The telautograph, scenes of handwriting and the changing cultural appreciation of physical authenticity

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November 2011

A thesis submitted to McGill University in partial fulfilment
of the requirements of the degree of Doctor of Philosophy

Abstract

This is the first study of the telautograph, a device that transmitted the movement of a writing hand over telegraph lines to a remote fountain pen that simultaneously replicated the movement. I argue that the telautograph created a unique niche within the media landscape of the late 19th century: it provided a novel and instantaneous way to communicate long-distance and was thus unprecedented as a writing technology. It transmitted handwriting, clearly a familiar and trusted technology and clearly attributable to an individual person. Yet it produced writing in the absence of the writer, thus challenging notions of authenticity and context of origin. In addition, I establish that Elisha Gray's particular business strategy combined with certain technical short-comings limited the telautograph's adoption despite unanimously favourable reviews.

Today, handwriting similarly inhabits a borderland in our culture. Its increasingly limited practice is in competition with various forms of typing, yet handwritten documents are generally perceived as more personal and authentic than electronic documents. I propose that the cultural appreciation of handwriting stems from the notion of physical authenticity, the particular physical bond that exists between a writer and a text, a bond that we think is different from the link between a writer and an electronic text. I identify five assumptions on handwriting: (1) handwriting is produced by the body/hand while typewriting is produced by a machine; (2) a handwritten text leads to an individual while a typed text leads to a device; (3) handwriting directly reflects our thoughts while typing leaves doubts in this regard; (4) handwriting cannot be copied while typing creates only copies; (5) handwriting implies presence while typing implies absence. I use these assumptions to explore the historical trajectory of handwriting practices. I thus examine scenes of writing in the 19th century (the telautograph) and 21st century (signing and handwriting practices today) and portray the respective semantics, gestures, and instruments.

Résumé

Ceci est la première étude sur le télautographe, un appareil qui a transmis sur les lignes télégraphiques le mouvement d'une main qui écrit à un stylo à distance reproduisant simultanément le mouvement de la main de l'écrivain. Je soutiens que le télautographe a créé une niche unique dans le paysage médiatique de la fin du 19e siècle: il a fourni une façon nouvelle et instantanée de communiquer à distance et a donc été sans précédent en tant que technologie d'écriture. Le télautographe a transmis l'écriture manuscrite, clairement une technologie familière et clairement attribuable à une personne individuelle. Cependant, il a produit l'écriture dans l'absence de l'écrivain, défiant ainsi des notions d'authenticité et du contexte d'origine. J'établis aussi que la stratégie d'affaires particulière de Elisha Gray, combinée avec certains manques techniques, a limité l'adoption du télautographe malgré des commentaires unanimement favorables.

Aujourd'hui, l'écriture manuscrite occupe de même une zone frontalière dans notre culture. Sa pratique est de plus en plus limitée et en compétition avec les diverses formes de dactylographie, mais les documents écrits à la main sont toujours perçus comme plus personnels et plus authentiques que les documents électroniques. Je propose que l'appréciation culturelle de l'écriture manuscrite découle de la notion d'authenticité physique qui est assise sur le lien physique particulier qui existe entre un écrivain et un texte, un lien que nous pensons être différent du lien entre un écrivain et un texte électronique. J'identifie cinq hypothèses sur l'écriture manuscrite: (1) l'écriture manuscrite est produite par le corps/la main tandis que la dactylographie est produite par une machine; (2) un texte écrit à la main mène à un individu tandis qu'un tapuscrit mène à un appareil; (3) l'écriture manuscrite reflète directement nos pensées tandis que la dactylographie laisse des doutes à cet égard; (4) l'écriture à la main ne peut pas être copiée tandis que la dactylographie ne crée que des copies; (5) l'écriture manuscrite implique la présence tandis que la dactylographie implique l'absence. J'utilise ces hypothèses pour explorer la trajectoire historique des pratiques d'écriture manuscrites. J'examine ainsi des scènes d'écriture au 19e siècle (le télautographe) et au 21e siècle (la signature et les pratiques d'écriture contemporaines) et présente les sémantiques, les gestes, et les instruments respectivement.

Acknowledgements

I am eternally grateful for the support and encouragement from my co-supervisors, Dr. Darin Barney and Dr. Cornelius Borck. When I needed a personal nudge, they nudged me. When I needed a professional push, they pushed me. It is a privilege to have had my work read and criticized by these two Doktorväter. My heartfelt thanks.

I was very fortunate to have my studies and research supported by a Fonds québécois de la recherche sur la société et la culture doctoral scholarship; a Media@McGill student travel grant and dissertation completion grant; and a McGill Arts graduate student travel award.

To Murray, Sam and Ben. (If this seems short, it is not from a lack of gratitude but from a lack of words for its extent.) May we have a long time left together.

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Chapter 1: Introduction

Official photographs taken of heads of states signing peace treaties, which they should do more often, or athletes autographing jerseys, usually show the person with a fountain pen or Sharpie touching the paper or fabric while their eyes are looking up into the camera. Celebrities and politicians alike mark their presence and agreement with pens. Nothing else manifests with the same vehement unambiguity that a particular person has been 'there' and left a trace. The signature identifies the person, the signed document or item conserves the moment and signifies the context in which it was signed. The act of signing is the performance. The official photograph of the occasion can be taken as a testament of this performance.

Handwriting and signing have an operative and performative purpose as cultural techniques. A handwritten proper name as a recognizable image identifies a person. The signature, in this case, instantiates not the writing of letters but the creation of an image. With celebrities, for example, the autograph operates on the level of name recognition but also on the level of performance, as a memento of the fan encounter. It arises, exists and persists as a visual symbol of authenticity.

Neef describes handwriting as an anthropomorphic, somatic expression of writing in general.[1] As such, it is also a prevalent cultural technique. The hand, if not the body for posture, has to be trained for many years in order to produce what is accepted as handwriting. Typing with ten fingers on a keyboard, however, can be learned in a few weeks. What if the body at the time of the typewriting training would not have been trained in the fine-motor skills necessary for handwriting?

