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Canons and 'Recipes' for the Layout of the Medieval Book

New Observations and Verifications

1 The *mise en page*—balancing aesthetics with functionality

'A book's format is determined by its function, and therefore is naturally related to the average stature of an adult and the size of his/her hands. Folio-sized books should not be produced for children, as they would be too difficult for young readers to handle. A high, or at least adequate degree of comfortable handling characteristics should always be strived for. A book as large as a table would be an absurdity, whilst books the size of postage stamps are considered pure whimsy. Similarly, cumbersome books are not readily accepted, since elderly people can find them difficult to handle without assistance. Giants would naturally require large books and newspapers; on the other hand, many of our everyday books would be considered far too large for dwarfs to handle.'[1]

These, together with various other observations made by Jan Tschichold (an important figure in 20th-century European typography)[2] on the anything but

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The overall subject matter of this research was anticipated in a paper titled *Medieval Book Design: Layout Canons and Recipes,* which was presented at the conference *Writing Europe before 1450. A Colloquium* (Bergen, University of Bergen, 3–5 June, 2012). I received some highly thought-provoking notes, observations and suggestions from two anonymous reviewers (and by one of them in particular), which for the most part I judged to be legitimate. These led me to re-think to a significant extent a number of issues; thus I was able to improve both the form the and the substance of the results of my work. I am grateful to the people concerned; at the same time I remain solely responsible for the opinions expressed in the present text, and for any errors it may contain.

1 Tschichold 1948 (1975, 2003) [slightly revised English version].

2 See the recent bibliography dedicated to Tschichold by McLean 1997.

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accidental 'physiognomy of the book' can be extended to the medieval codex. Indeed, it is not purely by chance that the polymath German designer—a theorist, artist, artisan and graphic designer—exhorts us to 'tirelessly study in a scientific way the impeccable works of the past',[3] with the aim of reviving the fundamental 'rules' that underlie the harmonious layouts seen in ancient manuscripts, and then to apply them in their modern, printed counterparts. Tschichold himself engaged in this activity, which led him to come up with some rather ingenious designs. However, such designs are perplexing to scholars of the medieval book, owing to the flimsy theoretical suppositions they are based on, and a lack of archaeological validation.[4]

It is also true, however, that while the world of contemporary graphics has held an open and lively debate and devised numerous tenets and guidelines for the production of reasonably sized and aesthetically pleasing books with well-balanced layouts, on the technical matters, in common with all of his 'trade secrets', the medieval manuscript maker remains highly reticent. Furthermore, allusions to such matters in literary sources are sporadic and rather vague, and consequently of little help in defining the technical criteria that the artisans applied, and by extension the basic principles underlying them.

In any event, despite the dearth of technical and non-technical documentation, analysis of the spatial organisation of the page has long held an irresistible attraction for scholars, since the intellectual implications of the *mise en page*—which is to say its capacity to 'shape' the text, and therefore to 'steer' its reception—are intertwined (often indissolubly) with the irrational allure of numbers. The geometry of the page—'terre d'élection des codicologues'[5]—is, after all, among the various aspects of medieval codex production, the one in which the primary function of a book is expressed to a maximum degree: that is, to accommodate and transmit literary content, and above all to render it usable and sufficiently legible. For the same reason, it is also a 'terrain' characterised by rather delicate and fickle balances, thanks to the consciously or unconsciously exerted influences determined by different tastes and traditions, and

3 Tschichold 1948 (1975, 2003), 60.

4 A critical assessment of Tschichold's theories on the *mise en page* of (late) medieval manuscripts is not the subject of the current work and merits a separate discussion. Here, I shall limit myself to pointing out the difficulty of following the thread of fragmentary reasoning in publications that are not always easy to penetrate, and which are characterised by *a priori* judgements on the presumed aesthetic qualities of specific constructions (see below, footnote 11).

5 Muzerelle 1991, 370.

various requirements imposed by the need to contain economic costs and to assure legibility.[6]

The history of studies on the design of medieval manuscripts is dominated by a clear contraposition between two antithetical approaches. One approach is devoted to the purely theoretical search for abstract 'models of spatial balance' that would have influenced the artisans' production, whilst the other is fuelled by the conviction that aesthetics played an entirely secondary role in comparison to far more concrete and pressing demands of a functional and economic kind. Such criteria can be retroactively reconstructed (in terms of overall trends) by analysing the synchronic and diachronic evolution of the page's basic parameters, namely its relative and absolute dimensions; the ratio between the page's total surface area and its written surface area (and the degree of exploitation of the latter); and the arrangement of text into one or more columns. If the first approach reflects a 'strongly idealised vision of the aesthetic of the *mise en page*',[7] in the second the written page is seen as a 'consequence of the various contradictions that weigh upon the text transmission process'—in other words, the result of a preliminary planning phase aimed at defining the degree to which information is concentrated and optimising the usability of the message, in accordance with the means and expectations of the commissioning client, and also with his reading ability and needs. From a methodological standpoint as well, descriptions of individual specimens of particular appeal or graphic complexity are contrasted with statistical analyses of measurements taken from a broad range of codices.

Proponents of the idea that the geometric harmony of the medieval page derives from the combination of so-called 'remarkable rectangles' (among whom one cannot fail to mention, besides Jan Tschichold, the Belgium codicologist Léon Gilissen)[8] have been challenged by some pertinent counter arguments in the form of 'statistical' or 'quantitative' codicology. Such arguments range from a questioning of the intrinsic vagueness of the idea of a 'remarkable relationship' ('formule remarquable'),[9] to pointing out the abundance of relationships identified as such by medieval sources, and the relative ease of identifying a certain number of more or less 'remarkable' rectangles (based on acceptable margins of tolerance) among the many formed by the ruling grids laid out on

6 The implications of this dialectic are persuasively presented, with due reference to a previous bibliography, in Ornato 1997, 648–654.

7 *Ibid.*, 651.

8 Gilissen 1977, 123 onwards.

9 Gilissen 1977, 126.

the actual pages of ancient manuscripts, or even on pages generated artificially by applying random criteria.[10] Quite apart from the theoretical issues, the chief objection to the theory of the 'remarkable rectangles' consists, on the practical level, in the lack of convincing results following the repeated application of 'significant' combinations of relationships (and not just from one or another of them, taken on its own).[11]

Whilst it is rather easy to highlight the limitations of mere numerological speculation—which in any event has not ceased to exert its seductive influence over scholars of the *mise en page*, and even extends into spheres other than the Greek and Latin world[12]—it is less easy to identify and support with hard facts (based on a sufficient amount of directly obtained data, or data gleaned from existing catalogues) the general inclinations, or possible canons, adhered to by artisans. Likewise, it is difficult to define the circumstances and extent of their use.

10 See Bozzolo et al. 1990.

11 The most important example is found in the emphasis placed on the so-called 'Golden Ratio' or 'Divine Proportion', based on the definition proposed by the Franciscan mathematician Luca Bartolomeo de Pacioli (for further information about Pacioli, see Tristano 2010). As is well known, this is the proportion of a quadrangle–obtained through various procedures–whose sides have the irrational numerical relationship 0.618, approximating to 3/5 (0.600) and 5/8 (0.625). Irrespective of the intrinsic beauty and peculiar balance attributed to it (above all by Renaissance theoreticians), the 'Divine Proportion' is, in fact, very seldom found in the layouts of Western manuscripts of any era (in both Northern and Southern Europe), and practically unknown (at least continuing through the 12th century) in Greek book production (see below). The suggestions implied by the 'Golden Ratio' also influenced Tschichold's speculations about the 'canons' that were supposedly devised in late medieval book crafting workshops, and subsequently 'inherited' by proto-typographers in order to attain an opportune positioning of the written area on the surface of the page, which is to say a geometric balance regarded as being particularly in harmony with the four blank margins surrounding it (see, for example, Tschichold 1948 [1975, 2003], 44–52).

12 References to the presence of 'remarkable rectangles' in the layout of manuscripts can be found in the works of Giorgio Montecchi (cit. below, footnote 28), and Paolo Cherubini (cit. below, footnote 27), and also in publications dedicated to the *mise en page* of codices written in Arabic script, which seem to be consistently ignored in bibliography relating to the Western book: Polosin 1999; Polosin 2001; Porter 2004. A paragraph (not by chance) is dedicated to remarkable rectangles in Déroche et al. 2000, 180–182, and largely reproduced in the recent new Italian edition of the manual (Sagaria Rossi / Déroche 2012, 126 ff.). Also inspired by the construction methodology devised by Tschichold is the purely theoretical procedure hypothesised for the shaping of the page by Tristano 1991, 61–71. The reconstruction by Batlle (undated), is entirely without scientific foundation.

2 The notion of a 'recipe'

In an attempt to systematise and build on the findings of recent research into the present topic, it is only natural to start out from the explicit pieces of evidence that have been collected from various sources, even if these (despite being bolstered in recent years by some fortuitous discoveries) remain quite scarce and scattered through space and time, in addition to frequently being rather obscure in their stipulations and therefore difficult to interpret, if not highly problematical or even downright perplexing. These clear constraints notwithstanding, it does not seem an entirely pointless exercise to attempt a synoptic analysis of the texts that have been identified up to the present, drawing attention to consistent as well as inconsistent points, and re-examining, wherever necessary, their various interpretations; and, within the limits of feasibility, their actual level of dissemination (where this has not already been done).

Before introducing the texts that will be placed under scrutiny, it should be made clear that—regardless of the fact that their blanket definition as 'recipes' is widely accepted—not all of them conform to the specific definition of the term that I proposed a number of years ago, which has been embraced in subsequent research and handbooks, namely 'a recipe is a coherent collection of tenets which, by establishing a systematic link between the various elements of a page, aims to facilitate the construction of an unambiguously defined grid. In addition to not being ambiguous, a recipe must also be of universal value: in other words, it must be applicable, without any degree of uncertainty, to any size of manuscript. It is for this reason that dimensional prescriptions can only be expressed in terms of fractional relationships, that is to say in the form of *proportions* (i.e. ratios) between the various components of the page'.[13]

Actually, there is no need for such a stringent definition to exclude from the surviving group of recipes the common-sense recommendations formulated at the end of the 13th century by the Swiss *magister* Corrado de Mure in his *Summa de arte prosandi*, which does not in fact refer to the layout of books, but rather to that of documents (*litere seu epistole*):[14]

> Sic quadranguletur, ut latitudo longitudini respondeat convenienter, et ne latitudo nec longitudo modum debitum excedant et mensuram, sicut archa Noe in longitudine, latitudine, altitudine jussu dei artificialiter et proportionaliter composita fuit et compacta. [...] Item scriptura litere seu epistole tam a capite quam a fine secundum debitam quadraturam cum spaciis ab

13 Maniaci 1995, 17–18.

14 The piece can be found in Wattenbach 1896, 188–189, edited by Kronblicher 1968, 62.

> omni latere, scilicet superius inferius dextrorsum sinistrorsum, competentibus habere debeat ductum seu terminos lineales, ita ut scriptura margines carte seu extremitates fugere videatur modo debito et decenti. Alioquin carta sic detruncata proprietatem littere deformaret. Unde carta seu carte forma non sit nimis longa, non sit nimis lata, spaciis ut dictum est regulariter ordinatis.

The indications transmitted through an Arabic book by the learned Andalusian Abū Bakr Muhammad ibn Muhammad al-Qalalūsī al-Andalusi, who was active in the second half of the 13th century,[15] are more clearly aimed at describing the various steps involved in a specific procedure for the 'construction' of a page. It would seem that the ancient text has come down to us in a partially corrupted ('omise ou déformée') form—or that, at least, that is certainly the impression one gets when reading it in translation:

> The paper is folded lengthways; the fold serves as a guide to fix the lower margin, which is defined by the line linking two points pricked with a compass on the two edges of the sheet. There are two margins running widthwise, starting from the prickings of the first two points; heightwise, the upper margin is parallel to the lower margin. The block of text is divided into two parts, determined by the shīḥa which is obtained [as follows]: mark a point parallel to the point marking the middle of the first line traced lengthways, based on three semi-circles; starting from two equidistant points on this semi-circle, trace two arcs that meet at a point; a straight line is drawn between these two points. This is the figure of the shīḥa, which divides the block of text into equal parts. The guidelines are established half-by-half, starting from the lateral prickings.

