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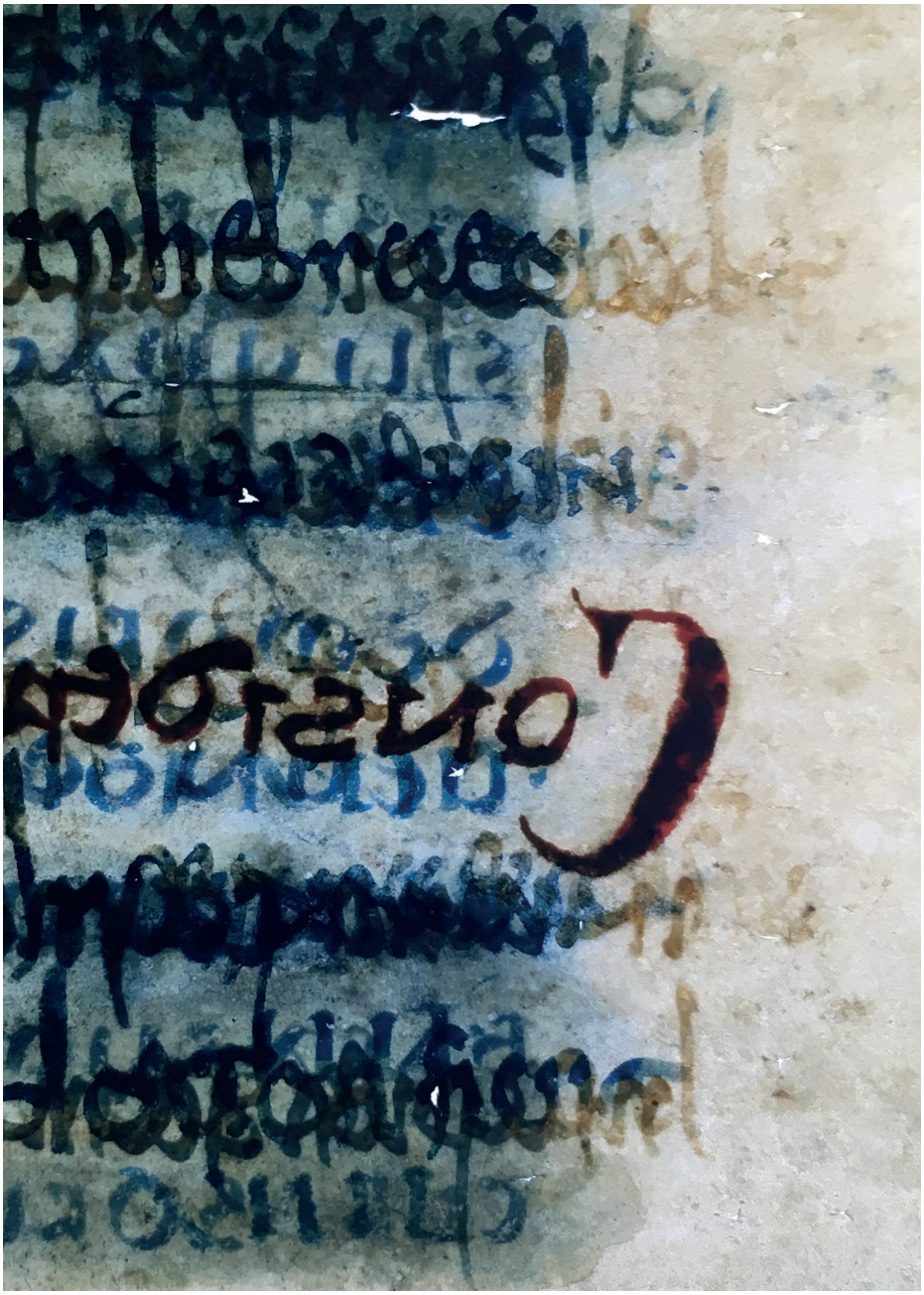

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Transmitted light image (detail) of Codex 3/1 (5th century Luxueil or 7th–8th century Italy), Benedictine Abbey St Paul in Lavant Valley, Austria. Hieronymus, *Commentarius in Ecclesiasten*; Plinius Secundus, *Historia naturalis*. Photography by Thomas Drechsler, Berlin.