The machine producing writing from typing is often seen as a black box: the movement of the typing hand seems to run through numerous transformations and translations before a letter appears on a sheet of paper. In handwriting, the hand holding the pen seems to directly apply the ink on the paper. The body is in charge, operating and performing like an open book. We increasingly just use our thumbs to type on cell phone keypads, for example. How does this same body effect the same message with such minimal effort? The body becomes blackboxed and writing, again, is perceived as independent from corporeality. This notion has a long tradition in media studies and philosophy, for instance, as expressed in Neef's statement regarding handwriting as an exceptional case of writing. The view of writing as a physical act leaving a trace of a body, on the other hand, has been taken by proponents as diverse as Jacques Derrida and graphologists.

Electronic emulations of handwriting together with new forms of writing make a reinterpretation of handwriting necessary and possible. The goal of my study is to provide a historical perspective on some of the many remediations handwriting has experienced.

Authenticity

The direct production of writing by hand is often juxtaposed to the indirect production of writing by a machine. These associations play a pivotal role in the notion of authenticity in text production. Before I present five theses describing what I perceive as the current status of handwriting in our culture, I would first like to define authenticity as the central concept around which the five theses then

will be grouped. Authenticity seems inherently bound up with everything related to handwriting and the signature, particularly when it is compared to other forms of writing and I will try to define it more precisely. While many sources do not qualify authenticity in detail, others attempt to define it more carefully. Most helpful for this discussion are the contributions in *Sign here! Handwriting in the Age of New Media* and Lauer's paper on 19th century autographomania.[2] Authenticity can generally be associated with singularity and personal expression and can be juxtaposed to multiplicity and ubiquity or mass production. It is a notion that we attribute to the different forms of links that we perceive as existing between an author and a text. It is obvious, that this attribution changes over time.

John Mackenzie Owen, for example, distinguishes between four types of authenticities: type 1, authenticity with reference to identity ('that's me'); type 2, authenticity with reference to connotation ('that's what I mean'); type 3, original authenticity ('that was me then: it's not me anymore'); and type 4, current authenticity ('that's me now').[3] In my view, two main problems arise with these distinctions: first, at which point in time does type 4 ('that's me now') transform into type 3 ('that was me then: it's not me anymore') authenticity? In other words, it seems exceedingly difficult to determine the moment when 'now' changes into 'not anymore.' Who is determining this moment? The usefulness as well as the practicality of this distinction appear questionable, then. And second, how does type 1 (identity) relate to the assumption, by the court system, for example, that a handwritten text or signature proves the writer's physical presence at the moment of its creation? More precisely, how are 'identity' and the physical act of writing

connected? Is it not rather the case, here, that 'identity' is very closely related to the writer's intentions, that is, type 2 authenticity so that the distinction between type 1 ('that's me') and 2 ('that's what I mean'), too, is quite problematic?

For this study, I would like to propose two main types of authenticity: the first type of authenticity sees it as the bond between a text and the physical presence of a writer, implying the genuine production of the document by an identifiable person or group of persons at a specific moment in time. This *physical authenticity* is, for instance, very relevant in legal contexts, particularly signatures. In general, physical authenticity is assumed to pertain to and is valued in handwriting as an attribute that reflects a varying degree of physical closeness and immediacy between author and text. Similarly, it is seen as facilitating a certain closeness and immediacy between reader and text. The text's materiality affords many opportunities to express bodily traces. Physical authenticity often is problematized in the context of digital writing. This type corresponds to the corporeal aspects of Owen's type 1 authenticity.

The second type of authenticity sees it as the faithful representation in a text of the intended meaning of the writer. This *semiotic authenticity* does not necessarily apply to signatures. Dekeyser notes in the context of (European) court practice that "even signatures that are illegible to the point that they give no clue whatsoever about the signatory's identity are often accepted."[4] Again, semiotic authenticity becomes particularly problematic in the context of digital writing when, for instance, only the most recent version of a text is available and the author's intentions appear to be shifting. It has also been problematized around

diaries, for instance, Anne Frank's and Hitler's diaries, which deal with authentic events through forged handwriting (Hitler).[5] This type corresponds to Owen's type 2 authenticity.

For my research, I am primarily interested in physical authenticity, that is, all kinds of notions and ideas about the corporeal bond between a writer and his or her handwritten document and how this bond is culturally regarded and valued. Because views and practices of handwriting depend on other writing technologies within the same media landscape, our perspectives on handwriting's claims to authenticity are dynamically changing with the composition of the media landscape, a phenomenon to which I repeatedly will return in greater detail.

I would also like to point out that different types of authenticities are not necessarily mutually exclusive and that they should be located on a continuum rather than in separate categories. For instance, legal notions of authenticity in the context of handwriting might historically derive from a more general association of handwriting with the physical presence of the writer. In other words, while I am not particularly focusing on legal and similar meanings of authenticity, these can in my opinion not be separated from general views of the concept and thus, they will undoubtedly appear in a thorough discussion of handwriting and signing.

Finally, in the context of more recent media technologies, related concepts will provide further possible avenues of investigating and defining authenticity. Immersive, virtual reality applications, for example, mainly seek to emulate a type of sensory or physical authenticity in order to blur the distinction between 'real' and 'virtual' for the user. The immediacy or hyper-reality in a virtual environment

is experienced by the user but is specifically sought to be built into the application by the designers. Similarly, whatever authenticity is perceived in a handwritten text is affecting both author and reader. Often, however, I find that concepts around virtual reality are rooted in what I would call unfortunate realism: the split between real, objective existence and a mental (virtual) production, a split to which I do not subscribe.[6] In this sense, authenticity is more about our belief in the capacities of these technologies than in the actual relation between a text (or sensory VR experience) and its source. It emerges, rather, from social relations between people, texts, technologies, and practices.[7]

Whether writing with a fountain pen or on a computer, by striving for authenticity in communication, we are hoping for the successful communication of our physical and cognitive genuineness. Issues of subjectivity, the self, and identity are paramount in discussing writing and writing technologies. Moreover, they are intrinsically bound together by hopes for authenticity and fears about the loss of authenticity. "What cannot be reproduced, especially the body, remains the bastion of communicative authenticity," writes John Durham Peters.[8] Are writing technologies corrupting our selves by adding something artificial to bodies and selves which are conceived apart from technology? Are (writing) technologies part of what it means to be human and what sets us apart from other animals?