The rather mysterious sequence of steps described by the treatise's writer—which have no equally explicit[16] parallel in the Arab contest—involve, in addition to folding, the use of a compass, mention of which ostensibly recurs centuries later (although in an entirely different context) among the final recommendations provided in Sigismondo Fanti's recipe.[17] The use of a compass involves adopting a construc-

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15 See Sauvan 1989, 49–50. See also Déroche et al. 2000, 179, and Sagaria Rossi / Déroche 2012 (the recipe's text, as reproduced here, can be found on p. 127). The treatise was edited by Abbady 2005.

16 Worth pointing out, however, in Sagaria Rossi / Déroche 2012, 127, is a reference to a rather unspecified norm, which stipulates that 'the upper space should be larger than that in the lower margin, in such a way so that the said spaces, once the script has been laid down, are equal'. In the absence of any systematic investigations, it seems imprudent to speculate on this issue, just as it is on other features, actual or presumed, of the *mise en page* of the codices written in Arabic script.

17 See. below, 438 and 443, and footnote 66. It has been well noted how often the compass, employed since ancient times, appears in Byzantine miniatures (though more rarely in Latin ones predating the 15th century) as a generic element of the iconography showing the evange-

tion technique based on irrational geometric relationships, which differs from other possible approaches that depend on the relationship between whole numbers or the multiplication of a determinate basic unit. Despite providing us (albeit in translation) with valuable food for thought, the Andalusian's recipe remains highly mysterious, thanks to a complete lack of explicit information on measurements or proportions that would make it possible to identify a specific *mise en page* template.[18]

Much more detailed, although not exhaustive or free from vagueness in their stipulations, are the currently known sets of instructions for codices in Greek and Latin script, which it will be worthwhile to pay particular attention to here. Specifically, these are two texts in Latin and two in vernacular Italian—very distant from each other chronologically and in relation to their transmission backgrounds and geographical contexts and a single, represent an unparalleled (and still unpublished) Byzantine source, whose contents have only recently been made the subject of an initial and only partial examination (the preparation of an annotated edition is currently underway).

It seems appropriate to begin with a few remarks about the aforesaid source, as it will not be referred to again in the present essay. In the Greek context it remains a unique source and is of considerable interest, not for this reason alone. It was transcribed by an anonymous Greek Aristotelean copyist in the second half of the 14th century and came down to us as a unit in a composite codex (Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. gr. 604).[19] Although Daniele Bianconi—who pointed out the text's existence and initiated its study—recognised the booklet (which consists of nine densely-written pages) as a recipe, likening it to the already known Latin ones,[20] it is more similar to a detailed template[21] for a *mise en texte* and

list engaged in his copying tasks. Not even references in written sources, including 16th-century treatises on writing, provide details on the use of the instrument in the production of books and documents (here, it should suffice to direct the reader to the meagre information offered by Rosenfeld 2002, 168, and to the dossier edited by Gumbert (undated), which can be viewed at http://www.palaeographia.org/outils/outils.htm, with additional bibliography).

18 Not concerning the *mise en page*, but rather the *mise en texte* (understood as the combination of steps that contribute to the distribution of the content within a book and to its visual and functional organisation), are 29 interesting prescriptions with respect to the treatment of the text of the Koran (1279 AH / 1862 CE) analysed by Witkam 2002. It would seem that no similar indications are offered by any Western sources.

19 The text, which is briefly described in Devreesse 1950, 1–7, here 6 (but previously pointed out by Mercati 1931, 158–159) was recently presented, in broad terms, by Bianconi 2010, a contribution that foreshadows a more detailed study.

20 Bianconi 2010, 406; Bianconi observes correctly, however (*ibid*., 407), that the text lacks the universality that sets the other texts apart.

mise en page intended for the complicated manufacture of an annotated manuscript, in which a variable portion of the text of Aristotle's *Organon* is framed, on each page, by a suitable exegesis.[22] The minutely detailed instructions provided by the unknown compiler of the text not only stipulate the number of written lines (varying from 12 to 24) to be copied, page-by-page, on to the block of quires destined to accommodate the group of treatises that comprise the *Organon*, but also the exact sequence of words to appear, on the *recto* and *verso*, at the end of every page, and the position of the blank spaces that signal the transition between one text and another, or between different sections of the same text. The drawn-out and rather monotonous sequence of instructions concludes, in the lower third of the penultimate sheet of the 'booklet', with a revealing description of the ruling diagram for the Aristotelian volume, together with a visualisation of the distribution of spaces in the form of independent perpendicular segments, as follows: horizontally, the inner margin, the width of the written area, the distance between this and the marginal notes, the width of the space reserved for commentary, the outer margin (respectively equating to 31, 116, 10, 47 and 28 mm); and vertically, only the width of the upper and lower margins (22 and 30 mm), while the height of the written area is omitted (probably because it is variable) (Fig. 1).[23] On a single straight line that diagonally traverses the *recto* of the final sheet there is reproduced, most likely in life-size, (which would explain its unusual positioning), the sequence of segments corresponding to the width of the codex whose *mise en page* is described. The segments measure, in sequential order, 28, 114, 9, 46 and 28 mm, for a total of 225 mm (Fig 2).[24]

21 The term denotes, in the technical jargon used for traditional printing, a model employed for the layout of printed works consisting of multiple pages.

22 This interpretation would appear to be validated by the incipit *ex abrupto* of the text, which is entirely devoid of literary ambition.

23 The *mise en page* described by the anonymous copyist is of the 'variable balance' type, in which the dimensional relationship between the areas, or zones, set aside for commentary and the written area (in the strictest sense of the term) is defined, page-by-page, in relation to the size of the two text masses. This is in contrast to what happens in the case of 'fixed balance' typography, in which the relationship between the two areas is fixed for once and for all when the volume is first planned. For a more detailed description of the two techniques and of the consequences resulting from choosing between either one or the other approach, see Maniaci 2006, 217, 244–253 and *passim*.

24 The measurements of the individual segments roughly replicate those already furnished by the copyist on the previous page.

Figs. 1 and 2: Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. gr. 604, f. 186r–187r.
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The absence of a crucial piece of data, namely the height of the written surface (which prevents us from being able to define with accuracy the height of the codex), and the peculiarity of the layout referred to in the source, make it impossible to draw a comparison between the *mise en page* so meticulously described by the Byzantine copyist (or artisan-copyist) and the reality of coeval Greek manuscripts. It is not surprising, then, that up to the present day no Aristotelian volume (or volume of different content) has emerged which conforms perfectly to the guidelines preserved in the Vatican manuscript. Indeed, if one takes a closer look, it seems difficult to believe that one, or perhaps even several copyists were able to follow to the letter such a rigid set of instructions. In fact, it seems more reasonable to suppose that the text concerned constitutes a description made after the fact, perhaps with a certain degree of smugness, following the completion of a doubtless very demanding task.

3 The Latin recipes

Whilst awaiting a more in-depth analysis and the complete edition of the Byzantine source, it seems sensible to move on to a comparative examination of the four recipes known in the Latin context, namely:

– the so-called 'Saint-Remi' recipe, jotted down at the beginning of the 10th century in the lower margin of a codex originating from Northern France, of which only a small fragment survives (Paris, Bibliothèque nationale de France, Par. lat. 11884, f. 2v) (Figs. 3a and 3b);[25]
– the 'Munich recipe', discovered by Bernhard Bischoff in a 15th-century Bavarian miscellany of predominantly medical content (München, Bayerische Staatsbibliothek, Clm 7755, f. 199r), as part of a series of instructions for the manufacture of dyes and colours (Fig. 4);[26]
– a recipe written in the middle of the 15th century (approximately) in vernacular Italian by an unknown hand (possibly of Emilian origin), on the *recto* of the front parchment flyleaf of a paper-supported compendium of accounting and commercial matters dating to 1429 (Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. lat. 4825, f. Iv) (Fig. 5);[27]
– a detailed series of instructions, also in vernacular Italian, formulated at the beginning of the 16th century by Sigismondo Fanti, a multi-talented mathematician, astronomer and astrologer of Ferrara, in the introduction to his *Theorica et practica… de modo scribendi fabricandique omnes litterarum species* (Figs. 6a and 6b).[28]

25 This consists of only three surviving leaves from a codex of miscellaneous content originating from the Saint-Remi Abbey at Reims, where it was probably produced after the year 882. For further information and a detailed study of the recipe, see Muzerelle 1989, with earlier bibliography, and in particular, 127, footnote 8.

26 The recipe was briefly referred to by Bischoff 1984, 239–240. A full reproduction can be viewed at https://bildsuche.digitale-sammlungen.de/index.html?c=viewer&bandnummer=bsb00069150&pimage=00003&einzelsegment=&v=2p&l=it. In addition, the brief and rather antiquated description printed in *Catalogus* 1873 (1968), 196, is available to view online at https://daten.digitale-sammlungen.de/bsb00008267/images/index.html?fip=193.174.98.30&seite=200&pdfseitex= (last access 07/09/2021).

27 Credit for the discovery is owed to Cherubini 2004, 241–258.

28 The *Theorica et pratica perspicacissimi Sigismundi de Fantis Ferrariensis in artem mathematice professoris de modo scribendi fabricandique omnes litterarum species*, Venetiis 1514 (the reproduction of the text, below, 438–439, was transcribed from the exemplar held in Rome at the Biblioteca Casanatense, Rari 783). The text was studied by Montecchi 1995 (1997), previously appeared in Mon-

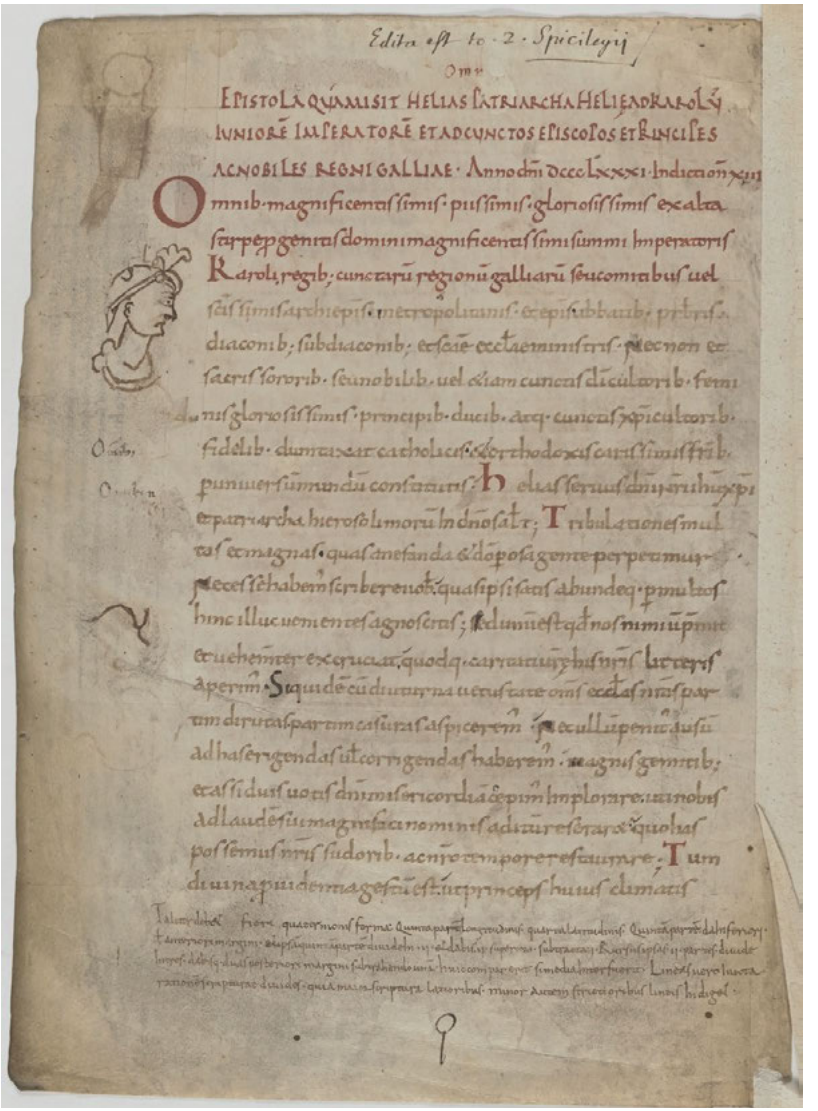


Fig. 3a: Paris, Bibliothèque nationale de France, Par. lat. 11884, f. 2v. With permission of the Bibliothèque nationale de France

tecchi 1994). On Fanti's multifaceted disposition, see Ernst 1994, also online at http://www.treccani.it/enciclopedia/sigismondo-fanti (Dizionario_Biografico; last access 07/09/2021). Concerning the role played by Sigismondo Fanti in 16th-century treatises on writing, see Casamassima 1996, 24–26, 84, Tables V–VIII.

