CLW 9 · CAHIER VOOR LITERATUURWETENSCHAP

GENREHYBRIDITEIT IN DE LITERATUUR

HYBRIDATIONS GÉNÉRIQUES EN RÉGIME LITTÉRAIRE

Reindert Dhondt & David Martens (red.)

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BIJDRAGE BUITEN HET THEMA

PHILOLOGY AND THE DIGITAL WRITING PROCESS

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While contemporary authors have widely shifted from pen and scratch paper to word processors, questions have arised whether there is still a material basis for textual criticism, historical critical editions and the French critique génétique. The whole field of study has been written off by scholars like Wolf Kittler, Jacques Derrida and Marita Mathijsen, stating that writing with a text processor leaves 'no trace [...] of the [author's] revision', rendering any inquiry of the avant-texte impossible, as it allegedly cannot be reconstructed 'in a material sense':

> So, if it is possible to delete the once written letter at any time, there will be no trace left of the [author's] revisions. [...] Even if [an author] had the idea to preserve all of his deleted passages on a separate storage medium, there would be little left to do for the scholarly editors. Because a printout of these passages in chronological order would already be the critical edition. Which leaves the question open whether philology and literature as we knew them will survive this technology.
> (Kittler 1991: 235)

> With the computer, everything is rapid and so easy; you get to thinking that you can go on revising forever. writing is so amazingly fast and easy. [...] During this same time you no longer retain the slightest visible or objective trace of corrections made the day before. [...] Previously, erasures and added words left a sort of scar on the paper or a visible image in the memory. There was a temporal resistance, a thickness in the duration of the erasure. But now everything negative is drowned, deleted; it evaporates immediately, sometimes from one instant to the next. [...] Another provocation for "genetic criticism", as it is called, which has developed around drafts, multiple versions, proofs, and the like.
> (Derrida 1996: 24)

> Manuscripts teach us that a text is the effect of a working process, made visible in the living memory of the manuscript. The généticiens defend what they call the third dimension of the text, which is to be found in the nonlinear manuscript. [...] [But this] is no longer applicable to [contemporary] authors, as they work in completely different dimensions. Genetic study of a text has become impossible. [...] The Sofortkorrektur [i.e. instant revision] and the ['avant texte'] will become categories which are no longer possible to reconstruct in a material sense, [as they] leave no traces.
> (Mathijsen 2009: 235)

The selected quotes formulate concerns of humanist scholars about the recording, transmission, stability and relevance of the historical born-digital record that would form the material basis of historical-critical textual scholarship and genetic

editions. The from a current digital forensic point of view inaccurate statements date back seven, 20 and 25 years – they document historical stages of reasoning about the materiality of the born-digital record and its transmission from the perspective of routined users with a professional background in paper-based analytical bibliography, philology including critical manuscript and typescript analysis, textual criticism and scholarly editing. It is remarkable that the editor of Franz Kafka's published works, Wolf Kittler (Kittler 1990, Kafka 1996), already thinks about the transmission of born-digital drafts self-archived by an author on separate storage media, about different material qualities of transmission and the effect of this specific type of materiality of the born-digital record on the structure and purpose of the historical-critical edition. A few years later, Derrida's interview statement in *The Word Processor* about writing on his 'small Mac' computer reflects not only his self-observation of a different rhythm, a different temporal resistance of the digital writing process compared to writing by hand or with a typewriter and a different linearity and dependency of the user on the function of the word processor, but also his immersion into the 'invisible' graphical user interface of his Macintosh computer (Emerson 2014: 25, passim). As Wolf Kittler, his personal experience with the word processor made him believe that a deleted character, word or text passage in this theatrical 'scene' of writing 'evaporates immediately, sometimes from one instant to the next' without 'the slightest visible or objective trace of corrections made the day before' – and at the same time, as Kittler, he also sees the phenomenon of digital self-archiving when he mentions authors who fetishize first versions of an essay, a novel or a poem that they keep on a floppy disk (Kittler 1991: 29). Marita Mathijsen, specialist for scholarly editing of 19th century Dutch literature, referred to the same 'provocation for "genetic criticism"' when she warned 13 years later that 'genetic study [...] bec[a]me impossible' as the digital writing process 'leave[s] no traces', arguing that for contemporary authors, the three spacio-temporal dimensions of the writing process that the *critique génétique* identified (Hay 1984) have been replaced by differently aligned ensembles of digital writing tools and online publishing channels ('completely different dimensions'). The specific materiality of the born-digital record of the literary writing process becomes indeed a categorial problem for philology, as Christian Benne indicates when he reconstructs the history of the literary manuscript as an object of study (Benne 2015: 635, passim). In his lecture series *Bitstreams. The Future of Digital Literary Heritage* at the KISLAK center at UPenn Libraries, Matthew Kirschenbaum refutes the idea of the primary record defined as physical object as '[e]lectronic texts, files, feeds and transmissions of all sorts' – Kirschenbaum mentions blogs, tweets, facebook, youtube and instagram – 'are also indisputably primary records.' (Kirschenbaum 2016b: 0:24:50). These primary records propagate through system levels and networks by copying and multiplication of bits, he argues, which, on the one hand, result in the relevance of different bibliographic aspects such as encoding errors and and metadata such as timestamps and geolocation data, but also in a funda-

mental instability of these born-digital records 'in the sense that they rest upon the foundations of other data, what is quite literally in the trade known as metadata, in order to be legible under the appropriate computational regiments, which I have previously termed as formal materiality' (Kirschenbaum 2016b: 0:22:40; 0:30:05).

The three historical statements by Kittler, Derrida and Mathijsen discussed above have to be corrected from today's perspective: digital forensic tools and methods enable the digital philologist to reconstruct born-digital *dossiers génétiques*. In many cases, large amounts of deleted textual draft versions can be recovered from archived storage media, depending on the specific material transmission and historical technological setup. The analysis of the 'forensic materiality' of the born digital record, Kirschenbaum's antonym to the mentioned 'formal materiality' (2008), requires different skills. The 'e-palaeographer' (Kirschenbaum 2016b: 00:43:54, citing a term coined by Robert J. Morris) must be 'conversant in the antiquarian cants of vanished operating systems, file systems, file formats, and data structures, as well as specialized tools like hex viewers, file carvers, and emulators' in order to 'carefully reconstruct the composition process of works [from an author's] hard drives' (Kirschenbaum 2016a: 232-233).

The present article will give an introduction to some of these digital forensic recovery and analytical methods against the backdrop of genetic criticism, scholarly editing and philology. It will discuss methodological implications of the born-digital record's specific historical materiality for our understanding of fundamental concepts such as 'document', 'trace', 'variant' / 'version' and the materiality of the literary writing process itself.

The born-digital dossier génétique: the digital forensic perspective and distributed digital materiality

Since the beginning of the millennium, early theoretical advances and approaches to born-digital genetic criticism have been made in the context of the French *critique génétique* (Lebrave 2006, Hay 2006), the German project *Zur Genealogie des Schreibens* (Giuriato, Stingelin and Zanetti 2006, Stingelin and Thiele 2009), as well as in media studies, history, bibliography (Gitelman 2006) and archival studies. In his recent book *Track Changes. A Literary History of Text Processing* (2016a), Matthew Kirschenbaum gives a wide-ranging account of the history of literary text processing, ranging from Charles Bukowski, Stephen King and Isaak Asimov via Max Barry up until today. Other important genetic studies work with born-digital material self-archived by donors (Vauthier 2014a, 2014b, 2016, Crombez and Cassiers 2015, Wilken 2014).

In the wake of Kirschenbaum's *Mechanisms. New Media and the Forensic Imagination* (2008), his subsequent publications (Redwine et al. 2010, Kirschenbaum 2011, 2013, 2014, 2016a) and the work of Luciana Duranti (2009, 2010),

Jeremy Leighton John (2012), Susan Thomas (2007, Redwine et al. 2010), Doug Reside (2011, 2012, 2014a, 2014b, Kirschenbaum and Reside 2013) and many others in international projects on digital preservation, personal digital archives (e.g. PLANETS, NESTOR, InterPARES and PREMIS, Redwine 2015, PDA 2017 conference), forensic imaging has become one of the standard practices for long-term preservation of storage devices in archives, libraries and memory institutions (Redwine et al. 2010, John 2012, Dappert et al. 2016). From the point of view of the *critique génétique*, original hard drives (and forensic images of these) are especially interesting, as they are likely to contain draft snapshots and traces of writing processes preserved in digital documents, recoverable temporary files, residuals of deleted files and metadata in numerous locations. This has been demonstrated at rather limited, exemplary scale in several publications, for floppy-disk based assets as well as for hard drives (Ries 2010a, Reside 2011, Kirschenbaum and Reside 2013, Kirschenbaum 2014, Ries 2016).

Bitstream-preserving images are bit-precise representations of the original physical medium's data structure which are therefore suitable for longerm preservation as well as digital forensic analysis and data recovery. Forensic images ensure fixity of the evidence, can be authenticated and cited with hash values, mounted in other operating systems or analyzed with forensic tools. They may even serve as a basis for virtualisation. Well-known examples are the emulations of Salman Rushdie's *Mac Performa 5400/180* (Rockmore 2014) and Vilém Flusser's *Apple Macintosh* (bwFLA 1992-2016, collaborating with iMAL, Resurrection Lab, Brussels).

