



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA

ARCHIVIO ISTITUZIONALE  
DELLA RICERCA

## Alma Mater Studiorum Università di Bologna Archivio istituzionale della ricerca

Galen in the Late Antique, Byzantine, and Syro-Arabic Alchemical Traditions

This is the final peer-reviewed author's accepted manuscript (postprint) of the following publication:

*Published Version:*

Martelli, M. (2019). Galen in the Late Antique, Byzantine, and Syro-Arabic Alchemical Traditions. Leiden : Brill [10.1163/9789004394353\_031].

*Availability:*

This version is available at: <https://hdl.handle.net/11585/691445> since: 2019-07-11

*Published:*

DOI: [http://doi.org/10.1163/9789004394353\\_031](http://doi.org/10.1163/9789004394353_031)

*Terms of use:*

Some rights reserved. The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

This item was downloaded from IRIS Università di Bologna (<https://cris.unibo.it/>).  
When citing, please refer to the published version.

(Article begins on next page)

# Galen in the Late Antique, Byzantine and Syro-Arabic Alchemical Traditions

Matteo Martelli

## 1. Medicine and Galen in the Greek Alchemical *Corpus*

The main source that allows us to explore the origins of alchemy in the Graeco-Roman Egypt along with its late antique and Byzantine developments is a large collection of Greek alchemical writings (usually referred to as Greek alchemical *corpus*) that is handed down in various Byzantine manuscripts nowadays kept in important European libraries.<sup>1</sup> Next to this collection, a few Greek papyri have been preserved in the hot and dry sand of Egypt; in particular, the so-called Leiden and Stockholm papyri (third–fourth century AD), sometimes defined as “(al)chemical handbooks”, collect hundreds of recipes describing metallurgical techniques, procedures for dyeing stones and wool, and methods for producing gold and silver inks.<sup>2</sup>

Different branches of medicine, such as pharmacology and surgery, are evoked in these alchemical texts. The four books on dyeing attributed to the philosopher Democritus (first century AD) urge the young practitioners, who want to prepare dyeing *pharmaka*, to follow the example of physicians, who carefully test the qualities of natural substances before mixing them in a healing drug.<sup>3</sup> Indeed, eleven entries from Dioscorides’ *On Materials for Medicine* have been copied in the last two leaves of the Leiden papyrus (fols. 14-16), where they are introduced by the following title: “From Dioscorides’ *On Materials (of Medicine)*” (“*Dioskoridou ek tou peri hylēs*”). Each entry includes a short description of a mineral ingredient, thus providing alchemists with a helpful tool for identifying the natural substances and their properties.

Not only issues of identification troubled ancient alchemists. They also tried to determine the exact quantities required in the different processes that were described in the texts they used to study and put into practice. In order to respond to such a practical need, Byzantine alchemical collections include a short metrological work attributed to the Egyptian

---

<sup>1</sup> The reference edition for most of these writings is the work in three volumes by Berthelot-Ruelle (1887-8). More recent editions of single treatises will be referred to in the following footnotes. All translations in this paper are mine, unless otherwise stated.

<sup>2</sup> Critical edition, translation and commentary in Halleux (1981).

<sup>3</sup> [Democritus], *Physika kai Mystika*, 14, ed. Berthelot-Ruelle (1887-8) II.47 = ed. Martelli (2013) 96.

queen Cleopatra.<sup>4</sup> This work, which bears the title “From Cleopatra’s (writings), *On Weights and Measures*”, overlaps to a large extent with the tenth chapter of a pseudo-Galenic collection of metrological excerpts that appears in Kühn’s uncritical edition under the title “*On Weights and Measures* by the wisest Galen”.<sup>5</sup> The tenth chapter of this collection is indeed entitled “From Cleopatra’s *Cosmetics*, *On Weights and Measures*”.<sup>6</sup> Galen’s interest in metrology along with the frequent quotations of Cleopatra’s *kosmētika* in his pharmacological writings might justify the inclusion of such a chapter in a pseudo-Galenic work; Galen is thus presented as the collector of metrological texts written by earlier authors (we also find a chapter attributed to Dioscorides).<sup>7</sup> However, the version included in the alchemical *Corpus* seems later, as one can infer from its prologue, which does not appear in the pseudo-Galenic chapter. In the following table, the *incipits* of the two versions are compared:

<p>Ps.-Galen, <i>On Weights and Measures</i>, chapter 10: From Cleopatra’s <i>Cosmetics</i>, <i>On Weights and Measures</i> (<i>ek tōn Kleopatras kosmētikōn peri stathmōn kai metrōn</i>).<sup>8</sup></p>	<p>Alchemical <i>Corpus</i>: From Cleopatra’s (writings), <i>On Weights and Measures</i> (<i>ek tōn Kleopatras peri stathmōn kai metrōn</i>).<sup>9</sup></p>
	<p>From the (writings) of Cleopatra, thorough explanation on weights and measures, in order to easily find any kind of mina, litra, uncia, drachma and gramma, and how many obols, <i>thermoi</i>, <i>keratia</i> and <i>chalkoi</i> they consist of. In these (writings) one can find the subtlety of the weights that are used in the <i>dynamidia</i>: I have dealt with this in what follows; and along the subtlety of these weights, in what follows I also dealt with</p>

<sup>4</sup> Greek text edited in Hultsch (1864) I.253-7.

<sup>5</sup> Ps.-Galen, *Pond. Mens.*, ed. Kühn (1830) XIX.748-81 = ed. Hultsch (1864) I.218-44. The same collection, that includes 16 chapters, is already part of the Aldine edition of Galen (1525) IV.fols. 48v-50r.

<sup>6</sup> Cleopatra’s metrological chapter in Ps.-Galen, *Pond. Mens.*, 10, ed. Kühn (1830) XIX.767.1-771.3 = ed. Hultsch (1864) I.233-6. This chapter attributed to Cleopatra is also included in a collection of metrological works preserved at the end of the so-called *Hippiatrica Berolinensia*, App. 3, ed. Oder-Hoppe (1924) 442-4, a Byzantine compilation of texts dealing with horse medicine preserved in the Berlin MS Philipps 1538 (tenth century AD) and later codices.

<sup>7</sup> See Pernice (1888) for a collection of Galen’s authentic passages on weights and measures; on Galen’s knowledge of Cleopatra’s *Kosmētika*, see Fabricius (1972: 201-2).

<sup>8</sup> Ps.-Galen, *Pond. Mens.*, 10, ed. Kühn (1830) XIX.767.1-9 = ed. Hultsch (1864) I.233.20-234.3.