Handwriting's relation to authenticity has certainly experienced fundamental shifts. Béatrice Fraenkel interestingly suggests that the actual link between handwriting and authenticity is a more recent phenomenon. Cuneiform and even medieval scripture aimed at anonymity of the author for two reasons.

First, because these texts were intended to be duplicated, they were supposed to display a certain neutrality unspoiled by personalization. Second, writing tools like the stylus did only allow a limited range of movement on the surface.[9] With this uncoupling of handwriting and authenticity, the commonly made distinction between 'manuscript = individual and unique' versus 'printed book = standardized and formalized' does not hold up. Only with the development of gothic cursive and new writing tools did individual scribes become distinguishable. The singularity of the writing body leaves written traces in the shape of the *ductus*. While a signature is a deliberate trace on the surface, the ductus, that is the way the written line is guided over the paper, leaves an involuntary and unique type of trace.[10] Describing the transition from anonymous writing to individual writing, Fraenkel states that

> [t]he identification of an anonymous trace requires, therefore, preconditions, a kind of prior presentation allowing then its recognition. This could mean historical or informed transmission or a direct knowledge of the author but in any case, a 'contact' is necessary. When no contact exists, the link between the biological and the symbolical (the proper name) is disconnected and the ductus is reduced to its distinctive function, differentiating between imprints of different bodies. That is why ductus and signature can only be equated with the functional difference between identification and distinction.[11]

However, other even more direct signs have long been used to testify to the physical presence of a scribe: fingernails, fabric, seals, etc. were applied in order to mark a surface rather than leave a personalized trace of a body.[12]

Authenticity in the sense of the connection between authorship and writing, therefore, is a contested area of inquiry. Different forms of writings – apart from handwriting – often are accused of breaking a direct connection

between author and text. As we have seen, this break was at times intentional and viewed as beneficial for the dissemination of manuscripts. In the context of print and typewriting, however, it has been problematized as a rupture removing reader from writer and text from author. When typing on computers is seen as being mediated by devices like mouse and keyboard, handwriting, in turn, suddenly becomes an unmediated and thus more authentic writing technique through apparently direct manipulation of the text itself. Pen and paper, in this view, are diligently overlooked. When Gitelman states that "typewriters intervened more directly into the experience of writing itself in ways that further interrogated categories of orality, aurality, and textuality,"[13] this does imply that from early on, typewriting was juxtaposed to handwriting because typewriting was presented as 'automatic,' a product of both mental distraction and physical attention.[14]

Similarly, in the context of handlettering, the use of types and fonts imitating handwritten ones in graphic design, Heller and Ilič claim that "the hand has long been the tool of choice and, while not always the fastest and most precise, it is the most emotive. Going directly from hand to paper (or wood, stone, textile) is the most effective means of achieving unfettered communication."[15] This graphic technique is frequently used in advertisements (e.g., 'handwritten' brand names like Tim Hortons) and comics (the text in the bubbles). Although handlettering is a 'fake' form of handwriting as it is often produced with conventional (digital) typographic technologies, visually it implies all the connotations of handwriting. For instance, a handwritten graphic design implies

the absence of machines and of mediation between product or company and customer, of individualization rather than standardization.

(Re)mediation

As already proposed, challenges to the notion of authenticity focus on two areas: authenticity in the connection between the author and the text as content (semiotic authenticity) and authenticity in the connection between the author's body and the creation of the text as its trace (physical authenticity). Interestingly, both perspectives derive their argument from the changing configuration of inscriptive media. The situation where a person dictates a story to a scribe might serve as illustration. Clearly, the scribe produces the letters on the paper, hence readers might be troubled by concerns about the degree to which the person dictating was involved. When and how was that person present in the conception of the trace? Immediately, questions arise about who the author of the final product is and who is leaving the traces which readers will be interpreting.

I have already noted how handwriting's authenticity has changed with the arrival of new typing techniques. Also, I have discussed how the notion of authenticity changes depending on the composition of the media landscape. The back and forth of mutual effects between old and new technologies is, in my opinion, best captured by the concept of *remediation*. Media continually engage with each other by re-activating each other's features in an iterative process. New media and their practices, then, refashion older media while still exhibiting characteristics of these older forms (e.g., incunabula displaying the layout of older

manuscripts; hypertext looking like paper prints). Bolter and Grusin[16] label this phenomenon of the presence of multiple, dynamically changing media characteristics as *hypermediacy*. Hypermediacy actually creates a heightened sense of awareness of the medium. Paradoxically dependent on hypermediacy is the notion of *transparent immediacy*, that is, the designers' and users' desire to make media disappear (i.e. making users forget their awareness of the medium) for an apparently immediate experience of communication.

Together, immediacy and hypermediacy illustrate how writing technologies are both the products and generators of mutual on-going repercussions. A writing technology is perceived as particularly successful and authentic in communicating when both author and reader feel that they have managed to overcome at least part of the distance to the other. In this view, the simultaneous denial of mediation (transparent immediacy) and the heightened awareness of the potential of multiple media (hypermediacy) can contribute to a sense of a particularly authentic communication. Media develop meaning in our lives through their interactions with our bodies and senses; both the first introduction of a new technology as well as its remediation, then, have repercussions on these interactions. These repercussions have to be analyzed for every media constellation separately.

