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Indice

# The puzzle of *Compositiones*: a proposal for its reconstruction

ABSTRACT: In questo studio si tratta delle *Compositiones*, una delle più importanti fonti letterarie di tecniche delle arti e artigianato tramandate dalla tarda antichità fino al medioevo. Il primo obiettivo di questo contributo è quello di presentare i risultati di un'analisi filologica e letteraria del testo al fine di risolvere alcune questioni cruciali della tradizione manoscritta e del suo stato dell'arte. Nello specifico questo studio si concentra sull'origine delle *Compositiones* e sulla ricostruzione della disposizione originale sulla base di un "indice" nascosto nel testo stesso, fino ad ora mai identificato dagli studiosi. L'articolo si conclude con una descrizione dei contenuti trasmessi all'interno delle *Compositiones* (metallurgia, lapidaria, produzione di pigmenti per la pittura, tintura di materiali diversi, lavorazione e colorazione del vetro, mosaici, intonaci, colle, inchiostri e tintura della pergamena) con alcuni esempi delle più interessanti procedure tecniche elencate nel testo.

ABSTRACT: This study deals with *Compositiones*, one of the most important literary sources on practical arts and craftsmanship passed down from Late Antiquity to the Middle Ages.
The first aim of this contribution is to present the results of a philological and literary analysis of the text in order to resolve some crucial issues neglected or wrongly considered in scholarly investigations.
After a brief analysis of the manuscript tradition and its state of the art, this study focuses on the origin of *Compositiones* and the reconstruction of its original arrangement on the basis of a hidden "index" in the text itself which so far has not been identified by scholars. This paper concludes with a description of the contents found inside *Compositiones* (metallurgy, lapidary, pigment production for painting, dyeing of different materials, glass making and colouring, mosaics, coatings, glues, inks and parchment dyeing) and some examples of the most interesting technical procedures listed in the text.

PAROLE CHIAVE: Storia tecnica dell'arte, Letteratura tecnica, Filologia, Manoscritti, Tarda antichità, Medioevo, *Compositiones*, *Mappae Clavicula*
KEYWORDS: Technical Art History, Material Culture, Technical Literature, Philology, Manuscripts, Late Antiquity, Middle Ages, *Compositiones*, *Mappae Clavicula*.

## 1. Introduction

*Compositiones* is probably the most important literary source on art technology between Late Antiquity and the Middle Ages.

Despite the numerous studies that followed the first contribution by Ludovico Antonio Muratori in 1739, a unanimous interpretation by scholars on *Compositiones* has yet to be established. Cited in basically every study dealing with Medieval artistic techniques (painting, glass working and colouring, mosaics, metallurgy, leather working, etc.), this work represents a still unclear literary heritage of recipes and technical knowledge that is often referenced without proper contextualisation.

This article, which precedes our forthcoming critical edition of *Compositiones*, aims to present the result of a new study of this text in order to facilitate a correct reading, interpretation and historical evaluation. The main goal is to give some preliminary answers to many crucial issues that have been neglected or wrongly considered in scholarly investigations.

First of all, a few prominent questions should be posed: is *Compositiones* a coherent and single text, written by an author, or is *Compositiones* merely the result of an accumulation of heterogeneous recipes collected from different sources? Secondly, when did the work originate and what was its original arrangement?

A philological and literary analysis of the *Compositiones* tradition allows not only to rediscover a significant text but also to reshape our understanding of the transmission of ancient technical knowledge all the way from antiquity through the Middle Ages. An improved comprehension of the way *Compositiones* was developed will undoubtedly prove to be a useful advantage in the current fields of art history and conservation.

## 2. The text and manuscript tradition

*Compositiones* is the conventional title assigned by Muratori (1739) to a text preserved in the well-known manuscript 490 held at the Biblioteca Capitolare of Lucca[1]. The text is included in approximately thirty other Medieval manuscripts – most of which are unpublished so far – both individually and associated with another work of the Late Antiquity, *Mappae clavicula*[2]. The manuscript tradition may be divided into three groups:

[1] The complete title conceived by Muratori is *Compositiones ad tingenda musiva, pelles et alia, ad deaurandum ferrum, ad mineralia, ad chrysographiam, ad glutina quaedam conficienda, aliaque artium documenta, ante annos nongentos scripta.*

[2] A census of the manuscripts has been published by Rozelle P. Johnson (1935a, 1935b, 1937). The author, however, considers these manuscripts as witnesses of *Mappae clavicula* and does not distinguish between *Mappae clavicula* and *Compositiones.*

(**Table 1**)[3].

| **1st group of mss.** | | **2nd group of mss.** | | **3rd group of mss.** | | **Fragments** | |
|---|---|---|---|---|---|---|---|
| *Lu* | Lucca, Biblioteca Capitolare, 490, 8th century. | *M* | Madrid, Biblioteca Nacional, 19, 12th century. | *S* | Sélestat, Bibliothèque Humaniste, 17, 10th century. | *K* | Klosterneuburg, Stiftsbibliothek, CCI, Fragm. 338, early 9th century. |
| *V* | Vatican City, Biblioteca Apostolica Vaticana, Reg. Lat. 2079, 11th-12th century. | *P* | Paris, Bibliothèque Nationale de France, Lat. 7418, 13th-14th century. | *C* | Corning, Museum of Glass, Phillipps 3715, 12th century. | *Pa* | Paris, Bibliothèque Nationale de France, Lat. 6514, 13th-14th century. |
| | | | | | | *Fb* | Florence, Biblioteca Nazionale Centrale, Pal. 981, 14th-15th century. |
| *Si* | Siena, Biblioteca degli Intronati, C.V.24, 16th-17th century. | *F* | Florence, Biblioteca Nazionale Centrale, Pal. 951, 14th-15th century. | *L* | London, British Library, Add. 41486, 13th century. | *Appendicula codicum Vitruvii.* | |
| *Le* | Leida, Rijksuniversiteit Bibliotheek, VFC 33, 17th century | | | *Ob* | Oxford, Bodleian Library, Bodley 679, 13th century. | | |
| | | | | *Od* | Oxford, Bodleian Library, Digby 162, 13th century. | | |
| | | | | *Om* | Oxford, Magdalen College Library, 173, 14th century. | | |
| | | | | *G* | Glasgow, University Library, Hunterian 110, 13th-14th century. | | |

**Table 1.** *Compositiones* manuscript tradition.

The first group includes *Compositiones* disassociated from *Mappae clavicula*: Lucca, Biblioteca Capitolare, 490, 8th century (*Lu*); Vatican City, Biblioteca Apostolica Vaticana, Reg. Lat. 2079, 11th-12th century (*V*). Two *descripti* of *V* are currently known: Siena, Biblioteca degli Intronati, C.V.24, 16th-17th century (*Si*), and Leida, Rijksuniversiteit Bibliotheek, VFC 33, 17th century (*Le*).

The most ancient witness of *Compositiones*, the Lucca manuscript, has been the object of a number of studies and editions which are too lengthy to be mentioned in their entirety in this article (for instance, Hedfors 1932; Johnson 1939; Svennung 1941).

[3] In the present study, only the most important manuscripts are mentioned. Almost all manuscripts appear in the inventory published by Johnson. The text of *Compositiones* is extractable from this fundamental work of Johnson, in which the author has individually classified the recipes based on the Corning manuscript. An attempt to inventory the manuscripts of *Compositiones* was recently proposed by Brun (2015). This particular study mainly relies on the inventory already published by Johnson, adding the definition of *editio minor* for the manuscripts of the so-called *Appendicula codices Vitruvii* recorded by Rose (1899). This study also does not take into account some other witnesses, such as Cambrai, Bibliothèque Municipale, ms. 919 (818), *olim* Catt. Amiens 244, f. 38, 15th century, that contain one version of *Memoria.*

Scholarly literature has often considered the text in this manuscript as the only witness of *Compositiones* (in this case commonly known as *Compositiones Lucenses*), thus neglecting the presence of the same recipes in many other manuscripts.

The Vatican manuscript, originating in France, includes the association of *Compositiones* with Vitruvius' *De architectura.* A few minor differences can be found between the Vatican manuscript and the Lucca one; the discrepancy that stands out the most is that the Lucca manuscript does not include the poliorcetica recipes. However, this discrepancy is not original and is rather highlighted by the numbering of recipes, which skips from number III to XVIIII in the Lucca manuscript (f. 211v and f. 217r). A recent study (Baroni 2013) proved that the Lucca manuscript lost a quire exactly at this point: indeed, the interruption between recipes number III to XVIIII corresponds with the change of two quires.

The second group includes manuscripts transmitting an ancient *florilegium*, whose best-known and oldest witness is manuscript 19 of the Biblioteca Nacional in Madrid (12th century; *M*). The other specimen belonging to this group of codices is Paris, Bibliothèque Nationale de France, Lat. 7418, 13th-14th century (*P*). Also the manuscript Pal. 951 held in the Biblioteca Nazionale Centrale of Florence (14th-15th century; *F*) may be included in this group, although it does not transmit the text of *florilegium*. In the context of this second family, *Mappae clavicula* is associated with the text of *Compositiones*.

