

The third way: philology and critical edition in the digital age¹

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31 March 2012

In 2006, as I prepared to begin my doctorate, I met with my supervisor-to-be to discuss prospective research topics. It became clear during the meeting that he already had a project in mind: I would produce a critical edition of the Armenian-language *Chronicle* of Matthew of Edessa, and it would be a digital critical edition. Some time later, at the celebration that followed my viva examination, my supervisor cheerfully admitted that he had not had the least idea what a “digital critical edition” might be when he had set me on the path to making one. He simply trusted that I, as a software engineer turned humanist, would figure something out along the way. The fact that I now write this suggests that I did produce something that was accepted by my supervisor and examiners as a digital critical edition. So where is it? What does it look like? And if, as recently as that, a lone doctoral student had to work out for herself what a digital critical edition should be, does it not go some way toward explaining why there are so few of them about?

This paper arises from a round table discussion whose aim was to question whether digital techniques can coexist with traditional critical editing, or whether digital methods make critical editing obsolete. Given the ability to publish faithful digital facsimiles of all our source material, is there any need for the editorial emendation or text reconstruction that is the central activity of the traditional philologist? Is the so-called “new philology” better suited for the digital age than the “old” methods that have their root in classical philology, and does the “old” way have a future? Here I shall address some of these questions from the perspective of a relative philological neophyte to whom the digital realm is second nature. I argue (and I am by no means the first to do so) that digital methods afford opportunities to transcend the distinction between old and new philology, allowing the scholar to adopt the best of both approaches as suits the nature and heritage of each individual text. In order for us to grasp those opportunities, however, the working methods of all philologists must adapt to the realities and capabilities of the digital age.

I will discuss here some of the working methods of the digital philologist as pioneered in the late 1990s and early 2000s and adapted for my own doctoral work, and point to some of the technological progress that has been made since then through initiatives such as the Interedition project (Interedition 2012) to make these digital methods ever more feasible for ever more texts. Finally, I will look at the particular problem of text stemmatology—how it serves neatly to divide philological opinion, and how it might be reinvented when we revisit our assumptions about what is possible to analyze and compute.

Digital editions and digital philology

I would argue that digital critical editions are rare for two reasons. First, very few people have articulated a clear idea of what a digital edition ought to look like. Only two years ago, a session held at the THATCamp “unconference” connected to the Digital Humanities conference in London aimed to re-think the forms that a digital edition might take (Timney et al. 2010). It was widely agreed that most users want a reading text and transcriptions of the source; the idea of a standardized visual vocabulary to represent text features was also supported. Beyond that, there were many potentially useful feature proposals but very little consensus. This is somewhat

¹ A version of this paper was originally presented at the LECTIO Round Table ‘Digital or critical / digital and critical?’ held in Leuven on 21 November 2011.

surprising, given the comprehensive and complementary visions set forth both before and since by Robinson (2004), Buzzetti and McGann (2006), Buzzetti (2009), Bodard and Garcés (2009), and van Zundert and Boot (2011) among others, but the 2010 session made it abundantly clear that consensus is indeed lacking on what exactly a digital critical edition should be. As long as there is no agreement on the end result of digital philology, there can be none on its methods; as long as there is no consensus on method, there will not be widely applicable computational tools available to help produce digital critical texts.

This lack of consensus brings me to the second reason for the dearth of digital critical editions. With rare exceptions, both old and new philology remain fundamentally non-digital in their methods, eschewing the standardization and formal models that computers by their nature enforce. Even the TEI guidelines, which comprise the *de facto* representation standard for textual scholarship, are interpreted differently and routinely customized for each new project; this idiosyncratic interpretation and insistence upon customization, wherein exception becomes the rule, is a misunderstanding of the nature of a digital data model that effectively prohibits large-scale interchange or machine analysis across different projects (Schmidt 2011). If this is the current state of the art of digital scholarship, it goes some way toward explaining the paucity of tools for the task. At the TEI Members' Meeting in October 2011, partially in response to the discussion initiated by Schmidt, a think tank was sponsored by Interedition on the subject of TEI and interoperability. It became clear over the course of the meeting that flexibility and customizability is currently much more important to textual scholars than the sort of standardization that would allow for true progress toward digital critical editions.²

