medieval Communities of Southern Italy', in B. Pitarakis and G. Tanman (eds.), *Life Is Short, Art Long: The Art of Healing in Byzantium. New Perspectives*. Istanbul: Istanbul Research Institute, 155–84.
- Bouras-Vallianatos, P. 2020. *Innovation in Byzantine Medicine: The Writings of John Zacharias Aktouarios (c.1275–c.1330)*. Oxford: Oxford University Press.

¹⁰⁸ For the term 'σπέτζα' (or 'σπέτσά'), from the Italian 'spezia' ('spice'), see Du Cange (1688: II.1421, s.v. σπετζ[ίσις]).

¹⁰⁹ For the term 'τζουκάλι' (or 'τσουκάλι'), from the Italian 'zucca' ('pumpkin'), see Colinet (2010: XLV).

- Bouras-Vallianatos, P. 2021. 'Cross-Cultural Transfer of Medical Knowledge in the Medieval Mediterranean: The Introduction and Dissemination of Sugar-Based Potions from the Islamic World to Byzantium', *Speculum* 96.4: 963–1008.
- Capone Ciollaro, M. ed. 2003. *Demetrio Pepagomeno, Prontuario medico, testo edito per la prima volta, con introduzione, apparato critic e indice*. Naples: Bibliopolis.
- Capone Ciollaro, M., and Galli Calderini, I. G. 1999. 'Aezio Amideno in Teofane Nonno-Crisobalante', in A. Garzia and J. Jouanna (eds.), *I testi medici greci: Tradizione ed ecdotica. Atti del III Convegno Internazionale (Napoli, 15–18 ottobre 1997)*. Naples: M. D'Auria Editore, 29–50.
- Cataldi Palau, A. 2010. 'Mazaris, Giorgio Baiophoros e il monastero di Prodromo Petra', *Nέα Πώμη* 7: 367–97.
- Colinet, A. 2000. 'Le travail des quatre éléments ou lorsqu'un alchimiste byzantin s'inspire de Jabir', in I. Draelants, A. Tihon, and B. van den Abeele (eds.), *Occident et Proche-Orient: Contacts scientifiques au temps des croisades*. Turnhout: Brepols, 165–90.
- Colinet, A. ed. 2002. *Les alchimistes grecs, x: L'Anonyme de Zuretti ou L'art sacré et divin de la chrysope par un anonyme*. Paris: Les Belles Lettres.
- Colinet, A. ed. 2010. *Les alchimistes grecs, xi: Recettes alchimiques (Par. gr. 2419; Holkhamicus 109). Cosmas le hiéromoine, Chrysope*. Paris: Les Belles Lettres.
- De Gregorio, G. 2019. 'Un'aggiunta su copisti greci del secolo XIV. A proposito di Giovanni Duca Malace, collaboratore di Giorgio Galesiota, nell'Athen. *EBE* 2', *Nέα Πώμη* 16: 161–276.
- Delacenserie, E. 2014. 'Le traité de diététique de Hiérophile: Analyse interne', *Byzantion* 84: 81–103.
- Delatte, A. ed. 1927–39. *Anecdota Atheniensia*. 2 vols. Paris: Droz.
- Du Cange, C. 1688. *Glossarium ad scriptores mediae et infimae Graecitatis*. 2 vols. Lyon: Anisson; Posuel; Rigaud.
- Eijk, P. J. van der 2010. 'Principles and Practices of Compilation and Abbreviation in the Medical "Encyclopedias" of Late Antiquity', in M. Horster and C. Reitz (eds.), *Condensing Texts: Condensed Texts*. Stuttgart: Franz Steiner, 519–54.
- Eijk, P. J. van der, Geller, M., Lehmann, L., Martelli, M., and Salazar, C. 2015. 'Canons, Authorities and Medical Practice in the Greek Medical Encyclopaedias of Late Antiquity and in the Talmud', in E. Cancik-Kirschbaum and A. Traninger (eds.), *Wissen in Bewegung. Institution – Iteration – Transfer*. Wiesbaden: Harrassowitz, 195–221.
- Felici, L. 1981–2. 'L'opera medica di Teofane Nonno in manoscritti inediti', *Acta medicae historiae Patavina* 28: 59–74.
- Festugière, A.-J. 1950². *La révélation d'Hermès Trismégiste, vol. 1: L'astrologie et les sciences occultes*. Paris: J. Gabalda.
- Froidefond, C. ed. 1988. *Plutarque, Oeuvres morales, Tome V – 2^e partie: Isis et Osiris*. Paris: Les Belles Lettres.
- Gamillscheg, E., Harfinger, D., Hunger H., and Eleuteri, P. 1981–97. *Repertorium der griechischen Kopisten 800–1600*. 3 vols in 9 pts. Vienna: Verlag der Österreichischen Akademie der Wissenschaften (=RGK).
- Garland, L. 2007. 'Mazaris' Journey to Hades: Further Reflections and Reappraisal', *Dumbarton Oaks Papers* 61: 183–214.

