# ESCAPING FLATLAND: MULTI-DIMENSIONALITY IN MEDIEVAL TEXTS

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## ABSTRACT

The paper illustrates how dynamic forms of presenting a historical text, such as late medieval administrative records, can support the reader of this text to approach it from yet unknown angels. It does so by employing the *kundige bok* digital edition of 15th century town statutes to discuss several cases of research into everyday life in the town of Göttingen. The paper argues that traditional approaches towards opening up historical texts for research have led to "flattening" the multi-dimensionality of historical knowledge into static and linear format. The paper presents examples for the benefit of a scholarly edition that is based on the principles of dynamic information visualisation and outlines the modern edition as a multifunctional instrument for research. The argument concludes with an outlook into the workshop of a "digital medievalist" with its new methods and tools to augment research.

## KEY WORDS

Scholarly editing, digital media, information, visualisation, town law, everyday life, 15th century.

## CAPITALIA VERBA

Editio academica, Media digitalia, Indagatio, Sensus cernendi, Lex urbis, Quotidiana Vita, Quindecimum saeculum.

# 1. Introduction[1]

> *The world is complex, dynamic, multidimensional; the paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?*[2]

Tufte's statement that "all the interesting worlds (physical, biological, imaginary, human) that we seek to understand are inevitably und happily multivariate in nature"[3] is in particular valid for the Humanities. Research data in medieval studies, for instance, is to a good amount text-based. But these are not texts "written with print design in mind".[4] They usually are historical texts, never intended to be printed. Such texts are often of complex nature, non-linear, multi-dimensional and of "unending variation".[5]

The traditional interface of the humanities, its format for interaction between historical text and reader is the (scholarly) edition. With the emergence of the digital age, scholarly editions are nowadays more often disseminated as electronic texts to facilitate access and to serve better the needs of their readers. However, as can be observed during the past years, these e-texts do not reach much beyond the limitations of (traditional) print-based texts, they are still in an "early stage of design"[6] and their potential for research is far away from being fully exploited.[7] One of the pioneers of scientific information visualisation, Edward Tufte, would express it more dramatically: the texts are "caught up in the two-dimensionality of the endless flatlands of paper and video screens".[8]

Reasons for this can be two-fold: on the one hand, there is a persistent scepticism against new forms of representation of historical data in general or against electronic editions in particular. These sceptics argue mainly with the (negative) instability and arbitrariness of electronic texts while printed texts claim (positively) definitiveness and established usage for themselves. They do not take, however, into consideration that electronic editions, on the hand, can be multifunctional. The story does not end with providing simply huge amounts of texts, they can go far beyond that and offer opportunities for an-depth research by automated processing of textual data, by on-demand mining of such data and

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1. Abbreviations used: SG (Stadtarchiv Götingen).

2. Tufte, Edward. *Envisioning Information*. Cheshire, CT: Graphics Press, 2008: 9.

3. Tufte, Edward. *Envisioning Information...*: 12.

4. Shillingsburg, Peter. *From Gutenberg to Google: electronic representations of literary texts.* Cambridge-New York: Cambridge University Press, 2006: 85.

5. Eggert, Paul. "Text-encoding, Theories of the Text, and the 'Work-Site'". *Literary and Linguistic Computing,* 20/4 (2005): 429.

6. Sutherland, Kathryn. "Being Critical: Paper-based Editing and the Digital Environment", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Farnham: Ashgate, 2009: 22.

7. Buzetti, Dino. "Digital Editions and Text Processing", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Farnham: Ashgate, 2009: 45; Shillingsburg, Peter. *From Gutenberg to Google...*: 88.

8. Tufte, Edward. *Envisioning Information...*: 9.

by dynamic visualisation. Such possibilities open the field for new questions as they lead to new answers.

The complexity of medieval texts described above derives as well from the cognitive process of textual production as from the dissemination of text(s) in space and time. For medieval documents, this can be particularly well observed in frequent use and rewriting of administrative records. This paper[9] looks behind the rationale of a recently finished electronic edition of a late medieval manuscript which is characterised by various revisions over time. It thus serves as an example for multi-dimensionality due to its chronological component. The study shall demonstrate added values of dynamic, electronic texts in comparison to static, printed texts. It begins with outlining the setting of 15th century Göttingen, its process of emancipation as a self-governed town, the fast changing conditions it had to face, and the role that statutory regulations on everyday life played within this framework. It goes on by characterising the Göttingen *kundige bok* (book of announcements) as a dynamic text for which the first scholarly edition from the early 20th century has to be regarded as an attempt to express in a "flat" way what was multidimensional instead. Employing various case studies, the paper then discusses how the digital edition of *kundige bok*[10] has been realised how it may help to change the reader's attitude towards the text, and to give new insight into everyday life in the late medieval town. With this, I hope to proof that a static predefinition, traditionally undertaken by the editor, is no longer a postulate. This paper will show that a dynamic form of presenting a historical text in terms of a scholarly edition is indeed capable to approach a text from unknown angles. It concludes with an outlook to illustrate the workshop of a "digital medievalist"[11] and how new methods and tools can cater for extended or improved research.

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9. This paper is based on a talk given at the Kalamazoo 2009 International Congress on Medieval Studies. Part of the research described here was undertaken during my fellowship at the National University of Ireland, Galway. I would like to thank the Moore Institute for its hospitality and the European Commission for funding within the Marie Curie Schema "Transfer of Knowledge" in the Sixth Framework Programme.

10. Rehbein, Malte. *Kundige bok 2. Die elektronische Edition*. Stadtarchiv Universität Göttingen. 5th of May, 2010 <kundigebok.stadtarchiv.goettingen.de>.

11. See: O'Donnell, Daniel Paul. "Welcome to The Digital Medievalist". *Digital Medievalist*, 1 (2005) for a characterisation and illustration of the "Digital Medievalist" as a "community of practice. O'Donnell, Daniel Paul. "Welcome to The Digital Medievalist". *Digital Medievalist*. Spring 2005. University of Lethbridge. 16th March 2010 <www.digitalmedievalist.org/journal/1.1/odonnell/>.

## 2. Multi-Dimensionality

### 2.1 The Göttingen Burspraken

This case-study[12] is based on a 15th century administrative record from the North German town of Göttingen.[13] In the Middle Ages, Göttingen, with its 4,000 to 6,000 inhabitants,[14] was one of Germany's bigger medium-sized towns,[15] member of the Hanseatic League and had some supra-regional importance. The town was located along major trade routes that facilitated a vivid economy and allowed for exchange of goods and to market Göttingen's products, in particular linen, on trade fair places such as Frankfurt.

During the 14th and 15th century, the town had emancipated itself from the rule of the Brunswick dukes and gained certain autonomy. Similar to other towns in late medieval Germany, this was achieved by acquiring important rights, such as jurisdiction or the right to mint and issue coins. At the end of the 15th century, the town can be regarded as self-governed with the duke's rule been replaced by the city council (*Stadtrat*)[16] as the new authority.[17] This process of emancipation was neither straight forward nor always peaceful. During financial crises of the dukes, rights could be acquired with money. In particular in the 14th century, however, military actions were also undertaken to free from the duke's rule. The period of interest for this case study is the 15th century in which these developments had just reached their peak: Göttingen was in the midst of a period of dynamic change and an evolving environment.

A major role in the town's efforts to gain autonomy is played by the town law: it expresses the independency from the Brunswick dukes and the willingness of the city council to replace their rule and to govern the town themselves. The manuscript studied here, is part of this new law that the town is giving itself. The so called *kundige bok 2* is one of many extant documents of the administration of late-

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12. For a description of this case study see also: Rehbein, Malte. "Reconstructing the textual evolution of a medieval manuscript". *Literary and Linguistic Computing*, 24 (2009): 319-327.

13. The term "North Germany" here refers to the northern part of late medieval Germany in which until the 16th/17th century Middle Low German was the written language, as opposed to Middle High German in the south. Middle Low German can be regarded as an administrative *lingua franca* of the Hanseatic League. See: Schmidt, Wilhelm. *Geschichte der deutschen Sprache*, Norbert Wolf, Helmut Langner, eds. Stuttgart: Hirzel, 2007; Lühr, Rosemarie. "Deutsche Sprache IV". *Lexikon des Mittelalters*. Munich: Artemis, 1980: III, 765-766.

14. Asmus, Bärbel. "Die Bevölkerung: Entwicklung und Sozialstruktur", *Göttingen: Geschichte einer Universitätsstadt*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: 166.

15. See: Isenmann, Eberhard. *Die deutsche Stadt im Spätmittelalter.* Stuttgart: Ulmer, 1988: 31.

16. Mohnhaupt, Heinz. "Stadtverfassung und Verfassungsentwicklung", *Göttingen: Geschichte einer Universitätsstadt*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: 233.

17. They acquired power in a way that Max Weber described as a "Monopol legitimer physischer Gewaltsamkeit" (Weber, Max. *Wirtschaft und Gesellschaft*. Paderborn: Voltmedia, 2006: 29).

medieval Göttingen.[18] It is a collection of various texts about everyday life in the town with a special kind of statutes, so called *burspraken,* being their main content.[19]

*Burspraken* were local regulations which were regarded by the council as so important, in particular for the order in town (*Stadtfrieden)* that they were announced (read aloud) to the public on a regular basis. The term *bursprake* refers to both: the statutes or legal texts themselves and the annual assembly of the *bûren* (citizens, fellow occupants of the town) to which the statutes were announced and which formally had to approve them.[20] The Göttingen *Burspraken* were mostly regulations on everyday life. They cover among others: taxes, dress codes, beer brewing, exchange rates for coins, cleanliness, fire protection, defence of the city, ceremonies, leisure and gambling. One must assume that both, the assembly and the statutes, originally were an element of the municipality as a confederation of "equal" citizens. However, in the 15th century, the *burspraken* had long ago become a political agent for the council to demonstrate its power and strengthen its authority. The Göttingen administrative records describe this instrument as follows:

> *[...] des vridaghes darna [after the annual election of the council], spreken de rad umme schot unde bruwerk, wu se dat darumme dat tokomende jar holden willen, ef me dat schot minneren edder meren wille, [...] unde wu vaken jowelk bruwen schulle, und andere artikele, de me kundeghet des sondages na dem vrigdaghe. Unde wanne me kundighen wil des sondages na middaghe, so lut me ersten dem rade unde darna drige de grote klocken den borgheren [...]*[21]

What we witness here is a quite common ritual for late medieval North German towns: at a specific date every year, the new council was set into power.[22] One of its first actions was to discuss, possibly change and conclude the new statutes for the forthcoming year. One week later, the town's population was called by ringing the bell's of the city hall and had to assemble for the meeting (which was compulsory) on the town hall square, the *forum*. There, the council's scribe read the statutes from

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18. SG. AB, Ms 2,2.