Part of the difficulty in defining what a digital edition might be is that the term refers simultaneously to two things. There is the eventual digital publication of a text edition, which may have been prepared using state-of-the-art digital tools for the purpose, specialist software such as Classical Text Editor (Hagel 1997–2012), in a spreadsheet, in a word processor, or even on paper and then transcribed into electronic form. Alternatively, there is what we might call "digital philology", an approach to textual editing that welcomes the aid of technology wherever possible and which will usually, but not necessarily, result in a digital publication. The difference between the traditional approach to philology, whether "old" or "new", and the digital approach lies in their respective willingness to divide labour between human and artificial intelligence; where the former tends to be reluctant to embrace digital possibilities, the latter favours a more efficient division of labour and encourages the production of new methods of presenting texts. The method of production, rather than the published form that the resulting editions take, is the practice wherein lies most of the promised revolution within textual scholarship, but it has attracted considerably less attention than the question of digital publication. Consequently, as the 2010 session at THATCamp showed, it is only rarely that scholars express a conception of a digital critical edition as anything more than an electronic and hyperlinked version of a book that can accommodate a very large and detailed critical apparatus. Indeed I am aware of only a very few digital critical editions which were produced outside of the conventional, painstakingly manual, framework of twentieth-century philology in either of its forms.

Editions based on the conventional, manual approach are all produced in roughly similar ways, notwithstanding their segregation into products of the "old" and "new" philology. Manuscripts must be transcribed into a computer format; multiple manuscripts of the same text are collated. A critical text is then produced, whether it be a full diplomatic representation of a single manuscript witness, a normalized version of a consensus text with variations noted in an *apparatus criticus*, or an attempt at reconstruction of a lost archetype after the construction of a stemma.

² Summaries of the participants' conclusions may be found online (Interedition 2011)

At its core, the difference between old and new philology can be seen as a subtle but crucial shift in purpose. The older practice of philology, whose methods are taken from traditional classical philology, emphasizes the “ideal” text whose authority supersedes that of any surviving witnesses; the specific ideal text in question might be the author’s original, the recoverable archetype, or even the emended and conjectured version of a sole surviving witness. Conversely, the emphasis of new philology is on the “real” text as it has been preserved, received, annotated, and used. The distinction between “ideal” and “real” is a simple shift that nevertheless prescribes radically different working methods.

For the “old” philologist seeking to recover the ideal text, an entire series of steps has been prescribed (Maas 1957, West 1973) to use philological principles and editorial intuition to determine the extent to which the surviving manuscripts have fallen into copying error of various sorts. This requires a full collation of all witnesses, almost always reduced to “a full collation of all significant differences between witnesses” in the interests of time and practicality. The new philologist, who is generally more interested in the individuality and the variation in each witness (Cerquiglini 1989) than in a unified *textus receptus*, will often publish an edition of a single manuscript or a very few at most, and will take care to provide as accurate as possible a transcription. Consequently, editions produced according to the principles of new philology only rarely require extensive text collation.

If there are multiple witnesses, their groupings into witness families can be done in a variety of ways. Many classical philologists use Lachmannian or neo-Lachmannian principles to construct a stemma hypothesis of the copying relationships between the manuscripts based on shared copyist error; this stemma becomes the key to the reconstruction of an archetype. Other philologists, whether old or new, might use cladistic analysis based on methods borrowed from phylogenetics to group the manuscripts into statistically probable families based on the variation within the text. Still others rely entirely on observation and intuition in discussing the relationships between texts. The methods for stemma construction or manuscript groupings, digitally assisted though they may be, remain grounded in assumptions about what we can and cannot know dating from before the digital age.

The critical text may now be produced according to the principles of the philologist, along with the *apparatus criticus*.³ It is immediately obvious to almost all editors that digital publication removes the practical limitations on the size of the apparatus, and thus on the granularity of variation that may be displayed. This insight has nevertheless had little practical effect on most resulting editions, as the fine-grained variation has usually been excluded already at the time of transcription and/or collation.

In essence, then, the classical philologist is limited from the outset by the perception that there is too little value in the “insignificant” data provided by the manuscript sources to justify the time it would take to include all of it in a critical edition. The new philologist, while more likely to make this data digitally available in the first place, needs little more than a way to present and annotate the text to be published. Little wonder that the result so often amounts to an electronic and hyperlinked book, and that the practices of new philology might therefore seem at first glance more suited to digital edition than those of the old. In both of these cases, the preparatory work is still largely manual in nature, even where it is computer-assisted with word processors, spreadsheets for collation, or XML editors for TEI transcription. How may we move beyond this to the sort of “digital edition 2.0” envisioned by van Zundert and Boot (2011)?