While the Madrid and Paris manuscripts transmitted the text of *Compositiones* within *florilegium*, the Palatine manuscript, originating in Southern Italy, copied it directly from the codex from which the technical part of *florilegium* was extracted. *Recentiores non deteriores*: the manuscript now in Florence provides confirmatory evidence of the diffusion of an ancient codex between the 10th-11th and the 15th centuries and also the origin of *florilegium*; already related by some scholars to the Cassinese circle.

The third group of manuscripts is the biggest and proves the widespread diffusion of this text north of the Alps: Sélestat, Bibliothèque Humaniste, 17, 10th century (*S*); Corning, Museum of Glass, Phillipps 3715, 12th century (*C*); London, British Library, Add. 41486, 13th century (*L*); Oxford, Bodleian Library, Bodley 679, 13th century (*Ob*) and Digby 162, 13th century (*Od*); Oxford, Magdalen College Library, 173, 14th century (*Om*); Glasgow, University Library, Hunterian 110, 13th-14th century (*descriptus* of the Corning manuscript; *G*).

The manuscripts in this third group show the association between *Compositiones* and *Mappae clavicula* and, in some specimens, the addition of other brief Medieval works on practical arts, such as *De coloribus et mixtionibus*. However, if we were to exclude from the whole text of these manuscripts the two wide sections identified as *Mappae clavicula* and *De coloribus et mixtionibus*, what remains are essentially the literary

materials corresponding to the two previous groups of codices, i.e. the *Compositiones* text. Moreover, the manuscripts of this third group show several signs of contamination occurred by means of a very ancient codex which allowed the correction of clear mistakes shared by almost all manuscripts.

Some fragmented witnesses, sometimes very ancient and significant, may be added to these wide groups of manuscripts: Klosterneuburg, Stiftsbibliothek, CCI, Fragm. 338, early 9th century (*K*)[4]; Paris, Bibliothèque Nationale de France, Lat. 6514, 13th-14th century (*Pa*); Florence, Biblioteca Nazionale Centrale, Pal. 981, 14th-15th century (*Fb*); and the so-called *Appendicula codicum Vitruvii*.

Along with the Lucca manuscript, the Klosterneuburg fragment is the most ancient witness, thus proving the diffusion of *Compositiones* between the 8th and the 9th century. The Paris manuscript seems to descend from a very ancient tradition: as we will see later, as the contaminated manuscripts of the third groups, it corrects a mistake not resolvable by conjecture only. The fragmentary witness of Florence (*Fb*) is a sort of extract and constitutes part of a Medieval *Compendium* recently published (Baroni–Ferla 2016).

Lastly, *Appendicula codicum Vitruvii* is a sort of extract of *Compositiones*, made up of 24 recipes. Published in 1899 by Valentin Rose, who identified it in the most ancient tradition of Vitruvius' *De architectura*, this work is currently preserved in six codices derived from a codex of the 9th century (Brun 2015; Baroni–Travaglio 2016: 46-47).

The analysis of the manuscript tradition highlights that almost every codex has its own physiognomy, including both changes in the sequence of text-units (*consecutio*) and sometimes whole recipes absent in other witnesses. Actually, technical recipe books commonly contain the addition of glosses or other recipes (titled, for instance, *Aliter* or *Alio modo*) to a "base-text", sometimes copied from other well-known texts of similar topics. Generally, these additions do not exceed a few percentage units in the overall number of recipes of a single manuscript. However, added throughout the tradition, these glosses contribute to making the physiognomy of the original text or "base-text" less identifiable.

This "base-text" is what we consider the basis of the reconstruction of the text of *Compositiones*: its recovery is essential to approach one of the most peculiar and important sources of art technology between Late Antiquity and the Middle Ages.

[4] Starting from Ganzenmüller (1941-1942), the fragment is cited as "s.n." (so, for example, in Bischoff, 1980, p. 48) or, most recently, as "W.8.293" (Frison & Brun, 2018, p. 24). Indicated to us by Dr. Martin Haltrich of the Stiftsbibliothek of Klosterneuburg, that here we take the opportunity to thank, the actual correct shelf mark of the fragment is CCI, Fragm. 338.

## 3. State of the art

*Compositiones* enjoyed a notable interest among scholars who have offered different interpretations and definitions of this work as well as generated significant misunderstandings.

On the one hand, *Compositiones* and *Mappae clavicula* have long been wrongly considered a single text due to the frequent presence of both texts in the same manuscripts, the fragmentary state of some of them and the lack of knowledge of fundamental witnesses such as the Vatican codex. Despite the intuition of Robert Halleux and Paul Meyvaert (1987) and Francesca Tolaini (2004), who clearly distinguished between the two works, some recent scholarly investigations seem to underestimate this distinction or describe *Compositiones* as an unsolvable accumulation of recipes, suggesting definitions like "*Mappae clavicula* text family" (Clarke, 2013), "*Compositiones-Mappae clavicula* family" (Kroustallis, 2013), "Tradition B of *Mappae clavicula*" (Tolaini, 2004), "*Corpus artium*" (Brun, 2011) or "*Compositiones lucenses* tradition" (Brun, 2015; Frison, Brun, 2018)[5].

On the other hand, the original context of this work has also been misunderstood and flattened depending on the manuscript's age. Albeit *Compositiones* is recognised as containing an ancient nucleus, the work has been often wrongly considered a Medieval recipe book, i.e. a compilation of heterogeneous recipes collected during the Middle Ages[6].

The recent edition of *Mappae clavicula* (Baroni–Pizzigoni–Travaglio 2013), based on an intuition of Marcelin Berthelot (1893) and then reinforced by Halleux and Meyvaert (1987), allowed for the better discernment of the two literary traditions and for the identification of the respective textual sections. In fact, subtracting the *Mappae clavicula* text from the manuscripts which contain both works demonstrates that what remains is basically the text preserved in the manuscripts belonging to the first group. Therefore, the *Compositiones* tradition corresponds to the text mainly transmitted by the Lucca and Vatican manuscripts but also included in the other cited codices, although in different forms.

## 4. A single author for a unique encyclopaedic work

As mentioned earlier, the apparent disorganised *consecutio* of recipes and heterogeneity

[5] It is important to point out that the adjective *lucenses* refers not to the entire work but to the only version preserved in the Lucca manuscript, which constitutes just one of its witnesses. It is therefore more correct to indicate the work with the conventional title of *Compositiones* or *Compositiones variae.*

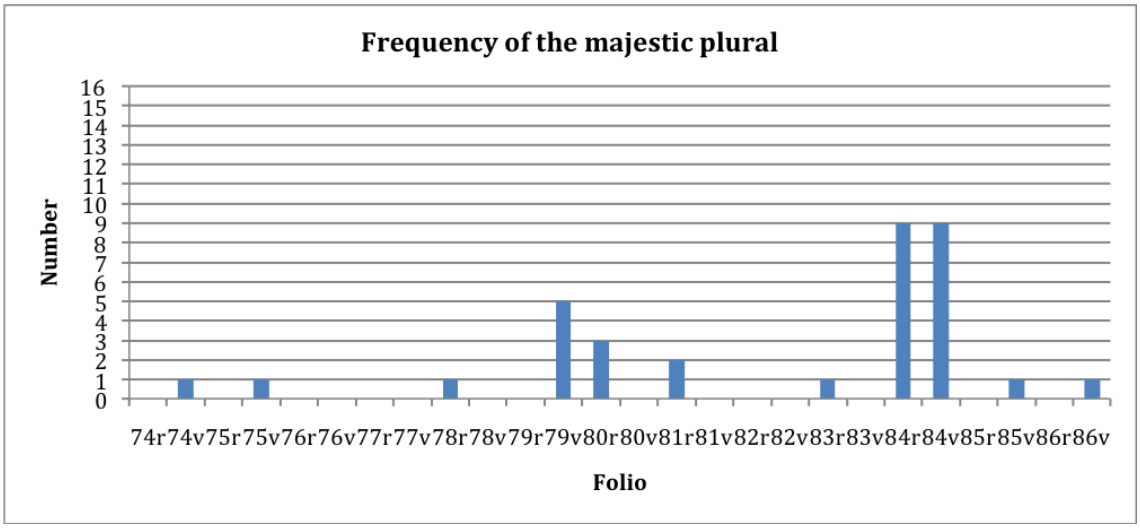
[6] It is still the case of the recent paper by Frison and Brun (2018), where *Compositiones* is considered «an aggregation of small recipe nuclei» (p. 1).

of topics have suggested the identification of *Compositiones* as an accumulation of recipes of different origins rather than a single work. The title itself, conceived by Muratori, strengthened the idea of a diversity of literary constructions[7].

However, the literary analysis of the text and a preliminary collation of manuscripts have allowed us to identify *Compositiones* as a coherent work written and organised by only one author.

Often simply corrupted by misunderstandings and mistakes of the copyists, the language of the recipes itself shows unity, using elements and structures that are difficult to find in other similar texts and especially in recipe books.