The digital document and the digital trace are not a self-sufficient piece of evidence, as they have to be read against the backdrop of their original system context, a specific historical ensemble of hardware, operating system, application and usage data. Files, textual data, metadata and contextual information relevant for the born digital *dossier génétique* are to be found distributed throughout several layers of the archived system. The technical interdependence of trace and context in digital forensic analysis can be described as the 'distributed' and 'layered materiality' of the digital historical record. The terms quoted refer to Jean-Francois Blanchettes *A Material History of Bits* (2011), where he analyses the historical role of modularisation, layered stack design and distributed computing for the development of infrastructures as abstractions that have the purpose to 'reliev[e] users and programmers from the specific constraints of the material resources of computation', but always come with '*efficiency trade-offs* their abstraction requires' (Blanchette 2011: 1042). These abstractions, however, leave their imprint in system design, mechanisms and, ultimately, in the digital forensic record. Johanna Drucker gives a compelling summary of the idea of *distributed digital materiality*, establishing a link with 'forensic approaches' (Drucker 2013: par. 21):

> Distributed materiality focuses on the complex of interdependencies on which any digital artefact depends for its basic existence. In a distributed approach, any digital "entity" is

dependent on servers, networks, software, hosting environments and the relations among them just as surely as a biological entity depends upon atmospheric and climatic conditions. An extension of forensic approaches, the distributed concept requires attention to the many layers and relationships of hardware, software, bandwidth, processing, storage, memory, and other factors. [...] We can understand all textual and material production in the same way — as dependent upon interrelated systems and conditions.

Taking a similar angle, Jeremy Leighton John stresses the role of the 'multi-evidential perspective' in digital forensics in the advisory for 'Customary Practice for Memory Institutions' of his guide *Digital Forensics and Preservation* (John 2012: 43):

> Context and Integration: Forensics and the curatorship and scholarship of personal archives both hinge on an understanding of the value of context. In forensics this is known as the multi-evidential perspective, where a number of diverse extant traces are examined and interpreted in order to retrospectively infer an ancestral state or event. [...]

John derives the importance of this principle for forensics from the 'scale, complexity and intertwining levels of abstraction that exist in modern computing systems' through which 'small, seemingly independent, extant traces serve to corroborate each other making it possible to build up a picture of past events or objects' (John 2012: 13). For example, determining the correct reference time of a system, for instance, can be a 'labyrinthine task' which requires a multi-evidential approach involving distributed resources 'in an approach that is strongly reminiscent of scholarly methods of textual analysis' (John 2012: 13).

The concept of *distributed digital materiality* and the multi-evidential perspective formulate the interdependence of the digital object or trace with its specific historical computing context from a forensic as well as a philological point of view. Copies and fragments of digital objects, as well as metadata have been propagated throughout the system and connected network during the writing process, leaving traces that might not have been effectively erased by other, subsequent system processes over time. Variant draft material produced during the writing process is therefore potentially highly distributed throughout an operating system, its several layers and locations, formally determined by the specific process stage. Variant draft snapshots might be found within the original document file itself or in temporary or autobackup files and even in trashbin folders or on separate, protected system snapshot partitions or backup media.

It is important to understand that the specific material distribution, transmission and forensic access method for each of these types of traces on media curated in an archive are highly version-specific and in itself a matter of the history of computing. For instance, *fast save* feature artefacts can (mainly) be found in digital documents and temporary files created by pre-2007 versions of Microsoft Word that worked based on the .doc binary format. Deleted and variant text passages of a document may still be embedded in a document's or temporary file's data stream in clear text, sometimes text may be garbled with other data patterns.
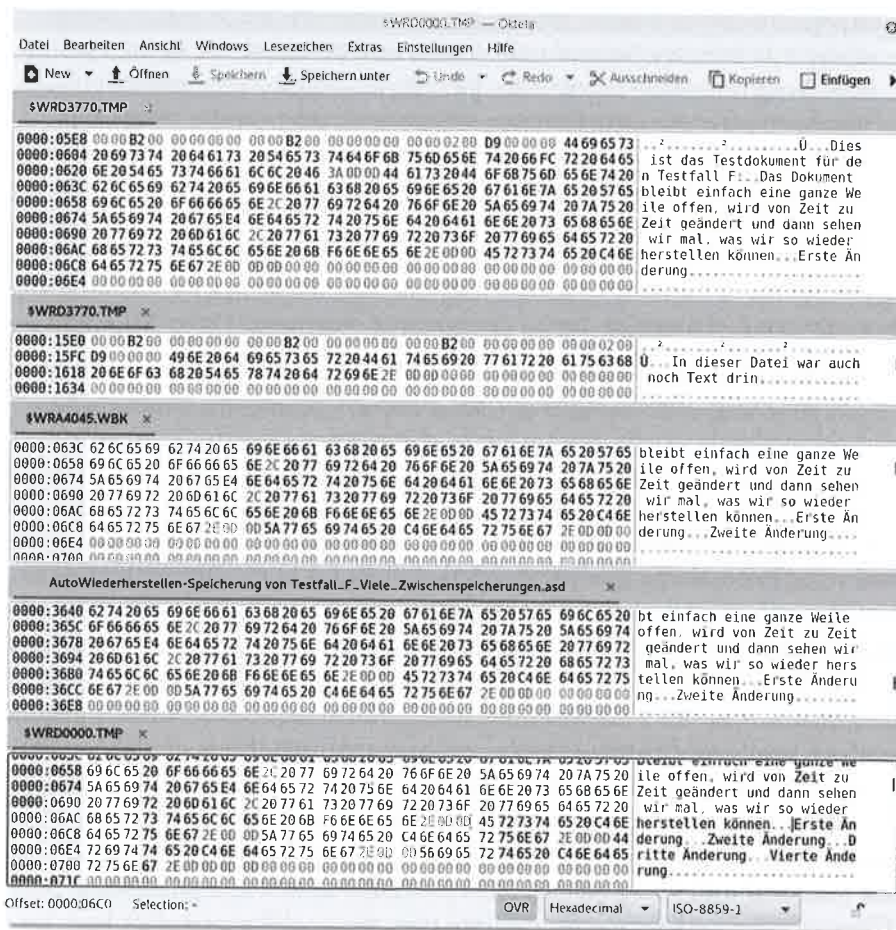
Fig. 1: Recovered temporary files from a writing process experiment in Microsoft Word (2000), TMP, WBK, asd files, viewed in a hex editor (Okteta).

Typical file names of such temporary data are [~WRD[…].tmp] (document), [~WRL[…].tmp] (clipboard), [~WRA[…].wbk] (automatic backup), [~WRS[…].tmp] (scratch file) and [~WRA[…].tmp] or [[…].asd] (autorecovery file), according to Microsoft's *Description of how Word creates temporary files* (2017). Fig. 1 shows the traces of a short writing experiment under controlled conditions, where a Microsoft Word 2000 word processor created temporary files, autorecovery and backup files ([~WRD[…].tmp], [~WRA[…].wbk], [[…].asd]) over a short editing cycle that were recoverable with forensic means. One of the temporary files ([~WRD3770.tmp]) even preserved a text passage that was deleted before the file was saved to the hard disk with a file name for the first time – this file actually preserved multiple variant snapshots of the text with the *fastsave* mechanism. If e-palaeographers analyse the digital record of editing cycles performed on more recent version of Microsoft Word, after the switch to the

Office Open XML format (docx) in 2007, they will find that the structure of files such as document.xml and footnotes.xml contained in all docx file ZIP containers embeds *RSID-tags* (XML revision identifier tags) which reveal the chronological, genetic layering of the document. (Garfinkel and Migletz 2009, Fu, Sun, Liu et al. 2011, Ries 2010a: 162-169, mention of *RSID-tags* also Redwine et al. 2010: 46). Some temporary files created by Word-installations of this generation are written in ZIP-compressed XML-based formats, other in updated versions of the older binary format, which has implications for file recovery and analysis (Garfinkel and Migletz 2009).

Thomas Kling's Herodotus-chapter in 'Projekt Vorzeitbelebung'

As an example for the spread of traces throughout an archived system, I would like to introduce a selection of traces from the born-digital dossier génétique of German poet Thomas Kling's *Projekt Vorzeitbelebung* (Project Prehistory Revival), a collection of short essays published in his last book *Auswertung der Flugdaten* (Flight Data Analysis, 2005).

Thomas Kling was one of the most renowned German avant garde poets from the 1980ies up till today. His work was closely related to the poetics of the *Vienna Group* of poets (H.C. Artmann, Konrad Bayer, Oswald Wiener, Ernst Jandl, Friederike Mayröcker and others). Among Kling's friends and collaborators were not only poets, publishers and critics such as Kurt Aebli, Marcel Beyer, Christian Döring, Aris Fioretos, Tobias Lehmkuhl, Norbert Wehr, Hubert Winkels, to name but a few, he often performed with the musician Frank Köllges, worked and published together with his life partner and visual artist Ute Langanky. Kling had an impressive network amongst the lively visual arts scene in Cologne (Wix 2017). In recent research, the genetic criticism approach has been applied to Thomas Kling's poems *manhattan mundraum* and *manhattan mundraum zwei* by Gabriele Wix (Wix 2016). It is this research perspective to which I add digital forensics and the examonation of born-digital documents and objects as primary sources.