- Goltz, G. 1972. *Studien zur Geschichte der Mineralnamen in Pharmazie, Chemie und Medizin von den Anfängen bis Paracelsus*. Wiesbaden: F. Steiner.
- Gwyn Griffiths, J. ed. 1970. *Plutarch's De Iside et Osiride*. Cardiff: University of Wales Press.
- Halleux, R. ed. 1981. *Les alchimistes grecs, vol. 1, Papyrus de Leyde, papyrus de Stockholm, fragments de recettes*. Paris: Les belles lettres.
- Halleux, R., and Meyvaert, P. 1987. 'Les origines de la *Mappae clavicula*', *Archives d'histoire doctrinale et littéraire du Moyen Âge* 62: 5–58.
- Hultsch, F. ed. 1864–6. *Metrologicorum scriptorum reliquiae*. 2 vols. Leipzig: Teubner.
- Ideler, J. L. ed. 1841–2. *Physici et medici Graeci minores*. 2 vols. Berlin: G. Reimer.
- Ieraci Bio, A. M. 1982. 'I testi medici di uso strumentale', *Jahrbuch der Österreichischen Byzantinistik* 32: 33–43.
- Ieraci Bio, A. M. 2017. 'La sistematizzazione della farmacologia a Bisanzio', in L. Lehmhaus and M. Martelli (eds.), *Collecting Recipes: Byzantine and Jewish Pharmacology in Dialogue*. Berlin: De Gruyter, 301–14.
- Käs, F. 2010. *Die Mineralien in der arabischen Pharmakognosie*. 2 vols. Wiesbaden: Harrassowitz.
- Katsiampoura, G. 2018. 'The Relationship between Alchemy and Natural Philosophy in Byzantine Times', in E. Nicolaidis (ed.), *Greek Alchemy from Late Antiquity to Early Modernity*. Turnhout: Brepols, 119–29.
- Kostomoiris, G. A. ed. 1892. *Ἀετίου λόγος δωδέκατος*. Paris: C. Klincksieck.
- Krallis, D. 2016. 'Harmless Satire, Stinging Critique: Notes and Suggestions for Reading the *Timarion*', in D. Angelov and M. Saxby (eds.), *Power and Subversion in Byzantium: Papers from the Forty-Third Spring Symposium of Byzantine Studies, University of Birmingham, March 2010*. London: Routledge, 221–46.
- Kraus, P. 1933. 'Zu Ibn al-Muqaffa', *Rivista degli studi orientali* 14: 1–20.
- Kraus, P. 1942. *Jābir ibn Ḥayyān. Contribution à l'histoire des idées scientifiques dans l'Islam, vol. II: Jābir et la science grecque*. Cairo: Imprimerie de l'IFAO.
- Kühn, C. G. ed. 1821–33. *Claudii Galeni opera omnia*. 20 vols. in 22 pts. Leipzig: Knobloch.
- Lagercrantz, O. ed. 1924. 'Les recettes alchimiques du *Codex Holkhamicus*', in *CMAG* III.30–81.
- Lagercrantz, O. 1932. 'Über das Verhältnis des *Codex Parisinus* 2327 (= A) zum *Codex Marcianus* 299 (= M). Fortsetzung von Catalogue II 341–358', in *CMAG* IV.399–432.
- Lazaris, S. 2006. 'La production nouvelle en médecine vétérinaires sous les Paléologues et l'oeuvre cynégétique de Dèmétrios Pépagôménos', in M. Cacouros and M.-H. Congourdeau (eds.), *Philosophie et sciences à Byzance de 1204 à 1453 : Les textes, les doctrines et leur transmission*. Leuven: Uitgeverij Peeters, 225–67.
- Leontsini, M., and Merianos, G. 2016. 'From Culinary to Alchemical Recipes: Various Uses of Milk and Cheese in Byzantium', in I. Anagnostakis and A. Pellettieri (eds.), *Latte e Latticini: Aspetti della produzione e del consumo*