Firstly, the narrator uses a peculiar majestic plural, unusual in the Medieval technical literature, often addressed as the second plural person (*indicamus vobis*; **Figure 1**)[8].



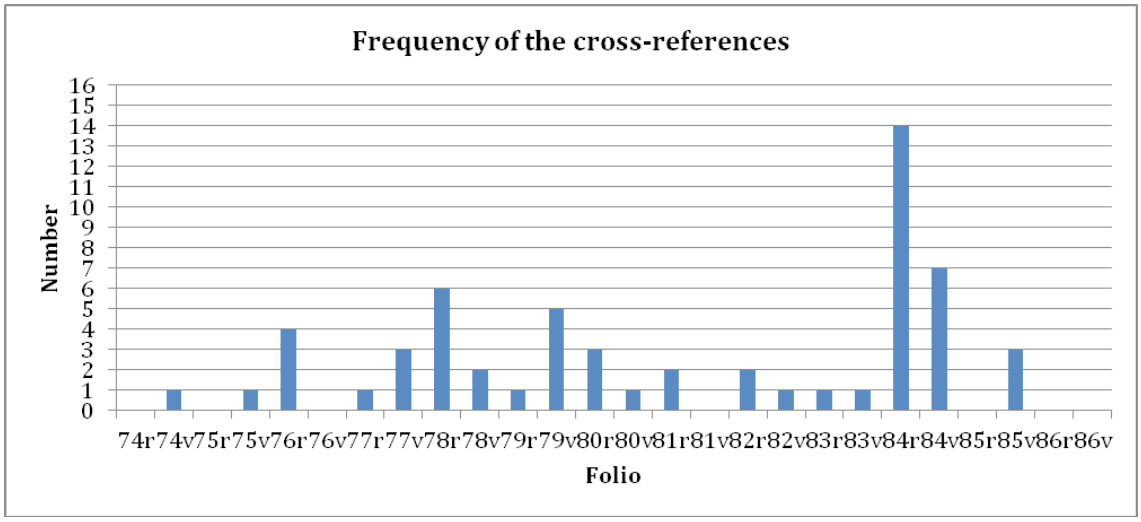

It is unlikely that the use of a plural pronoun could have been caused by a random

[7] More likely, Muratori chose this title due to the frequent presence in the titles of the recipes of the word *compositio*, thus unconsciously identifying it as one of the pillars of the whole structure of *Compositiones.*

[8] This peculiar Majestic plural appears 36 times in one of its more extended witness, the Vatican manuscript whenever the author speaks in the first person: *sicut superius diximus*, f. 74v, l. 4; *dicamus nunc*, f. 75v, l. 31; *secundum id quod superius diximus*, f. 77v, l. 24; *sicut superius docuimus*, f. 78r, l. 5; *haec omnia exposuimus*, f. 79v, l. 7; *ita memoramus*, f. 79v, l. 10; *superius docuimus*, f. 79v, l. 25; *diximus*, f. 79v, l. 26; *ut supra docuimus*, f. 79v, l. 29; *sicut superius docuimus*, f. 80r, l. 9*; *indicamus vobis*, f. 80r, l. 14; *indicamus vobis*, f. 80r, l. 22; *sicut superius diximus*, f. 81r, l. 6; *praediximus*, f. 81r, l. 13; *secundum quod superius exposuimus*, f. 83r, l. 27; *secundum quod superius docuimus*, f. 84r, l. 13; *quomodo diximus*, f. 84r, l. 15; *sicut superius diximus* […], *sicut diximus*, f. 84r, l. 22; *sicut superius diximus*, f. 84r, l. 25; *sicut praediximus*, f. 84r, l. 30; *sicut superius diximus*, f. 84r, l. 31; *ut docuimus*, f. 84r, l. 35; *sicut praediximus*, f. 84r, l. 36; *ad modum diximus*, f. 84v, l. 1; *sicut praediximus*, f. 84v, l. 2; *sicut praediximus*, f. 84v, l. 5; *sicut supra diximus*, f. 84v, l. 19; *sicut supra diximus*, f. 84v, l. 21; *levigamus*, f. 84v, l. 30; *terimus et* […] *lavamus*, f. 84v, l. 31; *siccamus*, f. 84v, l. 32; *sicut superius diximus*, f. 85v, l. 7; *sicut superius docuimus ad aureum*, f. 85v, l. 29; *omnia ista praediximus*, f. 86v, l. 2.

accumulation within a heterogeneous collection of recipes. On the contrary, the extended use of plural pronouns within the work indicates literary ambitions unusual in most recipe books. The same can be said of peculiar verbal forms that systematically alternate gerund and imperative, thus creating complex constructions of refined accuracy and coherence[9].

Secondly, there are frequent direct or indirect cross-references within the recipes[10] that allow to reconstruct their *consecutio* (**Figure 2**).

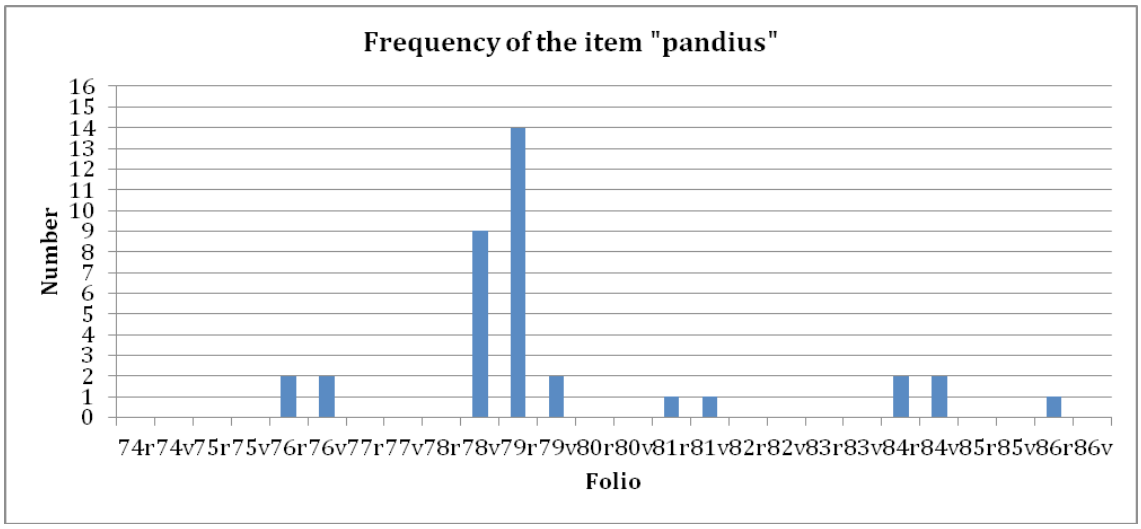



Moreover, the thematic sections of *Compositiones* show a homogeneous technical language along with the use of words that cannot be found elsewhere (*hapax*) but that are

[9] There are more than 70 constructions of gerund and imperative verbs within the recipes.