The digital documents, residual and recoverable temporary files that belong to the digital record of the writing process of *Projekt Vorzeitbelebung* are disseminated across the system- and data-partitions of two hard drives preserved in the Thomas Kling Archive, Stiftung Insel Hombroich. The reason for this distribution of the digital forensic record is partly due to hardware failure: Thomas Kling had migrated to a new Windows XP computer[1] during the early stages of his work on *Projekt Vorzeitbelebung* after the hard drive of his Windows 95/98-based laptop broke

1. Hard drive, Thomas Kling Archive: MIC (Western Digital), Model: IC25N060ATMR04-0, capacity 60gb, 2.5"/SSL, IDE, FAT32/Extd, three partitions. Part No: 08K0634H695550P43, Serial No.: K3JR4NXH. Image hashes (dd): MD5: c2bc72b9a6eb2c1a8ce3e025e551b761; SHA1: 3488ea3f5bc6f8 e987ae6d64afa6f35ae3cc16c6; SHA256: 67aa7cb607e86b3593e16efc7d24671805fb007538013d14863 6987338ef6c74.

down in June 2004.[2] This hardware defect interrupted the author's work on *Projekt Vorzeitbelebung* and *Auswertung der Flugdaten*, setting him back to his backed up document versions during a time period in which his health condition deteriorated. The data partition of the defective hard drive has been later recovered and imaged in a forensic laboratory in 2012 for the Thomas Kling Archive, preserving substantial amounts of recoverable data on bitstream-preserving images, amongst which early stages of *Projekt Vorzeitbelebung* and *Auswertung der Flugdaten*.
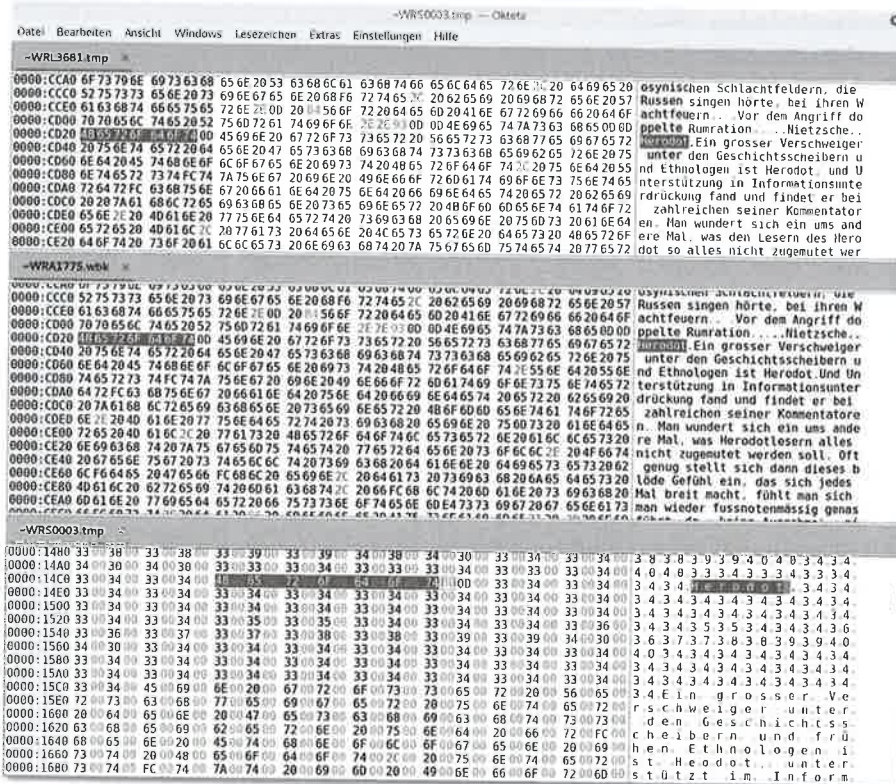

Fig. 2: The start of the *Herodot*-chapter of *Projekt Vorzeitbelebung* in the files [~WRL3681.tmp], [~WRA1775.wbk] and [~WRS0003.tmp], viewed in a hex editor (Okteta), title highlighted.

A closer look at some born-digital draft versions of the last short essay of *Projekt Vorzeitbelebung*, titled *Herodot* (Herodotus), on the hard drive of the Windows XP-based laptop illustrates the difference of file formats and the dissemination of draft versions across the system. The automatically generated temporary and backup files [~WRL3681.tmp] (clipboard),[3] [~WRA1775.wbk] (autobackup)[4] and [~WRS0003.tmp] (scratch file)[5] (fig. 2) are located in two different application data and temporary data folders of the local 'documents and settings' path of the system partition, whereas the documents files [Bakchen etc.doc][6] and [Auswertung der Flugdaten.doc][7] are to be found in folders on Kling's private data partition. With the *undelete*-tool included in the forensic tool suite *SleuthKit*, large amounts of temporary files from this respective folder on the data partition can be recovered, as example serves here [_WRL1744.TMP][8] (fig. 3). Furthermore, a file fragment containing a version of the first paragraph of the *Herodot* essay has been recovered from the drive slack (fig. 4).[9]
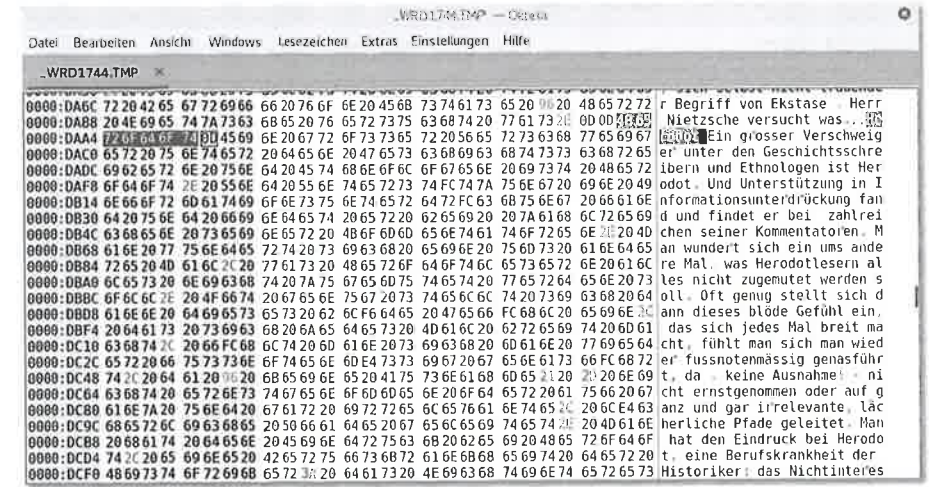

Fig. 3: The start of the *Herodot*-chapter of *Projekt Vorzeitbelebung* in the 'undeleted' file [_WRD1744.TMP], viewed in a hex editor (Okteta), title highlighted.

2. Hard drive, Thomas Kling Archive: Fujitsu MHF2043AT (1999), capacity 4,3gb, 2.5", IDE ATA, FAT32, two partitions. Part No.: CA01758-B940000G, Serial No.: 01223181. The drive was defective, the data partition could be imaged in the forensic lab at Kroll Ontrack. Image hashes (dd): MD5: ca4e6f03244d0d56e5a80b6e8066dd85; SHA1: e3fe2b8b0552865d806ac5e0cb18408582e0e44a; SHA256: 67aba08405ed1f1185cd0281dc60506d827c2ddf31813257852f8abafa077798.

3. File name: [~WRL3681.tmp], Microsoft Word temp file (clipboard); location: hard drive (see footnote 1), path: C://Dokumente und Einstellungen/Thomas Kling/Anwendungsdaten/Word, 105,0 kb (104.960 bytes), MD5 hash: adb0061220bc80fdc9512ac32a3c222d.

4. File name: [~WRA1775.wbk], Microsoft Word temp file (autobackup, autorecovery); location: hard drive (see footnote 1), path: C://Dokumente und Einstellungen/Thomas Kling/Anwendungsdaten/Microsoft/Word, 105,5 kb (105.472 bytes), MD5 hash: d98750dec83c31bc98cfebdc0e026020.

5. File name: [~WRS0003.tmp], Microsoft Word temp file (scratch file); location: hard drive (see footnote 1), path: C://Dokumente und Einstellungen/Thomas Kling/Lokale Einstellungen/Temp, 36,5 kb (36.460 bytes), MD5 hash: 80b5e637832cf56b4700a4af51a00a47.

6. File name: [Bakchen etc.doc], Microsoft Word document file; location: hard drive (see footnote 1), path: D://Neuer Band 2005, 139,8 kB (139.776 Bytes), MD5 hash: 1f767b85299bb1e9c2c46dc82bab8b3d. (Many instances of this file in different versions can be "undeleted" from the forensic image.)

7. File name: [Auswertung der Flugdaten.doc], Microsoft Word document file; location: hard drive (see footnote 1), path: D://AUSWERTUNG DER FLUGDATEN, 212,0 kB (211.968 Bytes), MD5 hash: ab30ec52309210a8155112bd62fc3faf. (Many instances of this file in different versions can be 'undeleted' from the forensic image.)