Late Byzantine Alchemical Recipe Books

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- nelle società mediterranee dell'Antichità e del Medioevo*. Lagonero: Grafica Zaccara, 205–22.
- Letrouit, J. 1995. 'Chronologie des alchimistes grecs', in D. Kahn and S. Matton (eds.), *Alchimie: Art, histoire et mythes*. Paris: S.É.H.A/Arché, 9–93.
- Magdalino, P., and Mavroudi, M. eds. 2006. *The Occult Sciences in Byzantium*. Geneva: La Pomme d'Or.
- Marasco, G. 1998. 'Cléopâtre et les sciences de son temps', in G. Argoud and J. - Y. Guillaumin (eds.), *Sciences exactes et sciences appliquées à Alexandrie*. Saint-Étienne: Université de Saint-Étienne, 39–53.
- Martelli, M. ed. 2011. *Pseudo Democrito, Scritti alchemici con il commentario di Sinesio*. Paris: S.É.H.A/Arché.
- Martelli, M. ed. 2013. *The Four Books of Pseudo-Democritus*. Leeds: Maney.
- Martelli, M. 2014. 'The Alchemical Art of Dyeing: The Fourfold Division of Alchemy and the Enochian Tradition', in S. Dupré (ed.), *Laboratories of Art: Alchemy and Art Technology from Antiquity to the 18th Century*. London: Springer, 1–22.
- Martelli, M. 2018. 'Byzantine Alchemy in Two Recently Discovered Manuscripts in Saint Stephen's (Meteora) and Olympiotissa's (Ellassona) Monasteries', in E. Nicolaidis (ed.), *Greek Alchemy from Late Antiquity to Early Modernity*. Turnhout: Brepols, 99–118.
- Martelli, M. 2019a. *L'alchimista antico: Dall'Egitto greco-romano a Bisanzio*. Milano: Editrice Bibliografica.
- Martelli, M. 2019b. 'Galen in Late Antique, Byzantine, and Syro-Arabic Alchemical Traditions', in P. Bouras-Vallianatos and B. Zipser (eds.), *Brill's Companion to the Reception of Galen*. Leiden: Brill, 577–93.
- Mavroudi, M. 2002. *A Byzantine Book on Dream Interpretation: The Oneirocriticon of Achmet and Its Arabic Sources*. Leiden: Brill.
- Merianos, G. 2017. 'Alchemy', in A. Kaldellis and N. Siniosoglou (eds.), *The Cambridge Intellectual History of Byzantium*. Cambridge: Cambridge University Press, 234–51.
- Mertens, M. ed. 1995. *Les alchimistes grecs. Tome 4, 1ère partie, Zosime de Panopolis: mémoires authentiques*. Paris: Les Belles lettres.
- Mioni, E. 1981. *Bibliothecae divi Marci Venetiarum, Codices Graeci manuscripti. Thesaurus antiquus, vol. 1: Codices 1–299*. Rome: Istituto poligrafico e zecca dello Stato, Libreria dello Stato.
- Mosshammer, A. A. ed. 1984. *Georgius Syncellus: Ecloga chronographica*. Leipzig: Teubner.
- Olivieri, A. ed. 1935–50. *Aetii Amideni Libri medicinales*. 2 vols. Leipzig: Teubner.
- Olivieri, A., and Festa, N. 1895. 'Indice dei codici greci bolognesi delle biblioteche Universitaria e Comunale di Bologna', *Studi italiani di filologia classica* 3: 385–494.
- Omont, H. 1888. *Inventaire sommaire des manuscrits grecs de la Bibliothèque Nationale. Seconde partie, Ancien fonds grec: Droit–Histoire–Sciences*. Paris: Alphonse Picard.
- Papathanassiou, M. K. ed. 2017. *Stephanos von Alexandria und sein alchemistisches Werk: Die kritische Edition des griechischen Textes eingeschlossen*. Athens.