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ARTICLES

Article

Advanced Codicological Studies of Cod. germ. 6 (Hamburg, Staats- und Universitätsbibliothek): Part 2

Mirjam Geissbühler, Georg Dietz, Oliver Hahn, and Ira Rabin | Bern, Dresden, Berlin, Hamburg

Abstract

The work presented here follows the article *Combining Codicology and X-Ray Spectrometry to Unveil the History of Production of Codex germanicus 6 (Staats- und Universitätsbibliothek Hamburg)*, published in 2014.[1] It confirms the main result of the previous article: the *Artusnotiz*, the fourth text in the bound manuscript, must have been introduced as the last one. This paper offers further details of the codex production, based on the composition of the black and red inks collected in four measurement campaigns. Furthermore, using imaging μ-XRF, we succeeded in understanding the strong variation of the composition of the red inks in the initials of all the texts except for *Parzival* and *Jeanne d'Arc*.

1. Introduction

Codex germanicus 6 (Cod. germ. 6) was created by a private person named Jordan around 1450 in the Rhenish-Franconian area. The 614-page manuscript contains eleven texts written in Middle High German and one in Latin. It is a simple manuscript (texts written with black ink, rubricated), but it has a complex history. The texts' order in the bound manuscript does not correspond to the sequence in which they were originally copied. We have added ink and paper analysis to the classical codicological methods that could not clarify this order.[2]

Since our previous study in 2013, we have continued the work on Cod. germ. 6 using μ-X-ray fluorescence in line scan modus. Adding some 100 measurements of black inks and 140 measurements of red inks enabled us to divide the texts into distinct units based on ink similarity and suggesting that the writing was conducted in various stages.

Table 1 shows the structure of Cod. germ. 6 in the bound manuscript.[3] Pages 7, 366 and 588 were left blank and indicate a gap between the *Meisterlieder* (*Horn* and *Mantel*) and *Parzival*, *Artusnotiz* and *Wigalois*, as well as between *Friedrich* and *Jeanne*. The study of the watermarks shows that there must be another gap between *Wigalois* and *Abul Nasr*.[4] We found five types of watermarks in the shape of the heads of oxen in the manuscript, though not a single one could be identified with certainty.[5] The numerous similar examples of the five watermarks we examined all date to between 1448 and 1452.[6] The paper exhibiting watermarks 1 and 2

[1] Rabin et al. 2014.

[2] Christine Putzo employed classical codicological methods to determine the production process of the Cod. germ. 6 in her description of the manuscript. Cf. Putzo 2002.

[3] For simplicity, we use short forms for some texts in the following: *König Artus' Horn* = *Horn*, *Luneten Mantel* = *Mantel*, *Sultansbrief Abul Nasr* = *Abul Nasr*, *Sultansbrief Almansor* = *Almansor*, *Der König im Bad* = *König*, *Jeanne d'Arc* = *Jeanne*.

[4] While *Abul Nasr* begins on quire 23, it ends on quire 24, which shows other watermarks.

[5] The examinations of the watermarks were carried out in the period from January to April 2017 using the Bernstein meta-portal <www.memoryofpaper.eu> (last accessed 15 April 2018). To assess the meta-portal, 35 watermark databanks containing more than 240,000 examples of watermarks are included.

[6] Watermark 1 resembles WZIS_DE2910-PO-75104 (Freiburg, Breisgau, 1448) and WZIS_DE3285-PO-75109 (n.p., 1448); Watermark 2 resembles WZIS_DE2910-PO-75122 (Freiburg, Breisgau, 1449); Watermark 3 greatly resembles WZIS_DE1185-S306_272 (period of use: 1420/1430 by Jacobus de Voragine for ManuMed); Watermark 4 resembles: WZIS_CH0780-PO-76559 (???, 1452), WZIS_CH0780-PO-76562 (Lucerne, 1452) and WZIS_DE2910-PO-76565 (Freiburg/Breisgau, 1452); Watermark 5 resembles WZIS_CH0780-PO-76556 (Basel, 1451), WZIS_CH0780-PO-76571 (Neuenburg, 1452), WZIS_CH0780-PO-76572 (???, 1452), WZIS_CH0780-PO-76573 (???, 1452), WZIS_CH0780-PO-76574 (Lucerne, 1452), WZIS_DE1695-PO-76569 (Lichtenberg, 1452), WZIS_DE2730-PO-76576 (Friedberg, 1453), WZIS_DE2910-PO-76570 (Freiburg/Breisgau, 1452), WZIS_DE4200-PO-76595 (???, 1451), WZIS_DE4200-Lichtental66_999a (???, ???), WZIS_DE4620-PO-76577 (Danzig, 1454), WZIS_DE4620-PO-76578 (Stargard, 1455) and WZIS_DE8085-PO-76580 (Kirchheim / Teck, 1452). Watermarks 1 and 2 greatly resemble each other. These could be the watermarks of a paperwright mould-and-deckle pair. Unlike watermarks 1 and 2, watermark 3