³ Greetham (1992, 313–46) gives a good overview of the different schools of thought, particularly with regard to early modern and modern texts, as they emerged throughout the twentieth century.

A third way: digital philology

Many sceptics of digital technology labour under the illusion that digital editions leave no room for human agency, that they obviate human judgment. Peter Robinson (2004) put forward a set of working methods for true digital textual criticism; these are largely the methods I used in my own doctoral work (Andrews 2009a), and they owe their origins to both “old” and “new” philological practices. Robinson took pains to point out how manual, exacting, and exhausting his methods are; this was necessary to counter the objection he faced that digital edition leaves no room for the human scholar, but was a little unfortunate from the perspective of convincing other philologists that fully digital methods are worth their while.

The most immediate value of digital methods is the ability to assign as much as possible of the work—particularly that which is repetitive, exacting, and error-prone—to the computer (Robinson 1989). It allows us to take advantage of the complementary strengths of man and machine to achieve a result far superior to that produced by either alone. The deeper value of digital philology, however, is that it should allow not only for innovative means of publication and display, but also innovative working methods and unexpected results, when we can cast aside so many of the practical limitations on the management of data that existed through to the end of the twentieth century. With these principles in mind, let us consider a digitally modified workflow for text criticism, and consider what can now be done and what may be possible in the near future.

Transcription. This represents the bulk of the manual work that must unavoidably be done by the editor or by human assistants. Fundamentally, as Robinson (2004) points out, the act of reading (and therefore transcription) of a text is an act of interpretation. There has been some research into the problem of optical character recognition (that is to say, automated transcription) for manuscript texts; although there is work in this direction (Wüthrich et al. 2009), very little generalizable progress has yet been made. Moreover, while OCR and other automated methods might speed the work significantly in the future, might someday even manage perfectly accurate automated transcriptions, the scholar who wishes to critically edit a text has little alternative but to closely read it in all its forms. Transcription remains thus a useful exercise, if a painstaking one.

In fact, witness transcriptions need not take any more time than manual collation of texts, and can usually be made to take considerably less. A full text transcription of any witness may be made simply by copying and altering the transcription of a similar witness, a process that is akin to the creation of a spreadsheet of variants but simpler and easier in execution. There is a small risk that the readings of the similar text might influence the readings of the manuscript being transcribed, but that is more than offset by the fact that a full transcription removes the scholar’s temptation to exclude a peculiar reading because it seems not to be worth the effort to set up a new variant location in a spreadsheet.

While transcription work can be (and often is) done directly into a text editor or an XML editor (especially if the scholar is transcribing according to the TEI guidelines), the need for more user-friendly transcription tools has long been recognized. Of the several development initiatives underway to address this need, the T-PEN system developed at Saint Louis University (Ginther et al. 2009–2012) is currently the most promising.⁴

Collation. It is the need to collate the source texts that most often deters editors, particularly classical philologists, from transcribing each of them in full. Although

⁴ It is ever more widely recognized that digital publication of a manuscript should include a full diplomatic transcription; however, I have omitted here to enter the lively discussion of what a diplomatic transcription can and should entail. See (Robinson 2009, Pierazzo 2011), among others, for more on this topic.

they understand the service to posterity that the transcription work represents, it is often not judged feasible to record and compare each non-normalized spelling, each punctuation mark, if the edition is ever to be completed.

As long as the collation must be done manually, the editor has a point. Whether directly into XML markup, into a specialist program such as Classical Text Editor, or (most painstakingly) into a separately maintained spreadsheet of text variants, manual collation is time-consuming, error-prone, and exhausting. If the workflow of edition is to be truly digital, an automatic collation of the transcribed witnesses with a program such as Juxta (Performant Software n.d.), CollateX (Dekker et al. 2008–2012, itself the successor to Robinson’s own COLLATE), or nCritic (Andrews 2009–12) is indispensable. The use of one of these programs frees the scholar to transcribe the sources as precisely as possible, secure in the knowledge that the minute level of detail in a diplomatic transcription will lengthen the collation process by mere minutes. The scholar need then spend only a very few hours checking the results.