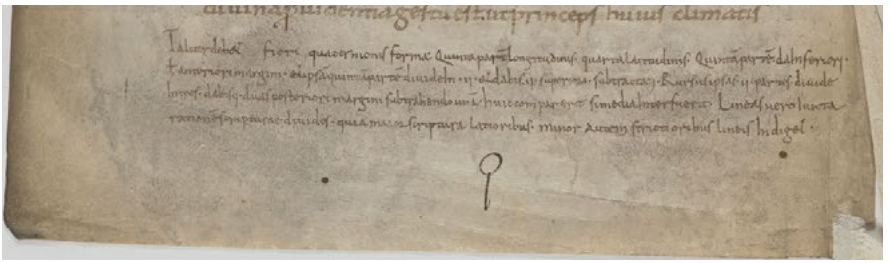


Fig. 3b: Paris, Bibliothèque nationale de France, Par. lat. 11884, f. 2v detail. With permission of the Bibliothèque nationale de France

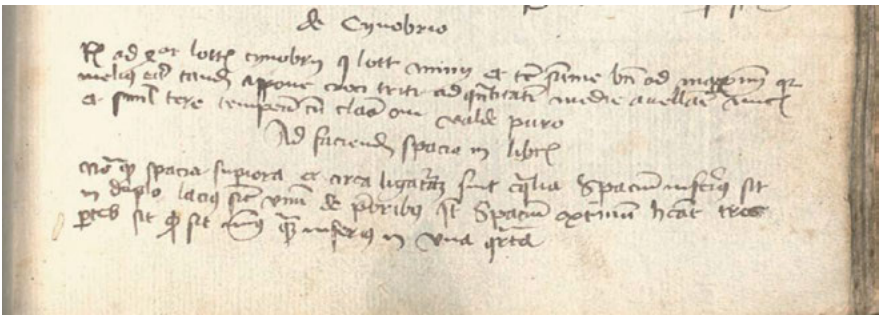


Fig. 4: München, Bayerische Staatsbibliothek, Clm 7755, f. 199v, detail. © Bayerische Staatsbibliothek München

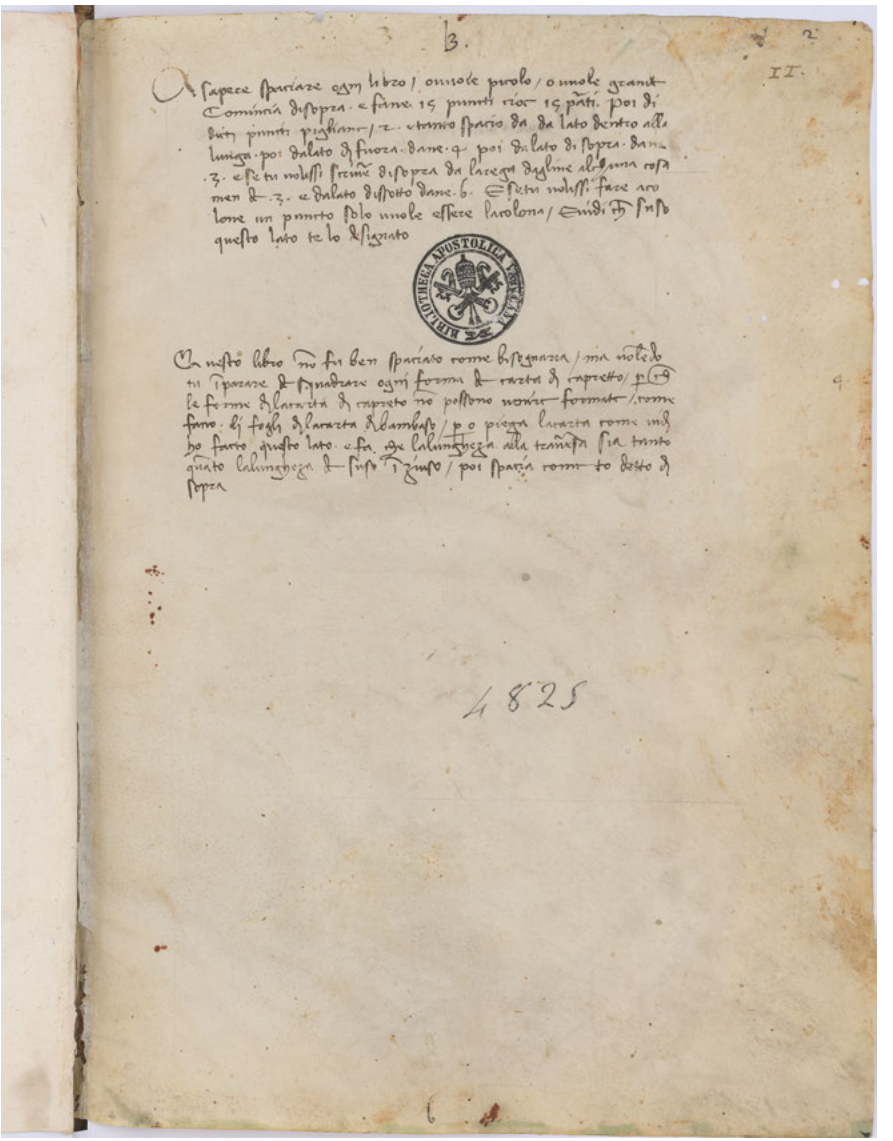
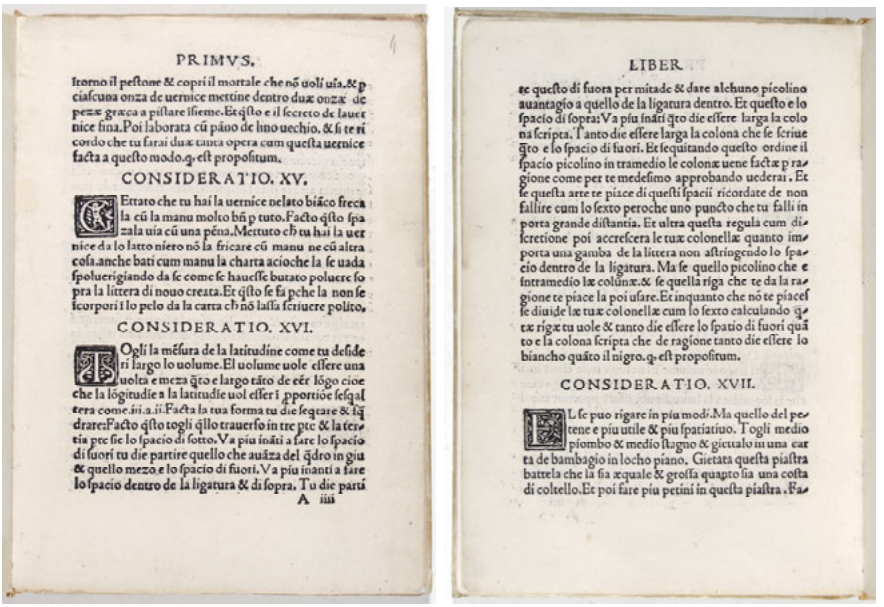


Fig. 5: Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. lat. 4825, f. 2r. © Biblioteca Apostolica Vaticana



PRIMVS.

Itorno il pestone & copri il mortale che nõ uoli uia. & p ciascuna onza de uernice mettine dentro duæ onzæ de pezæ græca a pistare isieme. Et q̃sto e il secreto de lauernice fina. Poi laborata cũ pãno de lino uechio. & si te ricordo che tu farai duæ tanta opera cum questa uernice facta a questo modo. q. est propositum.

CONSIDERATIO. XV.

Cettato che tu hai la uernice nelato biãco freca la cũ la manu molto bñ p tuto. Facto q̃sto spazala uia cũ una pẽna. Mettuto cħ tu hai la uernice da lo latto niero nõ la fricare cũ manu ne cũ altra cosa. anche bati cum manu la charta acioche la se uada spoluerigiando da se come se hauesse butato poluere sopra la littera di nouo creata. Et q̃sto se fa pche la non se icorpori i lo pelo da la carta cħ nõ lassa scriuere polito.

CONSIDERATIO. XVI.

Togli la mẽsura de la latitudine come tu desideri largo lo uolume. El uolume uole essere una uolta e meza q̃to e largo tãto de eẽr lõgo cioe che la lõgitudie a la latitudie uol esser i ꝓportiõe sesqaltera come. iii. a. ii. Facta la tua forma tu die seqtare & lq̃drare: Facto q̃sto togli q̃llo trauerso in tre pte & la tertia pte sie lo spacio di sotto. Va piu inãti a fare lo spacio di fuori tu die partire quello che auãza del q̃dro in giu & quello mezo e lo spacio di fuori. Va piu inanti a fare lo spacio dentro de la ligatura & di sopra. Tu die parti

A iiii

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te questo di fuora per mitade & dare alchuno picolino auantagio a quello de la ligatura dentro. Et questo e lo spacio di sopra: Va piu inãti q̃to die essere larga la colona scripta. Tanto die essere larga la colona che se scriue q̃to e lo spacio di fuori. Et sequitando questo ordine il spacio picolino in tramedio le colonæ uene factæ p ragione come per te medesimo approbando uederai. Et se questa arte te piace di questi spacii ricordate de non fallire cum lo sexto peroche uno puncto che tu falli in porta grande distantia. Et ultra questa regula cum discretione poi accrescera le tuæ colonellæ quanto importa una gamba de la littera non astringendo lo spacio dentro de la ligatura. Ma se quello picolino che e intramedio læ colũnæ. & se quella riga che te da la ragione te piace la poi usare. Et inquanto che nõ te piacesse diuide læ tuæ colonellæ cum lo sexto calculando q̃tæ rigæ tu uole & tanto die essere lo spatio di fuori quãto e la colona scripta che de ragione tanto die essere lo biancho quãto il nigro. q. est propositum.

CONSIDERATIO. XVII.

El se puo rigare in piu modi. Ma quello del petene e piu utile & piu spatiatiuo. Togli medio piombo & medio stagno & gietalo in una carta de bambagio in locho piano. Gietata questa piastra battela che la sia æquale & grossa quanto sia una costa di coltello. Et poi fare piu petini in questa piastra. Fa-

Figs. 6a and b: Roma, Biblioteca Casanatense, Rari 783, f. 4r–v. With permission of the Biblioteca Casanatense

As we shall presently see, the difference between the four texts does not depend solely on their respective lengths or the quantity of instructions they provide, nor on the arrangement of the pages that the prescriptions serve to guide the realisation of, but instead has to do with the selection of the basic steps involved in page construction and their hierarchical order of priority. That being said, the four recipes do, however, share some important basic characteristics.

First of all, with the sole exception of the instructions set out by Sigismondo Fanti, the precepts are all by unknown authors and have come down to us (by happy chance) inserted in other works dealing with various technical issues (such as in the case of the Munich recipe), when they are not 'randomly' inserted in blank spaces that were not originally intended to accommodate content[29]

29 Regarding the definition of 'random microtexts' as 'entirely unrelated written evidence, which accompanies a given text purely in the physical sense, and is the product of altogether random choices', see Petrucci 1999, 983. The recipes presently under examination can be placed in the second and third of the four categories of 'textual additions' identified by Petrucci (i.e. 'simple graphical additions'; 'corrective additions'; 'mnemonic additions', and 'drafting additions').

(at some point in time subsequent to the original creation of the 'host' codex). In the latter case, the adjuncts do not aspire to be of universal value, nor are they directly correlated to the layout of the volumes in which they appear, but instead seem to be inspired by secondary motivations. The aim of providing a minutely detailed account of a particularly complex *mise en page*, such as in the case of the Byzantine source mentioned above, is another way in which a recipe has come down to us.

Concerning the organisation of the four texts, all of them appear to be based—in accordance with the principle of 'universality' mentioned above[30]—on the definition (either full or partial) of the simple relationships existing between the basic parameters of the page, namely the book's total dimensions, the size of the written area and the breadths of the four margins, to which we can add (apart from in the case of the Munich recipe) the breadth of the intercolumnar space. Differing in each case—as we shall see—is the basic parameter chosen to serve as the 'foundation' of the geometric construction: the codex's height (in the case of Saint-Remi recipe); its width (in the 'Vatican' recipe and that of Fanti); or just the relationship existing between the margins, as in the case of the Bavarian text, which is the most 'reticent' among the four.