Table 1: Structure of Codex germanicus 6

Page(s)	Content	Position in writing process[7]	Quire	Watermark(s)
flyleaf	index[8]		-	-
1	left blank		1	1
2a–4a	1 *König Artus' Horn*	B: 2, 4 / A: 3, 5, 6, 7, 8, 9, 10 / ?: 11, 12	1	1
4a–6b	2 *Luneten Mantel*	B: 4 / A: 1, 3, 5, 6, 7, 8, 9, 10 / ?: 11, 12	1	1
7	left blank		1	1
8a–365a	3 *Parzival*	B: 1, 2, 4, 5, 6, 7, 8, 9 / ?: 10, 11, 12	1–15	1, 2
365a	colophone (*Parzival*)		15	1
365a	4 *Artusnotiz*	A: 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12	15	1
366	left blank		15	1
367a–560a	5 *Wigalois*	B: 1, 2, 4, 6, 7, 8, 9 / A: 3 / ?: 10, 11, 12	16–23	1, 2, 3
560a	colophone (*Wigalois*)		23	1
560a–567a	6 *Sultansbrief Abul Nasr*	B: 1, 2, 4, 7, 8, 9 / A: 3, 5, 10 / ?: 11, 12	23, 24[9]	2, 4, 5
567a–569a	7 *Sultansbrief Almansor*	B: 1, 2, 4, 8, 9 / A: 3, 5, 6, 10 / ?: 11, 12	24	4, 5
569a–575b	8 *Der König im Bad*	B: 1, 2, 4, 9 / A: 3, 5, 6, 7, 10 / ?: 11, 12	24	4, 5
576–587a	9 *Friedrich*	B: 1, 2, 4 / A: 3, 5, 6, 7, 8, 10 / ?: 11, 12	24, 25	4, 5
588	left blank		25	4
589a–610b	10 *Jeanne d'Arc*	B: 1, 2, 4, 6, 7, 8, 9, 11, 12 / ?: 3, 5	25	1, 2
611a–612b	11 *Lüttich*	B: 4, 12 / A: 10 / ?: 1, 2, 3, 5, 6, 7, 8, 9	25	1, 2
612b	12 *Notabile*	B: 4 / A: 10, 11 / ?: 1, 2, 3, 5, 6, 7, 8, 9	25	1, 2
613–614	left blank[10]		25	4

(quires 1-23 and 25) is probably older than the one showing watermarks 4 and 5 (quire 24 and the outermost double sheet of quire 25[11]). In addition, it should be considered that the only double sheet in the Cod. germ. 6, which has watermark 3, is the oldest. This is the innermost double sheet of quire 23. All the sheets of the manuscript contain vertical and horizontal lines drawn in lead (Pb) to circumscribe the writing area; the only exception is the double sheet with the watermark 3, where such lines are missing. It is noteworthy that the quality of the lines is not constant throughout the manuscript. They are fine and hardly discernable with the naked eye on the sheets with watermarks 1 and 2, but become thick and easily seen on the sheets with watermarks 4 and 5.

shows an additional circle in the forehead area and should be regarded as an independent watermark. Watermarks 4 and 5 resemble each other, but are not identical. The markedly different intervals between the catenary lines make a direct connection in the paper doubtful.

[7] Each number refers to the text number in the column on the left. 'B' stands for 'before', 'A' for 'after' and '?' for 'not yet clarified'.

[8] The index, also written by Jordan, mentions texts 3, 5, 6, 8, 9, 10, 11.

[9] Quire 24 begins on page 563.

[10] This page was pasted on the flyleaf of the inside of the back cover until the restoration of Cod. germ. 6 in 1967.

[11] As discussed in the previous article, this double sheet must have been added later. Cf. Rabin 2014 et al., 128. Cf. also Putzo 2002, 136–137, n. 134.