8. File name: [_WRD1744.TMP], Microsoft Word temp file (document), result of file undelete (probably true positive, multiple non-sequential fragments); location: hard drive (see footnote 1), path: D://Neuer Band 2005, 105,0 kB (104.960 Bytes), MD5 hash: 6be3c47c5ddec96733e7b177822ad551.

9. File fragment, located in file slack on hard drive (see footnote 1). Offset on forensic image: 50271124030.
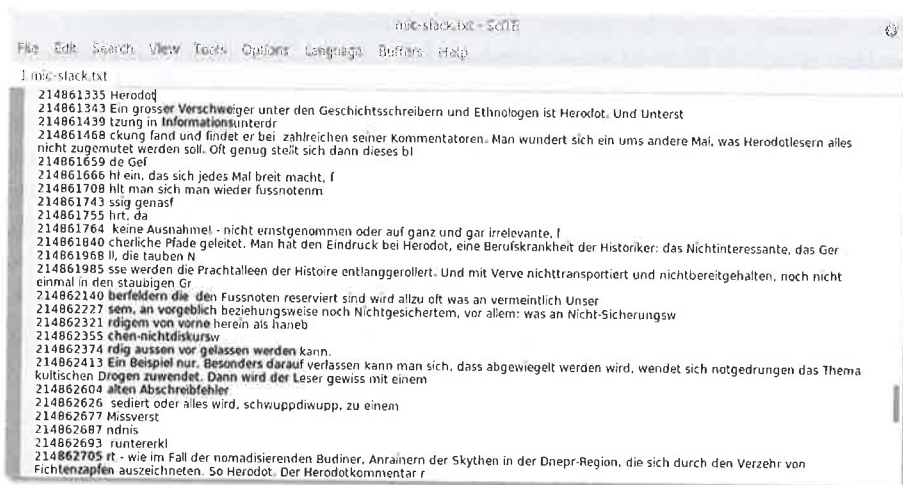
Fig. 4: The start of the *Herodot*-chapter of *Projekt Vorzeitbelebung* in a file fragment found in drive slack viewed in a text editor (SciTe), title highlighted.

The comparison of the extracted textual versions of the passage selected for this article, the first paragraph of *Herodot*, reveal the complete history of this passage, which in the final, printed version reads as follows (Kling 2005: 80):

Herodot	Herodotus
Ein großer Verschweiger unter den Geschichtsschreibern und Ethnologen ist Herodot. Und Unterstützung in Informationsunterdrückung fand und findet er bei zahlreichen seiner Kommentatoren. Man wundert sich ein ums andere Mal, was Herodotlesern nicht alles zugemutet werden soll. Oft genug stellt sich dann dieses blöde Gefühl ein, das sich jedes Mal breitmacht, fühlt man sich man wieder fußnotenmässig genasführt, da -- keine Ausnahme! – nicht ernstgenommen oder auf ganz und gar irrelevante, lächerliche Pfade geleitet. Man hat den Eindruck bei Herodot, einer Berufskrankheit der Historiker beizuwohnen: das Nichtinteressante, das	One great concealer amongst the historiographers and ethnologists is Herodotus. And he found and still finds support for his information concealment from many of his commentators. Every once in a while one wonders what readers of Herodotus are expected to put up with. Often enough the reader gets this unpleasant feeling that one always has when being given the runaround in footnotes, when – not an exception! – one is not being taken seriously or led down entirely irrelevant, ludicrous paths. Reading Herodotus, one gets the impression to witness the effect of an occupational disease: the uninteresting, the debris, the deaf nuts are paraded

Geröll, die tauben Nüsse werden die Prachtalleen der Histoire, dann der Posthistoire, entlanggerollert, mit Verve werden sie *nichttransportiert* und *nichtbereitgehalten*, noch nicht einmal in den staubigen Gräberfeldern, die den Fussnoten reserviert sind; allzu oft wird außen vor gelassen, was an vermeintlich Unseriösem, an vorgeblich beziehungsweise noch Nichtgesichertem, vor allem: was an *Nicht-Sicherungswürdigem* von vorneherein als hanebüchen-nichtdiskurswürdig gilt.

along the boulevards of the histoire, then the posthistoire, with verve they are *not-transmitted* and *not-preserved*, not even in the dusty burial grounds that are reserved for the footnotes; all too often is exluded what is regarded as dubious, what is allegedly not or just not yet ascertained, and most of all: things that a priori seem too absurd to be worth preservation or discussion.

The comparison of the extracted texts shows that the versions of this particular passage in the document files [Bakchen etc.doc], [Auswertung der Flugdaten.doc], the recovered temporary file [_WRD1744.TMP] and the drive slack fragment are identical – Kling worked on different passages of *Auswertung der Flugdaten* during this time, and these are where the versioned content these files differs. The content of the files [~WRL3681.tmp], [~WRA1775.wbk], [Bakchen etc.doc] and the printed text show best the development of the text, changes are highlighted:

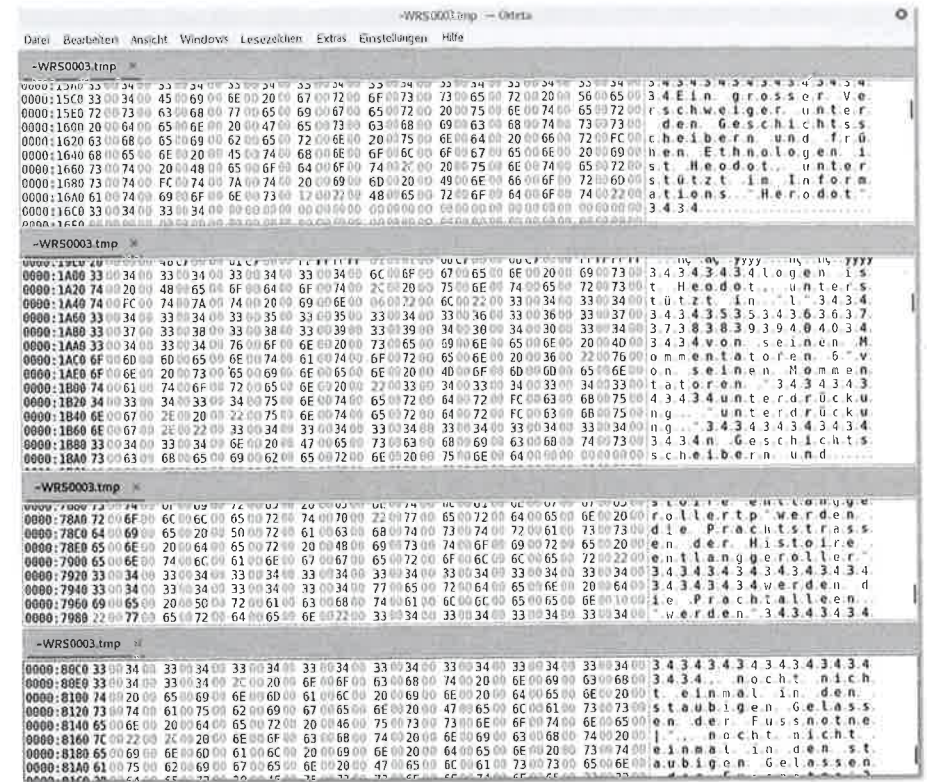| [~WRL3681.tmp]	[~WRA1775.wbk]	[Bakchen etc.doc] ([Auswertung der Flugdaten.doc], [_WRD1744.TMP], drive slack fragment)	*Auswertung der Flugdaten* (2005)
Herodot	Herodot	Herodot	Herodot
Ein grosser Verschweiger unter den Geschichts- schreibern und Ethnolo- gen ist Herodot, und Un- terstützung in Informa- tionsunterdrückung fand und findet er bei zahl- reichen seiner Kommen- tatoren. Man wundert sich ein ums andere Mal, was den Lesern des Herodot so alles nicht zugemutet werden soll. Immer steht dann dies zu vermuten, ein blödes Gefühl, das sich da jedes Mal breit macht, fühlt man sich man wieder Fussnotenmässig genas- führt oder auf ganz und gar irrelevante Pfade ge- leitet.nicht interessante immer an Unserösem, Nichtgesichertem, vor al- lem: Nicht-Sicherungs- würdigem! von vorne he- rein als Hanebüchenem vom akademischen Dis- kurs ausgeschlossenen	Ein grosser Verschweiger unter den Geschichts- schreibern und Ethnolo- gen ist Herodot. Und Un- terstützung in Informa- tionsunterdrückung fand und findet er bei zahl- reichen seiner Kommen- tatoren. Man wundert sich ein ums andere Mal, was Herodotlesern alles nicht zugemutet werden soll. Oft genug stellt sich dann dieses blöde Gefühl ein, das sich jedes Mal breit macht, fühlt man sich man wieder fussnoten- mässig genasführt, da - keine Ausnahme! - nicht ernstgenommen oder auf ganz und gar irrelevante, lächerliche Pfade geleitet. Man hat den Eindruck bei Herodot, eine Berufs- krankheit der Historiker: das Nichtinteressante, das Geröll, die tauben Nüsse werden die Pracht- alleen der Histoire ent- langgerollert. Und mit Verve nichttransportiert und nichtbereitgehalten noch nicht einmal in den staubigen Gräberfeldern die den Fussnoten reser- viert sind wird immer an Unserösem, Nichtgesi- chertem, vor allem; Nicht- Sicherungswürdigem! von vorne herein als Hanebü- chenem vom akademi- schen Diskurs ausge- schlossenen	Ein grosser Verschweiger unter den Geschichts- schreibern und Ethnolo- gen ist Herodot. Und Un- terstützung in Informa- tionsunterdrückung fand und findet er bei zahlrei- chen seiner Kommentato- ren. Man wundert sich ein ums andere Mal, was He- rodotlesern alles nicht zu- gemutet werden soll. Oft genug stellt sich dann die- ses blöde Gefühl ein, das sich jedes Mal breit macht, fühlt man sich man wieder fussnotenmässig genas- führt, da - keine Ausnah- me! - nicht ernstgenom- men oder auf ganz und gar irrelevante, lächerliche Pfade geleitet. Man hat den Eindruck bei Herodot, eine Berufskrankheit der Historiker; das Nichtinte- ressante, das Geröll, die tauben Nüsse werden die Prachtalleen der Histoire entlanggerollert. Und mit Verve nichttransportiert und nichtbereitgehalten, noch nicht einmal in den staubigen Gräberfeldern die den Fussnoten reser- viert sind wird allzu oft was an vermeintlich Un- serösem, an vorgeblich beziehungsweise noch Nichtgesichertem, vor al- lem: was an Nicht-Siche- rungswürdigem von vorne herein als hanebüchen- nichtdiskurswürdig aus- sen vor gelassen werden kann.	Ein großer Verschweiger unter den Geschichts- schreibern und Ethnolo- gen ist Herodot. Und Un- terstützung in Informa- tionsunterdrückung fand und findet er bei zahlrei- chen seiner Kommenta- toren. Man wundert sich ein ums andere Mal, was Herodotlesern nicht alles zugemutet werden soll. Oft genug stellt sich dann dieses blöde Gefühl ein, das sich jedes Mal breit- macht, fühlt man sich man wieder fußnotenmäßig genasführt, da – keine Ausnahme! - nicht ernst- genommen oder auf ganz und gar irrelevante, lä- cherliche Pfade geleitet. Man hat den Eindruck bei Herodot, einer Berufs- krankheit der Historiker beizuwohnen: das Nicht- interessante, das Geröll, die tauben Nüsse werden die Prachtalleen der His- toire, dann der Posthis- toire, entlanggerollert, mit Verve werden sie *nicht- transportiert* und *nichtbe- reitgehalten*, noch nicht einmal in den staubigen Gräberfeldern, die den Fußnoten reserviert sind; allzu oft wird außen vor gelassen, was an vermeint- lich Unserösem, an vor- geblich beziehungsweise noch Nichtgesichertem, vor allem: was an *Nicht-Si- cherungswürdigem* von vornenerein als hanebü- chen-nichtdiskurswürdig gilt.