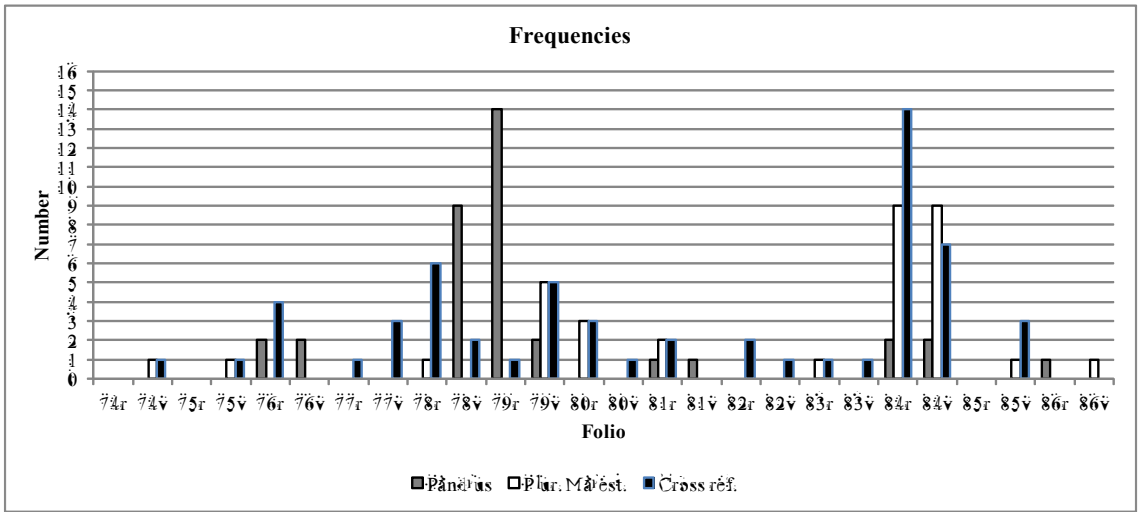
[10] There are at least 61 cross-references within the recipes excluding titles. In the Vatican manuscript, the cross-references are displayed in the following way: *sicut superius diximus*, f. 74v, l. 4; *superius designata*, f. 75v, l. 29*; *De iarin. Post haec tolle* […], f. 76r, l. 11; *suspende sicut primum*, f. 76r, l. 14; *sed secundum priorem virtutem*, f. 76r, l. 35; *supradictarum*, f. 77r, l. 31; *secundum compositionem lazurin*, f. 77r, l. 33; *secundum id quod superius diximus*, f. 77v, l. 24; *in vase sicut primum*, f. 77v, l. 32; *lava ea sicut prius*, f. 78r, l. 1; *sicut superius docuimus*, f. 78r, l. 5; *compone sicut superius*, f. 78r, l. 19; *sicut superius*, f. 78r, l. 20; *compositum sicut supra*, f. 78r, l. 21; *sicut supra*, f. 78r, l. 34; *sicut superius dictum est*, f. 78v, l. 7; *superius continetur*, f. 78v, l. 11; *ad modum et primum*, f. 79r, l. 5; *haec omnia exposuimus*, f. 79v, l. 7; *tria capitula ubi* […], f. 79v, l. 18; *ad modum superius*, f. 79v, l. 22; *superius docuimus*, f. 79v, l. 25; *ut supra docuimus*, f. 79v, l. 29; *marmoris superius*, f. 80r, l. 9*; *sicut superius docuimus*, f. 80r, l. 9*; *ex tribus supradictis*, f. 80r, l. 11; *sicut primum*, f. 80v, l. 37; *sicut superius diximus*, f. 81r, l. 6; *sicut pandia praediximus*, f. 81r, l. 12; *alia compositio litargiri*, f. 82r, l. 15; *secundum superiorem compositionem*, f. 82r, l. 16; *compositio afronitri secunda*, f. 82v, l. 16; *secundum quod superius exposuimus*, f. 83r, l. 27; *haec est prima tinctio pellium*, f. 83v, l. 36; *secunda tinctio*, f. 84r, l. 8; *secundum quod superius docuimus*, f. 84r, l. 13; *quomodo diximus de alithina*, f. 84r, l. 15; *terciam tinctionem*, f. 84r, l. 21; *sicut superius diximus* […], *sicut diximus*, f. 84r, l. 22; *sicut superius diximus*, f. 84r, l. 25; *quarta tinctio*, f. 84r, l. 27; *sicut praediximus*, f. 84r, l. 30; *sicut superius diximus*, f. 84r, l. 31; *Prima pandii tinctio. Confice eodem modo pelles*, f. 84r, l. 32; *sicut supra*, f. 84r, l. 34; *ut docuimus*, f. 84r, l. 35; *secunda pandii tinctio* […] *sicut praediximus*, f. 84r, l. 36; *tercia pandii tinctio*, f. 84v, l. 1; *ad modum diximus melino*, f. 84v, l. 1; *sicut praediximus*, f. 84v, l. 2; *sicut praediximus*, f. 84v, l. 5; *confice ipsas pelles sicut supra*, f. 84v, l. 8; *tercius pandius*, f. 84v, l. 10; *secundam tinctionem* […] *sicut supra diximus*, f. 84v, l. 19; *sicut supra diximus*, f. 84v, l. 21; *sicut superius diximus*, f. 85v, l. 7; *in modum auri*, f. 85v, l. 7; *sicut superius docuimus ad aureum*, f. 85v, l. 29.

recurrent and common to many recipes (**Figure 3**)[11].




Some recipes, which generally appear first in each respective section, include in their titles or incipit terms such as *principales* or *prima*, thus alluding to the succession of recipes on the same topic[12].

The number of these elements and their presence within the whole work prove the continuous intervention of a single author (**Figure 4**).




As we will see, the original *consecutio* of recipes and their arrangement in books

[11] For instance, the term *pandius*, which appears 36 times in the section on colours of the *Memoria* and in other occasions in other parts of the work in one of its more extended witness, the Vatican manuscript: ff. 76r, l. 16 and 19; 76v, l. 17 and 20; 78v, l. 20, 26, 27, 29, 31, 34 and 37; 79r, l. 2, 2(bis), 4, 6, 9, 11, 13, 13(bis), 14, 18, 21, 24, 26 and 29; 79v, l. 5 and 6; 81r, l. 6; 81v, l. 31; 84r, l. 32 and 36; 84v, l. 1 and 10; 86r, l. 20.

[12] For instance, *lazur principale*; *primus pandius*; *encausis prima*; *haec prima metallum*.

and chapters, all including about 24 recipes each and introduced by *principales* – the lengthier recipes found at the beginning of each section – confirm that *Compositiones* are one real literary work and not a random collection of recipes.

Like *Mappae clavicula*, *Compositiones* dates back to Late Antiquity, when it saw its origin and first diffusion in the Greek language before being translated into Latin. Most of the recipes show terms and grammatical constructions deriving from the original drafting in Greek that the translator was unable or unwilling to modify as well as whole recipes transliterated from Greek into Latin characters[13]. In some recipes there are populations, languages and materials ascribable to the Hellenistic-Roman world, unknown and no longer existing in the Early Middle Ages. The variety of lexicon that different people use to define the same substance is often amply illustrated and underlined by the author, who thus displays a tendency towards encyclopaedic narration.

*Compositiones* was more probably only a part of an ancient Latin translation of a wider encyclopaedic work written in Greek and now lost which included books on different topics displayed in a rigorous structure. We can therefore read only a part of this work, which has had an incredible diffusion throughout the Middle Ages and beyond.

Aside from the philological problems the text presents, any interpretation of these procedures or any attempt to identify an operative tradition must take into account that this work belongs to the ancient world and it was written in a "text of instruction" type-language. Although translated into Latin, *Compositiones* appears to belong to a particular encyclopaedic current of technical nature that probably founds its model in the *Kestoi* by Julius Africanus (c. 160-c- 240), from which *Compositiones* seem to descend. Perhaps the fortune of the text in the Early Middle Ages depends on its source as well as on the captivating contents of a wide-ranging technical knowledge. The protagonists of the Medieval tradition probably understood that they were dealing with the disordered relics of a practical encyclopaedia from the ancient world (an aspect that has instead escaped many "moderns" from three centuries ago till today). In the manuscripts prior to the 12th century, the association with Vitruvius, Faventinus and Palladius is therefore not fortuitous, as well as the association with *Mappae clavicula* and, later, with *De coloribus et artibus Romanorum* by Heraclius.

[13] For instance: *De crysorantista. Crysorantista. Cryso catarios anamemigmenos meta ydrosargyros ecthetes chynion. Chetis chete spyreosum ypsinchion ydrosargyros chematat aut abaletis scheu gnasias daufira haecnamixam. Chisimon p diati thereu pule aribuli* (*Lu*, f. 230r, l. 18); *Ante milieti doti rora cum acubella fantio per se unum cyronum elandyonos milyopxos in compositione alentium tentum in fantonio et aprothia aquilino* (*V*, f. 74v, l. 30).

## 5. Dating the text of Compositiones

Various elements can help date the Latin translation of *Compositiones*.

The *Alphabetum Galieni* or *Liber pigmentorum* (also *Ad Paternianum*) is a pseudo-galenic work ascribable to the 3rd-5th century (Everett, 2012). In this work, the item *calcetis* (or *calchetis*) presents the same text that appears in most of the manuscript witnesses of *Compositiones*: *Calcetis gleba est naturis que in Cipro insula invenitur in metallicis colore subauroso intus venas habens de fissas et alium est scissum et in modum stellarum fulgentes* (*S,* f. 29r, l. 13).

The above sentence proves the contamination between the two works that must have occurred before the oldest manuscript witnesses of each (7th century *Liber pigmentorum*, 8th-9th century *Compositiones*) and derived from the extraction of the text by one on the other or at most of both independently from a third one. Within *Compositiones,* the passage on *calcetis gleba* is part of the long section titled *Memoria*. This is actually, as we shall see, the index of contents of the original Greek work. In the section titled *Memoria,* this passage finds a logical sequence in the arrangement of the text, as well as in the Latin alphabetic progression of *Liber pigmentorum*. However, in another group of manuscripts of the *Compositiones* tradition, the cited sentence on *calchetis gleba* shows a conspicuous divergence. For instance, in the important manuscript Add. 41486 of the British Library (f. 100r) one finds: *Auripigmentum metallum est terre gleba est naturalis que in Cipri insula invenitur in metallicis colore subauroso intus habens venas discissas ut alumen scissum et in modum stellarum fulgens*.

Which of the two versions is preferable and is truest to the original form? Clearly the text concerns the orpiment and not the *calcetis* (or *calchetis*), a copper mineral similar to vitriol, also cited by Isidore and with completely different appearance and morphology. Orpiment is a *subaurosum* mineral, scissile and reflective *in modum stellarum*.

*Liber pigmentorum* has therefore formed at least part of its own alphabetical collection using a witness of the *Compositiones* tradition belonging to the family that contains the mentioned error, due to a trivial slipping of entries in the text: *calchetis* instead of orpiment. Between the 3rd and the 5th century – a time frame normally accepted by scholars for the origin of *Liber pigmentorum* – at least two distinct traditions of *Compositiones* were present in the Latin world: one containing the error as in the Sélestat manuscript and the other with the correct text that would get into the Additional manuscript.