19. See Köbler, Gerhard. "Bursprake". *Lexikon des Mittelalters*. Munich: Artemis, 1980: II, 1110-1111 for a general definition.

20. Evidence for this legal instrument is given for North Germany from 13th to 19th century. See Ebel, Wilhelm. *Bursprake, Echteding, Eddach in den niederdeutschen Stadtrechten*. Göttingen: Schwartz, 1953: 52-76.

21. Roughly translated: "the Friday thereafter, the council will speak about taxes and beer brewing, about how they will manage this during the forthcoming year, if one is about to lower or to raise taxes [...] and how often everyone is allowed to brew beer, and about other articles, that one will announce on the Sunday after that Friday. And when one is about to announce this, on this Sunday after noon, one will ring first for the council and then three times the great bells [of the town] for the citizens", *Göttinger Statuten. Akten zur Geschichte der Verwaltung und des Gildewesens der Stadt Göttingen bis zum Ausgang des Mittelalters*, eds. Goswin Freiherr von der Ropp hrsg. v. Goswin Freiherr von der Ropp. Hannover: Hahn, 1907: Nr. 225 Radkesen, Abs. 22-23, S. 313.

22. This was by no means a democratic act. In Göttingen, like many other towns in North Germany, the council was formed out of members of a small political class, mostly business men that could afford the work in the council which must have been expensive and time-consuming. Göttingen had two councils, and "old" and a "new" council. They mutually replaced the other every year around the end of October. See Mohnhaupt, Heinz. "Stadtverfassung und Verfassungsentwicklung"...: 299.

the records which usually started with the opening *pronunciatum est in foro* to the public.

These records had been put in written form by the town's chancellery in two manuscript volumes: *olde kundige bok²³* (old book of announcements) and *kundige bok 2*, the former a contemporary name given after the second book was started, the latter is a modern name. *Kundige bok 2* which is of interest here, is collection of various texts, mostly the *burspraken*, written on paper, still in relatively good condition. It is very accurately written in terms of its contents, but it is not a script with ornaments or illuminations. Its purpose was regular use and it might be considered as a typical administrative record of that time. It consists of 330 pages. The period of use was about 1420-1500, thus, indicating that various hands have written it. Few texts were in Latin, but the vast amount of text is written in Middle Low German to address the public.

The manuscript was written for various purposes: it formed the basis for the discussions of the city council, it served as a script for the announcement of the statutes and it was a reference for legal decisions and judgement. In the 15ᵗʰ century, one cannot speak of a book as a bound object, though. In order to allow regular use, the material, i.e. single pages or layers of the convolute *kundige bok 2* was often rearranged. Texts that were needed for a specific purpose were put together; obsolete texts were marked as such and moved elsewhere within the convolute. The name *kundige bok 2* was given by Goswin Freiherr von der Ropp in 1907 who first edited parts of the texts,²⁴ and the binding of the manuscript as a book happened only in 1988 (due to restoration). These anachronistic decisions do not really facilitate research nowadays.

By putting the *burspraken* into written form, the Göttingen town law gained new quality: law and script became inseparable from each other. This was a process that happened in Göttingen only in the 14ᵗʰ and 15ᵗʰ century: law and privileges were transmitted orally before. Generally spoken, law and justice have to be regarded as older "elements of culture" than script.²⁵ Although this does not imply that script was an invention of the late medieval time, but the application of script greatly increased,²⁶ so that with the end of the 15ᵗʰ we can indeed consider a high degree of written records for the town of Göttingen.²⁷ This transformation from oral to

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23. SG. AB Ms 2.1 I.

24. *Göttinger Statuten...*

25. Classen, Peter. *Recht und Schrift im Mittelalter*. Sigmaringen: Thorbecke, 1977: 8.

26. See Fees, Irmgard. *Eine Stadt lernt schreiben*. Halle: Niemeyer, 2002: 2; Dilcher, Gerhard. "Oralität, Verschriftlichung und Wandlungen der Normstruktur in den Stadtrechten des 12. und 13. Jahrhunderts", *Pragmatische Schriftlichkeit im Mittelalter*, Klaus Grubmuller, Hagen Keller, Nikolaus Staubach, eds. Munich: Fink, 1992: 9ff; Rörig, Fritz. "Mittelalter und Schriftlichkeit". *Die Welt als Geschichte*, 13 (1953): 29.

27. Hoheisel, Peter. *Die Göttinger Stadtschreiber bis zur Reformation*. Göttingen: Vandenhoeck & Ruprecht, 1998: 11ff; Dilcher, Gehard. *Bürgerrecht und Stadtverfassung im europäischen Mittelalter*. Cologne: Böhlau, 1996: 293.

written is to a good extent described for North Italian towns in the 12th and 13th century.[28]

## 2.2 A Dynamic Text

The period relevant for this case study is a period of change. Not only because of the intense installation of the town's administration and its written records and the process of independency from the rule of the Brunswick dukes. But also because the economic, social and political environment of the town was in permanent change. And the *kundige bok* is a great witness of these changes, because the city council needed to react permanently on those and they did so by modifying the town law and thus by letting the scribe altering the legal texts of the *burspraken.*

This illustration  (see page 274) shows a simplified example how the scribes dealt with the change of the town law in their written records. It is a sample page taken from *kundige bok 2,* containing regulations about beer brewing in the town. Apparently, this was an important topic for late medieval life: beer was regarded as a staple diet,[29] and in Göttingen, unlike other North German towns, the beer production was not organised in guilds but in principle allowed for every holder of a citizenship.[30]

The third picture shows the page as it looks today. The text of the brewing statutes in the centre as they were announced in 1484 (the entry was later on dated in the right margin) and several alterations, additions, substitutions and deletions interlinear within the text, on the margins and on the space that was, probably intentionally, left on the page. The first image of illustration 1 is a simulation (done with an image manipulation tool)[31] of how the document page must have looked after its initial writing in October 1484: this version of the statutes and space left for future alterations. The second image shows the page in its (reconstructed) state in 1487 after a couple of modifications to the text have been made in November 1484 and 1487 by adding paragraphs, deleting passages and substituting sections of the text. Overall, the figure illustrates how the scribes dealt with the change of the law in its written form. It is important to mention that nowadays, of course only the "version" of the document in the picture on the right is extant. The other versions obviously cannot exist (anymore) because alterations were done on the same physical sheet of paper. The older version of the text was thus not only predecessor in legal terms but also physical basis for the more recent one.

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28. See *Statutencodices des 13. Jahrhunderts als Zeugen pragmatischer Schriftlichkeit*, ed. Hagen Keller, Jörg Busch. Munich: Fink, 1991; Grubmuller, Klaus; Keller, Hagen; Staubach, Nikolaus, eds. *Pragmatische Schriftlichkeit im Mittelalter*. Munich: Fink, 1992.

29. Schubert, Ernst. *Essen und Trinken im Mittelalter*. Darmstadt: WBG, 2006: 206-240.

30. Moldenhauer, Günter. *Das Göttinger Braurecht in seiner geschichtlichen Entwicklung*. Göttingen: Universität Göttingen, 1958.

31. The software "gimp" (GNU Image Manipulation Program) in this case: GNU Image Manipulation Program. Gimp 2.6. <www.gimp.org>.

ILLUSTRATION 1. EVOLUTION OF THE *BURSPRAKEN* (DOCUMENT VIEW) BETWEEN 1484, 1487 AND 1495 (SG. AB MS, 2.2. F. KA04_4R).

Before moving on to the methodological part of this paper and the question on multi-dimensionality of medieval texts such as *kundige bok 2*, let me allow to have brief look at the content of the aforementioned sample page to conclude the

introductory description of this case study.[32] Starting with the first version of this text,[33] which has to be regarded as a draft version, the following was regulated:

- The right to brew beer is bound to the amount of taxes a citizen pays: less than 120 marks and you were not allowed to brew your own beer (that is a regulation to force the citizens to pay their taxes honestly and also to regulate the amount of production and trade);
- The ratio of malt is determined which is —among other rules— something to keep the beer on a certain level of quality (which was a problem for Göttingen since the town of Einbeck, only 45 kilometres away, produced, and still does so, a beer renowned for much better quality);[34]
- The number of days you are allowed to brew is regulated and also determined by the amount of taxes;[35] the brewing days and the order in which the mill had to be used were determined by a lottery (*lot*);[36]
- If you move into the town from somewhere else, you have to settle in first and become a citizen before getting the right to brew, etc.

The next version of the text contains the announcement of the statutes from October 1484. Referring back to illustration 1, we can spot changes on the right margin. With this new text, it is now compulsory for the citizens to use the public mill to prepare their grain for brewery. The public mill was under control of the city council and it was not allowed any longer to use one of the many mills outside the city walls. The council might have discovered the mill as a good new source of revenue or simply may have forgotten to include this paragraph in the draft.

In the following stage, already one month later, in November of the same year 1484, the council made it easier for new citizens to acquire their right to brew. Maybe, but this is just an assumption,[37] the council was impressed by a new arise of the Black Death and so quite eager to attract strangers moving into town and filling the gap, the plague had left behind. Anyway, three years later, this regulation was taken back again and a new statute about new citizens was introduced and

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32. See also Rehbein, Malte. "Vom Nutzen digitaler Editionen-das Göttinger kundige bok". *Bibliothek und Wissenschaft,* 42 (2009): 7-28 for an extended description of this case study in German.

33. "First" is not quite correct. There are older versions of the brewery statutes, written down elsewhere in *kundige bok 2* and also in its predecessor *olde kundige bok*. The oldest extant statutes about beer brewing in Göttingen are known from 1334. A copy of this text is included in *kundige bok 2*: SG. AB Ms, 2.2. KD07v.

34. Aumann, Stefan... *und wird gar weit geführet. Die Geschichte des Einbecker Bieres.* Oldenburg: Isensee, 1998.

35. This is a general principle of medieval justice: the application of the law was equal for all (citizens), but the content, the details could differ: the richer a citizen was, the more right he possessed to brew beer (*Rechtsanwendungsgleichheit* versus *Rechtsinhaltsgleichheit*); see Ebel, Wilhelm. "Über die rechtsschöpferische Leistung des mittelalterlichen deutschen Bürgertums". *Vorträge und Forschungen,* 11 (1966): 249.