<sup>9</sup> Greek text edited in Hultsch (1864) I.253.23-254.14.

	each weight in a general way, so that you will find in this book the weight you look for.
A mina – the name of a weight – consists of 16 unciae, 128 drachmae, 384 <i>grammata</i> (“letters”), 768 obols, 1152 <i>thermoi</i> (“lupines”), 2304 <i>keratia</i> (“carats”), 6144 <i>chalkoi</i> (“coppers”). An Attic mina consists of 12 and ½ unciae, 100 drachmae, 300 <i>grammata</i> , 600 obols, 900 <i>thermoi</i> , 1800 <i>keratia</i> , 4800 <i>chalkoi</i> etc.	A mina [is] the name of a weight; it consists of 16 unciae, 128 drachmae, 384 <i>grammata</i> , 768 obols, 1152 <i>thermoi</i> , 2304 <i>keratia</i> , 6144 <i>chalkoi</i> , 96 <i>nomismata</i> . An Attic mina consists of 12 and ½ unciae, 100 drachmae, 300 <i>grammata</i> , 600 obols, 900 <i>thermoi</i> , 1800 <i>keratia</i> , 4800 <i>chalkoi</i> , 75 <i>nomismata</i> etc.

The description of different kinds of minae is quite similar in the two versions, apart from the mention of *nomismata* in the alchemical text.<sup>10</sup> The main difference lies in the short introductory passage, which opens only the alchemical version. In this prologue, one finds the very rare Greek word *dynamidia*. While, to the best of my knowledge, this is the only occurrence of the term in a Greek text, its Latin transliteration is quite common in medieval medical literature. Already Isidore of Seville explains the meaning of this word in his *Etymologies* in the early seventh century AD;<sup>11</sup> later on, the term is generally used to refer to writings that describe the medical properties (*dynameis*) and uses of vegetal substances as well as animal and mineral ingredients (although to a smaller extent).<sup>12</sup> With this general meaning, *dynamidia* is often appended to different treatises transmitted in Latin manuscripts under the name of Hippocrates (e.g., the *Dynamidia Hippocratis* mainly dealing with dietetics) and, more frequently, under the name of Galen.<sup>13</sup> The reference to this genre of pharmaceutical texts in a metrological chapter makes perfect sense. After all, a good knowledge of weights and measures was certainly necessary for at least two essential aspects of the work of ancient pharmacists or alchemists: (1) to properly interpret the written formulas

<sup>10</sup> For a close comparison between the alchemical version and Ps.-Galen’s work *On Weights and Measures*, see Hultsch (1864: I.137-8).

<sup>11</sup> Isidore of Seville, *Etymologies*, 4.10.3, ed. Lindsay (1911): “*Dynamidia* (describe) the power of herbs, that is, their force and capability (*vis et possibilitas*). In herbal medicine, force (*vis*) itself is called *dynamis*, whence also the books where herbal remedies are inscribed are called *dynamidia*.” Translation by Barney *et al.* (2006: 114; slightly modified).

<sup>12</sup> See, e.g., Everett (2012: 54-5) with earlier bibliography. More common expressions in Greek to refer to this kind of writings are *en tais dynamesin* (from *dynamis*, “property”, “capacity”) or *en tois dynamerois* (from *dynameron*, “pharmacological book”): see Ieraci-Bio (1991). Fischer (2008: 77-9) suggests that the term might simply refer to recipe-books.

<sup>13</sup> See Everett (2012: 18-21); Fischer (2008: 76-7); and Mac Kinney (1936).

either of “Galenic” medicines or of alchemical drugs (2) to mix the right quantities of the required ingredients accordingly.

If we turn our attention to surgery, we must note that the Graeco-Egyptian alchemist Zosimos of Panopolis (third–fourth century AD) explicitly refers to illustrated books that explain how to mend fractures. Diseased patients – he says – were assisted by physicians “bearing books illustrated with geometrical drawings and hatched diagrams”.<sup>14</sup> Regrettably, Zosimos does not specify the author(s) of similar handbooks.<sup>15</sup> Moreover, his text belongs to a rather difficult period in the history of medicine; after Galen’s death, in fact, a variety of medical systems were competing with each other until the spread of Galenism (sixth–seventh century AD), when “arguments over the interpretation of Galen had replaced disputes over alternatives to Galen”.<sup>16</sup> If different medical sources may be implied behind Zosimos’ passage,<sup>17</sup> for later alchemical texts Galen’s influence will become more evident.

The medical expertise of alchemists is emphasised again in the Byzantine alchemical poem *On the Divine Art in Iambic Verses*, falsely attributed to the philosopher Theophrastus (seventh–eighth century AD).<sup>18</sup> Its prologue praises the fortunate life of sophists (*sophistai*), i.e. learned men who, like rhetorical performers (*rhētores*), spent their days inspired by a great wisdom (*pansophōs*). Their education was not confined to alchemy, but touched upon a wide array of disciplines: natural philosophy, astronomy/astrology and medicine. A quite substantial section of the prologue is devoted to the last discipline:

Yet, more than this, the causes we reveal  
Of each affliction in the body’s frame;  
Experimentally our school explores  
The science, art and ends of medicine,  
With such success that our prognosis shows  
What sicknesses are destined to appear  
And what is best to cure or ward them off.

---

<sup>14</sup> Zosimos of Panopolis, *Authentic Memoires*, I.180-3, ed. Berthelot-Ruelle (1888) II.233.20-1 = ed. Mertens (1995) 9. .

<sup>15</sup> Already Galen pointed out that Julian, methodic physician and teacher in Alexandria, tried to use painting to teach medicine (*MM*, 1.7, ed. Kühn (1825) X.54.1); see Lazaris (2013: 144). However, there is no evidence that Galen’s anatomical writings were at some point illustrated with images or diagrams.

<sup>16</sup> Nutton (2004: 292).

<sup>17</sup> For instance, scholars usually agree that the images that illustrate Soranus’ work *On Bandages* or Apollonius of Citium’s abridged version of Hippocrates’ *On Joints* in Byzantine MSS go back to late antique models; see, e.g., Marchetti (2010).

<sup>18</sup> See Letrouit (1995: 82-3).