As will be demonstrated, irrespective of any uncertainties and differences which can open the way to various interpretations of the individual recipes, it is fairly clear that their application resulted in the creation of profoundly different pages, both with respect to the quantitative relationship between the written and non-written areas and the positioning of the latter—i.e. the margins—around the written area. Despite this, all the known recipes share one basic criterion, namely the allocation of more space to the two outer and lower margins than to the inner and upper ones, hence the written area always gives the impression of being visually 'decentralised' towards the upper, inner corner of the page, as if the artisan wished to protect its integrity (in the case of a parchment codex, this might be threatened by natural irregularities in the periphery of the skin), or to spare it from contact with the reader's fingers, thereby providing him or her with as much blank space as possible to grasp the book by.[31]

Finally, all the recipes include instructions which to a greater or lesser extent are shrouded in obscurity and therefore present the 'interpreter' with a

30 See above.

31 Montecchi 2005, 202 attributes the 'decentralised' positioning of the written area to the desire that 'the text, due to the different angle from which it is perceived by the eye, does not appear "squashed" on to the page but instead "emerges" from it, purely on account of an optical illusion, and in this way seems to assume a third dimension, namely depth'.

rather perplexing set of problems and occasionally a range of alternative solutions, among which it is not always easy to settle on the most convincing.

Now that these introductory points have been adequately addressed, it is time to embark on a comparative reading of the recipes, with a view to fulfilling the following two objectives: (a) a critical examination of the interpretations that have been suggested by the authors who have studied them, and (b) verification of the applicability—and, wherever possible, of the actual application—of the various norms to the *mise en page* of medieval manuscripts. With respect to the second goal, work already completed a number of years ago on the 'Saint-Remi' and 'Munich'[32] recipes will be looked at afresh and integrated into the present study. Furthermore, the investigation will be extended to cover the other two recipes, the actual use of which has never, up to the present, been reliably confirmed.

In addition to the corpora of Greek and Latin codices that have already been examined in the past,[33] the verification process can also take advantage of the rich and valuable store of data generated by the cataloguing of dated Italian manuscripts. The vast majority of them date to the Late Middle Ages and were produced within the confines of the Italian Peninsula; for this reason they are particularly well-suited for the study of the representativeness and dissemination of the two recipes written in vernacular Italian.[34]

With respect to the 'Saint-Remi' and 'Munich' recipes, here I shall confine myself to briefly summarising the results obtained in the past—and for the most part confirmed in the Latin context—by extending the verification process to the new corpus of dated codices. Similarly, in the present study I shall not dwell on the theoretical problems raised by the alterations undergone by codices as a result of trimming—a theme that has already been discussed elsewhere—which,

32 Maniaci 1995, a work inspired by a previous contribution by Muzerelle 1989.

33 See Maniaci 1995, 29–30; Maniaci 2012, 480–483 [in this volume, 465–508].

34 The relevant data derive from an electronic survey of the first 20 volumes of *Manoscritti datati d'Italia* (the complete list of those which have been added to date can be viewed at http://www.manoscrittidatati.it/mdi/i-volumi.php?id=16; last access 07/09/2021). The survey was carried out and kindly made available to me by Leda Ruggiero. With respect to the size of margins, the survey is supplemented by a close scrutiny of the 'in progress' database present on the site, which contains a wide and well-chosen selection of information from catalogue descriptions ([editor's note: not yet available on the new website]; see also Palma 2010, 259–267). The individual codices taken into consideration number approximately two thousand (a figure that varies a little due to usability issues related to the *mise en page*), and they are chronologically distributed as follows: 9th century = 3; 10th century = 3; 11th century = 19; 12th century = 12; 13th century = 46; 14th century = 243; 15th century = 1,679.

when combined with the inexactitudes of medieval manufacturing processes and inaccurate measurements, make it difficult to verify discrepancies between the relationships prescribed in the ancient recipes and the actual relationships seen in the manuscripts today (a problem that calls for the judicious application of sufficient 'margins of tolerance').[35]

Now we can take a look at the recipes, starting with the oldest:

> Taliter debet fieri quaternionis forma, quinta parte longitudinis, quarta latitudinis. Quintam partem da inferiori vel anteriori margini, et ipsam quintam partem divide in III et dabis II superiori, subtracta I. Rursus ipsas II partes divide in tres, dabisque duas posteriori margini, subtrahendo unam. Huic compar erit si media interfuerit. Lineas vero iuxta rationem scripturae divides, quia maior scriptura latioribus, minor autem strictioribus lineis indiget.

The recipe adopts the constructional principle which prevails in the small group of surviving sources, namely the definition of a *pars* (termed *puncto* or *parte* in the Vatican recipe, and *parte* in Fanti's[36] later recipe); in other words, a module whose repetition gives rise to all the constructional dimensions of the page (i.e. height, width, margins, and sometimes an intercolumnium), independent of its total dimensions.

In comparison, the Munich recipe seems a lot more concise; indeed, it is in fact the briefest among the surviving texts:

> Ad faciendum spacia in libris. Nota quod spacia superiora et circa ligaturam sunt equalia. Spacium inferius sit in duplo lacius sicut unum de prioribus. Item spacium extremum habeat tres partes sic, quod sit minus quam inferius in una quarta.

The recipe is limited to describing—as usual in terms of relationships rather than of absolute values—the dimensions of the margins, leaving the reader at liberty to define as he or she pleases the relationship between the height and width of the page. This, however, is only an ostensible liberty, if one considers the clear tendency for the late medieval codex to assume an 'invariant' proportion of $1/\sqrt{2}$ (approximately 7/10 or 0.707)—a ratio which, not by chance, was adopted early on by Italian papermakers for the standardisation of the moulds they used on a daily basis.[37]

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35 The same procedure was applied in Maniaci 1995, see below, 448 and footnote 69.

36 See above, 422 and footnote 21.

37 As is widely known, the 'invariant' (i.e. Carnot's) proportion is repeated in all the subdivisions in two made along the short edge of an initially rectangular form. Not by chance, the same proportion is still employed today in ISO 216 format sheets, or the DIN A sequence (which starts out from an integral A0 sheet, whose surface area is 1 m^2).

In addition, the Munich recipe can rightly be considered as having been conceived for the *mise en page* of paper codices—which prevailed overwhelmingly in the German domain—of highly standardised dimensions and proportions.

Therefore, the 'Saint-Remi' and 'Munich' pages (the latter considered of invariant proportion) present major differences in their respective layouts. The former is rather square-looking (with a ratio of 4/5, or 0.800), and is characterised by the similarity of its two widest margins (i.e. the external and lower ones),[38] whilst the Munich page is (hypothetically) 'slimmer' in appearance, with the opposite pair of margins (i.e. the inner and upper ones) being of the same dimensions, as the external and lower margins in the 'Saint-Remi' page.

Despite being visually dissimilar, both of the layouts automatically imply respect for an 'unwritten rule'—a rule which is almost constant in the manufacture of the medieval book, namely the creation of a written area whose 'slimness' is more pronounced than that of the page which accommodates it. In the more ancient of the two recipes, the proportional ratio is 0.750/0.800, whilst in the later one the value is 0.655/0.707—assuming that the height of the written area and the width of the volume are equal.[39] Both values are essentially in line with the trend observed in Italian dated manuscripts throughout the Middle Ages.[40]

38 The reader will probably recall that Denis Muzerelle proposed a modification of the value stipulated in the recipe, setting the internal margin at half, rather than two thirds of the width of the upper margin. The correction, whilst necessary, is difficult to justify palaeographically–even when one allows for the fact that in the original text the relationship was expressed in words rather than in numbers–and therefore could be regarded as being superfluous, especially if we allow that the recipe tacitly adds the space necessary for the binding to the internal margin (which, in essence, is analogous to the 'small space' prescribed by Fanti, concerning which see below, 440 and footnote 60).

39 On the 'remarkable similarity' between the height of the written area and the width of the sheet, see below, 451 onwards.

40 One consistently encounters the same tendency in Greek codices; see Maniaci 2002, 157–165; Maniaci 2012, 501 [in this volume, 465–508].

Comparison of the written area's proportion and that of the page (l/h vs L/H) in Italian dated manuscripts (MDI) (tab. 1)

Century	L/H	l/h	No. mss
9th	0.758	0.745	3
10th	0.731	0.691	3
11th	0.717	0.654	19
12th	0.684	0.586	12
13th	0.691	0.632	44
14th	0.714	0.674	235
15th	0.699	0.637	1666
Total	0.701	0.641	1982

Tab. 1: Comparison of the written area's proportion and that of the page (l/h vs L/H) in Italian dated manuscripts (MDI)

In the Saint-Remi recipe the degree of page filling—which is to say the ratio between a page's written area and its total surface area, often referred to as the 'black'[41]—amounts to almost 42%, a figure that is entirely in conformity with that attested to in the Early Middle Ages. With respect to the recipe transmitted through the Munich codex, its application to a leaf of the same dimensions as those used in coeval paper manuscripts (i.e. with a written area whose height is equal to the leaf's width) results in a page filling value of 43.8%—one that tallies perfectly with the page filling value typical of the period, above all in the manufacture of paper volumes, on average lower than their parchment counterparts (see below, Tab. 5).[42] Despite its highly condensed and theoretically 'incomplete' nature, the Munich recipe therefore indirectly provides—thanks to two plausible additions—all the necessary information for the realisation of an 'acceptable' *mise en page*, with respect to coeval standards.

In the Latin context the artisan abandoned, from the Early Middle Ages onwards, a predilection for the manufacture of 'square-shaped' manuscripts typical of book production in late antiquity (apart from occasionally returning to it

41 See Bozzolo et al. 1984.

42 The total average value for 'black' (i.e. page filling) in the sample of 15th-century Italian dated manuscripts used for this research project is 41.8% for parchment volumes and 44.3% for paper ones. For additional information on the distribution of the values, see below, Tab. 18.

in the Carolingian Age),[43] whereas Greek parchment codex continued, until the Late Middle Ages, to exhibit distinctly broader pages, albeit somewhat less 'square-shaped' than those of the earliest volumes.[44] This conservative tendency justifies the 'success' enjoyed by the Saint-Remi set of rules in Greek manuscript production,[45] in contrast to its almost non-existent application in the Latin world.[46] On the other hand, the Munich recipe—rather predictably—appears frequently to be applied in the manufacture of Latin codices of the Late Middle Ages, a production which was progressively dominated by the use of paper, as can be deduced from the high percentage rate of the recipe's application recorded in a corpus of approximately 1,100 manuscripts originating from different periods and production centres, and confirmed, as we shall see, by tests carried out on the sample group of dated codices.[47]

In the light of these results, curiosity naturally compels one to extend the investigation to the recipes written in vernacular Italian between the 15th and 16th centuries. First of all, however, we must examine the instructions found in the two texts, whose past interpretation is not entirely convincing, and which have been summarised in a not altogether clear way in some recently published textbooks.

In chronological order, we can start with a re-reading of the text transmitted through Vat. lat. 4825, which was recently 'rediscovered' and brought to the attention of scholars by Paolo Cherubini:

> A sapere spaciare ogni libro, o vuole picolo o vuole grande. / Comincia di sopra e fane 15 puncti cioè 15 pa(r)ti; poi di/cti puncti pigliane 2. E tanto spacio dà da lato dentro alla / lunga, poi da lato di fuora dàne 4, poi da lato di sopra dàne / 3. E se tu volissi scriv(er)e di sopra de la rega dagline alchuna cosa / men de 3. E da lato di .ssotto dàne 6. E se tu volissi fare a co/lone, un puncto solo vuole essere la colona. E vidi che suso / questo lato te l'ò designato.

43 The 'archaicising' suggestions referred to in order to explain the 'revival' of the 'square' proportion in the Carolingian Age (see Palma 1998) quite plausibly accounts for its success in a few learned circles, albeit limited to certain textual typologies (e.g. sumptuous editions of the classics), but does not explain the spread of the 'square' format to other texts and contexts. Secondary motivations may emerge in the future that will shed light on the methods adopted for processing animal skins–methods aimed at maximising their exploitation, through the application of subdividing techniques similar to those identified in some Greek codex production centres (see Maniaci 1999 and Maniaci 1999a [in this volume, 309–321]).

44 Maniaci 1995; Maniaci 2002, cap. III. *La proporzione dei fogli*, 127–148; Maniaci 2012, 492–494 [in this volume, 465–508].

45 Provided that the width of the page is adjusted, reducing it from 4/5 to 3/4. See Maniaci 1995, 31.

46 Thus explaining Denis Muzerelle's strong criticism (Muzerelle 1989, 131), which speaks of 'une recherche proportionnelle purement speculative'.