- Raeder, J. ed. 1926. *Oribasii Synopsis ad Eustathium, Libri ad Eunapium*. Leipzig: Teubner.
- Reitzenstein, R. 1919. 'Zur Geschichte der Alchemie und des Mystizismus', *Nachrichten von der Königlichen Gesellschaft der Wissenschaften zu Göttingen*, s.n.: 1–37.
- Roberts, A. M. 2020. 'Framing a Middle Byzantine Alchemical Codex', *Dumbarton Oaks Papers* 73: 69–102.
- Roberts, A. M. 2022. 'Byzantine Engagement with Islamicate Alchemy', *Isis* 113: 559–80.
- Romano, R. ed. 1999. 'Il calendario dietetico di Ierofilo', *Atti della Accademia Pontaniana* 47: 197–222.
- Saffrey, H. D. 1995. 'Historique et description du manuscrit alchimique de Venise *Marcianus Graecus 299*', in D. Kahn and S. Matton (eds.), *Alchimie: Art, histoire et mythes*. Paris: S.É.H.A./Arché, 1–10.
- Schreiner, P., and Oltrogge, D. eds. 2011. *Byzantinische Tinten-, Tuschen- und Farbzepte*. Vienna: Österreichischen Akademie der Wissenschaften.
- Sonderkamp, J. A. M. 1987. *Untersuchungen zur Überlieferung der Schriften des Theophanes Chrysobalantes (sog. Theophanes Nonnos)*. Bonn: Dr. Rudolf Habelt GMBH (Freie Universität Berlin byzantinisch-neugriechisches Seminar).
- Steiner, S. ed. 2022. 'Nikephoros Blemmydes: Concerning Gold Making', in F. Spingou (ed.), *The Visual Culture of Later Byzantium (c. 1081–c.1350)*. Cambridge: Cambridge University Press, 432–44.
- Totelin, L. 2017. 'The Third Way: Galen, Pseudo-Galen, Metrodora, Cleopatra and the Gynaecological Pharmacology of Byzantium', in L. Lehmhaus and M. Martelli (eds.), *Collecting Recipes: Byzantine and Jewish Pharmacology in Dialogue*. Berlin: De Gruyter, 103–22.
- Touwaide, A. 2007. 'Byzantine Hospital Manuals (*Iatrosophia*) As a Source for the Studies of Therapeutics', in B. Bowers (ed.), *The Medieval Hospital and Medical Practice*. Aldershot: Ashgate, 147–74.
- Touwaide, A. 1999. 'Lexica medico-botanica byzantina: Prolégomènes à une étude', in L. Pérez Castro, F. Adrados, and L. de Cuenca (eds.), *Tês filiês tade dôra: Miscelânea léxica en memoria de Conchita Serrano (Manuales y Anejos de 'Emerita', XLI)*. Madrid: National Foundation for Scientific Research, Center of Humanities, 211–28.
- Trapp, E. 1994–2017. *Lexikon zur byzantinischen Gräzität, besonders des 9.-12. Jahrhunderts*. 8 vols. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.
- Trapp, E., Walther, R., and Beyer, H.-V., eds. 1976–96. *Prosopographisches Lexikon der Palaiologenzeit*. 12 vols. Vienna: Verlag der Österreichischen Akademie der Wissenschaften (=PLP).
- Ullmann, M. 1972. *Die Natur- und Geheimwissenschaften im Islam*. Leiden: Brill.
- Valentino, D. ed. 2016. *Das Iatrosophion des Codex Taur. B.VII.18*. Munich: Ars Una Neuried.
- Valiakos, I. ed. 2019. *Das Dynameron des Nikolaos Myrepsos*. Heidelberg: Propylaeum.

Late Byzantine Alchemical Recipe Books

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- Viano, C. 2018. 'Byzantine Alchemy, or the Era of Systematization', in P. T. Keyser and J. Scarborough (eds.), *The Oxford Handbook of Science and Medicine in the Classical World*. Oxford: Oxford University Press, 943–64.
- Wallraff, M., Scardino, C., Mecella, L., and Guignard, C. eds. 2012. *Iulius Africanus, Cesti, translated by William Adler*. Berlin: De Gruyter.
- Zervos, S. ed. 1911. 'Αετίου Ἀμιδηνοῦ Λόγος Ἐνατος', *Ἀθηνᾶ* 23: 265–392. [Reedited in *Aetius aus Amida, über die Leiden am Magenmund, des Magens selbst und der Gedärme, Buch IX der Sammlung zur ersten Mal nach den Handschriften veröffentlicht*. Athens: P. D. Sakellarios, 1912.]
- Zipser, B. ed. 2009. *John the Physician's Therapeutics: A Medical Handbook in Vernacular Greek*. Leiden: Brill.
- Zipser, B. 2019. 'Galen in Byzantine *Iatrosophia*', in P. Bouras-Vallianatos and B. Zipser (eds.), *Brill's Companion to the Reception of Galen*. Leiden: Brill, 111–23.