[...] with exactness we describe the flowers,  
 (Their qualities, their mixtures and their kinds),  
 And taste of juice and substances of plants.  
 Ana taste of juice and substances of plants.  
 Each class of growing herbs has been portrayed  
 For our prognosis and with words exact,  
 We also know the hues and kinds of stones,  
 The places where the metals are produced,  
 And all their properties both good and bad.  
 The many kinds of creatures in the sea  
 Are known to us and all their many forms, etc.<sup>19</sup>

Generally speaking, Ps.-Theophrastus' poem was influenced by the alchemical "lectures" (*praxeis*) of the Byzantine alchemist Stephanos of Alexandria, who worked under the emperor Herakleios (AD 610–641).<sup>20</sup> Some scholars have proposed to identify Stephanos the alchemist with the homonymous commentator of Hippocrates' and Galen's works.<sup>21</sup> Among other writings, Byzantine manuscripts preserve under the name of Stephanos of Athens two commentaries on *Prognostic* and *Aphorisms*, in which the author follows Galen's interpretation of the Hippocratic texts, along with a commentary on Galen's *Therapeutics to Glaucon*. The exact role of Stephanos as teacher of medicine in Alexandria, his possible relations with other *iatrosophists* (such as Gesios and Asklepios, whose works are mentioned in his writings) and his possible identification with Stephanos the alchemist are all points still debated among scholars.<sup>22</sup> Despite these uncertainties, Ps.-Theophrastus' verses clearly evoke sophists skilled in the *iatrikē technē*, who might be set side by side with late antique and early Byzantine *iatrosophists* and teachers of Galenic medicine, such as Gesios, Asklepios or Stephanos himself.

The main topics that were taught by these teachers – such as nosology or prognosis, both explicitly mentioned in the prologue – were actually explained on the basis of a selection of sixteen treatises by Galen (the so-called Alexandrian canon).<sup>23</sup> Finally, even though Galen's pharmacological works were not part of this canon, one must observe that the

---

<sup>19</sup> Ps.-Theophrastus, 33-54, ed. Ideler (1842) II.329 = ed. Goldschmidt (1923) 35-6. English Metrical translation by Browne (1920: 195-6), who based his interpretation on the Greek text edited by Ideler.

<sup>20</sup> See Goldschmidt (1923: 35-6); and Browne (1920: 193-4).

<sup>21</sup> See, in particular, Wolska-Conus (1989: 5-89); Papatthanassiou (2006: 197-8).

<sup>22</sup> For a recent summary of the *status quaestionis*, see Boudon-Millot (2016b).

<sup>23</sup> See, e.g., Overwien (2012); Iskandar (1976). See also Garofalo (Chapter 4) in this volume.

division of the natural ingredients used in the second part of the prologue (vv. 43-60) mirrors the standard classification of the simples introduced in the practical section (books 6-11) of Galen's treatise *On the Capacities and Mixtures of Simple Drugs*: books 6-8 are indeed devoted to plants, book 9 to minerals (earths, stones and metals), and books 10-11 to animals and animal products.

Another work by Galen is explicitly cited in one of the thirty chapters included in an almost contemporary alchemical compilation *On the Making of Gold*. In the first chapter, which deals with the question whether a species (*eidōs*) is composed and not simple, the alchemist Christianos (sixth–eighth[?] century AD)<sup>24</sup> quotes a short passage from Galen's *On the Affected Parts*:<sup>25</sup>

If the parts had just one and the same treatment and they were by no means different one from another, there would be no parts at all. Indeed, each natural <or> artificial part brings something specific (*ti xenon*) into the whole (*to holon*; i.e. the whole entity to which the single part belongs), and without this part, the All (*to pan*) would remain incomplete, as is possible to see for the bodily parts, which Galen referred to as “places” (*topoi*); let's listen to his own words: the bodily parts – he says – are called “places”<sup>26, 27</sup>

In general terms, Christianos' line of reasoning seems to imply a certain analogy between the human body and the metallic body (called *sōma* in the alchemical writings). As each single bodily part contributes to form a complete human body, in the same way a metallic body represents the combination of different parts or components. By treating and combining these parts – we may suppose – the alchemist tried either to “synthesise” the perfect metallic body (namely, gold) or to produce specific substances that could bring about the metallic transmutation.<sup>28</sup>

---

<sup>24</sup> The chronology of this author is uncertain: Berthelot-Ruelle (1888: III.378-9) propose the sixth century AD; Letrouit (1995: 62) is more inclined to the seventh/eighth century AD.

<sup>25</sup> These chapters are scattered in different sections of Berthelot-Ruelle's edition; for their correct order, see Letrouit (1995: 62).

<sup>26</sup> Galen, *Loc. Aff.*, 1.1, ed. Kühn (1824) VIII.695-6 = ed. Gärtner (2015) 226.4

<sup>27</sup> Christianos, *On the Making of Gold*, 1.1, ed. Berthelot-Ruelle (1888) II.272.10-15.

<sup>28</sup> According to Berthelot-Ruelle's interpretation (1888: III.262, n. 2), the expression “the All” (*to pan*) would have referred to the metallic alloy that was to be transformed into silver or gold. We must add that similar discussions about the simple or composite nature of natural or artificial substances are common in the Greek alchemical corpus: see, e.g., Viano (2015: 318-20) for an account of Zosimos' and Christianos' discussions on the nature of the so-called “water of sulphur” (or “divine water”), a central dyeing compound in ancient alchemy.

The argument developed by Christianos pertains to the philosophical question of the unicity of natural and artificial species, discussed for instance by the Neo-platonic philosopher and commentator Proclus (c. AD 410–85). In his commentary on the *Republic*, Proclus targets alchemists who “claim to make gold out of the mixture of certain species (*ek mixeōs tinōn eidōn*), while nature makes the one species of gold (*to eidos hen tou chrysou*) before the mixture of the species they talk about”.<sup>29</sup> The alchemist Christianos addresses a similar philosophical issue by relying on the authority of Galen. Such a meaningful combination of philosophical and medical education points to a late antique scholar system.<sup>30</sup> After all, Galen’s work *On the Affected Parts* was one of the sixteen treatises that belonged to the Alexandrian canon mentioned above.