The idea of authenticity, too, is constantly remediated by our use of changing communication technologies. We can look at writing as a hypermediated practice, as an opaque practice which is calling attention to the multiplied mediation of previous and subsequent writing technologies. Similarly,

we can look at authenticity as a hypermediated concept, thus calling attention to its multidimensionality based on previous and subsequent understandings of its meaning. Further, we can look at the reasons behind these effects of remediation and how they change over time. In short, a discussion on authenticity within the study of handwriting has to include historical, sociological as well as cultural perspectives. Chapters three and four will deal with these perspectives.

Similarly heterogeneous – historically, sociologically and culturally – is the idea of *Schreibszenen* or *scenes of writing*. Rüdiger Campe demonstrates that writing unravels in a heterogeneous ensemble of instrumentality, gesture and semantics.[17] Unlike Friedrich Kittler, who privileges the instrumentality of writing,[18] Campe takes the writing process to be composed of these three realms in order to be able to describe various forms of writing with their singular preferences and frictions.

> The scene of writing can describe a process in which bodies are linguistically signed or tools contribute to the meaning to which they are instrumental – it concerns the work of civilization or the effect of techniques.[19]

Campe emphasizes that this is not a theory but an analytical tool to find the conditions of writing, the gesture, the hand creating a text, the writing tool involved and the meaning (semantics) which is left after the process of creation ceases.

The list of writers who have reflected upon their use of writing instruments is long.[20] Goethe preferred a smooth lead pencil as opposed to a messy fountain pen when writing down poems in the middle of the night; Nietzsche, after a year-long struggle with typewriters, concluded that "[o]ur writing tools are also

working on our thoughts;" Barthes conceded that he had "an almost obsessive relation to writing instruments" which caused him to practice typewriting every day "in the fond hope of acquiring a more 'typewriterly' writing;" Kafka recommended various techniques for authors in order to take advantage of the resistance certain writing instruments offer:

> Keep your quill rough against your inspiration, and it will attract the latter with the power of a magnet. The more thought you put into the writing of your idea, the more mature it will present itself to you. Speech conquers thought, but writing commands it.[21]

For this project, then, I will look at scenes of writing in the 19th century (the telautograph) and 21st century (signing and handwriting practices today) and will analyze the respective semantics, gestures, and instruments. I am convinced that these three aspects of the process of writing together will yield a saturated portrait of scenes of writing at different moments in time when handwriting and signing found themselves in challenging circumstances.

Five theses on handwriting

I now want to turn to five theses on the current state of handwriting and define them in light of the type of authenticity that I call physical authenticity. One thesis is more concerned with semiotic authenticity while the other four are clearly related to physical authenticity. Although I believe that each of them is valid on its own merits, they are all very intimately linked. They all pertain in various degrees to my project.

The first thesis states that *handwriting is directly produced by the writer's body while typewriting is produced by a technological device*.[22] Following from this is that a handwritten text, then, is perceived as a more genuine and true expression of the writer. Conversely, the typewritten text is seen as at least one step removed from the writer.[23] Here, a rather complicated, almost black-box type of machine seems to create the characters on the paper. (With thesis three, this same theme comes up in relation to a text's capacity to reflect the writer's intended meaning.) Yet unless a person is writing with his or her fingers, even handwriting involves some sort of technical device, e.g. a quill or a pencil. Yet many people would say that writing on a keyboard appears to be a much more mediated way to write than writing by hand. The latter is, evidently, also called *hand*writing, thus directly referring to the most prominently involved part of the writer's body.

Movement is central to this thesis. When writing by hand, the movements necessary to produce the letters could be seen as the kinetic representation of the characters on paper. When typing, in contrast, all fingers execute almost the same movement regardless of which key is being pressed. This applies to writing on all kinds of keyboards. A particular case can be made for writing devices which move a pen. While a fax machine mysteriously spits out a complete document, the telautograph and LongPen – two long-distance handwriting technologies figuring in this study – can be observed in the process of creating the handwritten 'twin' original with a moving pen. The pen at the receiving station moves with the writer's movements at the transmitting station. Both pens are perhaps scratching

over the paper the same way, both lifting off the paper in the same places. Witnessing these remotely produced movements must have an impact on how we perceive the document's physical authenticity as opposed to a fax, for instance. What is the difference between receiving a postcard written by an absent person and witnessing the telautograph creating a handwritten text by an absent person in terms of the text's authenticity?

In respect to the relationship between writing and the body of the author, several questions come to mind. What is the role of the hand? Is handwriting more natural, more direct and immediate than writing on a keyboard, for instance? In both cases, training of one or both hands over a long time is necessary to achieve a certain mastery. This also brings up the larger question of what the relationship is between technology and our bodies, an issue to which I will return in chapter 3. Mauss' *techniques of the body*, for instance, provide an interesting point of departure. For example, do the heavily trained and culturally acquired skills necessary for writing render this practice a technology? Are our trained hands and bodies perhaps the technology? Training, education, discipline and standardization, individuality, style and their respective relationships to authenticity are all issues intimately linked to this first thesis.

The second thesis states that *a handwritten text is a unique and authentic trace of an individual at a specific moment in time while a typed text is iterable and reproducible and can at best be traced back to a unique device but not to an individual person*. In other words, a text's authenticity stems from it being an individual trace of a writer's body (and its movements). The body, in the case of

typewriting, appears as if it were hidden behind the machine and the text is a trace of this machine. Time is important in the discussion about written traces. While handwriting produces one original representing one 'version' of the author's thoughts, with electronic writing we tend to overwrite previous versions and only the most recent is thus readily available.