36. See the regulations of the *Sachsenspiegel* "Wer zuerst kommt, mahlt zuerst" (*De ok erst to der molen kumt, de scal erst malen*). Sachsenspiegel, Landrecht, II, 59, §4 (MGH Fontes iuris N. S., 1, 1., S. 178).

37. At least, we learn from other sources that people were leaving Göttingen to avoid the plague: "die ubersten und reichen [flohen] aus Göttingen hinweg zu anderen stedten" (Lubecus, Franciscus. *Göttinger Annalen,* ed. Reinhard Vogelsang. Göttingen: Wallstein, 1994: 28). The decrease of population in Göttingen during plague periods is described by Asmus, Bärbel. "Die Bevölkerung"...: 164-173.

announced in 1487. In the final stage of this sequence, the regulation about the brewing days was made more precise (1495).

## 2.3 Flat Representations

Overall, the general idea of these regulations about beer brewing remains the same while changes in details were made quite often.[38] They characterise the statutes, and this is valid for all of the *burspraken,* by the will to determine law and the need to react on a changing environment— as can be seen here by economic desires (the council's mill) or social circumstances (the plagues). Putting this together and taking into consideration that the text represents the town law for a particular period of time (1484 to 1495), one comes to a first conclusion:

1. Any changes done by the scribe in a particular context (i.e. the annual revisions) can be grouped and regarded as a new layer of the text. This layer describes a new version of the town law by replacing its predecessor.
2. Any of those text layers (with the exception of draft versions) represents a particular stage of the law which was then valid from a specific point in time onwards (the formal acknowledgement during the annual announcement), until a new version was decided.
3. Consequently, all of those layers have to be regarded as being equal. They had the same importance for everyday life in Göttingen, just to a different point in history.

The first (and until the development of the digital edition by the author of this paper only) edition of parts of the *kundige bok 2* manuscript was delivered by Gottwin Freiherr von der Ropp in 1907. In his edition titled »Göttinger Statuten. Akten zur Geschichte der Verwaltung und des Gildewesens der Stadt Göttingen bis zum Ausgang des Mittelalters«, in which he collated, put in chronological order and annotated several administrative records of late medieval Göttingen. *Kundige bok 2* build, however, only an appendix.[39] The editor used only part of the *burspraken* material which he also put into chronological order. But he had to make a severe decision, which he explains himself: "um Raum zu sparen, [habe ich] auf Wiederholungen nur hingewiesen, und geringfügige Abweichungen in Anmerkungen zu der ersten Vorlage mit Angabe der Jahre, in welchen sie beschlossen, mitgeteilt".[40] The editor of the early 20th century faced the limits of a print-based edition and the book as a medium: restricted space, a static form of presentation and limited possibilities for

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38. See Neitzert, Dieter. "Göttingens Wirtschaft, an Beispielen des 15. und 16. Jahrhunderts", *Göttingen: Geschichte einer Universitätsstadt*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: 309-310.

39. Due to the fact the material was found by the archivist of Göttingen, Ferdinand Wagner, only when Ropp already was about to prepare the print of the "Göttingen Statuten". See Rehbein, Malte. *Göttinger Statuten im 15. Jahrhundert. Entstehung – Entwicklung – Edition*. Göttingen: Staats- und Universitätsbibliothek, 2010.

40. To save space (in the edition), he says, I have only referred to repetitions, and I have annotated minor changes in the apparatus of the first version, mentioning the year when they were concluded. Ropp, Goswin. "Statuten"...: XXV.

dealing with textual variation typical for a multi-dimensional text such as *kundige bok 2*. His edition has to be regarded as *flat*.

The following example illustrates such a flat representation of the multi-dimensional *kundige bok 2* from a reader's perspective: The question, a curious scholar like me might ask, is simple: what were the tax regulations for the year 1500? The Ropp edition has no entry for this year, but taking into account the editorial principles of the work, one knows that it requires looking back for the most recent entry before that year. On page 527 of the edition, one finds an entry for the year 1497. This entry, however, is saying "Schoss (taxes) repeats entry No. 289, paragraphs 1-11". Consequently, you need to go back further to entry No. 289 (year 1468) in order to read: "Schoss repeats No. 171". Applying the same idea, you go back through the year 1445 (entry No. 136) and 1428 (entry No. 102). Finally, on page 108 (the start page was 527), you find a text "Statutes of the year 1415" containing the tax regulations (of the year 1415, though). The entry reads: "Eyn jowelk schal gheven to vorschote ½ ferding; von jowelker mark Gottingescher weringe to schote 7 Gottingesche penninge".[41] However, these were the regulations of the year 1415. In order to know what was valid in the year 1500, you need to go the whole way through the Ropp edition again —this time in reverse order— and to reconstruct the statutes of the year of interest by yourself. Only on your way through the whole book, you learn from the apparatus that in 1426 taxes had been reduced from seven to six *penninge* —a major change, not a minor one— despite orthographic variation which is not recorded at all.[42] Ropp actually mentioned some changes of the text, however, only the ones, he found worth mentioning, and only in the apparatus, although the characteristics of the manuscript requires to treat variants equally.

Applying this example to our case study on beer brewing, in which we identified the manuscript page in question as a container for at least five textual layers or five variants of a text with equal importance, in an edition of such a text, we cannot speak of a best text or copy text or any text with a central meaning. A printed edition with text and apparatus, however, implies this. As Heinemeyer states about administrative records such as *kundige bok 2*, texts of this genre are characterised by its frequent use which leads to a side-by-side of a text and additions with a claim of equal acceptance.[43]

Focussing on textual variation, thus on a dynamic understanding of textuality, rather than searching for textual authority of any kind has been discussed for a while

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41. Everyone has to give as *Vorschoss* (a "flatrate" tax per household) one half *ferding;* and from every *mark* (of income) seven *penninge* of the Göttingen currency. Statuten, 108. The Göttingen mark was calculated with 576 *penninge.* See Neitzert, Dieter. "Göttingens Wirtschaft"...: 299.

42. See Rehbein, Malte. *Göttinger Statuten...*: 69f. for full references of this example and the digital edition for the texts.

43. *Diese Quellengattung besitzt eine große Variationsbreite. Die Eigenart der Quelle wird bestimmt durch [...] ihre Gebrauchsdauer, die häufig zum Nebeneinander von Grundtext und Nachträgen mit gleichwertigem Anspruch auf Gültigkeit führt",* Heinemeyer, Walter. *Richtlinien für die Edition landesgeschichtlicher Quellen.* Marburg: Gesamtverein der Deutschen Geschichts-und Altertumsvereine, 1978: 20f.

now under the paradigm of a postmodern "New Philology".[44] In medieval studies, this comprises the relinquishment of a hierarchy of the textual witnesses in favour of status of a text that is in principle variant and unstable. Theorists of the New Philology conclude that the imagination of an *urtext* or an authoritative original[45] that has to be preserved in an untouched condition was "dem mittelalterlichen Schriftgebrauch weitgehend fremd".[46] Text versions (the same considerations apply for text layers) are regarded as "Manifestationen historisch spezifischer, also in situative Handlungskontexte eingelassener Kommunikationen"[47] and one asks about their importance and impact in space and time of their (the versions) usage and less about the intention the *urtext* had.


## 3. The Digital Approach

It should be obvious from the example above about tax regulations of the year 1500 that, in order to study the text and the law it manifests, it is necessary to have random access to any stage of the text at any point in time as well as to compare different variants with each other in order to understand the changes. The general issue that arises from these considerations of scholarly editing and research purposes is how to represent such a text which is characterised by a dynamic, diachronic process of changes; how to visualise the genetic or evolutionary succession of the stages (diachronic view); how to grant access to the *burspraken* as a whole for a given point in time (synchronic view); how to represent textual variety and display where versions differ and where not; and what was the non-textual context for such changes?

These issues are relevant and essential. It is the paradigm shift that the scholarly user of an edition should not be satisfied anymore with what is already there, what was regarded important only by the editor and what can be realised in printed form. How can we know in advance whether a scholar in the future (or even in the present) regards the lowering of the tax rate from seven to six as a minor change or not? Ingo Kropač in a general discussions states that it would be a severe hubris of nowadays historians or philologists to decide what will be of importance in the

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44. The theory of a "New Philology" has been developed since approx. 1970, but gained acceptance only in the 1990s. See Restall, Matthew. "A History of the New Philology and the New Philology in History". *Latin American Research Review,* 38 (2003): 113-134.

45. In the meaning by Karl Lachmann.

46. Arlinghaus, Franz-Josef; Ostermann, Marcus, Plessow, Oliver and Tscherpel, Gudrum. "Mostly unknown to medieval scribal habits". *Schrift im Wandel-Wandel durch Schrift*. Turnhout: Brepols, 2003.

47. "Manifestations of historically specific communication, i.e. communication that is embedded in a contextual (dependent from the situation) room for manoeuvre", Strohschneider, Peter. "Situationen des Textes. Okkasionelle Bemerkungen zur 'New Philology'". *Zeitschrift für deutsche Philologie,* 116 (1997): 66.

future and that you have to be a gifted prophet to predict all future paradigm shifts in the humanities.[48]

As the humanist scholar is interested in the text, the cognitive process behind it, its dissemination and reception, its translation it into a print-based scholarly edition must emerge as a detour, producing unwanted "noise"[49] and loss of possibly relevant information. The *kundige bok* project aims to eliminate this noise by reducing media translation and allowing the user to interact[50] with data rather than consuming the editor's interpretation. It tries to find a "form of representation to improve our critical engagement with the text through effective computational processing".[51] This requires a lot: the provision of comprensive information about the text, all variants and variations, images of the documents that transport the text, contextual data —a database as a scholarly edition.[52] This idea is not new,[53] and we seem now to "know how to make these editions".[54] What is new is that significant questions on how to present this new kind of edition for usage have only recently been addressed and not yet fully answered.