## 2. Galen in the Syriac Alchemical Tradition

As already seen, the reference that Zosimos makes to surgical handbooks is too vague to understand whether he had specific medical authors in mind. On the contrary, the identification of the medical sources of some Syriac works attributed to Zosimos is certainly easier. A collection of twelve alchemical books has been preserved in Syriac under the name of the Graeco-Egyptian alchemist.<sup>31</sup> Alongside these books, which probably depend on (nowadays lost) Greek writings, we also find a somehow different and separated treatise that is introduced by the title: “Incipit of the ninth book by the wise Zosimos on the varieties of earth and (on the varieties) of the dust that it produces, on stones, and on the medicines that derive from earth”.<sup>32</sup> Regardless of the (false) attribution to Zosimos, this last treatise represents a compilation that shortens and combines Galenic passages taken from the last three books of *On the Capacities of Simple Drugs*. The Syriac version is divided into four sections, each one organised as a kind of lexical list that follows the order of the substances as they are described in the Galenic books. For each entry, the anonymous compiler provides the Greek term transcribed with Syriac letters, its translation into Syriac and, in some cases, a description of variable length that depends on Galen’s text. The following correspondences can be detected:

---

<sup>29</sup> Proklos, *Commentary on Plato’s “Republic”*, ed. Kroll (1901) II.234.17-9. On this passage, see Viano (1996: 202-3).

<sup>30</sup> See Westerink (1964: 169-77) and the titles quoted above, n. 23.

<sup>31</sup> For a preliminary French translation of these books, see Berthelot-Duval (1893: 210-66). I am currently preparing a critical edition and English translation of these texts. On this collection, see Martelli (2014: 199-209).

<sup>32</sup> See Berthelot-Duval (1893: 297-08); and Martelli (2010: 211-28).

1. The first Syriac section is a list of different minerals that depends on the part on *metallika* (i.e. mined substances) in Galen's book 9.<sup>33</sup>
2. The second section describes different kinds of earth by following the order in which they are presented in Galen's book 9.<sup>34</sup> The part is introduced by the title: "Explanation of any kind of earth by the wise Zosimos".
3. The third section includes a list of stones that follows the order of the chapters devoted to the same topic in Galen's book 9.<sup>35</sup> A general statement opens the Syriac passage: "Now I deal with the stones that, if crushed with mortars and files, become liquid and produce a juice (*chylos*)". The following *explicit* closes the section: "End of the names of the stones that have healing properties of any kind and that are used by the wise physicians. Zosimos dealt with them and described them for the queen and priestess Theosebeia".<sup>36</sup>

The medical framework from which the names of stones are taken seems to be acknowledged in the last *explicit*, despite of its attribution to the alchemist Zosimos rather than to the physician (and legitimate author) Galen. However, as we shall see, all the data regarding how physicians made use of these substances in healing practices are left aside. Moreover, the original structure of Galen's book 9 is slightly distorted, since the Syriac abridgment opens with the description of the *metallika*, which rather constitutes the third and last part of Galen's book. The great relevance of this group of ingredients for the alchemical practice probably explains the opening position they occupy in the new alchemical *pastiche* of Galenic passages. The centrality of alchemical interests represented the main criterion that guided the selection of data to be kept in each entry. For instance, as far as *diphryges* (lit. "twice roasted") is concerned, we read:

I took a lot of this medicine as well from a hill in the island of Cyprus. There was a mine from which (this substance) comes and that is thirty stadiums away from the city. (This substance) lay in the region between a building that was close to the mine and

---

<sup>33</sup> Galen, *SMT*, 9.3.2-40, ed. Kühn (1826) XII.210-44.

<sup>34</sup> Galen, *SMT*, 9.1.1-4, ed. Kühn (1826) XII.165-92.

<sup>35</sup> Galen, *SMT*, 9.2.2-21, ed. Kühn (1826) XII.195-208.

<sup>36</sup> Theosebeia is a well-off (probably Roman) woman to whom Zosimos addressed many of his alchemical treatises.

the city that was nearby the mine. The procurator who was in charge for that mine told us that (this substance) is what remains unused...from the heat of the furnaces”.<sup>37</sup>

When compared with the original Galenic passage on *diphryges*,<sup>38</sup> the Syriac passage is clearly shorter and leaves all the details about the medical properties and applications of the substance aside. In the new alchemical context, readers were probably more interested in useful information about the availability of the substances in different geographical areas or in a detailed account of their nomenclature.

Indeed, if we come to the fourth and last section of this Syriac section, just a dry list of names is taken from books 10-11 of Galen’s pharmacological treatise. This section is simply introduced by the general *incipit*: “Explanation of further *materia medica* that belongs to the wise Zosimos”. The first entries read as follows:

*gala*, that is, milk.

*tyros*, that is, cheese.

*boutyron*, that is, oil of butter or butter or as you want to call it.

*pytia*, that is, curdled milk.

*cholē*, that is, bile.

*hidrōs*, that is, sweat.

*ouron*, that is, urine.

*sialon*, that is, saliva.

*rhypos*, that is, dirt.<sup>39</sup>

This short list is what is “distilled” out of Galen’s book 10, which originally included a short introductory chapter,<sup>40</sup> and a second chapter<sup>41</sup> with the description of many animal fluids and solids: from different kinds of blood (§§1-6) to different kinds of excrements (§§18-29) and finally “dirt of human beings” (§30). The Syriac list omits the first paragraphs on blood and those on excrements almost at the end of the book; for the rest, it follows the order of Galen’s chapter 2, where we actually find milk (§§7-8), cheese (§9), butter (§10), curdled milk of seal (§11), bile (§12), sweat (§13), urine (§14) and saliva (§15).

---

<sup>37</sup> Syriac text in Martelli (2010: 214).

<sup>38</sup> Galen, *SMT*, 9.3.8, ed. Kühn (1826) XII.214-7.

<sup>39</sup> For the Syriac text, see Martelli (2014: 210).

<sup>40</sup> Galen, *SMT*, 10.1, ed. Kühn (1826) XII.245-53.

<sup>41</sup> Galen, *SMT*, 10.2.1-30, ed. Kühn (1826) XII.253-309.