Among the elements that can help in the dating of *Compositiones* we can find the monetary term *tremissa*, which is attested by various manuscripts belonging to different families within the tradition: *Usque quinque tremisses Bizantii* […] (*L,* f. 221r, l. 11); *V,* f. 85r, l. 5)[14]. This gold

[14] The specification *Byzantii* is no longer used in other recipes, such as the Lucca manuscript, f.

coin was first manufactured in Byzantium (383-388) by Magnus Maximus and then survived the following coinages. During the first half of the 5th century huge quantities of this golden coin were produced under the reign of the emperors Theodosius II and Anastasius I. The coin was soon object of imitation, thus justifying the author's reference to the guaranteeing mint (Byzantium)[15].

Thanks to these elements that are worthy of further inquiry, one can propose a preliminary dating of the Latin text of *Compositiones* between the end of the 4th and the first half of the 5th century.

## 6. Memoria: the original arrangement of Compositiones

*Compositiones* was clearly the result of an organised and defined literary project even though each manuscript currently includes a unique number of texts displayed in a peculiar order.

Due to the disparity in manuscripts, some scholars, even admitting the presence of numerous and ancient manuscript witnesses and the divergence of often corrupt versions, have considered "impossible or useless" a philological reconstruction of the text: «we may never know […] or be able with meaningful results to trace the stemma of the recipes in *Compositiones Variae*» (Burns 2017: 4-6). The same scepticism permeates other recent studies which see *Compositiones* only as an aggregation of "small recipe nuclei" (Frison–Brun 2018).

However, these observations rely only on a "criticism external to the text", based on the statistic analysis of the sequence of recipes or on partial codicological elements of the manuscript witnesses conducted independently of the reading and evaluation of their content.

In our opinion, it is necessary to carefully read the text as a whole and carry out an "internal criticism" to find, on the one hand, the evidence of a particular order of the work intended by the author and, on the other, to elaborate the possible reconstruction strategies.

The first key to understanding the original arrangement of *Compositiones* is included in the text itself in a list of materials titled *Memoria*. Apparently meaningless, this list

222r, l. 33, f. 222v, l. 15, and Vatican manuscript, f. 85v, l. 25, which however still use the word *tremisse.*

[15] Another coin also frequently appears in the text, the solidus (*Croci solidos sint II* […] and *Vitriolum solidos II* […] in Vatican manuscript, f. 85v, l. 25 and f. 82r, l. 4; other occurrences in f. 74r, l. 28-29 and f. 76r, l. 8). Introduced under Constantine in 309-310, it remained current throughout the Eastern Roman Empire for several centuries.

is actually a summarising text, a sort of mnemotechnical "table of contents" useful to memorise the arrangement of topics. This long list of about seventy items corresponds to the execution of a precise form of ancient rhetoric, usually placed at the end of a large text. In fact, the title *Memoria* was nothing but the Latin translation of a probable *anamnesis* with the meaning of "memory, summary, index" (Baroni 2016: 93-95).

| | |
|---|---|
| | **Memoria universarum herbarum, lignorum, lapidum, metallorum, amorum aquae, fungi, salis, nitri, afronitri, olei, picis, resinae, terrae sulphuris, elei acosi**. |
| | **Natura herbarum, lignorum, lapidum et metallorum**. |
| | Metallorum quidem species: |
| 5 | Haec primum metallum ex quo fiet aurum, terra rufa amoydis subrubicunda propter adiuxtantem illi terra. Est enim et alia similis et dum incenditur perdet colorem et non est arenosa sicut illa prior. Nascitur autem in solanis loci ea terra et sic metallum auri. |
| | Metallum vero argenti viride est. |
| 10 | Metallum autem aeramenti petra est piritis, colorem autem petrae similis aeramenti. Dum percutis cum pirebolo ignem emittit. |
| | Auricalci autem petra est melina et eodem modo ignem emittit. Metallum lapis est colore ipso *gatizon*. Plumbum autem terra est fusca, lapis vero quae in ea invenitur viridis est. |
| | Arena est unde vitrum metallizatur. Est enim et lapis ipse vitrei coloris. |
| 15 | Vitriolum unde fiet terrae ogrizos. Sunt cretae ubi verno tempore gutta quae ipsa colligent et decoquent et ex ipsa terra fiet calcitarin quae autem arida vitriolum. |
| | Alumen autem metallum est terra florens. |
| | Eritarin terra est alba, facilis ad pisandum. |
| | Sulphur ex terra nascitur et ipse incenditur locus. Coctum autem ex terra sulphurea oleo mixta coquitur. |
| 20 | Nitrum sal est quod nascitur in terra, fiet in limnas in tempore cavatur. |
| | Sal scistis nascitur similiter. |
| | Afronitrum vero nascitur in loco nitri priusquam gelet. Componitur autem et aliud ex nitro: principale autem spuma alba ut nix, compositum vero plus fuscum est, habet tamen eandem virtutem. |
| 25 | Terra sulphuritana nascitur in eodem loco ubi sulphur nascitur. Ipsa enim terra generat sulphur. |
| | Lapis emathitis invenitur iuxta locum ubi sulphur nascitur. |
| | Argentum vivum nascitur ex terra. Nascitur et aliud ex metallo argenti in conflationem. |
| 30 | Auripigmentum metallum est terrae. |
| | Lapis gagatis invenitur in universis locis ubi sulphur nascitur. |
| | Prasinus terra est, metallizatur. |
| | Lulax componitur ex terra et herbis. |
| | Lazurin compositum est. |
| | Cyanus compositus. |
| 35 | Ficarin compositus. |
| | Iarin aeraminis est flos. |
| | Psimithin plumbi est flos. |
| | Chalcucecaumenum ex aeramine fit. |
| | Cinnabarin ex argento vivo fit. |
| | Siricum ex psimithin fit et ex plumbo. |
| | Ocrea terra est. |
| | Pandia omnia colores omnes compositio. |