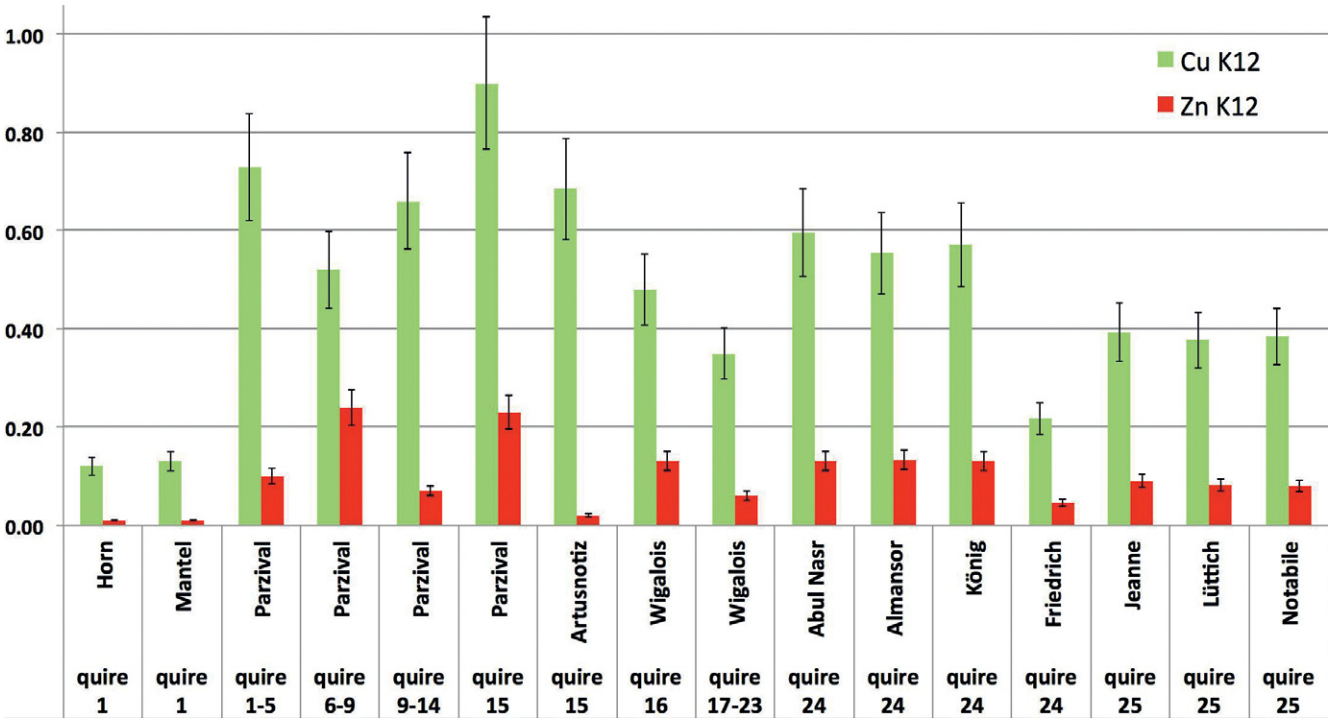


Fig. 1: Summary of the relative composition of the black ink in the texts of Cod. germ. 6.

The double sheet with the singular watermark 3 was most probably inserted to obtain sufficient paper to copy the *Wigalois* text. The lack of lines on this sheet may indicate that Jordan did not rule the paper himself. Moreover, the fact that the sheets with the *Parzival* and *Wigalois* texts (with the exception of the double sheet discussed above) and quire 25 possess the same watermarks may suggest that Jordan penned *Wigalois* after *Parzival* and the texts of quire 25.

Furthermore, inspection of Jordan's characteristic style reveals that he copied the *Meisterlieder* and *Friedrich* into the bound manuscript.[12] From the previous study of Cod. germ. 6, we also know that there is a gap between *Parzival* and *Artusnotiz*, meaning that the latter was added at the end of the writing process.

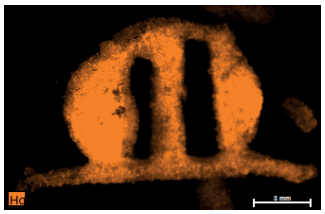
The arguments above suggest seven separate stages in the writing process of Cod. germ. 6: *Meisterlieder* / *Parzival*, / *Artusnotiz*, / *Wigalois*, / *Abul Nasr*, *Almansor*, *König* / *Friedrich* / *Jeanne*, *Lüttich* and *Notabile* (= quire 25). But one should keep in mind that each *Meisterlied* and each text of the twenty-fourth and twenty-fifth quire could be a single unit – and especially the short texts *Lüttich* and *Notabile* at the end of the bound manuscript could have been added later.[13] In the following, we demonstrate the extent to which the new material study supports or necessitates a revision of the grouping of the texts.

2. Results of the analysis of the black ink

Fig. 1 shows the amounts of copper and zinc in relation to iron, the main element of the iron gall ink. This fingerprint distribution summarizes the results for the black inks we measured. The green columns represent the values for copper, the red ones those for zinc.