The work on *kundige bok 2* was realised in form of an electronic, web-based edition. It was my intention to provide the user a tool, or as "complex instruments for exploration", as Hans Walter Gabler calls it,[55] to find answers to his scholarly questions in a convenient way. One general principle in this edition is that the representation of text can be adopted by the user according to their needs. In summary, the edition provides a multi-dimensional access to the manuscript and the texts, to escape the limitations of flat, printed editions. Access is granted on different levels: document-based (page-wise navigation through facsimiles) and text-based (through searching, multi-dimensional browsing and indices). Besides other features, the digital edition of *kundige bok 2* is based on two cornerstones:

1.  A synchronic as well as a diachronic navigation through the text layers which provides the user of the edition a random access to any text layer he or she is interested in. The text layer in question is in both ways automatically created on a user's request ("on-the-fly") out of the textual and contextual data that has been provided by the editor.

48. Kropač, Ingo. "Theorien, Methoden und Strategien für mulitmediale Archive und Editionen", *Mediaevistik und Neue Medien*, Ingrid Bennewitz, Klaus van Eickels Ruth weichselbaumer, eds.. Ostfildern: Thorbecke, 2004: 304.

49. Dahlström, Mats. "The Compleat Edition", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Farnham: Ashgate, 2009*:* 32-33.

50. Eggert, Paul. "The Book, the E-text and the 'Work-Site'", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Farnham: Ashgate, 2009: 69.

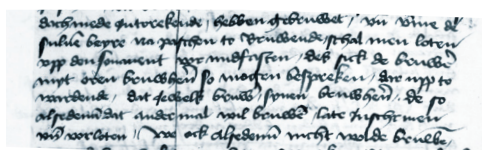51. Buzzetti, Dino. "Digital Editions and Text Processing"...: 46.

52. Buzzetti, Dino; McGann Jerome. "Critical Editing in a Digital Horizon", *Electronic textual editing*, Lou Burnard, Katherine O'Brien O'Keeffe, John Unsworth, eds. New York: Modern Language Association, 2006.

53. See Robinson, Peter. *The Wife of Bath's Prologue on CD-ROM*. Cambridge: Cambridge University Press, 1996; Shillingsburg, Peter. *From Gutenberg to Google...*

54. Robinson, Peter. "The Ends of Editing". *Digital Humanities Quarterly,* 3/3 (2009): 25.

55. Gabler, Hans Walter. "Theorizing the Digital Scholarly Edition". *Literature Compass*, 7/2 (2010): 46.

2. The capability to automatically compare any two text layers and to visualise the versions in question alongside each other.

The main objective of the edition is hence to visualise the textual development and evolution of the town law as a whole. The main point of entry to the edition from the users' perspective is thus a two-dimensional matrix, allowing a synchronic view on the text along the vertical axis (i.e. reading through the statutes and its various topics such as taxes and brewery for a specific point in time) as well as a diachronic view along the horizontal axis (i.e. the development of the text for a specific topic over the time).



Illustration 2. Screenshot of the two-dimensional matrix as the main point of entry to the kundige bok 2 digital edition[56].

While, in the matrix, a line indicates continuity of the law, each little circle represents a change in the text. The matrix provides, however, not only an instant overview but it is also an interactive tool: It allows the user to click on any position acces the text for the chosen topic and point in time. For instance, clicking on "taxes" and the year "1500" would forward the user to the tax regulations which were valid in the year 1500. Without any other action need by the user, this text is automatically reconstructed out of the edition's database and presented to the user in an easily readable format —according to the options they have chosen.

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56. Rehbein, Malte. "Burspraken-Übersicht (Thema-Zeit-Matrix)", *Kundige book 2. Die elektronische Edition*. Stadtarchiv Universität Göttingen. 5th of May, 2010. <kundigebok.stadtarchiv.goettingen.de/kbWeb/Main?cmd=matrix>.

Illustration 3. Brewey statutes (1473); left: facsimile; right: generated view on the text layer with "diplomatic" option activated by the user.

The primary intention of the *kundige bok 2* project was to build an edition of the *burspraken* for historical research, the analysis of scribal habits or the study of history of law. However, the flexibility of the electronic medium facilitates extensions, so that the edition might also serve as a textual database for linguistic studies. Although the corpus has not (yet) been annotated linguistically, the digital edition provides a lemmatised index of words which allows, for instance to follow orthographic variation diachronically over time.



Illustration 4. Index of words (extract)[57]

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57. Rehbein, Malte. "Burspraken-Wortindex". *Kundige bok 2. Die elektronische Edition.* Stadtarchiv Universität Göttingen. 5th of May, 2010. <hhttp://kundigebok.stadtarchiv.goettingen.de/kbWeb/Main?cmd=lemma#wort_navigation>.

Illustration 5. Different visualisations of the same text; left: single-text-view of the statutes on wine (1465)[58].

It was long before the peak of the discussion around the New Philology that Klaus Kanzog introduced the term of an *Archiv-Edition* for such a scholarly laboratory.[59] But it is only the digital age that makes multi-dimensionality of texts accessible and usable in a convenient way. The *kundige bok 2* edition is a digital edition in two senses. When Daniel O'Donnell recently asked whether a digitally produced edition

58. Rehbein, Malte. "Textschichten". *Kundige bok 2. Die elektronische Edition*. Stadtarchiv Universität Göttingen. 5th of May, 2010. <kundigebok.stadtarchiv.goettingen.de/kbWeb/Main?cmd=single&topic=3 &show=41&nonrule=SK.1>; right: to versions (1465 and [1472-96]) in comparison.

59. Kanzog, Klaus. *Prolegomena zu einer historisch-krotischen Ausgabe der Werke Heinrich von Kleists*. Munich: Hanser, 1970.

must be electronically published,[60] the answer in this case must be yes. It is not only the production of the edition that can be facilitated by digital means, it is also only the electronic medium that allows for multi-dimensional representation and visualisation beyond flat text and apparatus, and only in the digital age an edition can react "on-the-fly" to users' needs.

I have spoken elsewhere more about the technical realisation of the *kundige bok 2* digital edition.[61] But I would like to finish this section by briefly outlining —without going into the details— what the (methodological and technical) cornerstones of the edition are. In other words: what was needed (in addition to general editorial requirements) in order to create it?

The process started with the digitisation of the manuscript.[62] The facsimiles of *kundige bok 2* build a tool for the editorial work as well as they are now part of the edition itself. Surprisingly, digitisation of manuscripts is not necessarily a prerequisite for creating a digital edition. The provision of a digital surrogate of the manuscripts in question is, however, nowadays expected by most scholars.

After describing the document, the texts as such were transcribed and encoded in a machine-readable form so that they can be studied and further analysed with the aid of machines.[63] Through markup, the texts were enriched by editorial data. "Markup [...] maybe characterized [...] as information formally distinct from the character sequence of the digital transcription of a text, which serves to identify logical or physical features or to control later processing."[64] As schema (vocabulary and syntactic as well as to a certain extent semantic rules) for the markup, TEI P5 was chosen. TEI, *Text Encoding Initiative,*[65] is "two things: 1. an XML text encoding language; and 2. an international consortium that exists to develop, maintain, support, promulgate, and use that encoding language [...] It functions as a sort of a lingua franca [for text encoding in the Humanities]."[66] The definition of the text layers was achieved via a "stand-off" mechanism. Stand-off means that this

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60. O'Donnell, Daniel P. "Resisting The Tyranny of the Screen, or, Must a Digital Edition be Electronic?". *The Heroic Age. A Journal of Early Medieval Northwestern Europe,* 11 (2008); O'Donnell, Daniel P. "Resisting The Tyranny of the Screen, or, Must a Digital Edition be Electronic?". *The Heroic Age. A Journal of Early Medieval Northwestern Europe*, 11 (2008). <www.mun.ca/mst/heroicage/issues/11/em.php>.

61. See Rehbein, Malte. *Göttinger Statuten...*: 86ff. and Rehbein, Malte. "Reconstructing the textual evolution"...: 319-327.

62. Although I had not started working on the edition before 2004, the digitisation was already undertaken in 1998 during my fellowship in the (then) Duderstadt digitisation project. I am very thankful to Ernst Böhme, Hans Heinrich Ebeling and Manfred Thaller to facilitate this project and the digitisation of *olde kundige bok* and *kundige bok 2.*

63. Sperberg-McQueen, Michael. "Text Encoding and Enrichment", *The Humanities Computing Yearbook 1989-90: a comprehensive guide to software and other resources*, Ian Lancashire, ed. Oxford: Oxford University Press, 1991: 503.

64. Renear, Alan."Text Encoding", *A Companion to Digital Humanities*, Susan Schreibman, Ray Siemens, John Unsworth, eds. Malden: Blackwell, 2004: 219.

65. See: Tei Consortium. *Tei: Text enconding Initiative*. October 2007. Brown University-Nancy-Oxford University-University of Virginia. 16th March 2010 <www.tei-c.org>.

66. Bauman, Syd. "TEI: an Overview", *TEI Day in Kyoto 2006,* TEI Consortium, ed. Kyoto: キョウト ダイガク ジンブン カガク ケンキュウジョ, 2006.

information is not part of the encoding itself but is provided externally. A future improvement of the edition shall, however, be based on the Genetic Encoding Markup that has very recently been published by the TEI.[67] For on-the-fly (i.e. on user request) delivery of texts and for on-demand visualisation, a server-side application has been developed.

Creating such kind of an edition takes its time, of course. It generally "requires skills rarely if ever found in any one person",[68] a fact that we have to deal with in the future by more collaborative efforts and specialisation. This touches, for instance, the question about creditability of "technical" work and about acceptance of digital resources as scholarly work in general, which cannot be discussed here. The electronic edition does not "liberate" the editor from responsibility and accuracy. It would, however, allow for a step-by-step editorial work to allow a soon publication of preliminary or partly results in order to facilitate further research without waiting for the completed edition, an endeavour that often takes years to fulfil.


## 4. Some Examples


The development and implementation of new methods and methodology is not only a complex and costly enterprise, but also a risky one. The same applies for the shift from the printed to the digital medium.[69] The developer of such new methodology risks slipping on unknown academic territory while its user, on the other hand, has to change or at least to extend their established research practice. The more risks and effort involved, the more the question: what benefit does this shift in methodology provide? The following examples shall illustrate the value that an electronic edition of a multi-dimensional text can have in favour of a printed edition. All examples are based on research on everyday life in late medieval Göttingen and all scholars referd to used the Ropp "Statuten" edition from 1907, the then only possible acces to texts either from *olde kundige bok* or *kundige bok 2*.