47 See the charts/graphs presented in Maniaci 1995, 33, 34 and 36, and below, 443 ff.

> Questo libro no(n) fu ben spaciato come bisognarìa, ma vole(n)do tu i(m)parare de squadrare ogni forma de carta di capretto, p(er)ch(é) / le forme di la carta di capreto no(n) possono venire formate, come / fàno li fogli di la carta di bambaso, p(er)ò piega la carta come indi / ho facto questo lato, e fa che la lungheza alla traversa sia tanto / qua(n)to la lungheza de suso i(n) ziuso, poi spacia come t'ò detto di sopra.

The recipe, which broadly speaking is formulated in a clear enough way (despite a few inconsistences in the use of technical terms), adopts as its fundamental unit of measurement a *puncto* or *parte*, which equates to one fifteenth of the total width of the page. This unit is used to define the width of the four margins by establishing a ratio of 1:2 between the two opposite pairs. Respectively, the internal and external margins measure 2 and 4 *puncti*, whilst the upper and lower ones measure 3 and 6 *puncti*.[48] The intercolumnium, when present, is allotted a single *puncto*, that is half of the space allocated for the fold margin.[49] To compensate for the lack of instructions relating to the leaf's height (a lack which in theory renders the recipe 'incomplete'), in the second paragraph the unknown writer provides directions for the shaping of parchment sheets, albeit without supplying standardised measurements (unlike in the case of paper). The squaring of the parchment bifolia is achieved by equalising their horizontal fold line with the height of a paper sheet, which is to say with the height of its most widespread size type, known as '*reçute*' or 'common', which also predominates in the Vatican codex).[50] If, as we can take for granted, the implicit reference in the Vatican text is the reality of the Italian paper codex of (normally) 'invariant' proportion,[51] it should, in

48 The phrase 'e se tu volissi scriv(er)e di sopra de la rega dagline alchuna cosa / men de 3', which clearly alludes to the alternative possibilities of writing 'above' or 'below the top line', appears to create confusion between a 'geometric' vision of the written area, which is to say a rectangle defined beforehand during the *mise en page* planning stage, and a 'graphical' vision, which depends on the way in which the copyist utilises the spaces that are created by ruling.

49 With respect to this feature, for a comparison of the data supplied with the other recipes, see below, 443 n. 66. It is interesting to observe that in the Vatican source the *puncti* are physically marked out (and, indeed, are still visible) in the upper margin of the same page upon which the recipe appears, so much so, in fact, that the copyist refers to them in the final sentence of the recipe ('E vidi che suso / questo lato te l'ò designato'), which confirms its impromptu nature (see Cherubini 2004, 245).

50 The folding varies between 'royal quarto' and '*reçute*' only in the initial quires (including within one and the same quire).

51 The folding in two of a '*reçute*' sheet (which according to the 'Bologna Stone' measures approximately 440 mm × 310 mm and is of invariable proportion) automatically generates pages which are in turn of invariable proportion. Folding a 'royal' format sheet (measuring 608 mm × 440 mm) in four produces a value close to the invariable proportion (0.691). When a 'royal' sheet is folded in two it produces a large folio sheet with a broader appearance (0.723). Seen from this

theory, be correct to set the missing height value at approximately 21 *puncti*,[52] as Cherubini suggests. The addition of the missing value also makes it possible to set the height of the written area at 12 *puncti*.

Fully defined and completed in this way, the page set-up 'produces results that do not tally—not even when adjustments envisaged by practically all scholars are made—with any of the recipes known up to now'.[53] Furthermore, the page set-up produces results which in theory are not very compatible with the two 'rules' that were most commonly applied in the *mise en page* of medieval manuscripts, namely the relationship between the external proportion of the book and that (consistently narrower) of the written area, and the degree of page filling (i.e. 'black'), which is almost never less than one third of the total capacity of the page. In fact, the application of the Vatican recipe results in a written area which is noticeably more square-shaped than the page that hosts it (0.75, as opposed to 0.71), and a page filling value of around 34%, which is certainly somewhat lower than the standard value seen throughout the 15th century (see below, Tab. 5).[54]

The application of the Vatican text to a '*reçute*' page results in margins (measurements are expressed in centimetres) that are interesting to compare with the ones seen in the codex which bears the text (Tab. 2).

perspective, the results of the survey carried out by Cherubini 2004, 248–249 on a small group of 28 documents that are of nearly the same period as the Vatican text (1429–1442) and are all (apart from two) in '*reçute*' format, appear to be entirely predictable. The documents were all drawn from Briquet's inventory. The proportions, expressed in an unusual way by Cherubini as height/width ratios, range between two extremes of 1.30 and 1.51, or 0.768 and 0.659, but the average value is 0.39, or 0.717. As regards the measurements inscribed on the so-called 'Bologna Stone', which vary slightly depending of the scholar concerned and measuring criteria applied, see the detailed observations of Gumbert 1993, I, 240, footnote 27.

52 This results in a page proportion of 0,714. When the invariable proportion is respected a height of 21.2 *parti* results, which is equal to the page's width.

53 Cherubini 2004, 252.

54 Despite these clear contradictions, the set-up of the margins as stipulated in the recipe also achieves (somewhat surprisingly)–as we shall see (see below, 448 ff.)–a certain amount of recognition in late medieval book production.

Comparison of the margins prescribed by the recipe with those actually observed in Vat. lat. 4825 (tab. 2)

Margins	Recipe	Vat. lat. 4825
Mint	28	25
Msup	42	43
Mest	56	47
Minf	84	47

Tab. 2: Comparison of the margins prescribed by the recipe with those actually observed in Vat. lat. 4825

The harsh opinion expressed by the recipe's unknown writer in relation to a 'book not [...] as well laid out as it should be' can undoubtedly be accounted for by the very generous amount of space that the recipe allocates to the lower margin, which is far larger than that seen in the actual codex, and is noticeably greater than the space allocated by the other recipes.[55] The codex's outer margin is also narrower than what is prescribed by the recipe, but the difference in this case is far less apparent. Conversely, the inner and upper margins of the codex appear to be entirely compatible with those stipulated by the recipe.

These observations do not explain the formulation of an abstract and rather problematical set of alternative norms that are different from those seen in the actual layout of the Vatican manuscript, all the more so given that the said manuscript is fully in line with the characteristics of coeval production of the same level, both in relation to its total dimensions (today 295 mm × 210 mm) and those of its written area (205 mm × 138 mm). The Vatican manuscript is also in line with the percentage of page filling (46%, which is adequate for a volume of technical content), and the proportion of its written area (0.673), which is lower, as usual, than that of the slightly higher proportional ratio of the invariant page (0.712).

Furthermore, the proportionally abnormal width prescribed for the lower margin by the Vatican text is very seldom seen in other manuscripts dating from the same period: indeed, in the 15th century, in only 5.7% of Italian dated manu-

55 In the Vatican recipe the lower margin is equal to 28.6% of the total height of the sheet, in comparison to 20% in the Saint-Remi recipe, 19.5% in the Munich recipe, and 22.2% in Fanti's text.

scripts (97/1679) does the lower margin occupy more than 28% of the total height of the page, and 40% of them are parchment volumes.

In conclusion, it should be admitted that the analysis does not fully solve in an entirely satisfactory way the mystery lying behind a source which is not lacking in peculiarities. In any event, in the absence of direct and convincing evidence, Cherubini's suggestion of a connection with accounting schools, where the recipe was supposedly used for educational purposes to train pupils in the manufacture as well as the compilation of accounting books, remains rather feeble, and purely hypothetical.

A critical examination of the last (in chronological terms) of the four recipes shows it to be of a similarly problematical nature, and perhaps even more so than the Vatican text. The recipe was written down by the imaginative mathematician Sigismondo Fanti in the first book of the felicitous short treatise of 1514 on the geometric design of letters. The conclusions reached in a contribution by Giorgio Montecchi were recently revisited (and occasionally misunderstood) by Maria Luisa Agati in her textbook, and in the previously mentioned essay by Cherubini.[56]

> Togli la mensura de la latitudine come tu desideri largo lo volume. El volume vole essere una volta e meza, quanto è largo tanto da esser longo, cioè che la longitudine et la latitudine vol esser in proportione sesquialtera come iii a ii.
> Facta la tua forma tu die sequitare et squadrare. Facto questo togli quello traverso in tre parte et la tertia parte sie lo spacio di sotto.
> Va più inanti a fare lo spacio di fuori tu die partire quello che avanza del quadro in giù, et quello mezo è lo spacio di fuori.
> Va più inanti a fare lo spacio dentro de la ligatura et di sopra. Tu die partire questo di fuora per mitade et dare alchuno picolino avantagio a quello de la ligatura dentro. Et questo è lo spacio di sopra.
> Va più inanti quanto die essere larga la colonna scripta. Tanto die essere larga la colona che se scrive quanto è lo spacio di fuori.
> Et sequitando questo ordine il spacio picolino in tramedio le colonae vene factae per ragione come per te medesimo approbando vederai. Et se questa arte te piace di questi spacii ricordate de non fallire cum lo sexto, peroché uno puncto che tu falli inporta grande distantia. Et ul-

56 Caterina Tristano's observations in Tristano 2010 (82 onwards) are more generalised, and not all admissible; for example, in clear contrast to the results of the codicological analysis is the affirmation which states that 'the codex produced in the 14th century and at least up until the middle of the 15th maintains a dimensional ratio, which one can term "traditional" [...], summarised by the stipulations of the Saint Rémi Rule [*sic*]' (85), 'a rule' that the author arbitrarily applies to bifolia and not to single leaves, as is clearly anticipated by the recipe which has come down to us in the French manuscript. A number of inaccuracies can be found in the analysis of examples presented on pp. 87–88.

> tra questa regula cum discretione poi accrescera le tuae colonnellae quanto importa una gamba de la littera non astringendo lo spatio dentro de la ligatura. Ma se quello picolino che è intramedio lae columnae et se quella riga che te da la ragione te piace la poi usare. Et inquanto che non te piacesse divide lae tuae colonnellae cum lo sexto calculando quantae rigae tu vole. Et tanto die essere lo spatio di fuori quanto è la colona scripta che de ragione tanto die essere lo biancho quanto il nigro. Quod est propositum.

Fanti's rather long-winded description, in the form of seven directives, contains more than one ambiguous passage, and not all of the theoretically feasible solutions to resolve problems raised by the text produce results that are compatible with the facies of coeval codices.

The directions start out, as in the oldest of the surviving recipes, by defining the relationship between the external dimensions of a sheet, which are set 'in a sesquialteral ratio of three to two'. In other words, Fanti favours a 2/3 (0.67) proportional ratio, which is poorly represented in books produced prior to and immediately following the advent of printing.[57]

The setting up of the margins starts out from the 'space underneath', which corresponds to—as in the 'complete' prescription found in the Munich recipe—a third of the volume's width. The third stipulation, concerning the external margin, which is defined as 'that which extends downwards from the square', is less immediately comprehensible. Giorgio Montecchi is correct in interpreting this rather tortuous phrase as meaning the difference between the width and height of the page, a measurement which is equal to one unit.[58] The external margin is therefore equal to 1/2, and hence is equivalent to 1/6 of the page height, and also, as in the Munich recipe, to 3/4 of the lower margin. The alternative possibility proposed by Maria Luisa Agati, and seconded by Paolo Cherubini, allocates a space for the outer margin which is equal to half the lower margin's width (based on Agati's interpretation of the phrase 'that which extends downwards from the square'). This is a hypothesis that gives rise, as we shall see, to impracticable parameters

57 See above, Tab. 2. In the sample of dated Italian manuscripts, only 12% of the codices present a proportional ratio of less than 0.670. It should be recalled that the cataloguing rules published in De Robertis et al. 2007, conventionally sets the lower chronological limit for the census at 31.12.1500. A quantitative investigation of the dimensional and layout characteristics of incunabula and books of the 16th century, for which there is a lack of relevant data, would be a desirable goal to fulfil.