In Cod. germ. 6, we measured eleven different sorts of black ink in total, with six inks used for the Arthurian romances, *Parzival* and *Wigalois*. The first of these, with its 350 pages, displays four different compositions of black ink, whereas the 200 pages of the second romance show two different inks. Therefore, it seems that Jordan had to acquire new ink after writing four to six quires, i.e. for approximately 100 to 150 pages. Furthermore, the change in the black ink at the end of the first romance and the beginning of the second indicates that the Arthurian romances in Cod. germ. 6 can be considered two separate units. The rest of the Codex consists of 10 short texts that were penned in 5 different inks, whereby no ink change ever occurred within one text. If every single ink composition corresponds to a single unit in the writing process, the texts can be grouped accordingly: *Horn*, *Mantel* / *Artusnotiz* / *Abul Nasr*, *Almansor*, *König* / *Friedrich* / *Jeanne*, *Lüttich*,

[12] The characteristic style of the *Artusnotiz* written on the right-hand column of page 365 provides no insight into this aspect.
[13] Rabin et al. 2014, 12.



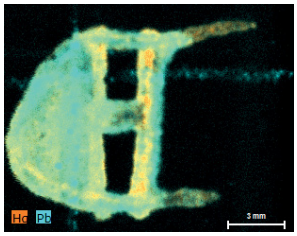
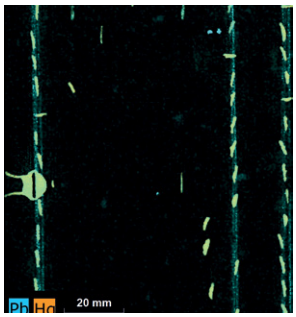


Fig. 2: Distribution of the element mercury (Hg) in the initial from the page 353 (*Parzival*, left) and in that of the mercury (Hg) and lead (Pb) on page 2 (*König Artus' Horn*, right).



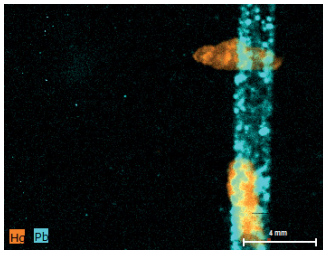


Fig. 3: Distributions of the elements mercury (Hg) and lead (Pb) on pages 558 (*Wigalois,* left) and 196 (*Parzival*, right), respectively.

Notabile. Thus, the measurements confirm the codicological suggestion that the two *Meisterlieder Horn* and *Mantel* form a single unit. They also corroborate our earlier finding, based on the composition of the red ink, that *Artusnotiz* presents a separate unit. The measurements of the black ink suggest two units in the twenty-fourth quire: the first three texts, *Abul Nasr*, *Almansor* and *König*, appear in one ink, forming one unit, while *Friedrich*, which was penned in another ink, would correspond to a separate unit. Finally, the measurements of the black ink in quire 25 indicate that *Lüttich* and *Notabile* at the end of the manuscript were not added later. They have the same black ink as *Jeanne*, the text placed at the beginning of the twenty-fifth quire.

The analysis of the black inks strongly supports the text units suggested on the basis of purely codicological study. Moreover, it reveals that the texts *Abul Nasr*, *Almansor* and *König* in quire 24 formed a single unit, while the texts *Lüttich* and *Notabile* in quire 25 were not added later.

If we assume that each unit corresponds to a copying stage from a certain exemplar, we suggest that the twelve texts in Cod. germ. 6 were copied from seven different exemplars.

3. Results of the analysis of the red inks

Unlike the black inks, the red inks of the codex present a rather complicated picture. Roughly speaking, the composition of the inks changes from pure cinnabar in *Parzival* to cinnabar adulterated with minium in other texts, whereby the content of minium progressively grows and even exceeds that of cinnabar in *Artusnotiz*. It is noteworthy that only the texts *Parzival*, *Artusnotiz* and those from quire 25 display a constant ink composition throughout the text and therefore can be used in conjunction with the conclusions based on the analysis of the black inks.

Jordan seems to have copied the *Parzival* text for his own use.[14] This view is offered by codicological quire analysis and is consistent with the composition of black and red inks. Similarly, *Artusnotiz* consistently presents a separate unit with its distinct, minium-rich red and black inks, which appear only in this text. The same arguments apply to the texts of quire 25. Their black inks indicate a single unit, while the red inks with less than 10% minium could suggest that the writing occurred between that of *Parzival* and that of *Wigalois*. The latter suggestion is, however, contradicted by their appearance on the separate quire, albeit written on paper identical to that of the *Parzival*. Therefore, we tentatively suggest that the texts of the twenty-fifth quire were penned first and later attached to the end of the manuscript when it was bound.

The remaining seven texts contain multiple rubrications, initials, titles and subtitles, a colophone (in *Wigalois*) and decorations executed in red inks whose composition doesn't seem to be well defined throughout the texts.