The first example shall illustrate both usage and benefit of electronic texts and refers to one particular statutory regulation in the farm? In medieval times, the citizens of Göttingen were obliged to possess their own weapons and to use them for defence of the city should it be attacked and its people alarmed by the guards (through a *gerochte*). The *burspraken* of Göttingen, thus, governed what kind of weapon each citizen had to hold in readiness. This very much depended on their income, respectively the amount of taxes paid:

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67. See: "Genetic Editions", Wiki. *Text Enconding Initiative*. <wiki.tei-c.org/index.php/Genetic_Editions. See also section 4 below>.

68. Shillingsburg, Peter. *From Gutenberg to Google...*: 94.

69. Rehbein, Malte. "The Transition from Classical to Digital Thinking". *Jahrbuch für Computerphilologie*, 10 (2010): 55-68.

*Während um 1340 in der untersten Vermögensklasse (unter 5 m[ark] Vermögen) bereits der Besitz einer grellen (Spieß) und einer barden (Beil) ausreichte, war für die Bürger in der obersten Vermögensklasse (über 60 m Vermögen) vulle wapene (vollständige Bewaffnung) vorgeschrieben [...] Etwa 50 Jahre später forderte der Rat bereits für Angehörige der Vermögensklasse 10 m – 20 m eine eygen armborst und eyne jacken [...][70]*

In his study on medieval warfare and the defence system of Göttingen, Helge Steenweg reconstructs the development of the town law nicely and concludes that this development also illustrates the rapid development of weapon technology, in this case of the crossbow, in the 14th century. However, in order to come to this conclusion. Steenweg needed to reconstruct the text layers in questions and to manually compare them among each other. He had to cite the "Statuten" edition of Ropp not less than ten times, a work that could have been achieved much more efficiently using direct access to the text stages and the comparison mode the digital edition provides.

The second example looks into *Seelbäder*, a charity in which poor people were allowed a bathe in return for a prayer in favour of the salvation of the donator's soul. The instrument of *Seelbäder* was popular especially in North German towns and so it was in Göttingen.[71] Apparently, however, this instrument was misused regularly so that the council introduced permanent regulations to assure that only poor people could benefit from the free bathe. The continuity of these regulations had been, however, overseen in a study on "town and church" in medieval Göttingen where the author states that the regulations were announced only on specific occasions.[72]

Already the matrix, the main entry point to the *kundige bok 2* digital edition, shows that the topic *Seelbäder* was constantly regulated between 1459[73] and 1500 and always were part of the *burspraken*. The 1907 edition does make this fact, however, not clear. It gives the illusion of selective regulations in specific years. In his study, Reinhard Vogelsang explicitly highlights an undated year (after 1459, before 1468), which he thinks was the only one between 1459 and 1468 to have regulations on *Seelbäder*. A comparison of this text layer with its predecessor (1459) gives however evidence that in the year in question, the text only got shortened since the council left out the reasoning for the regulations*: is old unde nye rad overkomen unde hebben ghesatt umme armer nottorfftiger lude willen[74]* was deleted. The exclusion of inhabitants

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70. "anyone with an income of less than five marks had or hold a spear (*grellen*) and an axe (*barden*), while for example, citizens with more than sixty marks of annual income were required to have full armament (*vulle wapene*) in 1340. 50 years later, the city council demanded a crossbow (*armborst)* and armament already for anyone with an income between ten and twenty marks" (Steenweg, Helge. "Das Wehr- und Wachtwesen der Stadt Göttingen im Mittelalter". *Göttingen: Geschichte einer Universitätsstadt*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: 211-227).

71. Schubert, Ernst. *Alltag im Mittelalter*. Darmstadt: WBG, 2002: 50.

72. Vogelsang, Reinhard. *Stadt und Kirche im mittelalterlichen Göttingen*. Göttingen: Vandenhoeck & Ruprecht, 1968: 101.

73. And before 1459, as part of *olde kundige bok*.

74. "Old and new council has agreed to and determined [to cater] for the needs of poor people".

with a certain income (*de dar 10 marck vorschotet edder 10 marck wert gudes hefft*)[75] remains on the other hand untouched.

The final example deals with the food supply of the population. The same study about the relation of town and church in late medieval Göttingen states

> *'Umme dur tiid to vorhoyden', gebot der Rat den Bürgern mehrfach, einen Getreidevorrat zu lagern, dessen Höhe sich nach ihrem schoßpflichtigen Vermögen richtete.*[76]

But is this true? Did the council really order the citizens various times to create stocks of grain in preparation for dry periods? Or was this not also a permanent regulation as an act of general precaution? The *burspraken* make it clear. The announcement of 1468 says:

> *Also dat ehir gekundiget is, umme dat kornnte, so schal eyn jewelk, de mit uns wonet, de dar vorschotet dusent marck edder darenboven, nu fortmehir to sunte Johannis dage to middensommer [Jun 24, Johannis baptiste nativitas] hebben drittich molder rogghen [...]*[77].

And this had been valid until the next change. Between 1471 and 1497 (a more precise dating was not possible), the text was altered into:

> *Umme dat kornnte [...] schal men dat holden, so hir bevornt ghekundiget unde vor deme huse beschreven is. Weme des is to donde, mach dar komen unde sick dat latin lesen.*[78]

The precautionary obligation to build stocks of grain was by no means a singular phenomenon. It was a constant regulation and the medieval texts themselves state to refer back to the previous version: *so hir bevornt ghekundiget unde [...] beschreven*.[79]

In addition, this example also illustrates the usage of the multidimensional electronic edition in conjunction with other sources, such as the development of the prices for grain.[80] There, an increase in prices has been found out for 1460, which was indeed the year in which the above mentioned regulations on grain stocks were first introduced. The comparison of different text layers might hence give insight into the economics development of the town, reflected by the evolution of the *burspraken* over time.

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75. "One who states 10 *marks* for taxes or has goods of a value of 10 *marks*".

76. "'To prevent drought periods', the council commanded the citizens several times, to put grain on stock, which amount was determined by their taxable assets" (Vogelsang, Reinhard. *Stadt und Kirche...*: 45).

77. "It has been announced before, about the grain, so shall everyone, who lives among us, who has a taxed 1000 *mark* or more, from now on until the day of Saint John, have a third of a *molder* of grain".

78. "About the grain, one shall keep it the way it has been announced before and is written in front of the city hall. Who needs to do it, is welcome to come and let (someone) read it for him."

79. "before announced and [...] written down."

80. Neitzert, Dieter. "Göttingens Wirtschaft"...: 324-325 for the years 1443 until 1594.

## 5. A Problem and an Outlook

What is being "electronified" in an electronic scholarly edition is not the texts but the access to texts and textual scholarship. The potential effects are profoundly textual, both in the sense of changing readers' relationships to the text and changing their interpretation and uses of texts.[81]

The electronic edition of *kundige bok 2* does not change the text as text, but offers its users enhanced ways to understand, analyse and process it and confronts their with a new access to textual data, which they can benefit from. One of the central concerns of the edition was representing textual variance towards the reader/user. Some questions remain, however, and there are methodologically not yet solved to satisfaction. They mainly deal with issues of editorial uncertainty and incomplete or ambiguous information. In the attempt to identify text layers of the *burspraken* and to put them into chronological order, it was in many cases not possible to do so. Palaeographical, codicological or contextual information which would allow a better or even complete assignment is not always present or applicable without uncertainty.

An example shall illustrate this.[82] A simplified paragraph from the brewery statutes reads: "We ock vorschote 100 marck, de darf 3 warve bruwen."[83] Though, if you find this paragraph in the manuscript with the figures "100" replaced by "150" and "3" by "2", substantial alterations have been made. Four different readings of this paragraph appear, two of which are mutually exclusive, and —without additional information (such as dating of the alteration or palaeographic clues)— you do not know about the order of the changes nor even the number of text layers that actually have existed is clear (Illustration 6, top).

The *kundige bok* edition deals with this fact by making the uncertainty transparent and allowing the user to make up his or her own decision about the evolution of the text. In cases like this, the edition provides the user with an interactive graph through which the user can navigate on different possible paths of textual development (Illustration 6, bottom). In respect to the path chosen by the user, the (possibly hypothetical) version of the text is generated (v1-v4 in the simplified example on the left) and presented in readable form. The edition turns into "a rebased authority, in which the emphasis shifts from intervention and interpretation to full information display [...] a shift in focus from the old-book-bound author-editor alliance to an editor-reader/user partnership".[84]

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81. Shillingsburg, Peter. *From Gutenberg to Google...*: 85.

82. The example has already been discussed elsewhere in greater detail. Rehbein, Malte. "Vom Nutzen"...: 17-19 for more background and Rehbein, Malte. "Reconstruction the textual evolution"... for a technical workaround in the first version of the *kundige bok 2* digital edition.

83. "Everyone who has a taxable income of 100 *marks* is allowed to brew thrice (a year)".

84. Sutherland, Kathryn. "Being Critical...": 22.

(v1) We ock vorschote 100 marck, de darf 3 warve bruwen.

(v2) We ock vorschote 150 marck, de darf 3 warve bruwen.

(v3) We ock vorschote 100 marck, de darf 2 warve bruwen.

(v4) We ock vorschote 150 marck, de darf 2 warve bruwen.

[1471–1497]: Zufügung eines dritten Absatzes 'Dar schal ock nymant' durch Heinrich Meier. Undatiert, nach 1471, da Meier erst ab 1472 in der Göttinger Kanzlei belegt ist.
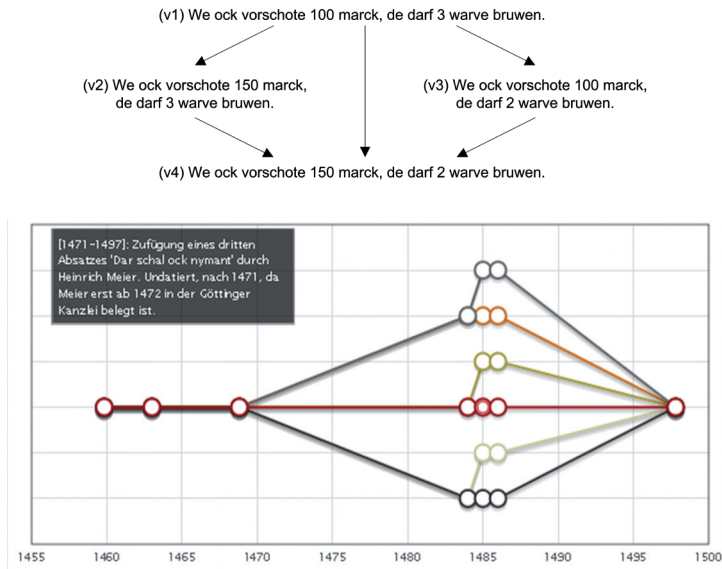
ILLUSTRATION 6. SIMPLIFIED EXAMPLE OF UNCERTAINTY IN TEXTUAL EVOLUTION AND GRAPH REPRESENTATION OF A MORE COMPLEX EXAMPLE IN THE KUNDIGE BOK 2 DIGITAL EDITION.