*V, f. 85v, l. 33; Lu*, f. 220r, l. 6; *S*, f. 28v, l. 10; *C*, f. 41v, l. 2; *Pa,* f. 52v, col. II, l. 21.
Natura herbarum, lignorum, lapidum et metallorum *V*; De memoriam *Lu*.
1 memoria…haec : *om. C, Pa* – memoria : memoriam *Lu* – memoria…metallorum : De speciebus metallorum, herbarum, lignorum, lapidum *S* – post lapidum : *add.* terrae sulphur *V* – amorum aquae : atque *S* – fungi : fugi *S*; 2 afronitri : afronitrio *Lu* – olei, picis : leipicis *Lu* – resinae : rasinae *S* – sulphuris : sulforis *Lu* – terrae : *om. S* – elei acosi : elacosi *Lu, om. S*; 4 *ante* metallorum : *add.* memoria *V*, de metallo re quidem *Lu* – metallorum…species : *om. S*; 5 Haec : *om. S* – fiet : fit *C, Pa* – aurum : auro *Lu* – *post* rufa : *add.* est *C, Pa* – amoydis *:* a modis *Lu,* ammoydis *S,* amoydde *Pa* – subrubicunda : subicum *Pa* – propter…perdet : *om. Pa* – adiuxtantem : ad vix stantem *S, Pa,* ad iuxta stantem *C*; 6 terra : terram *V, S, C* – perdet : perdit *V, C* – arenosa : aresosa *ante corr. Lu* – illa prior : prior illa *Pa*; 7 autem : *om. C* – sic : tale est *S, C*, tale *Pa*; 8 viride : viridis *V, L*; 9 autem : vero *V* – *recte* piritis : viridis *V, Lu, S, C, Pa* – colorem…aeramenti : quam *S, Pa, C* – aeramenti : heramenti *Lu* – colorem : colore *Lu*; 10 pirebolo : piregbolo *V, in rasura Lu*, pyregliolo *S*, pirepolo *C*, pirello *Pa* – emittit : mittit *Pa*; 11 autem : *om. Pa* – et : *om. V, Lu* – emittit : etmittit *Lu* – *ante* metallum : *add.* De metallum lapis est *Lu* – metallum : metalli *C, Pa* – gatizon : cagizon *V*, gagizon *Lu*; 12 *ante* plumbum : *add.* De plumbum *Lu* – terra est fusca : terra fusca est *Pa* – vero : autem *C, Pa* – ea invenitur : eadem est *Pa* – invenitur : invenietur *Lu*; 13 *ante* arena : *add.* De vitri arena *Lu* – est : *om. V, Lu* – unde : *om. Pa* – metallizatur : etallizatur *Lu*, metallizantur *C,* metalli *Pa* – et : *om. C* – lapis ipse : ipse lapis *S* – ipse : *om. C, Pa* – ipse vitrei : ipsi vitri *Lu*; 14 *ante* vitriolum : *add.* De vitriolum *Lu* – fiet : fit *V* – terrae : terra *V, Lu* – ogrizos : ogrios *Pa* – cretae : concrete *Pa* – gutta…colligent : guttam colligent ipsam *C*, gutta ipsa colligitur *Pa* – gutta quae : guttans *S* – ipsa : ipsam *S* – decoquent : decoque *Lu*, decoquitur *C*, coquatur *Pa*; 15 ex : *om. S* – fiet : fit *V* – *post* sunt : *add.* cum *C* – calcitarin : calottarin *V*, calcirin *Pa*; 16 *ante* alumen : *add.* De alumen *Lu* – alumen : aluminis *S, C, Pa* – florens : floriens *Lu, S, Pa*; 17 *ante* eritarin : *add.* De eritarin *Lu* – eritarin : eitarin *C* – eritarin … pisandum : eritarint est herba facilis ad pisandum *V* – terra : *om. Pa* – pisandum : piscandum *S*; 18 *ante* sulphuris : *add.* De sulfur *Lu* – sulphur : sulfor *Lu* – *post* terra : *add.* est *Pa* – et ipse : *om. Pa* – incenditur locus : in incendiis locis *Pa* – coctum…coquitur : coctum autem commixtum oleo et coquitur *V*, coctum autem commixtum oleo *Lu* – oleo : olei *Pa* – coquitur : quoquitur *Pa*; 19 *ante* nitrum : *add.* De nitro *Lu* – nitrum : nitro *Lu* – sal est : salem *S*, est sal *Pa* – terra : rafi *V* – fiet : et *V* – in terra fiet : in rafiet *Lu* – in limnas : limas *Pa* – tempore : *vox non legitur Lu*; 20 *ante* sal : *add.* De sal scistis *Lu* – sal scistis : salfistis *Pa*; 21 *ante* afronitrum : *add.* De afronitro *Lu* – afronitrum : afronitro *Lu*, affronitrum *C*, adfronitri *Pa* – in loco nitri : in lonitri *S* – gelet : velet *L*, gelat *Pa* – aliud : alium *V, Lu*; 22 spuma : spumam *Lu* – vero : autem *V, Lu* – plus : *om. Pa* – est : *om. V, Lu* – *post* est : *add*. prius *Pa* – tamen : autem *V, Lu,* cum *Pa* – eandem : eamdem *V*, eadem *Pa* – virtutem : virtute *Pa*; 23 *ante* terra : *add.* De terra sulforitan *Lu* – nascitur : *om. C, Pa* – ubi : qui *Pa* – enim : autem *V, Lu* – sulphur : sulphul *V*; 23-24 ipsa…locum ubi sulphur nascitur : *om. C*; 24 *ante* lapis : *add.* de lapis etmathitis *Lu* – emathitis : ematicus *V,* etmathitis *L,* ematites *S, vox non legitur Pa* – invenitur : nascitur *V, L*; 25 *ante* argentum : *add.* De argentum vibum *Lu* – aliud : alium *V, Lu* – argenti : argentum *Pa* – conflationem : conflatione *C*; 26 *ante* auripigmentum : *add.* De auripimentum *Lu* – auripigmentum : auripimentum *ante corr.,* auripicmentum *post corr. Lu* – *post* terrae : *add.* Calcetis gleba est naturis quae in Cypro insula invenitur in metallicis colore subauroso intus venas habens defissas et alium est scissum et in modum stellarum fulgentes *S*, gleba est naturalis quae in Cipro insula invenitur in metallicis colore subauroso intus habet venas descissas ut alumen scissum et in modum stellarum fulgentes *C*, gleba est naturalis quae in Cipro in insula invenitur in metallicis colore sub auroso intus habetis venas descissas ut alumen scissum et in modum stellarum fulgentes *Pa*; 27 *ante* lapis : *add.* De lapis gagatis *Lu* – ubi sulphur nascitur : *om. Lu* – lapis gagatis…nascitur : *om. S, C, Pa*; 28 *ante* prasinus : *add.* De prasinus terra *Lu* – prasinus : prassinus *V, C* – terra est : est terra *V* – metallizatur : *in rasura Lu*, metallizans *C, Pa*; 29 *ante* lulax : *add.* Lulax *Lu* – et : ex *Lu* – herbis : herba *Pa*; 30 *ante* lazurin : *add.* De lazuri *Lu* – est : *om. L*; 31 cyanus : ganus *V*, cianus *Lu,* quianus *C*, quinos *Pa* – *post* compositus : *add.* est *Pa*; 32 ficarin : ficarim *Lu*, fricarim *Pa* – compositus : compositum est *Pa*; 33 Iarin : iarim *Pa* – iarin…flos : iarin flos eramenti *V* – aeraminis : heramen *L* – est : *om. L*; 34 psimithin : psimithim *L* – est flos : flos est *V* – est : *om. L*; 35 chalcucecaumenum : calcucecaumenum *L, S,* caucucecaumenum *C*, calcucecumenon *Pa* – aeramine : eramento *V* – ex…fit : eramen fiet *L*; 36 cinnabarin : cynnabrin *S* – fit : fiet *Lu, om. Pa*; 37 siricum : sciricum *S* – psimithin : simithin *V,* ipsimitthim *Lu,* psimithio *S*, psimithu *C*, mitum *Pa* – et : *om. Pa* – *post* et : *add.* iam *S* – et ex plumbo : fit enim et ex plumbo *V,* fiet enim et ex plumbum *L*; 38 ocrea : ogrea *Lu,* ocria *S* – *post* est : *add.* metalli *V*; 39 pandia : pandio *Pa* – omnes compositio : omnia compones *C* – omnia colores omnes compositio : coloris omnia compositio *Pa.*

*Memoria* is divided into two sections: *Natura* and *Composita,* and includes some "keywords" that we can find identically in the related recipes, thus creating a "crossing mechanism" between table and text explained by the author at the end of the text (Baroni 2013).

By way of provisional example, we show in **Table 2**

| | |
|---|---|
| Memoria universarum herbarum, lignorum, lapidum, metallorum, amorum aquae, fungi, salis, nitri, afronitri, olei, picis, resinae, terrae sulphuris, elei acosi.<br><br>*V, f. 85v, l 33.*<br>*Lu, f. 220r, l. 6.*<br>*S, f. 28v, l. 10.*<br>*C, f. 41v, l. 2.*<br>*Pa: f. 52v, col. II, l. 21.* | |
| Natura herbarum lignorum lapidum et metallorum. | |
| Metallorum quidem species: | (Metalla) |
| Haec primum **metallum ex quo fiet aurum,** terra rufa amoydis subrubicunda propter adiuxstantem illi terra. | **De metallum ad aurum coquendum**.<br>Indicamus vobis quomodo aurum fieri possit de pinguitudine metalli […].<br><br>*V: f. 80r, l. 14.*<br>*Lu: f. 225v, l. 13.*<br>*S: f. 18,r, l. 15.*<br>*C: f. 28v, l. 15.*<br>*Pa: f. 46r, col. I, l. 21.* |
| Est enim **et alia similis** ed dum incenditur perdet colorem et non est arenosa sicut illa prior. Nascitur autem in solanis loci ea terra et sic metallum auri. | **Et alium metallum** indicamus vobis coquendum […].<br><br>*V: f. 80r, l. 14.*<br>*Lu: f. 225v, l. 13.*<br>*S: f. 18,r, l. 15.*<br>*C: f. 28v, l. 15.*<br>*Pa: f. 46r, col. I, l. 21.* |
| **Metallum vero argenti viride est**. | **De metallo argenti** coctione. Prasinus terra est viridis et **ipse lapis terrae viridis ex quo metallum manat argentum** […].<br><br>*V: f. 80r, l. 28.*<br>*Lu: f. 225v, l. 30.*<br>*S: f. 18,v, l. 10.*<br>*C: f. 28v, l. 15.*<br>*Pa: f. 46r, col. II, l. 20.* |
| **Metallum autem aeramenti petra est piritis, colorem autem petrae similis aeramenti. Dum percutis cum pirebolo ignem emittit.** | **Lapis qui dicitur focaria (*i.e. piritis*) ex quo eramen** coquitur nascitur enim in omnibus loci. Est et alium similis; **unum dum percutitur emittit scintillas raras et magnas**. Est et rubeus et igneus, **colores habens aeramenti** […].<br><br>*V: f. 81r, l. 22.*<br>*Lu: f. 230v, l. 10.*<br>*S: f. 20,v, l. 10.*<br>*C: f. 28v, l. 15.* |
| Auricalci autem petra est melina et eodem modo ignem emittit. Metallum lapis est colore ipso *gatizon*. | |