Two examples in Fig. 2 illustrate how the initials in *Parzival* and in *König Artus' Horn*, the first of the *Meisterlieder*, were executed. The distribution of mercury in the initials tracks the pigment cinnabar, whereas the element lead (Pb) corresponds to the pigment minium used to adulterate the very expensive cinnabar ink. In the left-hand picture, an example from the *Parzival* text, we see no traces of lead. However, one clearly sees that the pigment was added to the initial in more than one step. In the picture on the right, the initial from *König Artus' Horn* was also coloured in multiple steps. However, this time red inks with different degrees of adulteration were used, resulting in a composition with a

[14] The further explanations support Christine Putzo's thesis that Cod. germ. 6's compilation of texts was not planned from the outset. Cf. Putzo 2002, 65f.

Table 2: Summary of the red inks used to rubricate the texts.

Parzival	*Wigalois*	*Abul Nasr*	*Almansor*	*König*	*Artusnotiz*	*Friedrich*	*Meisterlieder*	quire 25
0	~0.2	~ 0.3	~0,4	~0.45	>1	~0.2	~0.2	~0.1

heterogeneous Pb/Hg ratio. We found this behaviour in the initials of every text studied except *Parzival* and the texts of the twenty-fifth quire.

The unequivocal determination of the red ink composition is further complicated because a larger number of rubrications fall on the first letters in the verses, which invariably coincides with the text area guiding line executed in lead. Fig. 3 demonstrates the distributions of the elements mercury and lead on pages 558 (*Wigalois*) and 196 (*Parzival*), respectively.

In the left-hand image, a fast overview scan of a large area displays the basic distribution of the red inks encountered throughout the manuscript. Two outer thin lead lines (in turquoise) belong to the layout of page 558, whereas the inner line corresponds to page 557. Its appearance reflects the fact that a paper sheet does not present the barrier to X-rays resulting from the element lead (Pb) that we detect in our analysis. Thick short lines in green result from the superposition of the orange colour we assigned to the element mercury (Hg) and correspond to the rubrications. We clearly see from this picture that only a small number of rubrications fail to coincide with the lead guideline. Moreover, initials are also at least partly drawn onto the existing lead lines. A more detailed scan on the right shows a portion of the guideline and the rubrications from the *Parzival* text on page 196. Here we see with greater clarity that the vertical rubrication coincides with the guideline, whereas the horizontal one crosses it. In the first case, no determination of the ink used for rubrication is possible, whereas in the second one we were able to use only a small portion of it.

For a quantitative evaluation of the Pb/Hg ratios, we extracted regions of interest and compared the spectra pixel by pixel using imaging XRF or, alternatively, used a line scanner to collect spectra from a virtual line across a region of interest. Fig. 4 illustrates the method and shows different typical ink profiles found in the manuscript under study. The composition of the black inks was determined in the same fashion.

In the first case, we present the data analysis for a rubrication from *Artusnotiz* on page 365 (Fig. 3 left). The profiles of the elements mercury and lead show a perfect match, reflecting that it was drawn with a single ink containing constant amounts of mercury and lead. In the second example, namely an initial from the text *Wigalois* (Fig. 3 right), the profiles of the elements Hg and Pb run