In this context, there are directions of research that should be taken into consideration in the near future, three of which I would like to outline in the remainder of this paper and to conclude it with an insight into the workshop of a digital medievalist. All projects derive, at least to a certain extent, from the work on *kundige bok 2* and relate to the aforementioned problem. The first project describes potential technological means in order to reduce uncertainty in the particular question of dating entries or alterations. The second project deals with the issue of how to formalise textual variation in a machine-processable and standardised way in order to facilitate representation and user-interaction.

A joint project with the An Foras Feasa Institute at the National University of Ireland, Maynooth, investigated how Hyperspectral Imaging (HSI) technique can be used to perform quality text recovery, computational segmentation and dating of historical documents.[85] HSI, together with modern two-dimensional spectrum software and three-dimensional image and visualisation software, provides modern researchers working in the field of historic documents analysis

85. Shiel, Patrick; Rehbein, Malte; Keating, John. "The Ghost in the Manuscript: Hyperspectral Text Recovery and Segmentation", *Kodikologie und Paläographie im digitalen Zeitalter. Codicology and Palaeography in the Digital Age*, Malte Rehbein, Patrick Sahle, Torsten Schassan, eds. Norderstedt: Books on Demand, 2009: 159-174.

with opportunities for forensic examination that were heretofore unavailable. Since the result of the HSI scanning process is not simply an image but a "data cube", this data can to be further processed and visualised in order to allow the user to draw conclusions. Illustration 7 shows a simulation how this can be applied to ink analyses to support dating issues.
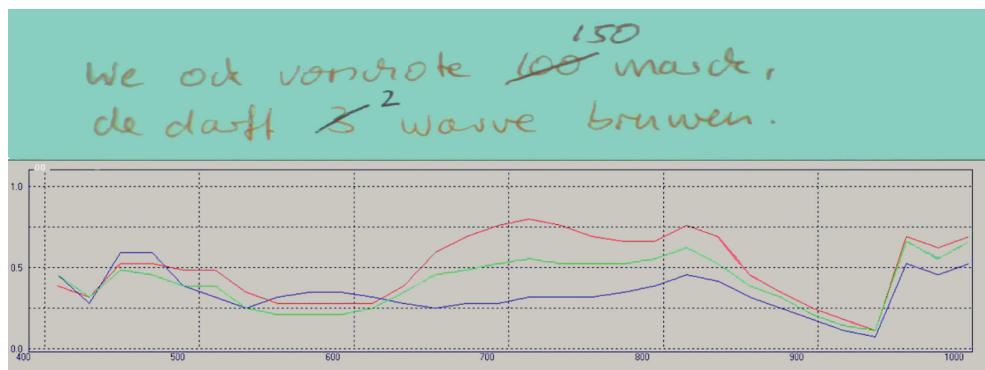


Illustration 7. Hyperspectral analysis in order to detect different layers of writing (simulation).

The image on the top shows the paragraph of the brewery statut (see above) written with different pens of modern inks, all black. The analysis displayed on the bottom gives a clear indication that three different inks had been used. If this had been a manuscript from medieval time, one can assume that these belong to different stages of writing,[86] thus to different textual layers.

The second phase of this experiment used ink that was self-made following medieval recipes for iron-gall inks which were mainly based on four core components: Iron Sulphate, Tanic Acid, Water and Arabic Gum.[87] This phase is, however, not yet concluded, since we are intending to extend it, by simulating a naturally increased aged state of paper and ink. This should be achieved by artificial ageing of the documents[88] that were prepared for this investigation. The overall approach of this experiment is to verify or falsify HSI as a practical

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86. Taking into consideration the habits of medieval scribes to produce their own ink. Brannahl, Günther; Grause, Malte. "Untersuchungen an Tinten". *Archivalische Zeitschrift*, 70 (1974): 79-98.

87. Roselieb, Hans. "Die Chemie alter und neuer Tinten". *Archivalische Zeitschrift*, 70 (1974): 74-78.

88. Weyermann, Céline; Spengler, Bernhard. "The potential of artificial aging for modelling of natural aging processes of ballpoint ink". *Forensic science international*, 180/1 (2008): 23-31.

means and *in situ* method for identification and ideally dating of different writing stages.[89]

By technology as the one described before, it might be possible in the future to gain more insight into the practice of medieval scribes and to increase our knowledge and certainty about it. However, complexity such as fuzziness, ambiguity and uncertainty is characteristic for research data in the humanities, and tools and methods to deal with it are permanently under development. One step that has to be undertaken in this context to allow for computer-based processing is the formalisation of complex structures such as textual variation. The *kundige bok 2* digital edition employed the TEI P5 standard to make explicit most features of the manuscript but reached the limits of the TEI guidelines in the attempt to express textual evolution. A stand-off mechanism was developed to solve this problem as described above.

The TEI is successfully used by many projects encoding digital editions. But it has been recognized for some time now that the guidelines on editorial matters focus on traditional editions and provide very little if any guidance for those working in the tradition of genetic criticism, that is where the main purpose is to analyse the genetic process —how a work of art developed— rather than offering simply a survey of variation. In order to fill this gap, a work group on genetic editions was established almost two years ago within the Special Interest Group on Manuscript Encoding (MS SIG) of the TEI community. The objective of this work group is to propose a standard for encoding of textual variation and textual evolution (encoding of time) and to express complexity and uncertainty by computational means. This model for Genetic Editing developed here, promises to handle:[90]

- Genetic transcription of a single document in such a way as to trace its evolution;
- Genetic reconstruction: that is, creating a genetic dossier by assembling multiple related documents, and describing the genetic relations amongst them;
- Genetic editing, the goal of which is preparing a genetic edition whether derived from a single or multiple witnesses.

What is developed here to serve mainly for editing modern literature and philosophical texts with extant drafts by their authors can also be applied for a case like *kundige bok 2.* Further research in this direction will help to improve the interoperability of resources that deal with textual variation and textual evolution.[91]

All these considerations serve an understanding of textuality and editions such as proposed by Kanzog, Shillingsburg or recently Dahlström. Editions like the

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89. See also: Havermans, John; Abdul Aziz, Hadeel; Scholten, Hans. "Non destructive detection of iron-gall inks by means of multispectral imaging". *Restaurator*, 24 (2003): 88-94.

90. For the motivation of this work group see: Pierazzo, Elena. "Digital Genetic Editions: The Encoding of Time in Manuscript Transcription", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Farnham: Ashgate, 2009: 169-186.

91. The results of the work group were proposed to the TEI Council in April 2010. <www.tei-c.org/Activities/Council/working/tcw19.html>. They were incorporated into the TEI guide lines in January 2012.

one presented provide a full plethora of information about the past (documents, images, texts, variants etc.). However, one should not oversee that such approaches carry with them a certain abundance of information which the user has to learn to handle. Traditionally, editing means consolidation of information by the editor. A palaeographic and codicologic analysis of a manuscript, for instance, leads to dating of an entry. The less such results we have and the less we can be certain of them, however, the more "raw information" has to be provided to the user to allow him to develop his own ideas, e.g. on dating of this entry. In the example above (cf. Illustration 6) the user is —instead of being presented with one unambiguous diachronic view— confronted with three hypothetical paths.

This approach has to face one significant problem: it attempts to deal with complexity of historical data but risks to become complex in usage itself. The final question to be discussed in this context is, hence, to find means of visualising and representing data in a way that allows the user to reduce complexity, to focus his or her attention to particular research questions. Greengrass states about such means of information visualisation: "They can help us to see the patterns, and put together the pieces of the jigsaw, from the chaotic plethora of information that confronts us about parts of the past".[92]

Information visualisation[93] can be described as the "use of computer-supported, interactive, visual representations of abstract data to amplify cognition".[94] It offers a "method for seeing the unseen",[95] and its primary objective is to "gain insight into an information space" (Senay et al 1994).[96] Information visualisation has a long tradition in our cultural heritage; maps were known before writing systems. An illustrative modern example of information visualisation for scholarly purposes is Minard's *Carte figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813* from 1869, which was described as perhaps "the best statistical graphic ever drawn" (illustration 8).[97]

It shows the movement of the Napoleonian troops towards Moscow (brown) and back (black) with the width of line indicating the troop strength. Napoleon's retreat is accompanied by a decrease in temperature which is (at the bottom) brought into relation with the spatial location of the troops. Now, with new media at hand that allows multi-dimensional, dynamic and interactive visualisation of such information: how powerful could this be?

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92. Greengrass, Mark. "Introduction", *The Virtual Representation of the Past*, Mark Greengrass, Lorna Hughes, eds. Aldershot: Ashagate, 2008: 2.

93. Techniques generally applied in information visualisation include e.g. zooming of visual information, panning, scaling, add-ing/removing data, in-/decreasing granularity, changing focus, scope or viewpoint, navigating, browsing, searching, comparing, selecting, grouping, aligning, sampling etc.

94. *Readings in Information Visualization,* Stuard K. Card, Jack Mackinlay Ben Shneiderman, San Francisco: Morgan Kaufmann, 1999.

95. McCormick, Bruce; DeFanti, Thomas and Brown, Maxine. "Visualization in Scientific Computing". *Computer Grahpics,* 21 (1987): 1-14.

96. Senay, Hikmet; Igantius, Eve. "A knowledged-Based System for Visualisation Design". *IEEE Computer Graphics,* 14 (1994): 36-47.