The list format may also allow us to further reason on the origins of our Syriac compilation. According to the famous epistle (*risāla*) of Ḥunayn ibn Ishāq, the physician and philosopher Sergius of Reš ‘ayna (died 536) produced the earliest Syriac translation of books 6-11 of Galen’s *On the Capacities of Simple Drugs*.<sup>42</sup> His translation of the botanical part (books VI-VIII) features lexical lists that are quite similar to the lists mentioned above: we cannot exclude that Sergius’ translation represents the text shortened and reshaped in the alchemical *pastiche*, as recently suggested by scholars working on a precious Syriac palimpsest that preserve a more complete translation of Galen’s pharmacological work.<sup>43</sup> The alchemical reputation of Sergius, which seems to be acknowledged in al-Nadīm’s biobibliographical *Book of the Catalogue* (*Kitāb al-fihrist*), might be thus justified.<sup>44</sup>

### 3. The Arabic Alchemical Tradition

Among the beautiful pictures that enrich the *Book of the Theriac* (*Kitāb al-diriyāq*) in the MS Arabe 2964 (Paris, BNF; copied in AD 1199), we find the portraits of nine Greek physicians who invented and improved the antidote, from Andromachus the Elder to Galen.<sup>45</sup> The *Book of Theriac* is usually described as a pseudo-Galenic treatise on the preparation of the famous antidote, perhaps based a (no longer extant) late antique Greek model. Among the illustrations of different anecdotes on the therapeutic uses of snakes, an image in particular depicts a ruler (named Bathūlūs), whose favourite slave, after being poisoned with opium, was bitten by a snake; rather than killing him, the bite miraculously cured the slave (MS Arabe 2964, fol 27). This story is not detectable in any extant work by Galen, but it is already outlined in the *Book of Poisons* (*Kitāb al-sumūm*) by the famous alchemist Jābir ibn Ḥayyān (eight[?] century AD), where the anecdote is explicitly attributed to Galen.<sup>46</sup> In other cases, Jābir’s toxicological treatise and the *Book of the Theriac* share anecdotes that already occur in Galen’s writings. For instance, *On the Capacities of Simple Drugs* and the *Outline of Empiricism* tell the story of a man suffering from elephantiasis who was healed by drinking

---

<sup>42</sup> Ḥunayn, *Epistle on His Galen Translations*, 56, ed. Lamoëaux (2016) 67-8.

<sup>43</sup> See Bhayro, Hawley, Kessel and Pormann (2013: 145). See also Bhayro (Chapter 8) in this volume. On the lists in the Syriac translations of books 6-8, see Merx (1885) and Bhayro-Hawley (2014: 296-9).

<sup>44</sup> Ibn al-Nadīm, *Book of the Catalogue* (*Kitāb al-fihrist*), 10.9, ed. Flügel (1871) I.354.24-25.

<sup>45</sup> On this treatise and its illustrated manuscripts, see Guesdon et al. (2009); and Kerner (2007).

<sup>46</sup> See Boudon-Millot (2009: 49, n. 12); Kerner (2007: 33, n. 74). The *Book of Poisons* has been edited in facsimile and translated into German by Siggel (1958; see pp. 84-5 for this anecdote). On this treatise, see Kraus (1943: I.156-9).

the wine from a jar that contained a dead snake: the same story occurs in both the Arabic treatises mentioned above.<sup>47</sup>

The important role played by Galen in the Arabic tradition on toxicology is certainly understandable given Galen's reputation in the field. This reputation also spreads in different treatises attributed to Jābir. In the more alchemically oriented *Little Book of Balances* (*Kitāb al-mawazīn al-ṣaghīr*), the physician is mentioned as a source on the healing properties of the heads of snakes.<sup>48</sup> The *Book of Concentration* (*Kitāb al-tajmī'*, on the artificial generation of human beings) as well as the theurgical *Book of the Fifth* (*Kitāb al-khamsīn*) refer to Galen's *On the Composition of Drugs according to Places* and to the interpretation Galen provides there of the antidote by Philo of Tarse.<sup>49</sup>

Different references to Galen are disseminated in the huge corpus of writings attributed to the famous and enigmatic figure of the Shiite alchemist Jābir ibn Ḥayyān, under whose name the *Book of the Catalogue* (*Kitāb al-fihrist*, tenth century AD) lists more than 300 titles.<sup>50</sup> Poisons and snakes apart, Galen is evoked with regard to a wide spectrum of subjects, from anatomy to philosophical matters. For instance, Galen's *On the Function of the Parts of the Body* guides the description of the human skull in the Jābirian *Book of the Result* (*Kitāb al-ḥāṣil*), even though Galen's teleological approach is explicitly criticised in the *Book of the Research* (*Kitāb al-baḥṭh*).<sup>51</sup> This last treatise, which philosophically discusses the art of theurgy, also includes references to Galen's *On the Natural Capacities*, *On my Own Opinions*, and to two treatises that have not reached us in Byzantine manuscripts, namely, *On the First Unmoved Mover* and *On Demonstration*.<sup>52</sup> Both are cited within a discussion on the Aristotelian theory of the prime mover and Galen's related critique. Moreover, *On Demonstration* is quoted again in Jābir's *Book of the Transformation* (*Kitāb al-taṣrīf*), which accounts for Galen's philosophical stance on the question of the eternity of the world; this

---

<sup>47</sup> Galen, *SMT*, 11.1, ed. Kühn (1826) XII.312.9-313.25; Galen, *Subf. Emp.*, 10, ed. Deichgräber (1965) 75.21-77.7. See Boudon-Millot (2009: 49) and (2016a: cxxxvii). For the Arabic texts, see Siggel (1958: 40) for Jābir's *Book of Poisons* and MS Paris 2964, f. 22 for ps.-Galen's *Book of Theriac*.

<sup>48</sup> Jābir, *Little Book of Balances* (*Kitāb al-mawazīn al-ṣaghīr*), ed. Berthelot-Houdas (1893) 119, and tr. 152; on this Jābirian text, see Kraus (1942-3: I.123).

<sup>49</sup> Galen, *Comp. Med. Loc.*, 9.4, ed. Kühn (1827) XIII.267-76. Jābir, *Book of Concentration* (*Kitāb al-tajmī'*), excerpts, ed. Kraus (1935) 374.11; see also Haq (1994: 35). Jābir's *Book of the Fifth* (only partially preserved) is unedited; see Kraus (1942-3: I.147; II.118, n. 1).

<sup>50</sup> Ibn al-Nadīm, *Book of the Catalogue* (*Kitāb al-fihrist*), 10.12, ed. Flügel (1871) I.355-358. See Fück (1951: 97-104).

<sup>51</sup> Only a few passages from the two books have been edited: Jābir, *Book of the Result* (*Kitāb al-ḥāṣil*), excerpts, ed. Kraus (1935) 533-41; *Book of the Research* (*Kitāb al-baḥṭh*), excerpts, ed. Kraus (1935) 501-27. For the references to Galen, see Kraus (1943: I.83 and 143; II.327).