Fig. 5: Four passages with draft versions of the *Herodot*-chapter's first paragraph in [~WRS0003.tmp], viewed in a hex editor (Okteta).

Of specific interest is the 'scratch file' [~WRS0003.tmp] (fig. 5) on the system partition, not included in this synopsis, which contains an almost complete pro- tocol of the first writing phase of this paragraph in the form of text additions and textual variants from the very first written line on to a point of time between [~WRL3681.tmp] and [~WRA1775.wbk]. The text fragments in this scratch file, garbled with a '.' character (hex: '00') between the letters, are ordered chronolog- ically. After extraction of the fragments, a minute philological reconstruction of the editing cycle is possible. For want of a digital, dynamic interface that would represent the reconstruction in a more accessible way, the following integral syn- opsis of the paragraph's editing process as recorded in [~WRS0003.tmp] encodes the identifyable genetic layers, including editing phases as well as revision of typ- ing errors, as phase numbers from 1 to 35. Printed in black letters is the text that can be reconstructed as the last state that the file recorded, printed in grey deleted passages:

[1]Herodot

Ein grosser Verschweiger unter den Geschichtsscheibern und
[¹frühen|¹⁷⁽⁾] Ethnologen ist He¹⁷[r]odot[¹,|¹⁷.] unterstützt
[[¹i[¹m|²n] ¹informations²unterdrückung[³darin]|⁵[[⁵u|¹⁷U]nd
Unterstützung] ⁴in Informationsunterdrückung] [²von seinen[⁶fand
und findet er bei] ⁴[zahlreichen] ⁵[seiner] [¹M|⁴K]ommentatoren.
⁶Man wundert sich ein ums andere Mal, was
[[⁶den[¹⁸seinen]⁶L|¹⁹Herodot[]esern ¹⁹⁽⁾[des H[⁶t|⁷e]⁷rodot [⁷d[⁶s]o]
alles nicht zugemutet werden soll. ¹⁵[[¹⁵Immer steht dann dies zu
vermuten, ein blödes]¹⁹Oft genug stellt sich das blöde] Gefühl
¹⁹[ein], das sich da jedes Mal breit macht, fühlt man sich man
wieder [¹⁵F|¹⁵f]ussnotenmässig genasführt¹⁹[,²⁰[da [²⁰nicht selten
gerade]²¹- keine Ausn[²¹ha[²²ah]me! -]] nicht ernstgenommen]
oder auf [¹⁵nicht interessante[¹⁵ganz und gar irrelevante
²³[, lächerliche] Pfade geleitet⁽⁹[T]].] ²³[Man hat den Eindruck bei
Herodot: ²⁵[²⁶[,]eine [²⁶b|²⁷B]erufskrankheit der Hist²⁷⁽⁾[r]oriker
²⁷⁽⁾[P]] [⁹das [²³P|²⁴N]²⁸ichtinteressante ²⁷⁽⁾[wird]] ³⁷[, das Geröll, die
tauben Nüsse [²⁷werden]²⁹wird] die Pracht[²⁷strassen[²⁹alleen]
der Histoire entlanggerollert] ³⁰[mitVerve
nicht]transportiert³⁴[[²⁴,|³⁴und] nichtbereitgehalten]]⁹,]³⁰und
noch³³⁴[i] nicht einmal in den staubigen [³⁰Gelassen
der]³²Gräberfeldern die den] Fussnot[³⁰ne]³¹en] ³²[reserviert
sind.]]] ⁸Vermutlich immer an [⁹u]¹³U]nserösem, [⁹n|¹²N]icht
[⁹_]¹⁴⁽⁾]gesichert[⁹etem|¹⁵em], ¹¹[vor allem: [¹¹n|¹⁴N]icht-
Sicherungswürdigem!] von vorne herein als Hanebüchen
[⁹o|¹⁵V]om akademischen <[⁹d|¹⁰D]iskurs ausgeschlossenen

	¹Start of writing phase 1
	⁷[Insertion in phase 7]
	Replacing [²¹text[²⁷paragraph]
	¹⁹⁽⁾[Deletion] in phase 19

It has to be noted that although the relative, layered sequence of edits can be determined as shown here, due to textual fragmentation, it is not in all cases possible to determine a consistent text status at any given time time with certainty.

However, the genetic layering not only clearly shows the correction of typing errors, but the nonlinear development process of the whole text. Thomas Kling starts with the first sentence 'Ein grosser Verschweiger unter den Geschichtsscheibern und frühen Ethnologen ist Heodot, unterstützt im Informations' (1) and writes, with a few revisions, through to the end of this passage 'Vermutlich immer an unserösem, nicht gesichertetem, von vorne herein als Hanebüchen com akademischen <diskurs ausgeschlossenen' (9) before he starts adding sentences in the middle 'Immer steht dann dies zu vermuten [...] Pfade geleitet' (15-23), 'Man hat den Eindruck bei Herodot: das [...] Fussnoten reserviert sind' (23-32) and goes on revising them.

The discussion of this sample selection demonstrates the dissemination of the born-digital dossier génétique throughout an archived system. It furthermore shows that the material format of the digital record of the writing process – and in fact of each identifyable, individuated digital trace – is determined by the concrete software implementation and software process that created it as a saved document, as a temporary document, autorecovery, clipboard or scratch file in for-

mats specific for that purpose and implementation. The material format of the record may as well be changed by other system processes that influence transmission, for instance overwrite processes that truncated the file of which only a fragment remained in the drive slack.