97. Tufte, Edward. *The visual display of quantitative information*. Cheshire: Graphics Press. 2009: 40.
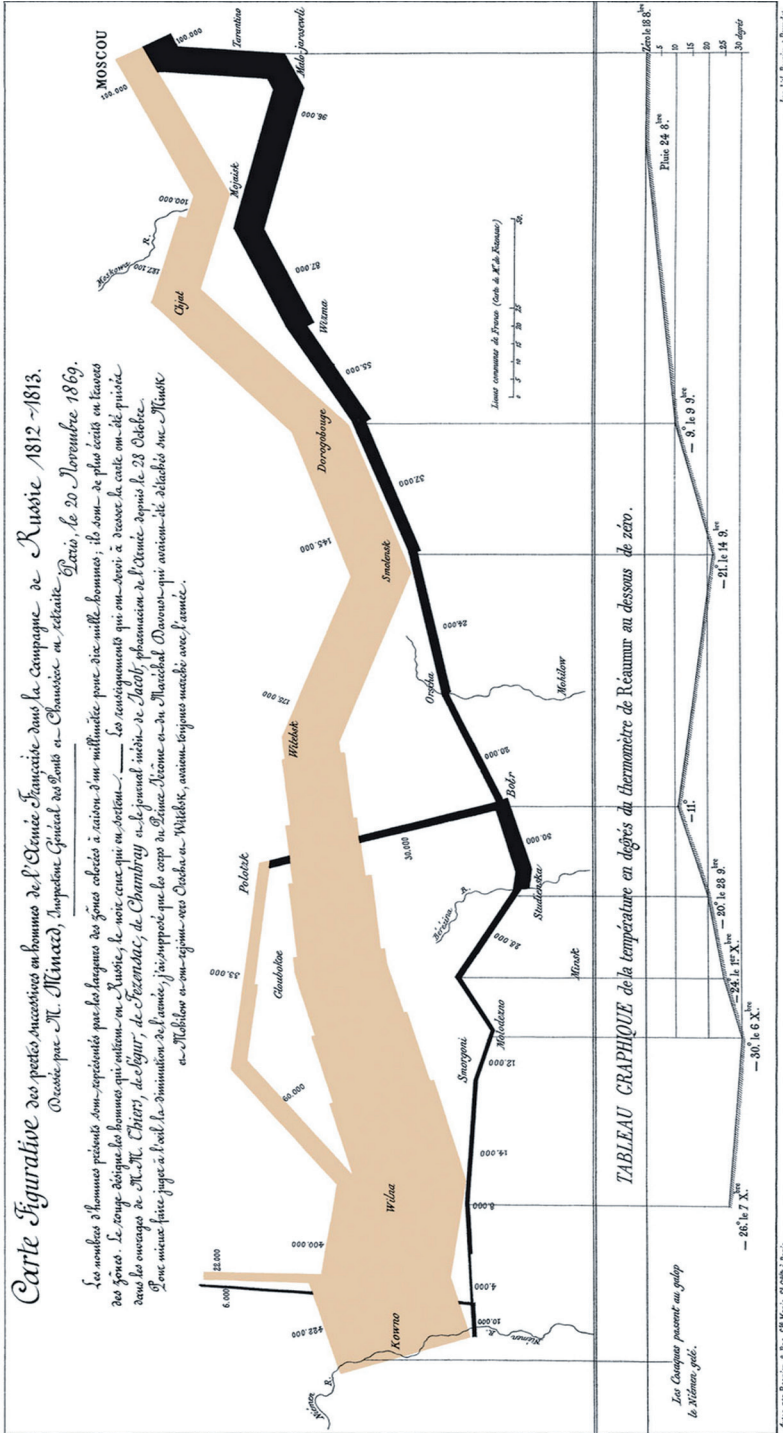
ILLUSTRATION 8. MINARD'S CARTE FIGURATIVE (1869).

Information visualisation and its related field scientific visualisation are investigated in sciences, engineering, business and commerce. This can be seen in numerous publications during the past three decades; information visualisation "as a distinctive field of research has less than ten years of history, but has rapidly become a far-reaching, interdisciplinary research field".[98] In the Humanities, the situation is different. In his illustrative report on visualising timelines for research in classics, history and archaeology,[99] York regards timelining as a "mainstay of in formation visualization", but states that "few digital humanities projects have made timelines their central concern"[100] and that "few were created explicitly to enable user collaboration".[101] This is symptomatic for projects in the humanities: visualisation, let alone dynamic and interactive visualisation is rarely applied; "humanities computing follows the text-based [...] approach typical of traditional humanities".[102]

The overall objective of the digital medievalist is, therefore, to overcome the stigma of electronic text as "computer-driven simulation[s] of bookishness"[103] and to facilitate digital resources to become "valuable as a laboratory, as working material for new scholarly editorial [or other] endeavours"[104] without requiring a "sophisticated user-editor".[105]

## 6. Bibliographical appendix. Cited Works

Arlinghaus, Franz-Josef. *Transforming the medieval world: Uses of pragmatic literacy in the Middle Ages*. Turnhout: Brepols, 2006.

Arlinghaus, Franz-Josef; Ostermann, Marcus; Plessow, Oliver; Tscherpel, Gudum. *Schrift im Wandel-Wandel durch Schrift: Die Entwicklung der Schriftlichkeit im Mittelalter*. Turnhout: Brepols, 2003.

Asmus, Bärbel. "Die Bevölkerung: Entwicklung und Sozialstruktur", *Göttingen: Geschichte einer Universitätsstadt: Von den Anfängen bis zum Ende des Dreißigjährigen Krieges*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: I, 161-198.

Aumann, Stefan. *... und wird gar weit geführet: Die Geschichte des Einbecker Bieres*. Oldenburg: Isensee, 1998.

---

98. Chen, Chaomei. *Information Visualization: Beyond the Horizon*. London: Springer, 2007: 1.

99. York, Christopher. "Digital Humanities Timelining Status Report". *Hyperstudio. Digital Humanities at MIT*. 2009. <hyperstudio.mit.edu/images/hyperstudio-timeline-whitepaper.pdf>.

100. See note 2.

101. See note 17.

102. Drucker, Johanna. "Speculative Computing: Aesthetic Provocations in Humanities Computing". *A Companion to Digital Humanities...*: 431-447.

103. Sutherland, Kathryn. "Being Critical...": 22.

104. Dahlström, Mats. "The Compleat Edition...": 39.

105. Sutherland, Kathryn. "Being Critical...": 25.

Bauman, Syd. "TEI: an Overview". *TEI Day in Kyoto 2006*. Ed. TEI Consortium. Kyoto: キョウト ダイガク ジンブン カガク ケンキュウジョ, 2006: 41-53.

Bennewitz, Ingrid; Klaus van Eickels; Ruth Weichselbaumer, eds. *Mediaevistik und Neue Medien*. Ostfildern: Thorbecke, Jan, 2004.

Brannahl, Günther; Malte Grause. "Untersuchungen an Tinten". *Archivalische Zeitschrift*, 70 (1974): 79-98.

Burnard, Lou; O'Keeffe, Katherine O'Brien; Unsworth, John, eds. *Electronic textual editing*. New York: Modern Language Association of America, 2006.

Buzzetti, Dino. "Digital Editions and Text Processing", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Aldershot: Ashgate, 2009: 45-62.

Buzzetti, Dino; McGann, Jerome. "Critical Editing in a Digital Horizon", *Electronic textual editing*, Lou Burnard, Katherine O'Brien O'Keeffe, John Unsworth, eds. New York: Modern Language Association of America, 2006: 53-73.

Buzzetti, Dino; Rehbein, Malte. "Textual fluidity and digital editions", *Text variety in the witnesses of medieval texts: Proceedings of the international workshop*, Milena Dobreva, ed. Sofia: Institut po matematika i informatika-BAN, 1998: 14-39.

Card, Stuart K.; MacKinlay, Jock D.; Shneiderman, Ben. *Readings in information visualization: Using vision to think*. San Francisco: Morgan Kaufmann, 1999.

Chen, Chaomei. *Information Visualization: Beyond the Horizon*. London: Springer, 2007.

Classen, Peter. *Recht und Schrift im Mittelalter. Vorträge und Forschungen / Konstanzer Arbeitskreis für Mittelalterliche Geschichte 23*. Sigmaringen: Thorbecke, 1977.

Dahlström, Mats. "The Compleat Edition", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, ed. Aldershot: Ashgate, 2009: 27-44.

Deegan, Marilyn; Sutherland, Kathryn, eds. *Text editing, print and the digital world*. Aldershot: Ashgate, 2009.

Denecke, Dietrich; Kühn, Helga-Maria eds. *Göttingen: Geschichte einer Universitätsstadt: Von den Anfängen bis zum Ende des Dreißigjährigen Krieges*. 1. Göttingen: Vandenhoeck & Ruprecht, 1987.

Dilcher, Gerhard. "Oralität, Verschriftlichung und Wandlungen der Normstruktur in den Stadtrechten des 12. und 13. Jahrhunderts". *Pragmatische Schriftlichkeit im Mittelalter: Erscheinungsformen und Entwicklungsstufen*, Hagen Keller, ed. Munich: Fink, 1992: 9-19.

Dilcher, Gerhard. *Bürgerrecht und Stadtverfassung im europäischen Mittelalter*. [Herausgeber fehlt!] Cologne: Böhlau, 1996.

Dobreva, Milena, ed. *Text variety in the witnesses of medieval texts: Proceedings of the international workshop*. Sofia, 21-23 September 1997. Sofia: Institut po matematika i informatika-BAN, 1998.

Drucker, Johanna. "Speculative Computing: Aesthetic Provocations in Humanities Computing", *A Companion to Digital Humanities*, Susan Schreibman, Ray Siemens, John Unsworth, eds. Malden: Blackwell, 2004: 431-447.

Ebel, Wilhelm. *Bursprake, Echteding, Eddach in den niederdeutschen Stadtrechten*. Göttingen: Schwartz, 1953.

Ebel, Wilhelm. "Über die rechtsschöpferische Leistung des mittelalterlichen deutschen Bürgertums". *Vorträge und Forschungen*, 11 (1966): 241-258.

Sachsenspiegel, Landrecht. *Monumenta Germaniae Historica Fontes iuris Germanici antiqui* Ed. Karl August. N.S., 1,1. Hannover: Hahn, 1995.

Eggert, Paul. "Text-encoding, Theories of the Text, and the 'Work-Site'". *Literary and Linguistic Computing*, 20/4 (2005): 425-435.

Eggert, Paul. "The Book, the E-text and the 'Work-Site'". *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Aldershot: Ashgate, 2009. 63-82.

Fees, Irmgard. *Eine Stadt lernt schreiben: Venedig vom 10. bis zum 12. Jahrhundert*. Halle: Niemeyer, M, 2002.

Gabler, Hans Walter. "The Primacy of the Document in Editing". *Ecdotica*, 4 (2007): 197-207.