58 The unquestionably convoluted character of the expression 'quello che avanza dal quadro in giù' ('that which extends downwards from the square') could be explained by a desire to maintain an implicit link to the width of the codex, which the geometric construction stems from, thereby avoiding express involvement of the volume's height.

for the proportion of the written area (larger than that of the page) and for the page filling percentage (which is abnormally high).[59]

Proceeding, then, on the basis of Montecchi's interpretation, Fanti makes the inner and upper margins equal to half of the breadth of the outer margin, adding an imprecise amount ('a little extra advantage') to the inner margin (and not to the upper one, as Maria Luisa Agati bafflingly suggests), so as to compensate for the space 'filched' by the binding.[60]

Montecchi's reading of the next point is far less convincing. In it, Fanti shifts attention from the definition of the margins to that of the written area. According to the first interpreter of the recipe (and all subsequent exegetes who have clung to it), this point notes a deviation 'from geometric strictness to an affirmation of general principles and practical compromises', no longer in relation to the individual dimensions of the page, but instead to the overall relationship between 'white' and 'black' areas. The stipulation *tanto die essere larga la colonna che se scrive quanto è lo spacio di fuori* ('the written column has to be as wide as the space outside' apparently refers to the latter (i.e. the 'black'), and is reiterated in the conclusion with the recommendation that *tanto die essere lo spatio di fuori quanto è la colona scripta* ('the outer space has to be as wide as the written column'), which establishes an equivalence between the written area and the area occupied by the margins. It does not escape Montecchi's attention that the said equivalence is not supported by his own hypothesis concerning the distribution of the margins, from which automatically stem the dimensions and surface of the written area, which represents 43% of the overall surface area of the page, in perfect agreement—as has already been mentioned—with the most widely adopted rules used in the artisanal production of

59 In Maniaci 2012, 505 and footnote 70 [in this volume, 465–508], the responsibility for an interpretation made exclusively by Agati 2009, 228 and footnote 3, is incorrectly attributed to Montecchi, thereby endorsing Cherubini's misinterpretation. (Agati specifically states that her interpretation is a 'correction' of Montecchi's reading.)

60 Agati 2009, 228. Montecchi 1995 (1997), 98, had already shown an inexplicable reluctance to interpret this passage ('it is not entirely clear whether or not this small amount should be added to the upper margin'), a passage which, in my view, is without ambiguity. In any event, it can be ruled out that the 'small space', which was clearly aimed at compensating for the reduction in the width of the inner margin caused by the intrusion of the binding, should be 'calculated as just a millimetre', a clearly trifling amount, especially when compared to the inevitably rough and ready nature of measurements made using the rudimentary instruments available to medieval craftsmen. A more plausible estimate can be found in the variation, which amounts to 3 mm, between the internal margin of the codex in which the Vatican recipe is transcribed and the theoretical one anticipated by the same recipe. See above, Tab. 2.

manuscripts during the 15th century.[61] In order to remedy what—in his view—appears to be an inconsistency, Montecchi proposes an ingenious interpretation, albeit one which is not supported by the text, when he hypothesises the addition of the space occupied by the written area to the area taken up by the inner margin lying adjacent to it. In this way, when a volume is open, the two writing areas and their two flanking internal margins generate a total surface area of 52%.[62]

A more persuasive solution, and one which is closer to the recipe's prescription, is achieved by interpreting the recommendation *tanto die essere lo spatio di fuori quanto è la colona scripta* in linear terms rather than in relation to the page area (which is never taken into consideration in the recipe), and by recognising the 'technical' value, which is anything but generic, of Fanti's directions. This requires one to believe that it was primarily his intention to specify the *mise en page* of a two-column book by prescribing the equivalence between the width of the outer margin and that of a column, already implied in the Saint-Remi[63] recipe, and reaffirmed centuries later in the Vatican recipe, and still verifiable—albeit not very widely—in the Latin codices of the 15th century, as evidenced in the sample of dated volumes (Tab. 3):[64]

61 The reconstruction suggested by Agati 2009, 230, is compromised by endowing the upper margin with an 'advantage' of a disproportionate size (even greater, indeed, than that of the margin to which it is applied!).

62 If we suppose that the width of the codex is 2 and its height 3, the dimensions of the written area will be 1.25 × 2.08, and those of the double written area plus the space occupied by the two inner margins 3 × 2.08; the ratio of 52% between the area of the internal rectangle and that of the double page area has to be increased a little in order to factor in the 'small advantage'.

63 Provided that the width of the volume equals four *partes*, the outer margin one *pars*, the inner margin 0.5 and the intercolumnium likewise (if present), two *partes* will remain to be divided equally between the two columns.

64 In the headings of this and the following tables, the margins are abbreviated as *msup* (upper margin), *minf* (lower margin), *mint* (inner margin), and *mest* (outer margin), according to the Italian acronyms.

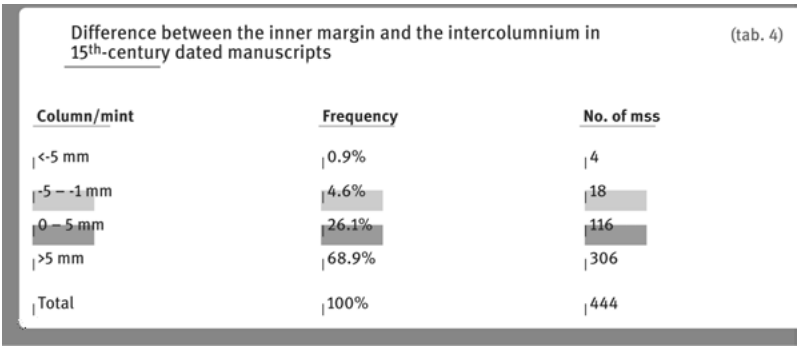
Difference between the written column and the outer margin in 15th-century dated manuscripts (tab. 3)

Column/mest	Frequency	No. of mss
<-5 mm	4.1%	18
-5 – 0 mm	6.3%	28
0 – 5 mm	7.9%	35
5 – 10 mm	16.0%	71
>10 mm	65.8%	292
Total	100%	444

Tab. 3: Difference between the written column and the outer margin in 15th-century dated manuscripts

According to this interpretation, the equivalence in size of the two columns and the outer margin automatically gives rise to the definition (*per ragione*, i.e. 'in consequence'?) of the width of the intercolumnium, which is described in the next directive. The intercolumnium turns out to be narrower than the inner margin (and therefore narrower than the upper margin too), with the obvious purpose of compensating for the 'small advantage' conferred on the fold. The prescription calls to mind the similarity between the intercolumnium and the inner margin set forth centuries prior in the Saint-Remi[65] recipe and, above all, turns out to be compatible with the working methods that were widely employed in the production of two-column codices in the Late Middle Ages (Tab. 4).

65 See above, 431, *huic* [= *posteriori margini*] *compar erit si media interfuerit*. In the Vatican recipe, the intercolumnium, which is very narrow, is equal to half the width of the inner margin (see above, 434–435).



Difference between the inner margin and the intercolumnium in 15th-century dated manuscripts (tab. 4)

Column/mint	Frequency	No. of mss
<-5 mm	0.9%	4
-5 – -1 mm	4.6%	18
0 – 5 mm	26.1%	116
>5 mm	68.9%	306
Total	100%	444

Tab. 4: Difference between the inner margin and the intercolumnium in 15th-century dated manuscripts

Fanti's concluding directions briefly address, in a rather obscure way, matters in relation to the exploitation of the spaces defined above, recommending that the artisan/copyist pay the utmost attention when using the compass (*sexto*),[66] and allowing him a certain amount of discretion both in defining the width of the columns and the number and spacing of lines.

4 Examination of the recipes' actual application

Now that we have concluded an overview of the currently known recipes, here, in a summarised table (Tab. 5; see also Figs. 7a/b and 8a/b), we present their main features (with the exception of the Greek text, which, as has already been pointed out, has characteristics that are not compatible with those of the others, on account of its structure and the environment in which it was applied):[67]

66 See above, 420, and footnote 17. Concerning the interpretation of this term, see Agati 2009, 228 and footnote 4.

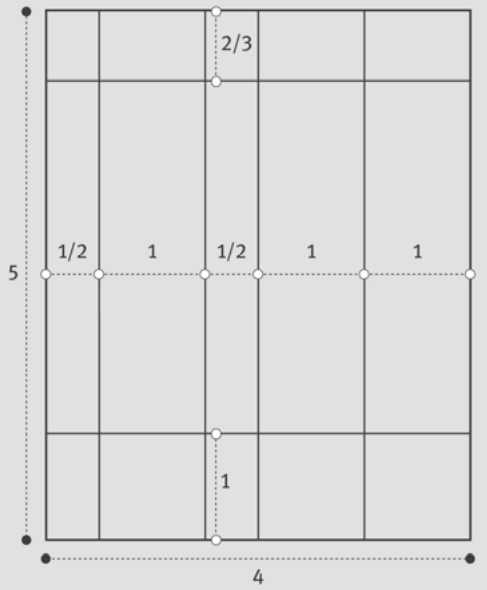
67 For Fanti's recipe some of the following tables also list the values anticipated by Agati 2009. The figures are shown in order to demonstrate that they are unsatisfactory.

Comparison of the layout configurations prescribed by the recipes (tab. 5)

	Saint-Remi	Munich	Vatican	Fanti Montecchi	Fanti Agati
Mint/msup	0.758	1	0.667	>1	<1
Mint/mest	0.500	0.667	0.500	>0.500	0.500
Mint/minf	0.500	0.500	0.333	>0.375	0.250
Msup/mest	0.667	0.667	0.750	0.500	>0.500
Msup/minf	0.667	0.500	0.500	0.375	>0.250
Mest/minf	1	0.750	0.667	0.750	0.500
Prop. codex	0.800	nd [0.707]	(0.707)	0.667	0.667
Prop. written area	0.750	nd [0.633]	0.750	0.600	0.692
'Black'	41.7%	nd [43.8%]	34.2%	43%	54.2%

Tab. 5: Comparison of the layout configurations prescribed by the recipes

The 'Saint-Remi' recipe (with correction by Denis Muzerelle) (fig. 7a)



Complete recipe

Base of the construction = height of the codex

mest = minf
mint = intercol
1 col = mest

mint/msup = 0.750
mint/mest = 0.500
mint/minf = 0.500
msup/mest = 0.667
mest/minf = 1

Prop. of the codex = 0.800 (4/5)
Prop. of the written area = 0.750 (3/4)
'black' = 41.7%

Fig. 7a: The Saint-Remi recipe (with correction by Denis Muzerelle)

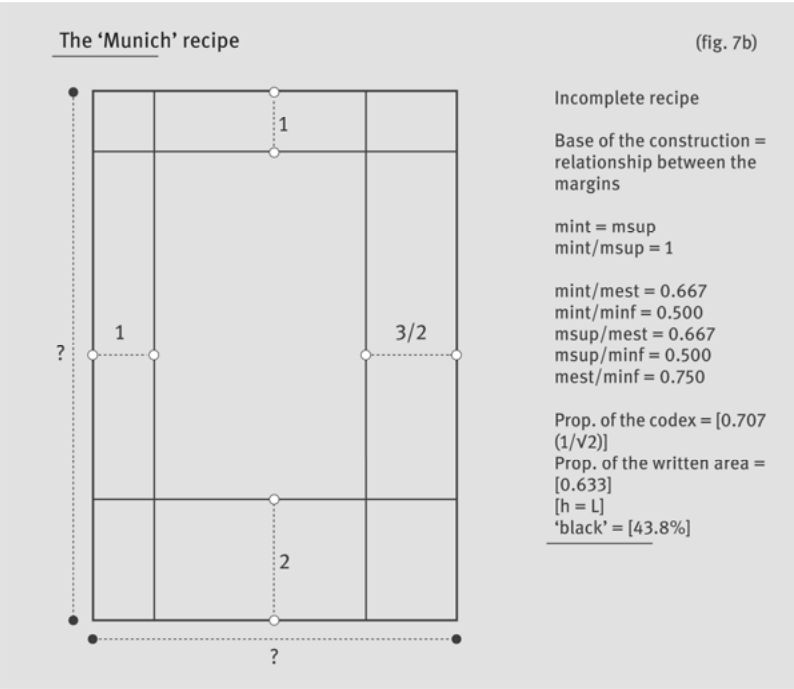


Fig. 7b: The 'Munich' recipe

A comparison of the layouts generated by the four recipes prompts a number of general remarks.

In the first place, it is well known that the *mise en page* of medieval manuscripts, Greek and Latin ones at least, presents—as has already been pointed out—two consistent features and a very widespread trend:

- both the outer and lower margins are broader than the inner and upper ones;
- the proportion of the written area is generally smaller than that of the codex;
- the proportion of the codex is concentrated on values which, in the Byzantine world, equate to approximately 3/4, whilst in the Western world the values incline towards the invariant value of 0.707.