Within this thesis, the signature occupies an important place as I will discuss in more detail in chapter four. The signature embodies a paradoxical nature as it is supposed to be singular and unique but necessarily has to be reproducible at any time and so in practice displays considerable variation. Derrida struggles with the paradox in his own way:

> I imitate and reproduce my 'own' signature incessantly. This signature is imitable in its essence. And always has been. In French one would say that *elle s'imite*, a syntactical equivocation that seems to me difficult to reproduce: it can *be* imitated, and it imitates *itself*.[24]

Thus, he basically concludes, he constantly reproduces his own signature in what could be considered a fraudulent way. Nevertheless, the signature creates a performative and permanent trace of a writer's physical presence. Schäfer, for example, looks at the changes within the study of handwriting from first, understanding it as a graphic trace of an expressive movement which reflects the uniqueness of a person to understanding it as reflecting a personality located in the person's brain and then, leading to the deeper understanding of the role of the hand as part of a complex system creating the trace.[25]

Thesis three pertains to the various links between written documents and the author's intentions and thus, subjectivity. It states that *we communicate our own thoughts, ideas, and representations. When writing by hand, we do so in a*

direct, immediate way. When typing, we are always left with some doubts about the authenticity of the content. Here, the argument seems to lead via the second thesis: because handwriting is perceived as a direct trace of the writer's body, the document so created, too, is perceived as a direct product of the writer/body. With typewriting, the machine is seen as standing between the writer/body and the text, therefore, the link between document and writer/body is seen as being only indirect. Subjectivity can be seen as relational. Its existence and specific characteristics derive from having certain connections to others in a shared environment (s. chapter three). The means to establish and maintain these connections include language and communication technologies. Writing is one of the tools with which subjectivity is constructed, shaped, and expressed to others. This process can occur on many levels, for instance, in the way a written document is exchanged (privately or publicly, etc.), how it has been composed (as a response, on time or belated, etc.), or its material aspects (on paper, electronically typed, handwritten, etc.). Taken together, these features will first, form the basis for any negotiations of meaning between author and reader, and second, contribute to the formation of the author's as well as the reader's selves.

The field of forensics reflects these perceptions: In handwriting analysis, for example, an identified author is tacitly assumed to be responsible for a document's content. In other words, the document is taken as an expression of the author's identity. When digital forensics are applied to written documents, however, the efforts are commonly directed towards identifying the device and other technical specificities which were used to create the document.

Consequently, the 'integrity' of a text is here taken as representing its authenticity. The author becomes, somehow, a neglectable or unattainable entity along the way.

This thesis is closely related to issues of semiotic authenticity, that is, the notion that a document ideally conveys the meaning intended by the author. Interestingly, Owen writes that typewriting might actually safeguard this form of authenticity better than handwriting since it is generally free from being misread and thus, misinterpreted.[26] I believe that there is a big discrepancy between what the technology actually offers and what we perceive it to achieve, that is, the gap between the valuation of handwriting and its actual practice.

Thesis four is concerned with original, copy, and forgery. It states that *in handwriting, only one original does and can exist. Reproducing a handwritten document, then, is equivalent to forgery. Reproducing typewriting, however, is equivalent to the creation of another original or another copy of something that always was a copy to begin with.* Does an original exist in the case of typewriting? Typewriters certainly produce different documents every time a new sheet of paper is used? What about typewriters with memory function, do they simply print out further originals? In the case of computer writing, is the text on the screen sort of an original and the print-outs represent copies? Could each print-out be an original? What role does location play, is a remotely printed document always a copy?[27]

Referring to photography, Walter Benjamin explained that "the presence of the original is the prerequisite to the concept of authenticity."[28] He was predicting

and also welcoming the disappearance of the cult value of the 'aura,' so highly treasured in bourgeois cultural discourse. He associated this disappearance with the increasing accessibility and availability of late 19th century inventions like photography and film. The telautograph and similar long-distance writing devices emerged in this same timeframe. Physical authenticity, in this context, could refer to the history of an object's production. Copies of the object, then, would be instances of its physical authenticity.

With handwriting, we certainly have this one original. The LongPen and telautograph provide interesting cases on this matter. While only one person is writing with either device, both telautograph and LongPen create two identical documents through the writer's movements. Similar to the notion of the original, handwriting often is attributed sort of an aura as a culturally relevant indicator of authenticity. Its authenticity or aura, however, is neither objective nor self-evident and only becomes really pertinent when it is compared to mechanical productions and representations of texts, i.e. typewritten texts.

Thesis five holds that *handwriting implies at least the presence of the author while typing only implies absence, that of the addressee and of the author*. In the speech act debate between Austin and Derrida,[29] Austin apparently held certain suspicions against written utterances because the creator was absent. While in terms of its content, he accepted a written text as basically equivalent to an oral utterance, he only did so when a signature was accompanying the text. This signature, somehow, was expected to make up for the physical absence of the

author. Unfortunately, Austin did not elaborate on how he came to value the signature in these terms.

Derrida, on the other hand, talks about a 'break in presence' rather than absence. For Benjamin, the aura of a work of art is its presence. Its authenticity as a technical (and chemical) feature is juxtaposed to the affective and emotional effects of the work of art. Benjamin also writes in an important footnote that "[p]recisely because authenticity is not reproducible, the intensive penetration of certain (mechanical) processes of reproduction was instrumental in differentiating and grading authenticity."[30] Here, it becomes obvious that authenticity is not an inherent trait of an artifact (e.g., a handwritten text) or of self-presence. Rather, in a remediated sort of way, it is a response to or a product of the artefact's reproducibility.

The postcard provides an interesting illustration of the fact that presence and absence (and technology and affect) are part of a coherent continuum rather than binary oppositions. Hjorth notes that the postcard "was marked by the politics of co-presence – shifts in public and private spheres, fusions of work and 'leisure' (symbolized by the flâneur), being *here* and yet *there*, being *present* whilst simultaneously *absent*."[31] The fact that the messages are personal yet potentially can be read by outsiders often inspires writers to use coded phrases that can only be understood by the addressee. Despite Derrida's fear of its corrosion of privacy, then, even a postcard can create an intimate bond between sender and receiver.[32] Postcards, in a unique way, exist in-between here and there: as a practice and *raison d'être*, they at the same time mark the sender's mobility

(the writer is away, 'there') and stasis (the writer is 'with' the reader, thinking about 'here'), a condition which in many cases also supplies part of the message content. Can we simply equate mechanical reproduction/copy with distance and absence? Or, on the other hand, can we equate original with presence? Is that why handwriting - which is producing one single original - is more closely associated with the presence of a writer than is typewriting?