<sup>52</sup> Jābir, *Book of the Research* (*Kitāb al-baḥṭh*), excerpts, ed. Kraus (1935) 509.15; 517.16ff.; 521. For a French translation of the relevant passages, see Kraus (1942-3: II.327-8).

passage complements the quotation from the same Galenic treatise in al-Rāzī's *Doubts about Galen* (*Kitāb al-shukūk 'alā Jālinūs*).<sup>53</sup>

The influence of Galen in theoretical issues – already detected in early Byzantine alchemical treatises – becomes even clearer in the Jābirian discussions of the first primary qualities (hot, cold, wet, dry) and of the three different degrees of intensity (*taxeis*) in natural properties, which is often based upon different Galenic treatises (e.g., *On the Elements* or Galen's pharmacological writings). On the other hand, Jābirian texts also criticise Galen, in particular when they question the reliability of senses in testing the properties of natural substances. Against the individual and subjective character of sensation, Jābir develops his “science of balance” (*'ilm al-mīzām*), which aims at assessing the properties of each substance through arithmetic calculations based on the letters that form its name.<sup>54</sup>

Probably because of his considerable impact, Galen was even credited with some form of alchemical knowledge within the Jābirian corpus, as emerges in the fourth section of the *Book of the Stones According to the Opinion of Bālīnas* (*Kitāb al-ahjār 'alā ra'y Balīnās*, i.e. Apollonius of Tyana). Here Galen is said to have studied alchemy (*al-ṣinā'a*, lit. “the art”) in his youth, before starting his education in philosophy (*al-falsafa*).<sup>55</sup> Similar legends probably legitimise Galen's reputation as an adept of the art, which becomes quite common in Arabic alchemical literature. For instance, his name is mentioned – along with the name of other physicians, such as Hippocrates and probably Oribasios and Paul (of Aegina) – in the list of alchemists at the beginning of the *Paradise of Wisdom* (*Kitāb firdaus al-ḥikma*), attributed to the Omayyad prince Khālīd ibn Yazīd (AD 668–704).<sup>56</sup> In the tenth-century Baghdad, the scholar al-Nadīm writes in his *Book of the Catalogue* (*Kitāb al-Fihrist*):

Muḥammad ibn Abī Bakr ar-Rāzī, i.e., Zakarīyā', asserts that no one can succeed in the science of philosophy, nor can a scholar be called a philosopher, unless he (first) succeeds in the science of the alchemical art...In another passage of his book, ar-

---

<sup>53</sup> Jābir, *Book of the Transformation* (*Kitāb al-taṣrīf*), excerpts, ed. Kraus (1935) 420,7ff.; for a French translation of the relevant passage and a short commentary on it, see Kraus (1942-3: II.329). The Galenic passage is also quoted in al-Rāzī, *Book of the Doubts about Galen* (*Kitāb al-shukūk 'alā Jālinūs*), ed. Muḥaqqiq (1993) 6.9-12; see Strohmaier (1998: 271-4). On Galen's reception by al-Rāzī, see Koetschet (Chapter 8) in this volume.

<sup>54</sup> See Kraus (1942-3: II.187-303, in part. 190-3) and Haq (1994: 49-80, in part. 65-8).

<sup>55</sup> This part of the fourth section of the *Book of the Stones* is edited neither in Kraus (1935) nor in Haq (1994; on this omission, see pp. 36 of the Arabic text and p. 253). Arabic text quoted in Kraus (1942: II.326, n. 1).

<sup>56</sup> The preface of this alchemical work has been edited and translated by Ruska (1929: 294-6).

Rāzī asserts that many philosophers, Pythagoras, Democritus, Plato, Aristotle and, finally, Galen practised the Art.<sup>57</sup>

According to Fück's interpretation,<sup>58</sup> the scholar al-Nadīm would refer to al-Rāzī's *Book of Secrets (Kitāb al-asrār)*, whose prologue includes a list of ancient authorities in the field of alchemy, whose teaching would have guided al-Rāzī's account. According to the translation by Stapleton-Azo-Ḥusain, this prologue reads:

Know that I have compiled this book out of the secrets of the experiments in this Art, so that it may be a guide to be followed and an authority to be referred to... Verily we have explained in this book what the ancient Sages, viz: Ġāḍimūn (Agathodaimon), Hurmus (Hermes), Anṭūs (or Aṣtus), Balīnās (Apollonius), Aflāṭūn (Plato), Ġālīnūs (Galen), Araṣṭāṭālīs (Aristotle), Fiṭāgūras (Pythagoras), Buqrāt (Hippocrates, or Socrates), Sarġīs (Sergius), Hiraql (Heraclius), Mariānus, Ḥālīd ibn Yazīd, and my master, Ġābir ibn Ḥayyān (may Allah illuminate his face!) have concealed.<sup>59</sup>

The mention of Galen does not come unexpected, given both al-Rāzī's interest in Galen's medical works (especially in his own medical writings) and the above mentioned sources attributing the same kind of expertise to the Greek physician. Galen's profile becomes more and more alchemically tintured: for instance, the view of the physician on the different degrees of intensity is quoted by the twelve-century alchemist al-Tughra'i in his commentary on a text by Zosimos;<sup>60</sup> moreover, alchemical texts attributed to Galen are transmitted both in Arabic and in Latin manuscripts, which still await for proper editions and translations.<sup>61</sup>

---

<sup>57</sup> Ibn al-Nadīm, *Book of the Catalogue (Kitāb al-Fihrist)*, 10.1, ed. Flügel (1871-2) I.351-2. Translation by Fück (1951: 88).

<sup>58</sup> See Fück (1951: 110, n. 6).

<sup>59</sup> Stapleton-Azo-Ḥusain (1927: 335). The name of Galen is mentioned in the prologue as preserved in different MSS (Leipzig, MS Or. 266; Escorial, MS Ar. 700), where, however, Ruska (1937: 19-24) suggests reading the name of Bālīnūs (i.e. Apollonius of Tyana) instead of Jālīnūs (Galen). According to the summary that Stapleton and Azo (1910: 71) gave of al-Rāzī's *Book of Testimonies (Kitāb aš-Šawāhid)* as preserved in MS *kīmiyā'* 12 (Rampur, Raza Library) the name of Galen (Jālīnūs) would also appear among other authorities whose opinions are collected in the book (e.g. Hermes, Maria, Zosimos, etc.).

<sup>60</sup> El Khadem (1996: 172).

<sup>61</sup> Ullmann (1971: 158-9).

## Acknowledgments

This publication is part of the research project *Alchemy in the Making: From Ancient Babylonia via Graeco-Roman Egypt into the Byzantine, Syriac, and Arabic Traditions*, acronym *AlchemEast*. 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).