Philological perspective on the born-digital record and digital materiality

As the materiality of the born digital record is fundamentally different from that of the manuscript or typescript, I would like to spend some thought on the consequences of these aspects of digital forensic materiality for basic philological concepts such as 'document', 'text', 'text carrier', 'text stage' and 'variant' under a '.txtual condition' (Kirschenbaum 2013). Kirschenbaum cites the MLA *Statement on the Significance of Primary Records* of 1995 (MLA 1995: 27): '"A primary record", the MLA told us in 1995, "can appropriately be defined as a physical object produced or used at a particular past time that one was concerned with in a given instance"' (Kirschenbaum 2016b: 00:24:50). He adds: 'But in that aspect, the MLA was only addressing half the issue. Today, the concept of a primary record can no longer be assumed to be coterminus with that of a physical object. Electronic texts, files, feeds and transmissions of all sorts are also indisputably primary records' (Kirschenbaum 2016b: 00:25:27). The evolution of technology and today's use of the term *digital document* as *digital object* obviously complicate the definition of the term *document*, more specifically, its formerly defining interdependence of physical materiality and text. Both in philological and technical definitions of the term 'document', the category of physical materiality of the text carrier generally plays a central role. This applies to the metaphorical 'physical container' definition ('the physical vessel (such as a book, manuscript, phonograph record, computer tape) that contains the text', Shillingsburg 1986: 170) and its digital-aware variants ('that contains (or incarnates) the text' Shillingsburg 1996: 174) and even more so for definitions that identify the term document with the physical object ('A document can be defined as the physical material (mostly paper and ink) on which the configuration of signs is written, which together form the text', translation T.R., Van Hulle 1998: 93). From a mediahistorical perspective, the (analogue) document, in the sense of a legal document issued by an authority, contract or certificate, can be used as proof or as evidence in court. Its materiality, the unique character of the forensical verifyability of the handwritten signature, creates a relationship between text and extra-textual facts that justifies descriptions such as 'potentially authentic, original, unique, complete, uncorrupted, lasting, immutable, citable, or otherwise "true"' (Gitelman 2006: 106-107, see also Blanchette 2012). The physical format plays a crucial role, as it ensures individuation (Kirschenbaum 2008: 10), and citability of historical records, not only from the legal domain, but also other historical, cultural

heritage and private documents preserved in GLAM institutions, e.g. drafts of literary work. When researchers try to define the digital document that manifests a historical text or a version of a text in the context of philology and analytical bibliography, the duality of the digital document as carrier-independent digital object on the one hand and as its unique, physically identifyable complement on the storage medium (or rather as the multitude of unique, physically identifyable address space instances and often fragmented traces) becomes a core definition problem. Two definitions of the term documents by Patrick Sahle may serve as an example for this problem: in 2013, he attempts to brigde analog and digital by rebasing the definition of the term *document* from the carrier-model to an information model with a physical component ('information unit bound to matter', Sahle 2013: 138). While this unorthodox, rebased definition would probably serve well to define digital documents as digital objects, a philologist might still ask what kind of information and information unit would sufficiently define a *document* and whether the information unit itself *is* the document. In 2016, Sahle does not seem to stick to the information model, reintroducing a physicalistic, circular definition according to which 'every non-abstract object that is the subject of an edition can be called a document'. Every edition, according to Sahle, 'starts with material documents', whereas 'text' would be merely a 'function' of this 'material document' (Sahle 2016: 25). This brief recapitulation of definitions shows the difficulty of integrating the born-digital document and the born-digital record into philological definitions of the term document – and, consequently, into the conceptual framework of scholarly editions.

The productive tension between digital materiality and the term *document* or *text* – more specifically: literary text – becomes especially apparent when *source code* comes into play (Cramer 2011). For instance, in a digital draft document that belongs to the *dossier génétique* of his poem *september st. nazaire,* the German poet Michael Speier deliberately poeticized HTML/CSS code that he had probably copied and pasted accidentally earlier on. In the digital document, the fragmentary code was never meant to be interpreted by any browser – in later stages of the writing process, Speier deleted the code again and encapsulated the poetic gist of the code experiment in the words "gezeiten-code" (tides-code) and "quellcode der gezeiten" (source code of the tides). Additionaly, he transformed the CSS-tag "<STRONG>" into the lines "da bist du ganz nackt / wirklich strong" (there you are all naked / really *strong*) (Ries 2010: 177, 180-181). Another example that challenges our philological understanding of the term *document* is constituted by Friedrich Kittler's programming samples. Kittler, who gained renown as a pioneer of literary media studies, also wrote code, which is regarded as a practical part of his theoretical work on media theory and poses therefore a theoretical challenge to scholarly editing (Enge and Kramski 2014, Hiller 2013, 2015). The question is: in which sense is *source code* a *document*? And how do we conceptualize the process of coding as a literary writing process? (Hiller 2015) This becomes a crucial question for future philological studies on

current authors who focus on the digital and regard coding as a means of literature and art. Kathrin Passig, who received the Ingeborg Bachmann Prize 2006, wrote a manual to *Write Less Bad Code* (Weniger schlecht programmieren) with Johannes Jander (Passig and Jander 2013). If we look at present-day digital literature, the works of J. R. Carpenter, for example *There he was, gone* (2012), deserve scholarly attention as examples of code-/text-based art and literature that philology will have to preserve and represent in appropriate ways. Carpenter merges the executable code of the poem with poetological commentary. Hannes Bajohr and Gregor Weichbrodt, founders of the digital literary collective named *0x0a* (Bajohr 2016), scraped social media accounts affiliated to the right-wing, anti-immigrant "Pegida" movement in Germany in order to document to document xenophobic hate speech online in the form of the corpus *Die Sprache Pegidas* (Pegida's language). By means of further digital processing of the corpus, they extracted the text that has been published under the title *Glaube Liebe Hoffnung* (faith love hope, Bajohr and Weichbrodt 2015). If one thinks about a hacktivistic literary project like this from a philological angle, it is obvious that the code of the tools, the scraper, the redaction and processing scripts, are a part of the *avant-texte*. The work of the Vienna-based artist Jörg Piringer is another, especially interesting example this context. His 'coded poetry' and 'data poetry' is part of his experimental artistic *œuvre* – next to being a poet, he is also a musician and a performance artist. Piringer implements new methods of an advanced digital *poésie automatique,* even employing artificial neuronal networks (Piringer 2016). His mission is the digital self-empowerment of the present generation of poets: 'die poetinnen der kommenden jahre werden nicht zusehen und konzernen die hoheit über die sprachalgorithmen überlassen' ('the poets of the years to come will not stand watching and leave the control over the language algorithms to the corporations', Piringer 2015). Here, the code of the work of art, the language-generative function of its algorithm, is the subject of the literary project, which consequently would have to be documented and explained in a scholarly edition.

The question in which sense a historical born-digital primary source and its characteristics are 'material', self-identical and unique is not only of bibliographical relevance, but raises fundamental questions about what it actually is that is being represented in a scholarly edition that includes born-digital primary sources. In the context of a scholarly edition, the primary source as *document* is defined by its reciprocal relationship with the term *text*, which means that by the act of textual criticism and editing, the *original document*, the historical *source* or *token* is translated into a reproducible, disseminable *type* in the framework of a scholarly edition (see Reuß 1999, who makes this argument about diplomatic transcriptions). This operation is comparable to the translation of a literary manuscript, represented by a facsimile or photo, into a diplomatic transcription, which selects a certain set of material properties and features of the 'document' as relevant for the representation of the 'text' in the scholarly edition (Ries 2010b). The 'transmedialisation' that Sahle sees as 'the gist' of the 'revolution[ary]' change

from analog to digital editions (Sahle 2016: 32) is at the core of any edition – analog or digital. The choice of transcribed features may be a matter of scholarly choice (Pierazzo 2011), a choice made by genre of scholarly edition and transmission or a choice enforced by constraints of the medium, as Dahlström suggests ('Certain features of the textual work that can be expressed within the new architecture and its web of signs are preserved, while others are treated as noise, obscuring the essential text signals.', Dahlström 2000, par. 1)

Especially in the context of genetic scholarly editing of modern manuscripts, the categorial scholarly decision about which material features are text, relevant genetic indexical features and 'noise' becomes a crucial question (Ries 2010b). From the perspective of today's everyday usage of the term *digital document,* it might be considered odd to still tie the term *document* to the physicality of a text carrier, although obviously the term and concept is historically derived from physical documents and graphical user interfaces are still mimicking the physical document on the screen. Digital documents are structured digital objects that can be written to a logical location on a file system at the address space of a physical storage medium, copied to other memory or storage, interpreted, displayed and processed losslessly by means of a compatible ensemble of hardware, operating system, application and network. Blanchette stresses, along the line of Kirschenbaum's argument, that copying and processing data throughout multiple system states and address spaces is in itself a resource-intensive and error-prone task that is critical in terms of maintaining the 'illusion of immateriality' (Blanchette 2011: 1045, Kirschenbaum 2008: 135) and which is implemented with technical 'efficiency trade-offs' (Blanchette 2011: 1042):

> By some accounts, the digital age fundamentally differs from all previous information epochs insofar as information has finally achieved what it has aspired to throughout history, namely, unburdened itself from the shackles of matter. [...] This purported independence from matter would have two distinct and important consequences: (a) digital information can be reproduced and distributed at negligible cost and high speed, and thus, is immune to the economics and logistics of analog media; (b) digital information can be accessed, used, or reproduced without the noise, corruption, and degradation that necessarily results from the handling of material carriers of information. [...] Yet, this abstraction from the material can never fully succeed. Rather, it stands in dialectical tension with the evolution of these material resources and with the efficiency trade-offs their abstraction requires. Materiality then is a key analytical category from which to track the complex positioning of market players as they respond to fundamental shifts in infrastructure – wireline to wireless, single to multicore, desktop to cloud and mobile.

Users and archivists are painfully reminded of this physical materiality when self-diagnose systems on hardware controller or file system level detect potential *bit rot* or the effects of a hard drive *headcrash*. Apparently, constraints of hardware design, necessary error-correction and efficiency trade-offs leave their traces in software design and in the digital forensic record.