In sum, the three research questions guiding this project are: (1) What are the ways and degrees to which perceptions of technology and the body interact and influence each other? How do these perceptions unfold in the context of the practice of handwriting? (2) How do these interactions between perceptions of technology and the body play out in the case of a 19th century long-distance handwriting technology? (3) What are the changing perceptions of the physical authenticity of handwriting in the 19th and 21st century? Can we articulate a general portrait of the changing cultural appreciation of physical authenticity in the context of handwriting?

Thus, this research seeks to determine the changing status of handwriting in relation to other existing and emerging forms of writing. Further, it seeks to investigate the reasons behind the continuing cultural appreciation of handwriting and the seeming decoupling of the practice. What are the current perceptions of handwriting (in relation to various forms of typewriting, for instance) and how have they changed over time? In order to examine changes over time, a detailed historical case study will examine the 19th century telautograph, a writing device that made it possible to write by hand at-a-distance. At this point, several

scenarios seem possible. For example, changing perceptions of handwriting could be the result of interplays of handwriting with other writing technologies; or, they could be the result of changing valuations of the human body; or, they could be the result of changing valuations of (writing) technology in our culture.

For now, authenticity emerges as the central hinge around which this continuing cultural appreciation of handwriting revolves. As well, the practice of signing promises an interesting area where notions of authenticity, presence/absence, of authorship and origin are particularly hotly debated. Without taking sides in the Austin/Derrida debate, the signature will receive specific attention within a thorough theorization of handwriting.

It will become evident that concepts like ‘aura’ and ‘authenticity’ are not transhistorical concepts by means of which I measure the relative failure or success of the telautograph and other telewriting systems; rather, it is the other way around: the case study allows to unpack theses very notions and to trace the evolution of specific forms of aura, believes in authenticity, writing practices and so on. As previously argued, the constant remediation of writing technologies is a phenomenon which echoes through all the notions attached to them.

Data

For the case study on the telautograph, I visited several archives. Most publicly accessible primary documents on Elisha Gray’s invention can be found at the National Museum of American History, Smithsonian Institution in Washington DC. I visited the Smithsonian’s Archives Center in February 2008.

The main goal of this research visit was to collect information about Elisha Gray, the telautograph and the process of its invention. Finding out about its technical specifications as well as its intended and actual applications helped me to at least partially re-imagine the history of long-distance writing machines. I believe it is crucial to add to this history the distinction between devices scanning and printing existing documents (writing as image) and devices creating identical handwritten documents in different locations (writing as process).

Alison Oswald, inventors and technology archivist at the Smithsonian's Archives Center, provided me with access to the obvious materials but also to some of Gray's correspondence. The collection at the Smithsonian also contains an unpublished manuscript by Lloyd William Taylor, *The Untold Story of the Telephone*, 1933, which discusses in detail the competition between Elisha Gray and Alexander Graham Bell including, apparently, their mutual interest in the development of the telautograph.

Unfortunately, no comprehensive biography on Elisha Gray exists and it quickly becomes obvious that the Smithsonian owns only a fraction of the records documenting his life and inventions. For example, the letter collection only contains one letter Gray wrote to his wife over the course of 39 years of marriage.[33] The most valuable item at the Smithsonian may be Leon McPherson's lab diary. McPherson was hired by Gray as his first technician solely working on the development of the telautograph.

My visit to the Chicago Public Library and the Chicago Historical Society explored the moment when the product of Elisha Gray's arduous work in

developing the telautograph was demonstrated to the masses at the 1893 Chicago World's Exhibition. The telautograph exhibit was a great success and I found numerous positive reviews in newspapers and scientific journals. Although the Gray National Telautograph Company so far had mainly sold their product to customers using the apparatus inside their office buildings, I found new evidence from visitors' accounts indicating that Gray's initial vision must have been that first, the transmitting unit could become a mobile device and second, that the receiving unit would be found in private households. Possibly, technical limitations disallowed these applications. One observer of a telautograph exhibit noted that the wire coils merely represented a theoretical possibility and that "the inventor will not dare to attempt to send a drawing […] from Chicago to New York."[34] Other visitors perceived this long-distance handwriting device as a potential rival for the telephone.

A visit to Gray's alma mater in Oberlin, Ohio, completed my research visits abroad. Elisha Gray attended Oberlin College for several years and later also taught there in the physics department. The department's chair from 1924 to 1948, Lloyd W. Taylor, collected and retained documents and correspondence relating to the famous inventor. My visit to the college archives revealed that Gray early and generously shared his plans on the telautograph. As early as 1888, when Gray had just hired McPherson to begin work full-time on the device, a fellow physicist awaiting his visit, wrote to Gray: "You will bring along one of the 'pens' will you not? to explain the theory + the practice of it."[35]

The materials are crucial for a historically adequate analysis of a long-distance handwriting technology which was developed at a time when new typing and transmission devices appeared. This 19th century *Schreibszene*, then, transpires as rather similar to today's challenges posed to the practice of handwriting.

The following chapter jumps right into Elisha Gray's workshop where over the course of several years he developed the telautograph. The chapter describes how Gray's big plans for the device played out. Always considered a promising machine, the telautograph never became as ubiquitous as Gray's other big invention, the telephone. I will argue that Gray's business strategy, very much influenced by his experience with the telephone, backfired and hurt the economic success expected for the telautograph. This success was reasonably expected to be big because the telautograph used telegraph lines. At the time of its conception in the 1880s, telegraph networks were transnational. In 1866, the first lasting transatlantic cable was laid. Subsequently, world-wide submarine telegraph networks developed. In the 1870s, Britain and India were connected; Japan had a domestic telegraph network which was soon connected to its colonies and abroad; the Great Northern Telegraph Company oversaw telegraph lines between Denmark, Sweden, and Russia in the early 1870s and in 1883, telegraph lines between Vladivostock and Shanghai were laid; in the 1880s and 1890s, Europe, Africa and South America were telegraphically connected.