Analysis. Once the texts have been fully transcribed and collated, using tools that have minimized the temptation to curtail or “normalize” the data prematurely and have avoided the need to assess the significance of any piece of evidence, the process of analysis may begin. Examples may include phylogenetic analysis of the variant relationships (Baret et al. 2006), any form of stylistic analysis such as authorship attribution (e.g. van Dalen-Oskam and van Zundert 2007), or even inclusion in a corpus for large-scale data mining or the application of distant reading techniques (Moretti 2005). The most common sort of analysis performed at this stage is exactly the stemmatic analysis that is considered central to text edition by those who would reconstruct an archetype, and that tends to be rejected outright by new philologists. I will return to this below.

Edition. Given a full set of diplomatic transcriptions made without prejudice as to “true” or “errant” readings, a detailed collation, and the results of any analysis that has been run, the editor may now begin to construct the critical text, applying the editorial and philological judgment that the text in question calls for. Here too the computer may assist, primarily by ensuring consistency of decision throughout the text and by ensuring that any departure from the given witnesses is marked out and commented upon. Computer-assisted creation of a critical text is a relatively straightforward task, and can be done with a tool that is much simpler in conception than (for example) an automatic collator, but to my knowledge there is not yet any tool widely available for the task. For my own edition I developed a simple command script, which used as input and output an XML-encoded collation using the TEI parallel-segmentation method; that tool remains available for academic curiosity (Andrews 2009b). The early months of 2012 have seen the development of a proof-of-concept tool (Andrews et al. 2012), developed under the aegis of the Interedition project, that has been incorporated into the workflow of the editors of the Greek New Testament at the Institut für neutestamentliche Textforschung (INTF) in Münster.

Publication. We can now see that digital methods can (and should) lend substantial support to critical analysis in the task of preparing an edition, before the reader sees a single published result. It is the published form of the critical edition, however, that most scholars have in mind when they wonder why there are so few digital editions. What then should the finished digital edition look like? Robinson (2004, 420) describes it thus: “The analysis, editorial commentaries derived from the analysis, all texts and all collations are published in electronic form.” This is a very open definition, and may be interpreted in a perfectly conservative fashion: the texts are presented individually and through collations, optionally with hyperlinks (or pop-up information) to connect related readings and supply additional commentary. More recently, Rosselli del Turco (2011) has proposed several best practices for the

graphical interface components of any digital edition. These discussions are welcome and needed, but how far do they take us beyond our hyperlinked book?

In the case of my own critical edition, the situation was very simple. My university's examination regulations required a printed publication; I duly wrote a script to convert my XML-encoded edition into LaTeX format for rendering to PDF, and thought no more about the matter beyond the occasional reflection that it would be nice to have the texts published online somehow, somewhere, someday. Only in recent months, as the collaboration within Interedition grew and began to produce some exciting tools and techniques, and as the "digital edition 2.0" began to emerge as an idea, have I begun to experiment with these innovative tools using my own critical text. The result (Andrews 2012) remains a work in progress. In accordance with Robinson's description, the full text of each witness is available for display and download; commentary is available for each witness, for individual locations in the text, and for the text as a whole; the analysis is available in the form of the critical text and the stemma. Taking the edition more fully into the digital realm, the individual witness texts are available through a REST-like (REpresentational State Transfer, a simple URL based mechanism for querying and updating resources on the Web) interface as TEI-encoded XML, as HTML for browser display, and as a series of JSON (JavaScript Object Notation, a very simple interchange format for any form of data) tokens for use in tools such as automatic collators. The critical apparatus for any variant location may be displayed or dismissed with a mouse click; the text at that location may also be viewed in graph form, in a modified version of the variant graph first described by Schmidt and Colomb (2009). The reader may likewise view the stemma, colour-coded according to witness agreements for that location.

I do not pretend that my own critical edition is the apex of innovation for digital critical editions, or anything approaching that. The visions of Robinson, of Buzzetti and McGann, of Bodard and Garcès, of van Zundert and Boot, remain largely unrealized by this edition as well, and it is so far impossible to say which of these features, if any, may be adopted by other editors or used in further research. In that sense, consensus about what digital editions will become is still missing from our field.