While at its material basis, every digital object is based on physical storage, the everyday usage of the term *digital document* refers to the logical construct of a digital object which can be processed in the form of numerous memory states and instances, but is represented as the *same* on multiple levels of the graphical user interface of the operating system or the word processor. We speak of the *same* digital document when we save *it* after changing its content, after copying *it* to a pen drive and *open it* on a different computer with a different word processor which might display the content in a different way, or even if this digital document is sent as an email attachment to another user and is opened on his or her laptop, tablet or mobile phone. One and the *same* digital document can be accessed, edited and revised by multiple authors simultaneously in the cloud. The fact that we refer to this as a single, identical and identifiable digital document is not just down to imprecise everyday usage of the term – digital documents, as logical digital objects of interpretable logical structure, are not bound to a single physical entity, not even to a single processing system context or display application. Their integrity, identity and authenticity as digital objects are usually checked by comparing the cryptographic hash values against a digital reference object, that is, through the bit-precise identity of the object and through the identifying metadata, irrespective of the physical data carrier. The digital object cannot be defined by its physical uniqueness or the material storage medium and its position in address space on a data text carrier, because its functionality itself is based on lossless transmission of information between volatile memory, non-volatile storage and network, between different system states and being processed as a whole or partially, as required by the application's and the algorithm's runtime (see also Kirschenbaum 2013: par. 16). Dahlström describes this aspect of digital documents in a straightforward manner: '*Digital documents are immaterial and therefore logically defined, rather than material and therefore physically defined.* [...] As well, digital texts, no longer absolutely fixed to their carriers, are transportable between carriers, machines, environments and file formats.' (Dahlström 2000: '3. Digitalics' par. 1-2) Dahlström's definition stresses the logical function and processing aspect of digital objects within formal materiality at the cost of neglecting the aspect of historical and forensic individuation within forensic and formal materiality of the digital. The assumption that a 'document' in 'print culture' can 'be constituted or defined by the more or less accurate alphanumeric notation of their texts' is, from a philological point of view, reducing the term 'document' to the text / noise logic that Dahlström establishes for transmission of text and scholarly editions (Dahlstöm 2000: '3. Digitalics' par. 1-2).

The digital *dossier génétique* consists, from a digital forensic perspective, of authored text stored in digital objects and their logical structure on physical storage media, organized and transmitted by their distributed logical infrastructures. The author may have self-archived these digital objects as part of his or her writing strategy or as a mode of data handling, as backups on separate media, via saving stages as different objects with different file names (Ries 2010: 169-198, the

example of Michael Speier) or by means of versioning systems (Kirschenbaum 2016a: 230, 323, the example of Max Barry). For instance, it was part of Michael Speier's digital writing strategy while he wrote *september st. nazaire* to save numerous writing stages under separate file names with a numbering scheme that even allowed for separate branches of textual development (Ries 2010). From a *critique génétique* point of view, it is not necessarily the case that such a saved stage also constitutes an *intended* version of the work, as the author might also have saved it because she or he was about to delete or to change a passage while not being sure whether the upcoming rewrite or deletion meant any improvement.

During the author's interaction with the user interface of the word processor, application and operating system automatically create temporary files, backup files and file structure artefacts to mitigate the effects of hardware constraints (fast save feature compensated slow hard drives, temporary files compensate limited RAM) and potential hardware failure, operating or file system and application instability (backup files, autorecover files) to ensure a seamless and safe propagation of text and data copies – and changes thereof –, between volatile memory and storage medium at all runtime stages (see examples of temporary files with draft snapshots of Thomas Kling's Queneau-review, below). Because erasing files effectively is a resource-intensive task on most hardware, deleted digital objects are in general not instantly overwritten by the file system. Therefore files, or at least fragments of these, remain recoverable until they are physically overwritten. One of the most important current challenges for forensic data recovery are solid state drives (see Bell and Boddington 2010). In his list of challenges that digital forensics will face until 2020 (and which will affect the materiality and material format of the born-digital record), Simson Garfinkel mentions, next to cloud computing, the difficulty of accessing *embedded storage* in mobile devices and the 'proliferation of operating systems and file formats', the necessity of 'analysis of multiple devices' per case (convergence of multiple operating systems and platforms in word processing) and the possibility that encryption might become pervasive (Garfinkel 2010: S66). Obviously, the digital *dossier génétique* not only consists of one or more 'digital documents' that an author deliberately saved and kept, but also of several related, automatically generated digital objects, fragments of digital objects, artefacts and metadata distributed across the system's interdependent layers.

Thomas Kling's Queneau-review 'Dieser Hund ist ein Rassist. Raymond Queneau verschreibt Beruhigungsmittel'

On March, 20th, 2002, a review by Thomas Kling was published with the title *Dieser Hund ist ein Rassist. Raymond Queneau verschreibt Beruhigungsmittel* (*This Dog Is a Racist. Raymond Queneau Prescribes Sedatives*) in the *Süddeutsche Zeitung*, a German daily newspaper. Kling's review of Hans Thill's translation of selected parts of Queneau's *Contes et propos* (1981) under the German title *Vom Nutzen*

und Nachteil der Beruhigungsmittel. Erzählungen (Berlin, Wagenbach 2002) was the first in a series of reviews by prominent critics such as Dietmar Dath and Stefan Zweifel (2002). Whereas later reviewers criticised the selectiveness and the translation, Kling chose to take a different angle. He observes that Thill, not only acting as translator, but also as commentator, on the one hand defends Queneau's work against literary critics that saw the later co-founder of Oulipo as the 'jester' amongst the surrealist avant garde of Paris, on the other, he seems to mostly value Queneau's 'showpieces', diminishing other parts of his œuvre. Consequently, Kling draws attention to Queneau's often indirect, yet edged polemic style and the literary quality of his underrated social background descriptions. The hard drive of the computer on which Kling wrote this text has failed later in 2004, but a forensic laboratory was later, in 2012, able to image its data partition for the Thomas Kling Archive (see footnote 2). In the folder 'Besprechungen' (reviews), the document file [Queneau.doc][10] is located, along with the temporary files [~WRL3954.tmp],[11] [~WRL0574.tmp][12] and [~WRL2232.tmp].[13] While the synoptic comparison of [~WRL0574.tmp], [~WRL2232.tmp], [Queneau.doc] and the published version of the text already give an idea of the writing process, including Kling's revisions and those presumably by the newspaper editors, [~WRL3954.tmp] (fig. 6) captured an early attempt for a different beginning of the text.

[~WRL0574.tmp]	[~WRL2232.tmp]	[Queneau.doc]	Süddeutsche Zeitung (2002)
Queneau	Queneau	Queneau	Dieser Hund ist ein Rassist Raymond Queneau verschreibt Beruhigungsmittel
Die frühen Avantgardisten liebten das Gruppenfoto als Dokument, auf dem, handelt es sich nicht um die seinerzeit beliebte Kirmesjux-Photographie, bei dem die Köpfe durch gemalte Kulissen gesteckt wurden, um als Motoradfahrer oder beschwingte Aviatiker zu erscheinen, noch die größten Abfahrer in bürgerlicher Aufstellung, mehrreihig stehend, sitzend, im Vordergrund wird gelegen posieren.	Die frühen Avantgardisten liebten das Gruppenphoto als Dokument, auf dem, handelt es sich nicht um die seinerzeit beliebte Kirmesjux-Photographie, bei dem die Köpfe durch gemalte Kulissen gesteckt wurden, um als Motoradfahrer oder beschwingte Aviatiker zu erscheinen, auf dem noch die größten Abfahrer in bürgerlicher Turnvereins-Aufstellung posieren mehrreihig, stehend, sitzend und im Vordergrund wird,	Die frühen Avantgardisten liebten das Gruppenphoto als Dokument, auf dem, handelt es sich nicht um die seinerzeit beliebte Kirmesjux-Photographie, bei dem die Köpfe durch gemalte Kulissen gesteckt wurden, um als Motoradfahrer oder beschwingte Aviatiker zu erscheinen, auf dem noch die größten Abfahrer in bürgerlicher Turnvereins-Aufstellung posieren mehrreihig, stehend, sitzend und im Vordergrund wird,	Die frühen Avantgardisten liebten das Gruppenphoto als Dokument, auf dem, handelt es sich nicht um die seinerzeit beliebte Kirmesjux-Photographie, bei der man den Kopf durch gemalte Kulissen steckte, um als Motoradfahrer oder beschwingter Aviatiker zu erscheinen – auf dem also noch die größten Abfahrer in bürgerlicher Turnvereins-Aufstellung posieren, mehrreihig stehend, sitzend und im Vordergrund, noch in Ermange-

10. File name: [Queneau.doc], Microsoft Word document file; location: hard drive (see footnote 2), path: D://Besprechungen, 22,5 kB (22.528 Bytes), MD5 hash: 62e2090bad65c1c11c6836decf54d2ec.

11. File name: [~WRL3954.tmp], Microsoft Word temp file (clipboard); location: hard drive (see footnote 2), path: D://Besprechungen, 19,5 kB (19.456 Bytes), MD5 hash: 394acd45c73d1dbb3f6231d0e505c8cc.

12. File name: [~WRL0574.tmp], Microsoft Word temp file (clipboard); location: hard drive (see footnote 2), path: D://Besprechungen, 20,0 kB (19.968 Bytes), MD5 hash: 6333d89906d620c5be5e5323dc229b0e.