| | |
|---|---|
| **Plumbum autem terra est fusca,** lapis vero quae in ea invenitur **viridis est** | Coctio plumbi**. Terra est fusca** […] **terra fusca et petra quae ex ea nascitur et ipsa fusca** […] **Lapis vero qui in ea invenietur subviridis est** […].<br><br>*V: f. 82v, l. 32.*<br>*Lu: f. 217v, l. 15.*<br><br>Item coctio plumbi**. Metallum plumbi fuscum est et lapis qui in eadem terra invenitur prasinus *(i.e. viridis*)** […].<br><br>*V: f. 83r, l. 6.*<br>*Lu: f. 217v, l. 29.*<br><br>(item coctio). **Plumbi metallum terra fusca est** […] **et lapis qui in ea nascitur viridis est** […].<br><br>*V: f. 83v, l. 11.*<br>*Lu: f. 217v, l. 34.*<br>*S: f. 25,r, l. 20.*<br>*C: f. 49r, l. 7.* |
| **Arena est unde vitrum metallizatur**. Est enim et **lapis ipse vitrei coloris.** | De metallo vitri coctione**. Vitri metallum arena est** quae nascitur in diversis locis […]. Est autem et **petra habet colorem vitri**, subnigra.<br><br>*V: f. 83 v, l. 22.*<br>*Lu: f. 218r, l. 15.*<br>*S: f. 25v, l. 14.*<br>*C: f. 49v, l. 6.* |
| Vitriolum unde fit terrae ogrizos. Sunt cretae ubi verno tempore gutta quae ipsa colligent et decoquent et ex ipsa terra fiet calcitarin quae autem arida vitriolum. | |
| **Alumen** autem metallum ex terra florens. | **Alumen** vero viride et porphireum et omnia tinguet extra berillium et hunichinum.<br><br>*V: f. 81r, l. 19.*<br>*S: f. 20v, l. 6.*<br>*Lu: f. 230v, l. 4.* |
| **Eritarin terra est alba**, facilis ad pisandum. | **Terra quae vocatur Limnia est alba**, subporphyra. Nascitur in petrosis loci […]<br><br>*V: f. 81r, l. 16.*<br>*S: f. 20v, l. 3.*<br>*Lu: f. 230v, l. 1.* |
| **Sulphur** ex terra nascitur et ipse incenditur locus. **Coctum autem ex terra sulphurea oleo mixta** coquitur. | Quomodo **sulphur** coquitur. **Coque** lardum et ex **ipso oleo** tolle libras II et **sulphuris terra** libras III. …<br><br>*V: f. 82 v, l. 14.*<br>*S: f. 23v, l. 13.*<br>*C: f. 48r, l. 6.*<br>*Lu: f. 228v, l. 27.* |

| | |
|---|---|
| Nitrum sal est quod **nascitur in terra**, fiet in limnas **in tempore cavatur**. | **Crescentem autem terra** et refloriens florentem florem album, rotundum, quadrum, acutum. Post haec constringit et fiet lapis. **Aprile mense et Maio, excalescente terra, habundanter floret**<br><br>*V: f. 81r, l. 10.*<br>*S: f. 21v, l. 1.*<br>*C: f. 46.v, l. 1.*<br>*Lu: f. 227r, l. 23.* |
| Sal scistis **nascitur similiter.** | **Alii enim floruerant** et induraverunt et terrae non adheserunt sed remanserint ut margaritae eo **quod non coniunxerunt tempus.**<br><br>*V: f. 81r, l. 10.*<br>*S: f. 21v, l. 1.*<br>*C: f. 46.v, l. 1.*<br>*Lu: f. 227r, l. 23.* |
| Afronitrum vero nascitur in loco nitri priusquam gelet. Componitur autem et alium ex nitro: principale autem spumam **alba ut nix**,<br><br>**compositum** vero plus fuscum est, habet autem eandem virtutem. | Alia florent competenti tempore **sicut nive alba**.<br><br>*V: f. 81r, l. 10.*<br>*S: f. 21v, l. 1.*<br>*C: f. 46v, l. 1.*<br>*Lu: f. 227r, l. 23.*<br><br>**Compositio afronitri** secunda qua et queritur ad gluten…<br>*V: f. 82v, l. 16.* |
| Terra sulphuritana nascitur in eodem loco ubi sulphur nascitur. Ipsa enim terra generat sulphur. | |
| Lapis ematithis invenitur iuxta locum ubi sulphur nascitur. | Terra nigra nominantur autem eo quod est fusca. Nascitur enim in Aegypto et Africa et in Evilat et in Italia. Nascitur in humidis locis et in vallibus. Ex ea tinguitur russeum. Commixta cum aceto, cocta reddet colorem et post haec revenitur in coccum.<br><br>*V: f. 84v, l. 33.*<br>*Lu: f. 219r, l. 32.* |
| **Argentum vivum nascitur ex terra**.<br><br>**Nascitur et alium ex metallum argenti in conflationem.** | Lapis Atriatis quem vocant Leuconpandium. Est **enim terra prasina in qua nascitur**. Florentem florem constringit terra ipsa […] Et ipsis egredietur argentum vivum […]. **Et terra quae in ea est iacta foras et remanet argentum vivum.**<br><br>**Exiet autem et de metallo argenti quando inchoat incendere**, praecurrit et colligunt illud artefices.<br><br>*V: f. 81r, l. 10.*<br>*S: f. 21v, l. 1.*<br>*C: f. 46v, l. 1.*<br>*Lu: f. 227r, l. 23.* |
| **Auripigmentum metallum est terrae**. | **Auripigmentum metallum est terrae** quae in Cypro insula invenitur in locis metallicis, colore subauroso. Intus venas habet descissas, prout alumen scissum et in modum stellarum fulgentis.<br><br>*V: f. 84v, l. 33.* |

| | |
|---|---|
| **Lapis Gagatis** invenitur in universis locis ubi sulphur nascitur**, prasinus terra est,** metallizatur. | **Lapis Gagatis** similis coloris auripigmenti non enim sic **multus viridis**. Qui dum rumpitur ignem emittit et finditur in laminas […].<br><br>*V: f. 21v, l. 1.*<br>*S: f. 21v, l. 10.*<br>*C: f. 31, l. 13.*<br>*Lu: f. 230v, l. 34.* |
| | (Colores) |
| **Lulax componitur** ex terra et herbis. | **Lulax,** id est Indicum, **compositio**. Iarin oncias II, vitrioli mundi uncias IV alumen egyptium uncias II uvato uncias II […]. Commisce ipsum cum supradicti speciebus defrica diligenter et dimittes dies unam requiescere.<br><br>*Lu: f. 229r, l. 6.* |
| **Lazurin compositum** est. | **Lazuri** principale. Folia floris Violae collige bene et in mortario mundo tere bene. Et mitte […].<br><br>*L: f. 76r, l. 22.*<br>*Lu: f. 224r, l. 32.*<br><br>**Lazuri** zonta ex floribus **compositum est**. Flores Neulacis quod graece Thapsya dicitur, alii Camaleonta. Collige flores et repone. Et post haec […].<br><br>*V: f. 77v, l. 4.*<br>*Lu: f.225r, l. 3.* |
| **Cyanus compositum**. | **Quianus** nascitur sic. **Quianus** nascitur de rosa Baltasion. Nascitur enim in locis humidis; nascitur quidem ex rore aestivo tempore. Colligitur autem sic: tollens, collige illam […] mitte ex illa coclea libras III, de Baltasion libras III, sapone libram dimidiam , Iarin uncias III […]. Omnia **commixta et trita** repone […].<br><br>*V: f. 79r, l. 34.*<br>*S: f. 50v, l. 8.*<br>*C: f. 40v, l. 18.*<br><br>**Confectio Quianus**. Propter pensum, ante **commixtione specierum**, marmorem tritum bene commisce […].<br><br>*V: f. 79v, l. 4.*<br>*S: f. 50v, l. 17.*<br>*C: f. 41r, l. 8.*<br>*Lu: f. 223v, l. 25.* |
| **Ficarin compositus.** | **Confectio Ficarim**. Tolle lacca mundissimam […]. **Commisce** in lacca […].<br><br>*V: f. 83r, l. 10.*<br>*S: f. 24v, l. 16.*<br>*C: f. 48v, l. 14.*<br>*Lu: f. 229v, l. 21.* |

| | |
|---|---|
| **Iarin aeraminis est flos.** | Compositio **iarin**. Tollens petala mundissima de **eramen** et suspende super acetum fortissimum et pone ad solem immobile manere. Post dies XIV aperiens, tolle ipsa petala, **collige florem et facies iarin** mundissimum […].<br><br>*V: f. 76r, l. 11.*<br>*S: f. 14v, l. 14.*<br>*C: f. 25v, l. 7.*<br>*Lu: f. 223v, l. 12.* |
| **Psimithin plumbi est flos.** | Compositio **psimithin**. Tolle acerrimum acetum et funde in anfum ut facias quasi dimidium. Deinde **plumbum** delatum […].<br><br>*V: f. 84v, l. 27.*<br>*S: f. 28r, l. 17.*<br>*Lu: f. 219v, l. 25.*<br><br>(Item) De compositione **psimithin**. Postea tollens **plumbum** fac petala et suspende sicut primum super acetum. Deinde collige **ipsum florem** et lava bene donec mundus fiat et **facies psimithin**.<br><br>*V: f. 76r, l. 14.*<br>*S: f. 14v, l. 19.*<br>*C: f. 25v, l. 10.*<br>*Lu: f. 223v, l. 16.* |
| **Chalcucecaumenum ex aeramine fit.** | **Chalcucecaumenon. Fiet ex eramine** mundissimum, petala […].<br><br>*Lu: f. 229 r, l. 21.* |
| **Cinnabarin ex argento vivo fit**. | Compositio **cinnabarin** alithinu mundi**. Sume ex argenti vivi** partes II […].<br><br>*V: f. 82v, l. 23.*<br>*S: f. 24r, l. 7.*<br>*Lu: f. 229r, l. 24.* |
| **Siricum ex psimithin** fit et ex **plumbo.** | Minion, qualem nos **Siricon** dicimus, componitur sic: **plumbum** purgatum mitte in ollam novam et coque in fornace dies VIII ex lignis communis et postea aperi ipsum cacabum et **invenies siricon** et lava utiliter et habebis.<br>Sed melius **siricon**, et rubeus sicut carbo, **coquitur ex psimithin** in illo ordine sicut diximus de plumbo.<br><br>*F: f. 12v.* |
| **Ocrea terra** est. | **Terra crocea** nimis est macra, dicta dum coquitur ut cerusia diutius exit macra prius tamen a sordibus emundetur aqua, solaribus expondenda fervoribus candeant.<br><br>*Fb: f. 8r.* |
| Pandia omnia colores omnes compositio. | |

The entire section of *Natura* based on the collation between the main manuscript witnesses; on the right, one can observe the concordance with the related references

contained in the recipes of *Compositiones*.