This does at first glance seem disappointing. The inability, as yet, for textual scholarship as a whole to progress substantially beyond the conception of a digital critical edition as a feature-rich electronic book indicates that not enough scholars yet grasp the possibilities of large-scale analysis of texts, or the variety of ways in which their own work might be useful in the research of others. The onus cannot fall entirely on the producers of critical editions, however; production is almost always driven by demand. Until those who might use our editions, beyond printing out a PDF copy of the critical text and citing the page number of an associated printed version, present themselves, our digital editions will continue to offer a convenient PDF version of the critical text with apparatus, and they will continue to have associated print publications to which most of the effort is devoted. It is the practice of deep and/or large-scale text analysis, rather than that of textual criticism itself, which must drive the development of digital editions in all their potential.

Digital philology and its impact on stemmatology

The concept of a stemma can often be used as a handy litmus test to determine the sort of philologist before you. A classical philologist will nod and begin discussing *Leitfehler*; a neo-Lachmannian may launch into a discourse about type-2 variant locations (Wattel and van Mulken 1996) and text-genealogical variants (Salemans 2000). A new philologist will reject the entire concept of variation as "error" (Cerquiglini 1989), and in many cases will reject the desirability or existence of a single archetype (e.g. Driscoll [2010]), rendering the entire concept of a stemma somewhat useless for his or her purposes.

This exchange might leave the digital philologist in some confusion. Surely it cannot be a choice between, on the one hand, an idealized and orderly picture of faithful yet fault-ridden copies of an authoritative source, and on the other hand a tangled web of texts whose relations to each other are coincidental and possibly even beside the point? Given the vast quantities of data that can be produced about a set of texts and given the generally accepted axiom that texts were, indeed, copied from other texts, the digital philologist might expect that, with enough aggregate empirical data, a scholar ought to be able to use computational analysis to arrive at an approximate order of copying. We ought moreover to have no fear of contamination, horizontal transmission, multiple archetypal versions, or extra-textual influences having skewed the result. The history of the text lies in its witnesses, and the historian of the text must seek to uncover that history.

In that sense, stemmatology is central to the methods of digital critical edition. It is the form of text analysis that lies at the heart of classical philology, and it is the type of analysis that, if done more correctly and sympathetically, could be of great help to mediaeval philologists whether of the old school or the new. Such analysis would necessarily render a “hyperlinked book” edition into something inalienably digital.

From this perspective, stemmatology is a field that desperately requires a new approach. Its shortcomings were first highlighted in the early twentieth century, most famously by Bédier (1928), and certain of those critiques still ring true. Classical stemmata still tend to bifurcate, even more so since the advent of cladistic analysis with its binary trees. The situation where a manuscript text is copied from multiple exemplars or influenced by an oral tradition is still called “contamination”, reminiscent of an unfortunate disease, and is still generally regarded as a block to further analysis even when it is suggested as a possible means to explain away puzzling textual evidence. If stemmatology is ever to be accepted as more than an idealized justification for preferring the reading that appeals most to the editor, it must be reinvented, grounded this time in a theoretical framework more rigorous (and more falsifiable, in the sense of the scientific method) than intuition and prejudices.

Even thirty years ago, such a proposal for a “new stemmatology” would have been dismissed as utterly impractical; it would take more than the lifetime of a scholar to consider every piece of evidence, to find a probability and a weighting for each comma shared between multiple witnesses to a text.⁵ Even up to the present, as the field of computer-assisted stemmatology has gained momentum, the implicit assumption remains that some variants are more “relationship-revealing” than others, and that scholars should restrict their attention to those considered *a priori* to meet some criterion for transmissibility. I would argue now that this approach too looks back into the capabilities of the past, rather than ahead to those of the present and future, and unnecessarily constrains the result to be that which we were already likely to find based on our intuition and prejudices. We should instead seek to use *all* the information available to us; we should be attempting to find out if some of those commas are significant after all. I do not claim that the attempt will meet with certain success, but given the volume of mediaeval texts that do after all survive, and given the fact that circumstantial and external information also survives about the manner in which some of them were copied, it can only be a matter of time before a corpus of empirical evidence about text transmission begins to surface.⁶

⁵ An outright dismissal of the idea can be found in the controversial appendix to Timpanaro’s history of Lachmannian method (2005, 182); Salemans (2000, 8–10) also justifies his use of deductive reasoning in terms of the impracticality of amassing enough data for inductive reasoning.

⁶ The “Tree of Texts” project at KU Leuven (2010–12), led by Caroline Macé, aims to lay the methodological foundations for just such an accumulation of empirical data and the creation of a model for mediaeval text transmission.