The development of telegraph networks was fast and partly successful because of a symbiosis with the railway. Wenzlhuemer writes that "[t]elegraphs were useful not because they allowed the railway operators to communicate fast, but because they allowed them to communicate faster than the fastest moving means of material communication."[36] Thus, the detachment of telegraph networks from non-electric transport like trains and ships brought a qualitative transformation of global communication.[37] I would claim that as a device transmitting handwriting over telegraph connections, therefore, the telautograph could potentially have had a global impact. Yet certain technical but mainly business aspects limited its adoption and diffusion.

Chapter Three provides the theoretical and historical context for the case study. In order to understand how the telautograph established itself in the business but not in the private realm, I use a rather strict version of media ecology theory by borrowing a terminology directly from classic evolutionary biology. The process of niche construction unfolded in a very particular way for the telautograph. Yet this is only one part of my argument why the machine did not fulfil its enormous potential. Thus, I will also discuss the ontological and political opposition between the body and technology, based on the fact that the telautograph engaged the communicating body in a specific way.[38] Here, I have left out the role of the hand, its capacity for touch and other haptic aspects of writing. This important area has to be covered elsewhere. And although writing about (hand)writing, the body, and subjectivity, I had to disregard the equally important role of reading and its interconnections with inscriptive media and

embodied subjectivity.[39] Consequently, I present my own portrait of the media landscape at the end of the 19th century.

Chapter Four revisits the main concepts explored in three *Schreibszenen*: the telautograph as a specific moment when the writing body was engaged in a specific way; signing as a specific application of handwriting across time; and the state of handwriting today and, perhaps, tomorrow. The relative stasis of the comparatively established practice of handwriting in our culture has been punctuated at several moments in time by developments in the general media landscape. How does handwriting's perceived physical authenticity translate into the digital, for instance? How will handwriting adapt to new competition? Like a biological organism in an ecosystem, handwriting does not simply adapt to a fixed environment but constructs its environment out of characteristics of the media landscape and, in turn, changes these characteristics in a cotillion of mutual remediation.

Notes

[1] Sonja Neef, *Abdruck und Spur: Handschrift im Zeitalter ihrer technischen Reproduzierbarkeit*. Berlin: Kadmos, 2008.
[2] Sonja Neef, José van Dijck, Eric Ketelaar (eds.), *Sign Here! Handwriting in the Age of New Media.* Amsterdam: Amsterdam University Press, 2006; Josh Lauer, "Traces of the Real: Autographomania and the Cult of the Signers in Nineteenth-Century America." *Text and Performance Quarterly* 27.2(2007): 143-163.
[3] John Mackenzie Owen, "Authenticity and Objectivity in Scientific Communication: Implications of Digital Media," in *Sign here!*, 2006. 64; 70.
[4] Hannelore Dekeyser, "Authenticity in Bits and Bytes," in *Sign here!*, 2006. 79.
[5] see Sonja Neef, "Authentic Events: The Diaries of Anne Frank and the Alleged Diaries of Adolf Hitler," in *Sign Here!*, 2006. 23-49.
[6] A considerable number of authors on virtual reality assume that in order to trick us into the experience of presence in an 'unreal' i.e. virtual environment, we have to 'suppress disbelief.' I tend to think that reality and virtual reality occur through the same processes within the same culture. Thus, presence and its experience is always mediated by both physical and intellectual tools that belong to a given culture.
[7] I found Jonathan Sterne's discussion on authenticity and sound fidelity very fruitful. He confirms that "authenticity and presence become issues only when there is something to which we can

compare them." See Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction.* Durham: Duke University Press, 2003. 218-221.
[8] John Durham Peters, *Speaking Into the Air: a history of the idea of communication*. Chicago: University of Chicago Press, 1999. 190.
[9] Béatrice Fraenkel, *La signature, genèse d'un signe*. Paris: Gallimard, 1992. 224.
[10] ibid., 229.
[11] "L'identification d'un tracé anonyme suppose par conséquent des préalables, une sorte de présentation autérieure permettant ensuite la reconnaissance. Il peut s'agir de transmission historique ou érudite, ou d'une connaissance directe de l'auteur mais, dans tous ces cas, un 'contact' est nécessaire. Qu'il cesse, le lieu entre le biologique et le sumbolique (le nom propre) se défait et le ductus se réduit à sa fonction distinctive, départageant des empreintes de corps différents. C'est pourquoi poser l'équivalence entre ductus et signature ne peut s'entendre qu'en posant la différence fonctionnnelle entre identification et distinction." [my translation], ibid., 226.
[12] ibid., see chapter entitled: "Nails, Hands, Hair" [Ongles, mains, cheveux], pp. 223-233.
[13] Lisa Gitelman, *Scripts, Grooves, and Writing Machines: Representing Technology in the Edison Era*. Stanford, Calif.: Stanford University Press, 1999. 185; this is an observation made again about textmessaging on mobile phones.
[14] Tim Armstrong, *Modernism, technology, and the body: a cultural history*. Cambridge: Cambridge University Press, 1998. 193-197.
[15] Steven Heller and Mirko Ilič, *Handwritten: Expressive Lettering in the Digital Age*. New York: Thames and Hudson, 2004. 6. In short, the authors write that "typesetting is official; handlettering is informal. Typesetting is mechanical; handlettering is expressive" (ibid., 7).
[16] Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media*. Cambridge, Mass.: MIT Press, 1999.
[17] Rüdiger Campe, "Die Schreibszene, Schreiben." In: Hans Ulrich Gumbrecht, K. Ludwig Pfeiffer (eds.): *Paradoxien, Dissonanzen, Zusammenbrüche. Situationen offener Epistemologie*. Frankfurt / Main: Suhrkamp Verlag, 1991. 759–772.
[18] Particularly in Friedrich Kittler, *Aufschreibesysteme 1800/1900*. München: Fink, 1985.
[19] "Die Schreibszene kann einen Vorgang bezeichnen, in dem Körper sprachlich signiert werden oder Gerätschaften am Sinn, zu dem sie sich instrumental verhalten, mitwirken – es geht dann um die Arbeit der Zivilisation oder den Effekt von Techniken." [my translation], Campe, 1991. 760.
[20] For the following examples, see Davide Giuriato, Martin Stingelin, Sandro Zanetti, "Eigensinnige Schreibwerkzeuge." *Basler Zeitung* Jul 13, 2002: 8.
[21] "Mache deine Feder spröde gegen die Eingebung, und sie wird mit der Kraft des Magneten sie an sich ziehen. Je besonnener du mit der Niederschrift eines Einfalls verziehst, desto reifer entfaltet wird er sich dir ausliefern. Die Rede erobert den Gedanken, aber die Schrift beherrscht ihn." [my translation], ibid., 8.
[22] Obviously, the term 'typewriting' is a simplification of a very diverse practise. Different keyboards, keypads, etc. require different degrees of physical attention, involving distinct noises and producing completely different writing. For my argument's sake, I am lumping writing on typewriter keys, computer keyboards, cell phone keypads, etc., together here.
[23] These perceptions have, of course, changed over time. Enlightenment rationalism saw the human hand as a source of error and falsity and the writing machine as objective, accurate and thus true. See Darren Wershler-Henry, *The Iron Whim: a fragmented history of typewriting*. Toronto: McClelland & Stewart, 2005.
[24] Jacques Derrida, "Limited Inc a b c…" *Glyph* 2(1977): 167.
[25] Armin Schäfer, "Lebendes Dispositiv: Hand beim Schreiben." In *Psychographien*, Cornelius Borck and Armin Schäfer (eds.). Zurich: diaphanes, 2006. 241-265.
[26] Owen, 2006. 64.
[27] Lisa Gitelman is currently working on some of these questions, also in the context of telegraphic and coded writing, as she announced in a talk at McGill University with the title "Modes and codes: Samuel FB Morse and the visual culture of texts." Social Studies of Medicine, McGill University, Montreal, Canada, 25 January 2007.
[28] Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction." In *Illuminations*. New York: Shocken, 1968 [1937]. 220.