13. File name: [~WRL2232.tmp], Microsoft Word temp file (clipboard); location: hard drive (see footnote 2), path: D://Besprechungen, 21,0 kB (20.992 Bytes), MD5 hash: 3501765088f63e577e50a40245aae220.

noch in Ermangelung des Weitwinkel-Objektivs, gern noch gelegen, damit auch alle mit draufpassen.

noch in Ermangelung des Weitwinkel-Objektivs, gern noch gelegen, damit auch alle mit draufpassen.

lung des Weitwinkel-Objektivs, gern auch liegend, damit alle mit draufpassen.

Column 1

Ein Foto für die Nachwelt ist eine ernste Angelegenheit. So auch das aus dem Jahr 1924, als die Pariser Surrealisten, zwölf Mann hoch, dazu zwei dekorative Gattinnen, sich ablichten ließen.

Fast verdeckt, so daß er das Kinn recken muß, steht der manifeste Wortführer, das Aphatier des Surrealismus, André Breton, und - komisch, keiner will so recht neben Ihm stehen - links daneben einer der Gruppen-Jüngsten: der einundzwanzigjährige Raymond Queneau.

Man nennt das wohl Sicherheitsabstand.

Column 2

Ein Foto für die Nachwelt ist eine ernste Angelegenheit. So auch das aus dem Jahr 1924, als die Pariser Surrealisten, zwölf Mann hoch, dazu zwei dekorative Gattinnen, sich ablichten ließen.

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Man nennt das wohl Sicherheitsabstand.

Szene gut und schön; irgendwoher aber muß auch die Bohème sich alimentieren. Queneau, bevor er ab 1933 mit Büchern - Romanen und Lyrik - an die Öffentlichkeit trat, verdiente sein Geld als Vertreter für Papiertaschentücher und vorübergehend als Bankangestellter, einen Job, den der Normanne aus Le Havre übrigens mit dem ihm auch sonst nicht unverwandten Wiener Konrad Bayer gemeinsam hat. beide Autoren liebten mathematikgestützte Schreib-Konzepte sowie den (sprachkritisch hinterfragten) Einsatz von Argot, Slangs, der ironischen, mitunter drastischen umgangssprachlichen Wendung.

Column 3

Ein Foto für die Nachwelt ist eine ernste Angelegenheit. So auch das aus dem Jahr 1924, als die Pariser Surrealisten, zwölf Mann hoch, dazu zwei dekorative Gattinnen, sich ablichten ließen.

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Beide Autoren liebten mathematikgestützte Schreib-Konzepte sowie den (sprachkritisch hinterfragten) Einsatz von Argot, Slangs, der ironischen, mitunter drastischen umgangssprachlichen Wendung - hiermit sind auch bei weitem nicht alle Berührungspunkte zwischen dem französischen Surrealismus und der österreichischen Nachkriegs-Avantgarde benannt.

Die verschmitzte Blackout-Serie „Textikel" beispielsweise liest sich wie von H.C. Artmann erdacht.

[...]

Column 4

Ein Foto für die Nachwelt ist eine ernste Angelegenheit. So auch das aus dem Jahr 1924, als die Pariser Surrealisten, zwölf Mann hoch, dazu zwei dekorative Gattinnen, sich ablichten ließen.

Fast verdeckt, so daß er das Kinn recken muss, steht der manifeste Wortführer, das Alphatier des Surrealismus, André Breton, und - komisch, keiner will so recht neben Ihm stehen - links einer der Gruppenjüngsten: der einundzwanzigjährige Raymond Queneau.

Man nennt das wohl Sicherheitsabstand.

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Beide Autoren liebten mathematikgestützte Schreib-Konzepte sowie den (sprachkritisch hinterfragten) Einsatz von Argot, Slang, der ironischen, mitunter drastischen umgangssprachlichen Wendung - und hiermit sind bei weitem nicht alle Berührungspunkte zwischen dem französischen Surrealismus und der österreichischen Nachkriegs-Avantgarde benannt.

Die verschmitzte Blackout-Serie „Textikel" etwa liest sich wie von H.C. Artmann erdacht.
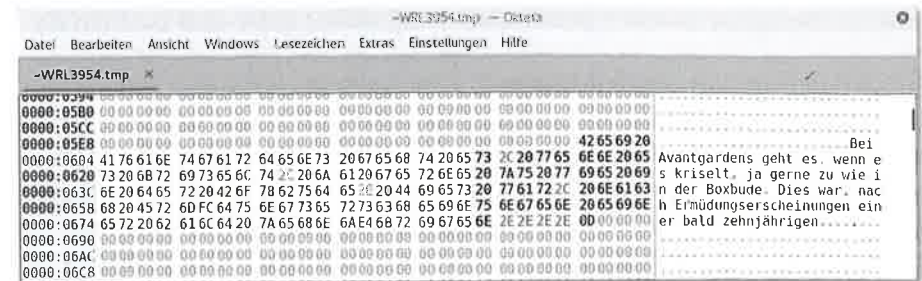
[...]

Fig. 6: Draft text fragment for [Queneau.doc] in [~WRL3954.tmp], viewed in a hex editor (Okteta).

[~WRL3954.tmp]

Bei Avantgardens geht es, wenn es kriselt, ja gerne zu wie in der Boxbude. Dies war, nach Ermüdungserscheinungen einer bald zehnjährigen

Avant garde circles tend to resemble boxing clubs when they are heading towards crisis. This was, after fatigue symptoms of an almost ten years long

In this early draft – the temporary clipboard file was last modified 14 March 2002 12:11 CET,[14] embedded metadata and paths confirm it belongs to the editing process of [Queneau.doc] – Thomas Kling makes an attempt to outline the main theme of his review, situating Raymond Queneau in a 'boxing' club' of surrealist avant garde circles in a fatigue crisis. The next day – [~WRL0574.tmp], [~WRL2232.tmp] and [Queneau.doc] have all been last modified on 15 March between 08:36 and 14:24 – Kling rewrites the first paragraph, starting his review with an ecphrasis of a group photo depicting *La Centrale surréaliste* by Man Ray (1924, see Bajac and Chéroux 2009: 30), where 'the twenty-one years old Raymond Queneau' stands behind, but also a bit set apart from André Breton, 'the manifest spokesman, the alpha leader of surrealism': 'odd, nobody seems to want to stand next to him [i.e. Breton]'. 'This is, I think, what is in general called safety distance.' Kling refines his reading of the cracks in the harmony of the staged group picture in [~WRL2232.tmp] (last modified 09:29) by extending the description of the 'middle-class lineup' to 'middle-class gymnastics club lineup' and by adding that some in the picture had to lie down 'in order to fit all in the picture', 'lacking a wide-angle lens'. In the second half of the review, Kling gives some examples of Queneau's strong language and edged 'boxing club' polemic rhetoric which connects him – in Kling's interpretation – to the Vienna Group of poets, here Konrad Bayer and H.C. Artmann.

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14. The timestamps mentioned in this paragraph cite the evidence metadata and do not necessarily reflect the actual CET time, as the system time could have been set incorrectly or inaccurate. As Kling's review has been published on 20 March 2002, at least the date seems plausible.

The born-digital dossier génétique: snapshots, gaps and historicity

In contrast to a handwritten manuscript, a notebook or a typescript, authors writing with a word processor are in general unaware which traces and variants the writing process leaves on the system next to the document versions they deliberately "saved" to the storage medium. It must be assumed that most of the textual stages that can be recovered from temporary files, file structure artefacts and file fragments are not a result of a deliberate decision on the part of the author to *save* the document but rather of an automatic process running in the background – such as the temporary files in the *dossier génétique* of Kling's Queneau-review above. From a philological point of view, these are not 'text stages' or 'versions', as these would represent 'one specific form or the work – the one the author intended' (Shillingsburg 1996: 44). They have to be considered as unintentional *snapshots* of the writing and revision process, which raises methodological as well as potentially ethical questions for archivists and researchers. What is more, their transmission depends on the coincidence that they are not being completely overwritten by later system processes in the course of months and years. The chronological density and completeness of these *snapshots* can vary significantly in concrete cases – see above Kling's *Herodot* example –, and the reconstructed digital *dossier génétique* of a work – as rich as it may be – has to be regarded as constitutively fragmentary and discontinous (see also Kirschenbaum and Reside 2013: 268). Not all changes to a text made in a word processor are transferred from the volatile random access memory to the hard drive, there is always a time gap between versions that an author self-archives. Therefore, immediate corrections of typing errors are often irretrievable. The digital forensic record of the bit-stream-preserving image – this was exemplified with the examples from the Thomas Kling Archive – is materially informed by effects of the interaction of historical hardware, operating and file system and application. As a result, reading the materiality of the born digital traces of the writing process requires taking into account the several layers of the historically specific system context that Kirschenbaum broadly termed as forensic and formal materiality. The digital forensic perspective adds another scientific layer of reflection to the textual and evidential status of the born-digital record for philology and the historical humanities, which also has to take into account the precision, efficiency and the version changes of the forensic tools that recover data (Garfinkel 2009, 2010; see also the 'constructed trace' problem formulated by Cohen 2011: 10).

Acknowledgements

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