This is the true strength of digital philology, a strength that neither the old nor the new can match. We can generate an enormous quantity of sheer data through digital methods; the level of detail in transcription and collation that was inconceivable during Lachmann's career is now simply tedious, sometimes daunting, but entirely attainable and becoming easier every day. Freed from the constraint of limiting ourselves to a practical level of text variation, we may also begin to free ourselves from the heuristic crutches that have been a feature of text criticism since its inception, and harness the power of raw computation to ask ourselves "what if?" What if some of our heuristics are wrong? What if a scholar finds a set of features of variants that were previously thought insignificant, and uses these to detect horizontal transmission in certain texts, and radically overturns our ideas of how twelfth-century historical chronicles were adapted for the seventeenth? What if the availability of full transcriptions, lexically tagged and morphologically analyzed, of Syrian, Cypriot and Catalan poetry of the fourteenth century provides evidence of cultural transmission never before imagined?

I truly believe this to be the future of text research, and it is tremendously exciting; but it is also a test for our field. Will we collectively shift from methods that are almost purely manual to embrace the capabilities that the digital world affords us? Will we learn to look at our texts in new ways, free of what we think we already know? Far better that we do, for this is the only way that we can continue to learn from them.

References

- Andrews, Tara L. 2009a. *Prolegomena to a Critical Edition of the Chronicle of Matthew of Edessa, with a Discussion of Computer-Aided Methods Used to Edit the Text*. D.Phil., University of Oxford.
- . 2009b. *Source for do_edit.pl*. http://cpansearch.perl.org/src/AURUM/Text-TEI-Collate-2.1/scripts/do_edit.pl [Accessed 31 March 2012].
- . 2009–12. *nCritic*. <http://byzantini.st/ncritic/collate/> [Accessed 31 March 2012].
- . 2012. *Excerpts from the Chronicle of Matthew of Edessa (Matt'ēos Urhayec'i)*. <http://byzantini.st/ChronicleME/> [Accessed 31 March 2012].
- Andrews, Tara L., et al. 2012. "Shared tools for digitized workflows – a text regularization case study". Paper presented at Interedition Symposium: Scholarly Digital Editions, Tools and Infrastructure, 19 March 2012, Den Haag.
- Baret, Philippe, et al. 2006. "Testing Methods on an Artificially Created Textual Tradition". In Macé, Caroline, Philippe Baret, Andrea Bozzi, et al. (eds.), *The Evolution of Texts: Confronting Stemmatalogical and Genetical Methods*. Pisa; Rome: Istituti Editoriali e Poligrafici Internazionali, pp. 255–83.
- Bédier, Joseph. 1928. "La tradition manuscrite du Lai de l'Ombre. Réflexions sur l'art d'éditer les anciens textes.". *Romania*, 54, pp. 161–96, 321–56.
- Bodard, Gabriel and Juan Garcés. 2009. "Open Source Critical Editions: a rationale". In Deegan, Marilyn and Kathryn Sutherland (eds.), *Text Editing, Print and the Digital World*. Farnham: Ashgate, pp. 84–98.
- Buzzetti, Dino. 2009. "Digital Editions and Text Processing". In Deegan, Marilyn and Kathryn Sutherland (eds.), *Text Editing, Print and the Digital World*. Farnham: Ashgate, pp. 45–61.
- Buzzetti, Dino and Jerome J. McGann. 2006. "Electronic Textual Editing: Critical Editing in a Digital Horizon". In Burnard, Lou, Katherine O'Brien O'Keefe and John Unsworth (eds.), *Electronic Textual Editing*. New York: Modern Language Association of America, pp. 53–73.
- Cerquiglini, Bernard. 1989. *Éloge de la variante : histoire critique de la philologie*. Paris: Éditions du Seuil.
- Dekker, Ronald Haentjens, et al. 2008–2012. *CollateX*. <http://interedition.github.com/microservices/> [Accessed 31 March 2012].