As shown, the concordance between the index and the sequence of recipes is anything but random and is repeated throughout the whole text.

Moreover, the text of *Memoria* and some recipes agree in the use of *hapax* as *pandia*, *lulacin* and other rare words that further highlight the mutual complementarity.

All the elements listed above prove that in its highest phase of tradition *Compositiones* presented its own structure, constituting a work of technical-encyclopaedic character. It can be added that the concordances establish a series of fixed points which, together with internal references and other elements of a philological nature, may allow the reconstruction of the original *consecutio* in the first part of the work (*Natura*)[16].

## 7. The content of Compositiones

At this time, presenting the detailed textual sequence of *Compositiones* is unsuitable. For the time being, we intend to focus on the general profile of the work through a careful reading and analysis of the text.

*Compositiones* does not include any prologue or incipit, which was probably present in the original work. However, at the end of *Memoria*, one finds what probably corresponds to the explicit of the work: *Haec omnia praesignavimus tinctionum, coctionum, colorum, tectionum. Lapides praediximus, metalla, aluminationes, herbas, qua inveniatur*.

As mentioned previously, *Memoria* is divided into two sections: a first section on natural elements, *Natura* (*Natura herbarum, lignorum, lapidum et metallorum*), and a second one dealing with *Composita* (*Composita herbarum, autem terrae et lignorum*), at present respectively divided into four and eight chapters (**Table 3**):

[16] The number of punctual correspondences between almost all the entries of the first part of *Memoria* and the approximately 160 recipes of *Compositiones* cannot be random. This element definitely removes any doubt about the unity of the work and its literary arrangement. In a future study we will demonstrate that practically all the remaining recipes of the text find a position in the second part of *Memoria*, the one dedicated to *Composita*. The *Composita* are made of several constituent elements and sometimes the ingredients are more than a dozen per composition. For this reason, the author of the *anamnesis* collected these ingredients, grouping them simply by categories and yet maintaining the general progression of the work: after *Coctiones* and *Colores*, developed in the first half, one finds *Tinctiones* and *Tectiones*. Indeed, all the substances mentioned in the second half of *Memoria* are ingredients from the recipes of the section on Dyes and Coatings.

| **I. Natura herbarum, lignorum, lapidum et metallorum** | |
|---|---|
| Chapter 1. Metalla | Book 1. **Coctiones** |
| Chapter 2. Lapides | |
| Chapter 3. Colores | Book 2. **Colores** |
| Chapter 4. Pandia | |
| **II. Composita herbarum, autem terrae et lignorum** | |
| † | Book 3. **Tinctiones** |
| Chapter 5. Tinctio pellis | |
| Chapter 6. Tinctio ossorum et omnium corniorum et omnium lignorum | |
| Chapter 7. Tinctio omnium musivorum | |
| Chapter 8. Tinctio vitri | |
| Chapter 9. Militaria (poliorcetica) | |
| Chapter 10. Deauratio | Book 4. **Tectiones** |
| Chapter 11. Glutina | |
| Chapter 12. Conchylium | |

**Table 3. *Compositiones* arrangement.**

*Memoria* is based on the opposition between two groups, each made up of four elements:

- four *operationes*: burning or melting (*coctiones*), colour (*colores*), dyeing (*tinctiones*), and coatings (*tectiones*).
- four categories of elements: stone (*lapides*), metals (*metalla*), mordants (*haluminationes*), and herbs (*herbae*).

The four *operationes* constitute the *Compositiones* main books. *Coctiones* are the procedures of melting in order to extract metals from minerals (*metalla*). The section *Colores* deals with the making of pigments, whereas the term *Tinctiones* refers to the permanent colouring of leather, fabrics, wood, bones, by means of bath or immersion, but covers also different meanings, such as glass colouring (*tinctio vitri*; Tolaini, 2004) or the making of incendiary mixtures. Finally, the term *Tectiones* deals with the coating of artefacts in order to imitate the appearance of precious stones.

The "natural things" are opposed to "compound things" with a classification which seems to echo that of Latin encyclopaedias. However, the main theme of *Compositiones* consists in the procedures that can change the appearance of things with what the earth produces both of simple or compound type: superficially, in case of colours and coatings, or deeply in case of melting – i.e. a procedure to release metals from ores containing them – and dyeing – i.e. the capability to permeate a substance giving it a quality.

Each chapter is made up of almost 24 recipes. The first chapter is devoted to the melting of metals, which are displayed following the ancient order, starting from gold up to glass as imitation of gemstones. Metal is extracted from its principal ores by means of different techniques of melting and according to their nature.

The following chapter contains a lapidary; still focused on the burning of stones.

Two chapters are then devoted to colours, containing almost fifty recipes that follow an interesting order: firstly, the most precious azures and then the reds, in their different hues, distinguishing the pure ones from those composed (called *pandia*). Most of the recipes describe mixtures of mineral pigments and organic dyes (Baroni–Pizzigoni–Travaglio 2018).

Then one finds four chapters that discuss the dyeing of leather, bones, wood, horn, glass and glass pastes for mosaics and a chapter devoted to incendiary mixtures still related to the concept of dyeing. These compositions may be considered as dye-baths, capable of giving the property of fire to the objects immersed.

The last three chapters develop the topic of coatings. The first describes the techniques of gilding by means of amalgams of quicksilver, metal leaves and powders, whereas the following one is devoted to the *glutina*, i.e. soldering alloys for various metals and glues for stones and wood conceived as useful to coatings. The last chapter focuses on the production of a codex purpureus, in which the parchment is coated with purple and gold and/or silver.

We cannot describe here all the technical procedures cited in the text as we will refer to them more specifically in our upcoming critical edition[17]. We can offer only a few examples, significant to the knowledge of technical art history and to the field of conservation.

The text describes different techniques for the surface decoration of metal objects in order to obtain polychrome effects: formation of superficial patinas, niello, pictorial *velatura*, etc. A coat of an oleoresin composition, even weakly coloured, *ganosis* (*De lucida*), was used on metal works but also on wooden and stone sculptures and polychrome layers in order to protect them and obtain peculiar aesthetic effects.

Most of the pigments cited in *Compositiones* are made by mixing inorganic pigments and organic dyes, thus obtaining particular colours, shades and hues. The use of such mixtures in the text proves the widespread presence of pigments containing anthocyanins and other organic dyes in the ancient world.

Lastly, in the field of vitrification and ceramic coating, the text proves that the use of white pot-metal glass produced with tin oxide was well-known during Late Antiquity and the Middle Ages, just as the use of powder of saccaroid marbles or sparry calcite and

[17] Having said that, it is now clear that the critical edition of *Compositiones* must first deal with the problem of the original extension and *consecutio* of the text. In fact, no manuscript witness, including *V* and *C*, passes down the whole work. Choosing a manuscript at random, even one among the largest or oldest ones, and collating the recipes of the others on it is ineffective in achieving a full understanding and restitution of the original work, that was certainly widespread and organised in a very different way from what the preserved manuscripts passed down.

protein glues as adhesive for stones (Andreotti *et al.*, 2018).

## 8. Conclusion

*Compositiones* is a technical encyclopaedia of sorts that passed down significant practical knowledge on arts and craftsmanship from Late Antiquity to the Middle Ages. *Compositiones* represents one of the oldest and widest ancient text of technical nature currently known and was subject to a widespread diffusion all over Europe from the beginning of the Carolingian reform to the threshold of the Renaissance. Even if it cannot be directly related to specific artefacts, this work is a fundamental source of information on ancient technical knowledge, useful to historians and conservators and even capable of subverting historiographical certainties.

In order to use this source correctly and resolve relevant issues left open by scholarly investigations, *Compositiones* has been analysed from a philological point of view, as well as restored in its probable original arrangement thanks to the identification of *Memoria* as the index of the work. Through this analysis it was possible to show that *Composotiones* is a coherent text organised by a single author and not merely an accumulation of heterogeneous recipes.

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