## Bibliography

### Texts Used

Barney, S., A., Lewis, W., J., Beach, J., A. and O., Berghof (tr.). 2006. *The Etymologies of Isidore of Seville*. Cambridge: Cambridge University Press.

Boudon-Millot. V. (ed. and tr.). 2016a. *Galien. Thériaque à Pison*. Paris: Les Belles Lettres.

Berthelot, M. and C.-E., Ruelle. (eds. and tr.). 1883-8. *Collection des anciens alchimistes grecs*, 3 vols. Paris: Georges Steinheil.

Berthelot, M. and R., Duval. (eds. and tr.). 1893. *La chimie au moyen Âge*, vol. 2: *L'alchimie syriaque*. Paris: Imprimerie Nationale.

Berthelot, M. and V., Houdas. (eds. and tr.). 1893. *La chimie au moyen Âge*, vol. 3: *L'alchimie arabe*. Paris: Imprimerie Nationale.

Deichgräber, K. (ed.). 1965<sup>2</sup>. *Die griechische Empirikerschule. Sammlung der Fragmente und Darstellung der Lehre*. Berlin and Zürich: Weidmannsche Verlagsbuchhandlung.

Everett, N. (ed. and tr.). 2012. *Pharmacy from Antiquity to the Middle Ages. The Alphabet of Galen. A Critical Edition of the Latin text with English Translation and Commentary*. Toronto: University of Toronto Press.

Flügel, G. (ed.), 1871-2. *Ibn an-Nadīm, Kitāb al-Fihrist*, 2 vols. Leipzig: Verlag von F.C.W. Vogel.

*Galenī librorum pars quarta*. Venetiis: in aedibus Aldi et Andreae Asulani soceri, 1525.

Gärtner, F. (ed. and tr.). 2015. *Galenī De locis affectis I-II / Galen. Über das Erkennen erkrankter Körperteile I-II*, 2 vols. Berlin: De Gruyter [C.M.G. V/6.1,1].

Halleux, R. (ed. and tr.). 1981. *Les alchimistes grecs, I. Papyrus de Leyde, papyrus de Stockholm, recettes*. Paris: Les Belles Lettres.

Haq, S. N. (ed. and tr.) 1994. *Names, Natures and Things. The Alchemist Jābir ibn Ḥayyān and his Kitāb al-Aḥjār (Book of Stones)*. Dordrecht / Boston / London: Kluwer Academic Publisher.

Hultsch, F. (ed.). 1864-6. *Metrologicorum scriptorum reliquiae*, 2 vols. Leipzig: Teubner (repr. Stuttgart 1971).

Ideler, I., L. (ed.). 1841-2. *Physici et Medici Graeci Minores*, 2 vols. Berlin: Reimer Verlag.

Kraus, P. (ed.). 1935. *Jābir ibn Ḥayyān. Textes choisis*. Le Caire: librairie El-Khandgi.

Kroll, W. (ed.). 1899-1901. *Procli Diadochi in Platonis rem publicam commentarii*, 2 vols. Leipzig: Teubner.

Kühn, C., G. (ed.). 1821-33. *Claudii Galeni Opera Omnia*, 20 vols in 22. Leipzig: Car. Cnoblochii.

Lamoreaux, J., C. (ed. and tr.). 2016. *Ḥunayn ibn Ishāq on His Galen Translations. A Parallel English-Arabic Text, with an Appendix by Grigory Kessel*. Provo, Utah: Brigham Young University Press.

Leemans, C. (ed.). 1843. *Papyri Graeci Musei Antiquarii Publici Lugduni Batavi*, 2 vols. Leiden: Brill.

Lindsay, W., M. (ed.). 1911. *Isidori Hispalensis Episcopi Etymologiarum sive originum libri XX. Tomus I, libros I-X continens*. Oxford: Oxford University Press

Martelli, M. (ed. and tr.). 2013. *The Four Books of Pseudo-Democritus*. Sources of Alchemy and Chemistry (Ambix supplement) 1. Leeds: Maney Publishing.

Mertens, M. (ed. and tr.). 1995. *Les alchimistes grecs, IV.1. Zosime de Panopolis, Mémoires authentiques*. Paris: Les Belles Lettres.

Muḥaqqiq, M. (ed.). 1993. *Muḥammad ibn Zakarīyā al-Rāzī, Kitāb al-shukūk ‘alā Jālīnūs*. Teheran: International Institute of Islamic Thought and Civilization.

Oder, E. and Hoppe, C. (ed.). 1924. *Corpus hippiatricorum Graecorum*. Vol 1: *Hippiatrica Berolinensia*. Leipzig: Teubner.

## References

Boudon-Millot, V. 2009. ‘Anecdote et antidote: fonction du récit anecdotique dans le discours galénique sur la thériaque’, in Ch. Brockmann, W. Brunschön and O. Overwien (eds.), *Antike Medizin im Schnittpunkt von Geistes- und Naturwissenschaften. Internationale Fachtagung aus Anlass des 100-jährigen Bestehens des Akademienvorhabens Corpus Medicorum Graecorum/ Latinorum zu Carl Werner Müller gewidmet, Beiträge zur Altertumskunde*. Berlin and New York: De Gruyter, 45-61.

Boudon-Millot, V. 2016b. ‘Stéphanos d’Athènes’, in R. Goulet (ed.), *Dictionnaire des philosophes antiques*. Paris: CNRS éditions, vol. VI: 579-88.

Bhayro, S., Hawley, R., Kessel, G., and P., Pormann. 2013. ‘The Syriac Galen Palimpsest: Progress, Prospects and Problems’, *Journal of Semitic Studies* 58: 131-48.

Bhayro, S. and R., Hawley. 2014. ‘La littérature botanique et pharmaceutique en langue syriaque’, in É. Villey (ed.), *Les sciences en syriaque*. Paris: Geuthner, 285-318.

Browne, C., A. 1920. 'The Poem of the Philosopher Theophrastos upon the Sacred Art: A Metrical Translation with Comments upon the History of Alchemy', *The Scientific Monthly* 11.3: 193-214.

El Khadem, H., S. 1996. 'A Translation of a Zosimos' text in an Arabic Alchemy Book', *Journal of the Washington Academy of Sciences* 84: 168-78.

Fabricius, C. 1972. *Galens Exzerpte aus älteren Pharmakologen*. Berlin and New York: De Gruyter.

Fischer, K.-D. 2008. 'The *Acharistum* in a Manuscript from the Library of Nicholas of Cues', in L. Cilliers (ed.), *Asklepios. Studies on Ancient Medicine. Acta Classica Supplementa* 2: 74-85.