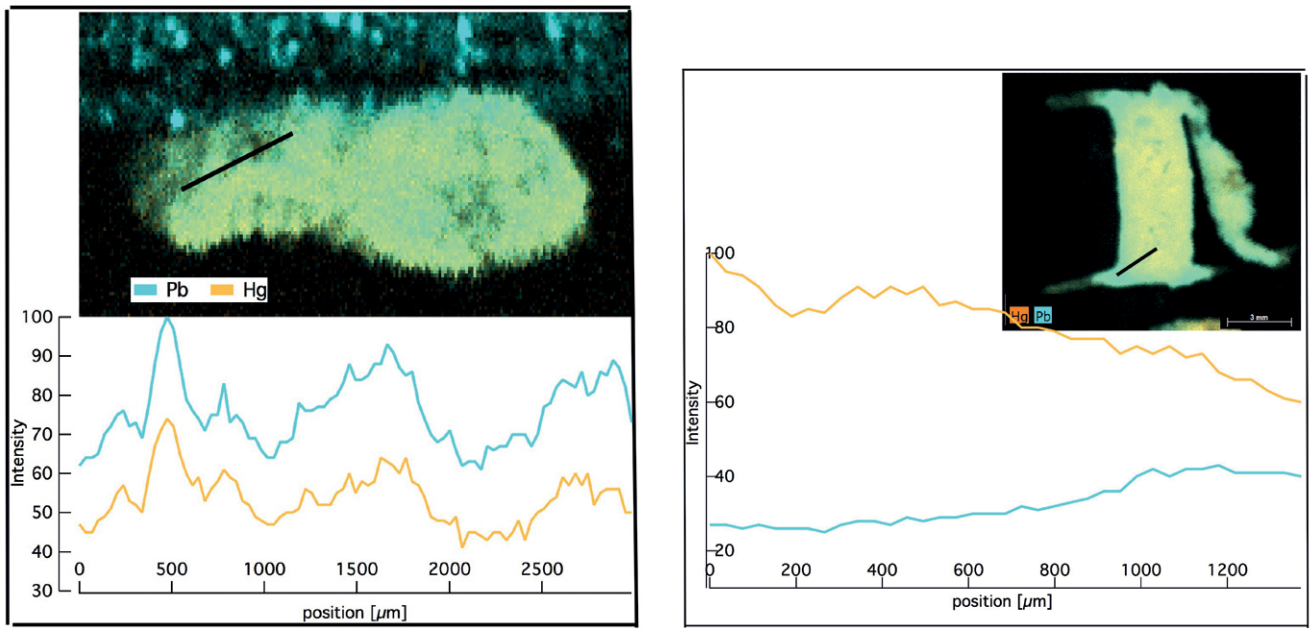


Fig. 4: Distributions of the elements mercury (Hg) and lead (Pb) extracted from the regions of interest for the rubrication on page 365 (*Artusnotiz*, left) and the initial on page 550 (*Wigalois*, right). The regions of interest or so-called line scans are indicated in the inserts showing the corresponding XRF images.

apart, clearly showing that inks of different compositions were involved in colouring this initial. In the latter case, we cannot determine unequivocally either the composition of the inks used or the sequence of their application.

Since neither initials nor first-letter rubrications can help reconstruct the production process, we are left with the in-text rubrications. Here of course, we cannot be sure that Jordan was adding all the rubrications in one go immediately after a text was penned. On the contrary, the analysis of the initials indicates that the red ink at hand was used during each correction cycle of the manuscript, producing random Pb/Hg ratios. Taking all the limitations into account, we have succeeded in estimating the composition of the red inks of the individual texts. In Table 2, the six texts are arranged in increasing order of minium content. The texts of the twenty-fifth quire, *Meisterlieder* and *Friedrich*, fall out of the scheme and are placed separately.

The values of the red inks not only place *Artusnotiz* outside of the main production process, they also indicate the singularity of *Friedrich*, *Meisterlieder* and the texts from quire 25. Interestingly, the similarity in the composition of the red inks found in *Friedrich* and *Meisterlieder* coincides with the result of the style study, namely that all three texts were written into the bound manuscript. Though the composition of the black inks speaks against grouping these texts together, the composition of the red inks could indicate that their completion was not separated by a large interval of time. On the other hand, the fact that the text of *Wigalois* was rubricated with similar inks should serve as a caution against using ink composition as the sole factor in the reconstruction of the manuscripts' production. In contrast, the composition of the red and black inks supports the codicological thesis that the texts of quire 25, i.e. *Jeanne*, *Lüttich* and *Notabile* constitute a single unit copied independently from the rest of the manuscript.

4. Note on the correction process

We observed many traces of multiple corrections. These include text cancelling performed in white lead or just crossing out in the red inks as opposed to direct overwriting in black and red inks. We interpret the overpainting of initials as a correction of the latter type. It seems that corrections of this type served to enhance the colour of the inks and were performed during multiple inspections of the manuscript. In principle, it might even be possible to reconstruct the correction cycles by comparing the composition of the correction ink with that of the original ink. However, such painstaking work would require a great deal more effort than what we have invested so far.

5. Conclusion

The analysis of the black inks confirms six 'gaps' in the writing process, which were already suggested codicologically. In addition, black and red ink analysis indicate that *Abul Nasr*, *Almansor* and *König* in the twenty-fourth quire, on the one hand, and the texts *Jeanne*, *Lüttich* and *Notabile* in the twenty-fifth quire, on the other, form two independent units, each probably copied within a relatively short time period. Combining the results of classic codicological examination with those obtained by materials analysis, we suggest the following seven stages in the writing of the texts in the Cod. germ. 6.: [I: *Parzival*], [II: *Jeanne*, *Lüttich*, *Notabile*] [III: *Wigalois*], [IV: *Abul Nasr*, *Almansor*, *König*], [V: *Friedrich*] [VI: *Horn*, *Mantel*] and [VII: *Artusnotiz*]. The importance of these findings for the collection's concept of Cod. germ. 6 will be presented in detail in Mirjam Geissbühler's dissertation (publication expected for 2018).