- Driscoll, Matthew J. 2010. "The Words on the Page: Thoughts on Philology, Old and New". In Quinn, Judy and Emily Lethbridge (eds.), *Creating the medieval saga: Versions, variability, and editorial interpretations of Old Norse saga literature*. Odense: University Press of Southern Denmark, pp. 85–102.
- Ginther, Jim, et al. 2009–2012. *T-PEN: Transcription for Paleographical and Editorial Notation*. <http://t-pen.org/TPEN/> [Accessed 15 May 2012].
- Greetham, D. C. 1992. *Textual Scholarship: an Introduction*. New York: Garland Publishing.
- Hagel, Stefan. 1997–2012. *Classical Text Editor*. <http://www.oeaw.ac.at/kvk/cte/> [Accessed 31 March 2012].
- Interedition. 2011. *Würzburg TEI 102011 Participants - Interedition Wiki*. http://www.interedition.eu/wiki/index.php/WürzburgTEI102011_Participants [Accessed 31 March 2012].
- . 2012. *Interedition: Powered by Interoperability*. <http://www.interedition.eu/> [Accessed 31 March 2012].
- Maas, Paul. 1957. *Textkritik*. Leipzig: Teubner.
- Moretti, Franco. 2005. *Graphs, Maps, Trees: Abstract Models for a Literary Theory*. New York: Verso.
- Performant Software. n.d. *Juxta: Collation Software for Scholars*. <http://www.juxtasoftware.org/> [Accessed 31 March 2012].
- Pierazzo, Elena. 2011. "A rationale of digital documentary editions". *Literary and Linguistic Computing*, 26, pp. 463–77.
- Robinson, Peter. 1989. "The Collation and Textual Criticism of Icelandic Manuscripts (1): Collation". *Literary and Linguistic Computing*, 4, pp. 99–105.
- . 2004. "Making electronic editions and the fascination of what is difficult". *Linguistica Computazionale*, 20–21, pp. 415–38.
- . 2009. "What text really is not, and why editors have to learn to swim". *Literary and Linguistic Computing*, 24, pp. 41–52.
- Rosselli del Turco, Roberto. 2011. "After the editing is done: Designing a Graphic User Interface for digital editions". *Digital Medievalist*, 7 <http://digitalmedievalist.org/journal/7/rosselliDelTurco/> [Accessed 31 March 2012].
- Salemans, Ben J. P. 2000. *Building Stemmas with the Computer in a Cladistic, Neo-Lachmannian, Way: The Case of Fourteen Text Versions of Lanseloet van Denemerken*. Ph.D., Katholieke Universiteit Nijmegen.
- Schmidt, Desmond. 2011. "TEI: clean, unclean & document interchange?". *Humanist Discussion Group*, 25.190 (26 July). <http://lists.digitalhumanities.org/pipermail/humanist/2011-July/002333.html> [Accessed 31 March 2012].
- Schmidt, Desmond and R. Colomb. 2009. "A data structure for representing multi-version texts online". *International Journal of Human-Computer Studies*, 67, pp. 497–514.
- Timney, Meagan, et al. 2010. "Rethinking the Digital Scholarly Edition". https://docs.google.com/document/d/1OXflh4AwaCpvwsX1ha8nnGmsHlZmjZAq_t-TaBWWVus/edit [Accessed 31 March 2012].
- Timpanaro, Sebastiano. 2005. *The genesis of Lachmann's method*. Chicago and London: University of Chicago Press.
- Van Dalen-Oskam, Karina and Joris van Zundert. 2007. "Delta for Middle Dutch: Author and copyist distinction in "Walewein"". *Literary and Linguistic Computing*, 22, pp. 345–62.
- Van Zundert, Joris and Peter Boot. 2011. ""The Digital Edition 2.0 and the Digital Library: Services, not Resources"". *Digitale Edition und Forschungsbibliothek (Bibliothek und Wissenschaft)*, 44, pp. 141–52.
- Wattel, Evert and Margot van Mulken. 1996. "Weighted Formal Support of a Pedigree". In van Reenen, Pieter Th., Margot van Mulken and J. W. Dyk (eds.), *Studies in Stemmatology*. Amsterdam; Philadelphia: Benjamins, pp. 135–68.

- West, Martin L. 1973. *Textual Criticism and Editorial Technique: Applicable to Greek and Latin Texts*. Stuttgart: B. G. Teubner.
- Wüthrich, Markus, et al. 2009. "Language Model Integration for the Recognition of Handwritten Medieval Documents". In *IDCAR 2009: Proceedings of the 2009 10th International Conference on Document Analysis and Recognition*. Los Alamitos, CA: IEEE Computer Society, pp. 211–15.