Gabler, Hans Walter. "The Primacy of the Document in Editing". *Ecdotica*, 4 (2007): 197-207.

Gabler, Hans Walter. "Theorizing the Digital Scholarly Edition". *Literature Compass*, 7/2 (2010): 43-56.

Greengrass, Mark. "Introduction", *The Virtual Representation of the Past*, Mark Greengrass, Lorna Hughes, eds. Aldershot: Ashgate, 2008. 1-3.

Greengrass, Mark; Hughes, Lorna, eds. *The Virtual Representation of the Past*. Aldershot: Ashgate, 2008.

Havermans, John; Hadeel, Abdul Aziz; Scholten, Hans. "Non destructive detection of iron-gall inks by means of multispectral imaging". *Restaurator*, 24 (2003): 88-94.

Heinemeyer, Walter. *Richtlinien für die Edition landesgeschichtlicher Quellen*. Marburg-Cologne: Gesamtverein d Dt. Geschichts-u. Altertumsvereine, 1978.

Hoheisel, Peter. *Die Göttinger Stadtschreiber bis zur Reformation: Einfluß, Sozialprofil, Amtsaufgaben*. Göttingen: Vandenhoeck & Ruprecht, 1998.

Isenmann, Eberhard. *Die deutsche Stadt im Spätmittelalter: 1250-1500; Stadtgestalt, Recht, Stadtregiment, Kirche, Gesellschaft, Wirtschaft*. Stuttgart: Ulmer, 1988.

Kanzog, Klaus. *Prolegomena zu einer historisch-krotischen Ausgabe der Werke Heinrich von Kleists*. München: Hanser, 1970.

Keller, Hagen, ed. *Pragmatische Schriftlichkeit im Mittelalter: Erscheinungsformen und Entwicklungsstufen. Akten des internationalen Kolloquiums, 17.-19. Mai 1989*. Munich: Fink, 1992.

Keller, Hagen; Busch, Jörg W., eds. *Statutencodices des 13. Jahrhunderts als Zeugen pragmatischer Schriftlichkeit: Die Handschriften von Como, Lodi, Novara, Pavia und Voghera*. Munich: Fink, 1991.

Kropač, Ingo H. "Theorien, Methoden und Strategien für mulitmediale Archive und Editionen", *Mediaevistik und Neue Medien*, Ingrid Bennewitz, Klaus van Eickels, Ruth Weichselbaumer, eds. Ostfildern: Thorbecke, 2004: 295-316.

Lancashire, Ian, ed. *The Humanities Computing Yearbook 1989-90*. Oxford: Clarendon Press, 1991.

Lubecus, Franciscus; Vogelsang, Reinhard. *Göttinger Annalen: Von den Anfängen bis zum Jahr 1588*. Göttingen: Wallstein, 1994.

McCormick, Bruce; DeFanti, Thomas; Brown, Maxine. "Visualization in Scientific Computing". Computer Graphics, 21 (1987): 1-14.

Mohnhaupt, Heinz. *Die Göttinger Ratsverfassung vom 16. bis 19. Jahrhundert*. Göttingen: Vandenhoeck & Ruprecht, 1965.

Mohnhaupt, Heinz. "Stadtverfassung und Verfassungsentwicklung", *Göttingen: Geschichte einer Universitätsstadt: Von den Anfängen bis zum Ende des Dreißigjährigen Krieges*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: I, 228-259.

Moldenhauer, Günter. "Das Göttinger Braurecht in seiner geschichtlichen Entwicklung". Georg-August-Universität Göttingen, 1958.

Neitzert, Dieter. "Göttingens Wirtschaft, an Beispielen des 15. und 16. Jahrhunderts". *Göttingen: Geschichte einer Universitätsstadt: Von den Anfängen bis zum Ende des Dreißigjährigen Krieges*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: I, 298-345.

Nichols, Stephen G. "Introduction: Philology in a Manuscript Culture". *Speculum*, 65 (1990): 1-10.

Nissen, Walter. *Das Göttinger Stadtarchiv: Seine Geschichte und seine Bestände*. Göttingen: Vandenhoeck & Ruprecht, 1969.

O'Donnell, Daniel Paul. "Welcome to The Digital Medievalist". *Digital Medievalist*, 1 (2005); O'Donnell, Daniel Paul. "Welcome to The Digital Medievalist". *Digital Medievalist*. Spring 2005. University of Lethbridge. 5th of July 2010. <http://www.digitalmedievalist.org/journal/1.1/odonnell/>.

O'Donnell, Daniel Paul. "Resisting The Tyranny of the Screen, or, Must a Digital Edition be Electronic?". *The Heroic Age*, 11 (2008); O'Donnell, Daniel Paul. "Resisting The Tyranny of the Screen, or, Must a Digital Edition be Electronic?". *The Heroic Age*. A Journal of Early Medieval Northwestern Europe, 11 (2008). <http://www.mun.ca/mst/heroicage/issues/11/em.php>.

Pierazzo, Elena. "Digital Genetic Editions: The Encoding of Time in Manuscript Transcription", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Aldershot: Ashgate, 2009: 169-186.

Plachta, Bodo. *Editionswissenschaft: Eine Einführung in Methode und Praxis der Edition neuerer Texte*. Stuttgart: Reclam, 2006.

Rehbein, Malte. "The Transition from Classical to Digital Thinking: Reflections on Tim McLoughlin, James Barry and Collaborative Work". *Jahrbuch für Computerphilologie*, 10 (2008): 55-68.

Rehbein, Malte. "Reconstructing the textual evolution of a medieval manuscript". *Literary and Linguistic Computing*, 24.3 (2009): 319-327.

Rehbein, Malte. "Vom Nutzen digitaler Editionen-das Göttinger kundige bok". *Bibliothek und Wissenschaft*, 42 (2009): 7-28.

Rehbein, Malte. *Göttinger Statuten im 15. Jahrhundert. Entstehung - Entwicklung - Edition*. Göttingen: Staats- und Universitätsbibliothek, 2010.

Rehbein, Malte; Sahle, Patrick; Schaßan, Torsten, eds. *Kodikologie und Paläographie im digitalen Zeitalter. Codicology and Palaeography in the Digital Age*. Norderstedt: Books on Demand, 2009.

Renear, Allen. "Text Encoding". *A Companion to Digital Humanities*, Susan Schreibman, Ray Siemens, John Unsworth, eds. Malden: Blackwell, 2004: 218-239.

Restall, Matthew. "A History of the New Philology and the New Philology in History". *Latin American Research Review*, 38 (2003): 113-134.

Robinson, Peter. "The Wife of Bath's Prologue on CD-ROM". Cambrdige: Cambridge University Press, 1996.

Robinson, Peter. "The Ends of Editing". Digital Humanities Quarterly, 3/3 (2009).

Ropp, Goswin von der. *Göttinger Statuten: Akten zur Geschichte der Verwaltung und des Gildewesens der Stadt Göttingen bis zum Ausgang des Mittelalters*. Hannover: Hahn, 1907.

Rörig, Fritz. "Mittelalter und Schriftlichkeit". *Die Welt als Geschichte*, 13/1 (1953): 29-41.

Roselieb, Hans. "Die Chemie alter und neuer Tinten". *Archivalische Zeitschrift*, 70 (1974): 74-78.

Schreibman, Susan; Siemens, Ray; Unsworth, John, eds. *A Companion to Digital Humanities*. Malden: Blackwell Publishes, 2004.

Schubert, Ernst. *Alltag im Mittelalter: Natürliches Lebensumfeld und menschliches Miteinander*. Darmstadt: Wiss. Buchges, 2002.

Schubert, Ernst. *Essen und Trinken im Mittelalter*. Darmstadt: Wiss. Buchges, 2006.

Senay, Hikmet; Ignatius, Eve. "A knowledge-Based System for Visualisation Design". *IEEE Computer Graphics*, 14/6 (1994): 36-47.

Shiel, Patrick; Rehbein, Malte; Keating, John. "The Ghost in the Manuscript: Hyperspectral Text Recovery and Segmentation", *Kodikologie und Paläographie im digitalen Zeitalter. Codicology and Palaeography in the Digital Age*, Malte Rehbein, Patrick Sahle, Torsten Schaßan, eds. Norderstedt: Books on Demand, 2009: 159-174.

Shillingsburg, Peter L. *From Gutenberg to Google: Electronic representations of literary texts*. Cambridge: Cambridge University Press, 2006.

Sperberg-McQueen, Michael. "Text Encoding and Enrichment", *The Humanities Computing Yearbook 1989-90*, Ian Lancashire, ed. Oxford: Oxford University Press, 1991.

Steenweg, Helge. "Das Wehr- und Wachtwesen der Stadt Göttingen im Mittelalter", *Göttingen: Geschichte einer Universitätsstadt: Von den Anfängen bis zum Ende des Dreißigjährigen Krieges*, Dietrich Denecke, Helga-Maria Kühn, eds. Göttingen: Vandenhoeck & Ruprecht, 1987: I, 211-227.

Strohschneider, Peter. "Situationen des Textes. Okkasionelle Bemerkungen zur 'New Philology'". *Zeitschrift für deutsche Philologie*, 116 (1997): 62-86.

Sutherland, Kathryn. "Being Critical: Paper-based Editing and the Digital Environment", *Text editing, print and the digital world*, Marilyn Deegan, Kathryn Sutherland, eds. Aldershot: Ashgate, 2009: 13-25.

TEI Consortium, ed. *TEI Day in Kyoto 2006*. Kyoto: キョウト ダイガク ジンブン カガク ケンキュウジョ, 2006.

Tufte, Edward R. *The visual display of quantitative information*. Cheshire: Graphics Press, 2009.

Tufte, Edward Rolf. *Envisioning information*. Cheshire: Graphics Press, 2008.

Vogelsang, Reinhard. *Stadt und Kirche im mittelalterlichen Göttingen*. Göttingen: Vandenhoeck & Ruprecht, 1968.

Weber, Max. *Wirtschaft und Gesellschaft*. Paderborn: Voltmedia, 2006.

Weyermann, Céline; Spengler, Bernhard. "The potential of artificial aging for modelling of natural aging processes of ballpoint ink". *Forensic science international*, 180/1 (2008): 23-31.

York, Christopher. "Digital Humanities Timelining Status Report". *Hyperstudio*. <http://hyperstudio.mit.edu/images/hyperstudio-timeline-whitepaper.pdf>.