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The Swiss National Science Foundation (SNF) and the Zeno Karl Schindler Foundation (Geneva), which enabled the advanced studies of Cod. germ. 6 by providing a scholarship.

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AMENDMENTS TO THE PREVIOUS PUBLICATION

a. The quire formula of Cod. germ. 6 on page 127 can be elaborated to (VI+1)13 + 13 VI169 + VII183 + 7 VI267 + VI293 + (VI+2)307.

b. The statement on page 128 ('There is no indication that the remaining texts in the two last quires of the codex were penned before the two Arthurian romances, *Parzival* and *Wigalois*. It is therefore most likely that the two longer texts in the codex were the first to be transcribed.') has to be revised in view of this study and the evaluation of the watermarks. We find that the texts in the twenty-fifth quire might have been copied before *Wigalois* or even before *Parzival*.[15]

c. Two values in table 2 on page 129 have to be modified. Control measurements have shown that the second value in the table (Rubrication in *Parzival*) is below 0.01.

d. Page 130 states that the *Meisterlied Luneten Mantel* and *Notabile* show the same red ink (0.07 Pb/Hg). The re-investigation of the red inks proved this sentence to be wrong.

[15] This modification has also effects on table 1 on page 127 in the article. The improvements are not listed here, but they are considered in the first table of the present article.

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Studies in Manuscript Cultures (SMC)

Ed. by Michael Friedrich, Harunaga Isaacson, and Jörg B. Quenzer

Writing is one of the most important cultural techniques, and writing has been handwriting throughout the greater part of human history, in some places even until very recently. Manuscripts are usually studied primarily for their contents, that is, for the texts, images and notation they carry, but they are also unique artefacts, the study of which can reveal how they were produced and used. The social and cultural history of manuscripts allows for 'grounding' the history of human knowledge and knowledge practices in material evidence in ways largely unexplored by traditional scholarship.

With very few exceptions, the history of the handwritten book is usually taken to be the prehistory of the (printed Western) book, thus not only denying manuscripts their distinct status as carrier medium, but also neglecting the rich heritage of Asian and African manuscript cultures from which, according to conservative estimates, more than ten million specimens survive until today.

The series *Studies in Manuscript Cultures (SMC)* is designed to publish monographs and collective volumes contributing to the emerging field of manuscript studies (or manuscriptology) including disciplines such as philology, palaeography, codicology, art history, and material analysis. SMC encourages comparative study and contributes to a historical and systematic survey of manuscript cultures.

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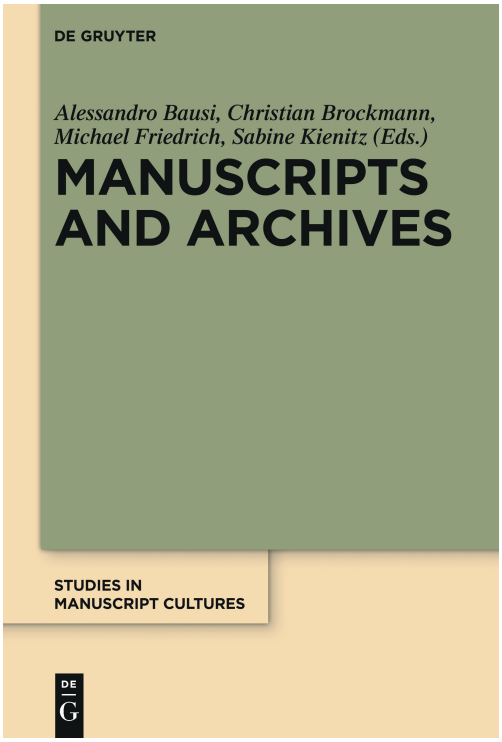

11 - *Manuscripts and Archives: Comparative Views on Record-Keeping* edited by Alessandro Bausi, Christian Brockmann, Michael Friedrich, and Sabine Kienitz

Archives are considered to be collections of administrative, legal, commercial and other records or the actual place where they are located. They have become ubiquitous in the modern world, but emerged not much later than the invention of writing. Following Foucault, who first used the word archive in a metaphorical sense as 'the general system of the formation and transformation of statements' in his 'Archaeology of Knowledge' (1969), postmodern theorists have tried to exploit the potential of this concept and initiated the 'archival turn'. In recent years, however, archives have attracted the attention of anthropologists and historians of different denominations regarding them as historical objects and 'grounding' them again in real institutions. The papers in this volume explore the complex topic of the archive in a historical, systematic and comparative context and view it in the broader context of manuscript cultures by addressing questions like how, by whom and for which purpose were archival records produced, and if they differ from literary manuscripts regarding materials, formats, and producers (scribes).

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