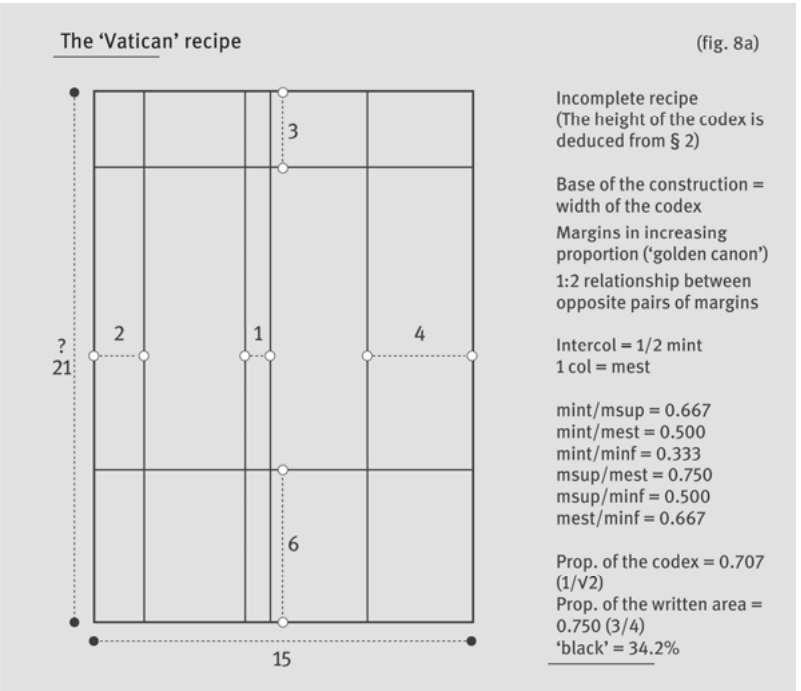


Fig. 8a: The 'Vatican' recipe

Logic dictates that the recipes should conform to these conditions. If they do not, the possible reasons are, in theory, several: (a) there is a 'gap' between the recipe and general practice, which perhaps reflects limited and local application; (b) the recipe introduces a new procedure; (c) the instructions set out in the recipe, in the form that it has come down to us, are incorrect; and (d) the instructions are correct, but they were incorrectly interpreted.

Given that all the recipes share in common the definition of the proportional relationships between margins, the following compatibility tests are limited to examining these alone.

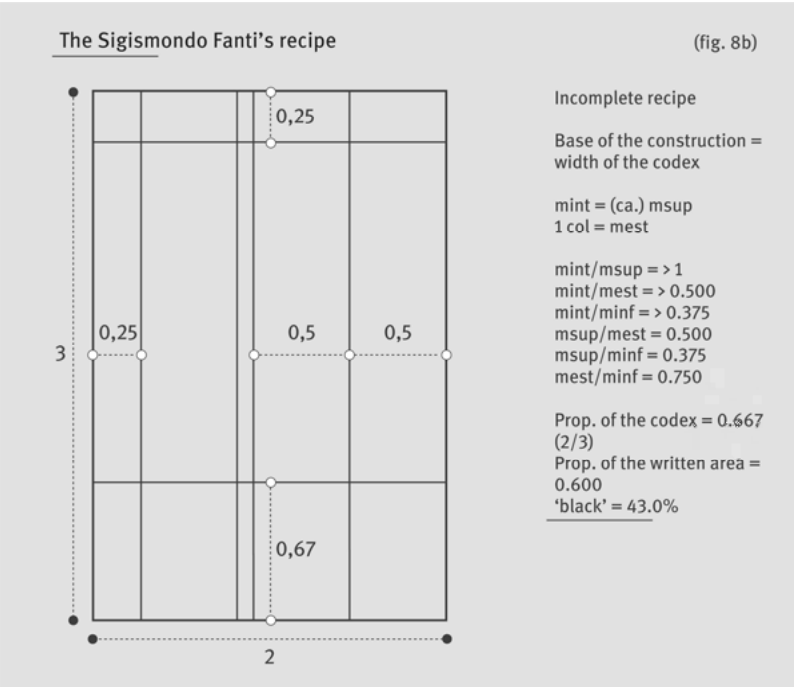


Fig. 8b: The Sigismondo Fanti's recipe

Therefore, declaring that one of the recipes was applied is equivalent to affirming that only the instructions in relation to the margins were followed, irrespective of the leaf's proportions and the proportional relationships between the margins and the two sides of the page (clearly defined in all the recipes—with the exception of the Munich text—inasmuch as the *pars* can be calculated by subdividing a page's height or width).[68] Thus one is dealing with—and it is important to bear this in

68 Strictly speaking, even if it is true that all the recipes are based on the definition of the proportional relationships between the margins, these are arrived at by applying different algorithms that make it possible for the relationships to derive from one another in an established order. It therefore follows that not all the relationships have the same 'weight' or level of accuracy: a few of them are, as it were, 'primordial', and should therefore be more accurately reflected in the manuscripts; others, instead, are either directly or indirectly drawn from antecedents, and are therefore impacted by approximations that tend to mount up upon each other. Besides, it is sufficient to know three of the four relationships between the margins, because the fourth is automatically determined by them. Therefore, verification of all four is a redundant step, even if it can be justified by the difficulty in

mind—a very rough interpretation of the term 'compatibility'. A sounder verification would have been impossible to achieve, given the large number of factors at play and the approximations that have to be taken into account for each of them. The verifications were carried out by calculating the space occupied (as a percentage) by each of the margins with respect to the total area and then comparing this figure to the values predicted by the recipes. In cases where the sum of the deviations as an absolute value with respect to a recipe turned out to be under 8%, the setting up of the margins was adjudged to be compatible with it.[69] For simplicity's sake, the validation procedure was limited to 15th-century codices, the category which prevailed (with almost 1,400 usable units) in the corpus assembled from the survey of Italian dated manuscripts (MDI).[70]

Number of manuscripts compatible with each of the recipes (tab. 6)

Total standard deviation	Saint-Remi	Munich	Vatican	Fanti Montecchi
0 – 2 %	0.1% (1)	0.2% (3)	0.1% (2)	1.0% (14)
2 – 4 %	0.9% (12)	3.5% (48)	1.7% (24)	4.2% (58)
4 – 6 %	2.0% (27)	5.7% (78)	3.5% (48)	7.1% (98)
6 – 8%	3.7% (51)	10.3% (142)	6.0% (83)	9.1% (126)
% total compatibility	6.6%	19.7%	11.4%	21.5%

Tab. 6: Number of manuscripts compatible with each of the recipes

The percentage of codices whose margins are compatible with one of the four recipes is not negligible. They reach, and exceed, respectively, 20% in the Munich and Fanti's prescriptions. However, more than half of the volumes (to be precise, 53.3%, or 734 units) turn out to be incompatible with any known recipe. Additionally, it should be borne in mind that the arrangement of margins often proves to be simultaneously compatible with more than one recipe. This can be seen to occur in 651 cases, distributed as follows (Tab. 7):

establishing, beforehand, the 'primordial' relationships. Needless to say, the problems presented by the verification of the width of margins alone are complex and, perhaps, not fully resolvable.

69 This procedure had previously been applied by Maniaci 2012, 505–506 506 [in this volume, 465–508]. Alternatively, in Maniaci 1995, a two-way 'range of tolerance', equating to +/- 15% of the margins' respective widths, was applied in an attempt to take into account the various sources of approximation.

70 See above, 431, footnote 36.

Distribution of manuscripts that exhibit 'dual compatibility' (tab. 7)

	Saint-Remi	Munich	Vatican	Fanti Montecchi
Saint-Remi	–	8.6%	2.3%	6.8%
Munich	8.6%	–	24.4%	39.2%
Vatican	2.3%	24.4%	–	25.7%
Fanti Montecchi	6.8%	39.2%	25.7%	–

Tab. 7: Distribution of manuscripts that exhibit 'dual compatibility'

Needless to say, the elevated number of cases of 'dual compatibility' involves the group of recipes of later origin, and in particular those of Munich and Fanti, which show the most striking similarities.

Conversely, there are 490 cases, which is to say more than a third of the total (35.6%, to be precise), in which the affinity between the arrangement of margins in an individual codex and that stipulated in a given recipe is sufficiently precise so as to exclude dual compatibility (Tab. 8):

Cases where there is compatibility with only one recipe (tab. 8)

	Number of mss	Percentage
Saint-Remi	78	5.7%
Munich	135	9.8%
Vatican	103	7.5%
Fanti Montecchi	174	12.6%
Total	490	35.6%

Tab. 8: Cases where there is compatibility with only one recipe

In this instance, too, the Saint-Remi recipe appears to stand out the most amongst the others, which confirms its low degree of compatibility with the prevailing tendency seen at the end of the medieval period. On the other hand, the application of an exclusive compatibility condition draws attention to the tendency for Italian 15th-century codices to favour the spatial organisation prescribed by Sigismondo Fanti: indeed, it cannot be ruled out that the Renaissance theorist may have wished to incorporate his innovative preference for the

3:2 ratio within the already popular margin arrangement seen in the late medieval codex.

The fact that a given distribution of blank marginal spaces is compatible with a recipe does not mean *per se* that its compatibility automatically extends to other aspects of its prescription. One can therefore pose the question as to whether, and to what extent, the preference for one or another recipe is linked to the relatively wide or narrow proportion of the sheet.

The analysis of the compatibility of recipes with the full range of proportional values yielded the following results (Tab. 9):

Compatibility with the recipes expressed as a percentage in relation to the value of L/H (tab. 9)

Proportion L/H	Manuscripts	Saint-Remi	Munich	Vatican	Fanti Montecchi	None
<0.67	274	4.4%	21.2%	13.1%	25.6%	48.5%
0.67 – 0.72	687	5.7%	22.1%	12.8%	24.3%	50.1%
0.72 – 0.77	232	9.0%	15.2%	8.1%	14.6%	61.0%
>0.77	95	11.6%	12.6%	7.4%	12.6%	63.2%

Tab. 9: Compatibility with the recipes expressed as a percentage in relation to the value of L/H

It is not surprising that the application of the Saint-Remi recipe turns out to be more widely distributed within, but not outside, the proportional range of 3/4 (0.750), which is typical—as has already been pointed out—of mid-Byzantine book production. On the other hand, it is remarkable to discover that all the other recipes turn out to be more representative when the proportional ratio is less than 0.720, in line with the practice established in book manufacture during the Late Middle Ages. The latter observation should be considered in relative terms: even when associated with the wide proportion criteria preferred by the Saint-Remi recipe, the proportional relationships prescribed by the Munich and Fanti's recipes still maintain their quantitative predominance in the 15th century.

More generally speaking, irrespective of the strict application of one or another of the recipes, the sampling of dated codices confirmed the increasing spread, in the Late Middle Ages, of a trend which sees the upper and inner margins becoming equal in width (a criterion prescribed, not by chance, in the Munich and Fanti's recipes). This trend runs parallel with a progressive abandonment of parity between the opposite pair of margins (i.e. the outer and lower): in fact, in the 15th century these tend to assume a proportion of 2:3 or 3:4, with a

definite skewing in favour of the lower margin, which in Western manuscript production is always markedly wider than the outer one (Tab. 10):

Distribution of the relationship between the outer and lower margins (tab. 10)

Mest/minf	Frequency
<0.4	2.3%
0.4 – 05	3.8%
0.5 – 0.6	10.7%
0.6 – 07	24.5%
0.7 – 0.8	24.3%
0.8 – 0.9	16.9%
0.9 – 1	8.1%
1 – 1.1	4.5%
1.1 – 1.2	1.8%
>1.2	3.2%
Total	100%

Tab. 10: Distribution of the relationship between the outer and lower margins

5 Three 'noteworthy equivalences'

At this point our analysis of the instructions that are clearly codified in the recipes (within the limits imposed by the application of an after-the-fact verification) can be brought to a conclusion. Scholars of the *mise en page* have, however, repeatedly recognised and hypothesised the conscious application, on the part of medieval artisans, of three 'equivalences' or 'remarkable relationships' which are not explicitly codified in the sources:[71]

– the width of the codex is equal to the height of the written area (h = L);
– the width of the writing area is equal to half the height of the codex (l = H/2);

71 This issue, which was only hinted at (and solely in relation to the first two 'noteworthy equivalences') in Maniaci 1995, 37–40, will be re-examined more closely in the pages that follow.

– when the volume is open, the total of the widths of the two written areas plus the two inner margins (adjacent to the binding) is equal to the height of the page (2l + 2mint = H).