Fück, J., W. 1951. 'The Arabic Alchemy According to an-Nadīm (A.D. 987). A Translation of the Tenth Discourse of the *Book of the Catalogue (al-fihrist)* with Introduction and Commentary', *Ambix* 4: 81-144.

Goldschmidt, G. 1923. *Heliodori carmina quattuor ad fidem codicis Casselani. Religionsgeschichtliche Versuche und Vorarbeiten*, 19.2. Giessen: Töpelmann.

Guesdon, M., G., Grabar, O., Caiozzo, A., Micheau, F., and J., J., Kerner. 2007. *Kitāb al-Diryāq (Thériaque de Paris)*. Sansepolcro: Aboca edizioni.

Ieraci-Bio, A., M. 1991. 'Un témoignage grec à propos des Dynamidia', in G. Sabbah (ed.), *Le latin médical. La constitution d'un langage scientifique. Réalités et langage de la médecine dans le monde romain*. Saint-Étienne: Publications de l'Université de Saint-Étienne, 63-73.

Iskandar, A., Z. 1976. 'An Attempted Reconstruction of the Late Alexandrian Medical Curriculum', *Medical History* 20: 235-58.

Kerner, J., J. 2007. 'Art in the Name of Science : The *Kitāb al-Dyriāq* in Text and Image', in A. Contadini (ed.). *Arab Painting: Text and Image in Illustrated Arabic Manuscripts*. Leiden and Boston: Brill, 25-39.

Kraus, P. 1942-3. *Jābir ibn Ḥayyān. Contribution à l'histoire des idées scientifiques dans l'Islam*, 2 vols. Cairo: Imprimerie de l'I.F.A.O.

Lazaris, S. 2013. 'L'image paradigmatique: des *Schémas anatomiques* d'Aristote au *De materia medica* de Dioscoride', *Pallas* 93: 131-64.

Letrouit, J. 1995. 'Chronologie des alchimistes grecs', in D. Kahn and S. Matton (eds.), *Alchimie: art, histoire et mythes*. Actes du 1er colloque international de la Société d'Étude de l'Histoire de l'Alchimie (Paris, Collège de France, 14-15-16 mars 1991). Paris and Milano: S.E.H.A – Arché, 11-93.

Mac Kinney, L., C. 1936. "'Dynamidia" in Medieval Medical Literature', *Isis* 24/2: 400-14.

Marchetti, F. 2010. 'Le illustrazioni dei testi *Sulle Articolazioni* (Περὶ ἄρθρων πραγματεία) di Apollonio di Cizio e *Sulle fasciature* (Περὶ ἐπιδέσμων) di Sorano di Efeso', in M. Bernabò (ed.), *La collezione di testi chirurgici di Nicea. Firenze, Biblioteca Medicea Laurenziana, Plut. 74.7. Tradizione medica classica a Bisanzio*. Firenze: Ed. di Storia e Letteratura, 55-90.

Martelli, M. 2010. 'Medicina ed alchimia. 'Estratti galenici' nel *Corpus* degli scritti alchemici siriaci di Zosimo', *Galenos* 4: 207-28.

Martelli, M. 2014. 'L'alchimie en syriaque et l'œuvre de Zosime', in É. Villey (ed.), *Les sciences en syriaque*. Paris: Geuthner, 191-214.

Merx, A. 1885. 'Proben der syrischen Übersetzung von Galenus' Schrift über die einfachen Heilmittel', *Zeitschriften der deutschen morgenländischen Gesellschaft* 39: 237-305.

Nutton, V. (2004). *Ancient Medicine*. London and New York: Routledge.

Overwien, O. 2012. 'Medizinische Lehrwerke aus dem spätantiken Alexandria', *Les études classiques* 80: 157-186.

Papathanassiou, M. 2006. 'Stephanos of Alexandria: A Famous Byzantine Scholar, Alchemist and Astrologer', in P. Magdalino and M. Mavroudi (eds.), *The Occult Sciences in Byzantium*. Geneva: La pomme d'or, 163-204.

Pernice, E. 1888. *Galen De ponderibus et mensuris testimonia*. Bonn: C. Georgi Univ. Typogr (PhD Diss.).

Ruska, J. 1929. 'Eim dem Chālid ibn Jazīd zugeschriebenes Verzeichnis der Propheten, Philosophen und Frauen, die sich mit Alchemie befaßten', *Der Islam* 18: 293-9.

Ruska, J. 1937. *Al-Rāzī's Buch Geheimnis der Geheimnisse, mit Einleitung und Erläuterungen in deutsche Übersetzung*. Berlin: Springer.

Siggel, A. 1958. *Das Buch der Gifte des Ġābir ibn Ḥayyān: arabischer Text in Faksimile (HS. Taymūr, ṭibb. 393, Kairo)*. Wiesbaden: F. Steiner.

Stapleton, H., E. and R., F., Azo. 1910. 'An Alchemical Compilation of the Thirteenth Century A. D.', *Memoirs of the Asiatic Society of Bengal* 3/2: 57-94.

Stapleton, H., E., Azo, R., F. and M., H., Ḥusain. 1927. 'Chemistry in 'Irāq and Persia in the Tenth Century A.D.', *Memoirs of the Asiatic Society of Bengal* 8/6: 317-417.

Strohmaier, G. 1998. 'Bekannte und unbekannte Zitate in den *Zweifeln an Galen* des Rhazes', in K.-D. Fisher, D. Nickel, and P. Potter (eds.), *Text and Tradition. Studies in Ancient Medicine and its Transmission, presented to Jutta Kollesch*. Leiden: Brill, 263-87.

Ullmann, M. 1972. *Die Natur- und Geheimwissenschaften im Islam*. Leiden: Brill.

Viano, C. 2015. 'Une substance, deux natures. Les alchimistes grecs et le principe de la transmutation', *Chôra* 13 (Supplement): 309-25.

Viano, C. 1996. 'Aristote et l'alchimie grecque: la transmutation et le modèle aristotélicien entre théorie et pratique', *Revue d'histoire des sciences* 49/1-2: 189-213.

Westerink, L., G. 1964. 'Philosophy and Medicine in Late Antiquity', *Janus* 51: 169-77.

Wolska-Conus, W. 1989. 'Stéphanos d'Athènes et Stéphanos d'Alexandrie. Essai d'identification et de biographie', *Revue des études byzantines* 47: 5-89