Accordingly, it is worthwhile check the possible compatibility of each of the three properties against the instructions contained in the surviving recipes, as well as their diffusion throughout the corpus of investigated manuscripts. The following table (Tab. 11) reports, for the four recipes, the relationship between the two elements that compose each of the three equivalences, as deduced from the values of the basic parameters (needless to say, a score of 1 corresponds to perfect compatibility).[72]

Relationship between the remarkable equivalences and the instructions provided in the recipes (tab. 11)

	Saint-Remi	Munich	Vatican	Fanti Montecchi	Fanti Agati
h / L	0.833	1	0.880	1.040	1.063
l / (H/2)	1	0.926	0.860	0.833	1
(2l+2mint) / H	1.20	1.121	1.05	1	1.111

Tab. 11: Relationship between the remarkable equivalences and the instructions provided in the recipes

Of the three 'unwritten rules' the most widely known,[73] which is to say h = L, is only compatible with pages of narrow proportions. Indeed, it is not purely by chance that it is encountered, albeit in an approximate way, in the Sigismondo Fanti's and Munich recipes, in the form of relationship values of 0.80 and 1.040, respectively.[74]

72 As the reader will recall, in the case of the Munich recipe, conformity to the h = L formula is hypothesised at the outset in order to presuppose the spacing measurements, which cannot be directly inferred from the text.

73 The rule is also clearly stipulated in the Gothic canon of Tschichold 1948 (1975, 2003), 45 of the Italian version.

74 The insufficient compatibility seen in the case of the Vatican recipe adds another layer of complexity to its interpretation.

It should be noted, however, that the percentage of codices in which this property is respected (within an asymmetrical tolerance range of -5 and 10 mm)[75] is high overall, irrespective of the recipes concerned (Tab. 12). This is not surprising, given that the equivalence is not explicitly stipulated by any of the recipes, nor does it constitute in any of the cases an implicit result of their application: in fact, it is also encountered in codices whose margins turn out to be incompatible with all of the recipes.

Distribution of the equivalence h = L in relation to the application of the recipes (tab. 12)

h-l (mm)	All	Saint-Remi	Munich	Vatican	Fanti Montecchi
-5 – 0	13.2%	16.5%	12.9%	10.8%	15.9%
0 – 5	8.9%	7.7%	7.8%	8.3%	8.8%
5 – 10	7.9%	8.8%	7.0%	6.4%	6.4%
Total	30.0%	33.0%	27.7%	25.5%	31.1%

Tab. 12: Distribution of the equivalence h = L in relation to the application of the recipes

On the other hand, the following table (Tab. 13) confirms that, irrespective of compatibility with the recipes, the h = L relationship criterion is satisfied above all in volumes of narrow proportion:

75 Whilst in the preceding calculations the margin of error is implicit in the tolerance permitted in the respective percentages of the margins, in the case of the equivalence h = L, it was necessary to set an 'asymmetrical' threshold: in fact, while the height of the written area (h), being contained by the page, is 'immune' from significant distortions, the width of the page (L) can be affected, to a not insignificant extent, by page trimming or errors made in measurements (due, for example, to the difficulty in reaching all the way to the leaf fold with the measuring instrument. For this reason, the tolerance latitude is set at 5 mm when h < L, and 10 mm if the opposite is true.

Distribution of the difference h–L in relation to the leaf's proportion (tab. 13)

L/H	Difference H/L			Total
	<-5	-5 – 10	>10	
<0.57	0	16.7%	83.3%	100%
0.57 – 0.62	20.0%	30.0%	50.0%	100%
0.62 – 0.67	26.4%	48.8%	24.8%	100%
0.67 – 0.72	52.6%	33.0%	14.3%	100%
0.72 – 0.77	67.2%	25.5%	7.4%	100%
>0.77	83.2%	12.6%	4.2%	100%
Total	52.8%	32.7%	14.5%	100%

Tab. 13: Distribution of the difference h-L in relation to the leaf's proportion

The height of the written area gradually decreases as the width of the leaf becomes relatively greater (thus its proportion becomes wider), and vice versa. This phenomenon is an automatic result of the positive correlation between the proportion of the leaf and that of the written area. The cases in which the relationship h = L is respected are most frequently observed when the leaf's proportion ranges from between 0.62 and 0.67, although parity is still well documented in the band that corresponds to a distinctly wider proportion.

The second rule—l = H/2—is naturally associated with the layout of wide-proportioned pages (Tab. 14), which make it possible to provide sufficient space for the horizontal margins. It is therefore not surprising that the rule is even implicit in the correct prescription of the Carolingian[76] recipe, nor that it appears less frequently in the Latin Late Middle Ages.

76 By allocating one *pars* to the outer margin and half of one to the inner one, the width of the written area equates to 2.5 *partes*, that is to say half of the 5 *partes* allocated to the page's height.

Distribution of the l = H/2 difference in relation to the leaf's proportion (tab. 14)

L/H	<-5	-5 – 10	>10	Total
<0.69	92.4%	6.6%	0.9%	100%
0.69 – 0.72	77.5%	19.2%	3.2%	100%
>0.72	51.9%	32.8%	15.3%	100%
Total	75.5%	18.5%	6.0%	100%

Tab. 14: Distribution of the l = H/2 difference in relation to the leaf's proportion[77]

In any event, the relationship is respected, in the 15th century, by 18.5% of Italian dated manuscripts (Tab. 15):[78]

Distribution of the l – H/2 difference in relation to the recipes (tab. 15)

l – H/2 (mm)	All	Saint-Remi	Munich	Vatican	Fanti Montecchi	None
<-5	75.5%	82.4%	89.3%	74.5%	90.9%	67.0%
-5 – 10	18.5%	13.2%	9.6%	20.4%	7.8%	24.0%
>10	6.0%	4.4%	1.1%	5.1%	1.3%	9.0%

Tab. 15: Distribution of the l - H/2 difference in relation to the recipes

Despite the connection that links it to wider pages, the parity is inexplicably most commonly seen in volumes with generally invariant proportion, such as those posited by the Vatican manuscript.

77 Also in this case, the margin of tolerance is identical to that which applies in the preceding equivalence.

78 The fact that in Tab. 14 and 15 the bulk of the occurrences are located in the first of the three bands (< -5 mm) is not a result of (as one might imagine) the adoption of an asymmetrical margin of tolerance, but instead is a consequence of the intrinsic properties of the recipes. If the distortion were in fact due to the asymmetry of the margin of tolerance, the > 10 category should register a much higher number of occurrences, given that the value of H, when subjected to trimming, would undergo a reduction which is too great in relation to the value of l.

The question still has to be posed as to whether or not the two equivalences appear simultaneously and, if so, how frequently? A simultaneous presence is, in fact, far from widely encountered in Italian manuscripts of the 15th century; indeed, within the limits of the defined tolerance range, it is observed in less than 7% of cases (Tab. 16).

Frequency of the possible different combinations of the two equivalences h = L and l = H/2 (tab. 16)

h – L (mm)	l – H/2 (mm)		
	<-5	-5 – 10	>10
<-5	43.0%	7.2%	2.5%
-5 – 10	24.5%	6.8%	1.4%
>10	8.0%	4.4%	2.1%
Total	75.5%	18.5%	6.0%

Tab. 16: Frequency of the possible different combinations of the two equivalences h = L and l = H/2

In the small sub-group composed of 94 manuscripts in which one observes the simultaneous presence of the two 'remarkable relationships', the Saint-Remi recipe is clearly underrepresented. In absolute terms, the manuscripts that are incompatible with all the known recipes predominate (Tab. 17).[79]

How, then, can we explain the poor success rate achieved by the combination of the two equivalences?

79 In this and the tables that follow the fact that the sum of the percentages sometimes turn out to exceed 100 is explained by the possibility that one and the same set of margins might be compatible with multiple recipes.

Distribution of cases of concomitance between h = L and l = H/2 in relation to the recipes (tab. 17)

Recipes	Frequency h = L + l = H/2
All mss	6.8%
Saint-Remi	4.3%
Munich	9.6%
Vatican	9.6%
Fanti	11.7%
None	71.3%

Tab. 17: Distribution of cases of concomitance between h = L and l = H/2 in relation to the recipes

If they were to be applied simultaneously, the written area would necessarily occupy half of the total page area, whereas the ideal level of 'black' (i.e. page filling) in late medieval manuscript production is in actual fact much lower than 50% of the total page area (this is also true of paper manuscripts, which are generally of a lower quality than parchment ones). Only 12% of 15th-century dated manuscripts exhibit a filling level which is greater than half of the page's total area (Tab. 18):

On the other hand, if the two equivalences were simultaneously applied to a codex of invariant proportion, the written area would automatically assume the same proportion as the leaf, although in practice it regularly proves to be narrower.[80] It therefore seems that the artisans' instinct for practicality took precedence over elegance and/or the ease of implementation predicted by the theory.

The mathematical expression of the third and less well-known 'remarkable relationship'—2l + 2 mint = H—is owed to Giorgio Montecchi, who submits it as a corollary to Fanti's recipe: 'in an open book positioned in front of the reader the base of the double written area, formed by the sum of the two bases of the writing areas (2b) plus the two inner margins (2c), is equal to the height of the page'.[81] This third rule also turns out to be compatible, overall, in the 15th century, with all the recipes (Tab. 19).

80 Montecchi 1995 (1997), 105.

81 In this instance, the margin of tolerance applied is +/- 10 mm, because the height of the codex may have been underestimated at both the top and the bottom of the volume as a result of trimming.

Distribution of the degree of page filling ('black') in full-page manuscripts, 15th-century Italian dated manuscripts (MDI) (tab. 18)

'Black'	Frequency
<0.30	5.7%
0.30 – 0.35	19.4%
0.35 – 0.40	29.7%
0.40 – 0.45	20.7%
0.45 – 0.50	14.1%
0.50 – 0.55	7.3%
0.55 – 0.60	2.8%
>0.60	1.9%
Total	100%

Tab. 18: Distribution of the degree of page filling ('black') in full-page manuscripts, 15th-century Italian dated manuscripts (MDI)

Frequency of the relationship 2l + 2mint = H in relation to the recipes (tab. 19)

Recipes	Frequency h = L + l = H/2
All mss	19.7%
Saint-Remi	20.9%
Munich	25.8%
Vatican	26.1%
Fanti	24.3%
None	15.1%

Tab. 19: Frequency of the relationship 2l + 2mint = H in relation to the recipes

However, it comes as no surprise to discover that the relationship is more frequently observed in full-page volumes (whose written area, generally speaking, is narrower), but far less frequently in two-column volumes. It is not quite as easy to explain the more frequent occurrence of the relationship in parchment volumes, although this might be related to their (largely speaking) superior quality of execution (Tab. 20).

Frequency of the relationship 2l + 2mint = H in full-page volumes and two-column volumes, on both parchment and paper (tab. 20)

Full-page	2 columns	Parchment	Paper
22.8%	13.3%	22.4%	18.0%

Tab. 20: Frequency of the relationship 2l + 2mint = H in full-page volumes and two-column volumes, on both parchment and paper

As regards the connection between the other two 'remarkable relationships', simultaneousness with l = H/2 can be ruled out mathematically[82]. On the other hand, a simultaneous presence with h = L can be confirmed in 87 cases (6.3%), chiefly associated with the Munich and Fanti's recipes (Tab. 21).

Distribution of cases of concomitance of 2l + 2mint = L in relation to the recipes (tab. 21)

Recipes	Frequency
All mss	6.3%
Saint-Remi	6.9%
Munich	24.1%
Vatican	14.9%
Fanti	27.6%
None	71.2%

Tab. 21: Distribution of cases of concomitance of 2l + 2mint = L in relation to the recipes

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Overall, the comparative study of the small number of recipes which—quite fortuitously—have come to light so far, confirms, notwithstanding various reservations as regards their interpretation, the existence of some basic trends with respect to the page's structure and the subdivision of written and blank spaces on its surface. The recipes provide a partial and (unfortunately) not always very clear reflection of the

82 In the case of l = H/2, H is obviously equal to 2l.

layout trends witnessed by medieval manuscripts, especially when they are seen purely as guidance on matters concerning taste, rather than as prescriptions to be followed to the letter. Seen in this perspective, the directions regarding the set-up of margins can be addressed separately from those that deal with the proportion of the page, which are more stringent. The tendencies documented by the recipes describe an evolutionary path that coincides with changes in the appearance of the written page that occurred between the Early and Late Middle Ages. Differences between manuscripts and printed books can also be observed. Numerous specific choices were made along this evolutionary path, which are borne witness to by the surviving recipes (only one of which dates prior to the Late Middle Ages). In any event, the extant recipes constitute the tip of an iceberg, beneath which it is quite reasonable to hypothesise the existence of additional fully developed sets of rules, or perhaps isolated examples of guiding principles for the artisans to observe when they made their choices. However, the large number and complexity of the various factors in play make it exceedingly difficult, if not impossible, to identify such recipes today.

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