[29] For the purpose of my discussion of the role of the signature in speech act theory see, J.L. Austin, *How to Do Things with Words*. Cambridge: Harvard University Press, 1967; Jacques Derrida, "Limited," 1977; Derrida, "Signature Event Context," in: *Margins of philosophy*. Chicago: University of Chicago Press, 1982; Michael Hancher, "The Law of Signatures," in *Law and Aesthetics*, Roberta Kevelson (ed.). New York: P. Lang, 1992. 227-243.
[30] ibid., fn 2 243.
[31] Larissa Hjorth, "Locating Mobility: Practices of co-presence and the persistence of the postal metaphor in SMS/ MMS mobile phone customization in Melbourne." *fibreculture: internet theory, criticism, research* 6: [2] http://journal.fibreculture.org/issue6/issue6_hjorth.html.
[32] As Peters (1999) and others have noted, Derrida was mistaken to assume that privacy had always been a characteristic of written postal communication. Post offices used to keep logs registering senders and receivers, mail had to be checked in order to set the postage and so on. In the U.S., for instance, only from the 1850s on was it possible to personally put a stamp and complete address on a standardized envelope and throw a letter into a public mailbox.
[33] Other letters can possibly be found in the archives of the Western Electric Company, New York and in private possession.
[34] Henry Davenport Northrop, *The world's fair as seen in one hundred days: containing a complete history of the World's Columbian Exposition: captivating descriptions of the magnificent buildings and marvelous exhibits: such as works of art, textile fabrics, machinery, natural products, the latest inventions, discoveries, etc., etc., including a full description of Chicago, its wonderful buildings, parts, etc.* Philadelphia: Ariel Book, 1893. 248.
[35] Charles C. Churchill, letter to Elisha Gray, Jan. 3, 1888.
[36] Roland Wenzlhuemer, "Telecommunication and Globalization in the 19th Century." *Historical Social Research* 35.1(2010): 7-18.
[37] Kaukiainen has famously shown, however, that global information transmission had massively increased in speed several decades before a global telegraph network, mainly due to the use of steamships, railway and overall improved efficiency. Yrjö Kaukiainen, "Shrinking the world: Improvements in the speed of information transmission, c. 1820-1870." *European Review of Economic History* 5(2001): 1-28.
[38] Self-identity and body appearances and perceptions have become central to a consumer culture. Consequently, gender issues emerge as central. Obviously, when bodies are taken as the focal point in investigating subjectivities, gender differences have to be taken into account. Female and male corporeality beyond nature/female/unreason versus culture/male/reason binaries, then, should also move into the center of our discussion. This aspect of the discussion, however, remains to be addressed elsewhere. Other aspects within a discourse on writing the human body that I have neglected here are the notion of networks. Technology can be seen as a network of certain human practices and products. Accordingly, writing is a significant practice in establishing and maintaining social networks. Siegert offers an original study about the network of writing technologies and institutions, particularly the postal system, and its effects on certain literary figures: Bernhard Siegert, *Relays: Literature as an Epoch of the Postal System*. Stanford, Calif.: Stanford University Press, 1999.
[39] According to Massumi, for instance, "reading, however cerebral it may be, does not entirely think out sensation…. A knitting of the brows or pursing of the lips is a self-referential action. Its sensation is a turning in on itself of the body's activity, so that the action is not extended toward an object but knots at its point of emergence: rises and subsides into its own incipiency, in the same movement." Massumi, 139.

Chapter 2: The Telautograph

Introduction

Sometime in 1890 in Chicago, Elisha Gray and one of his technicians were spending time, as they often did, experimenting on Gray's latest invention, the telautograph. Gray was writing on a telautograph downstairs in his study while the technician was in the workshop one floor up. Between the rooms, they had set up a standard telegraph connection by which the two telautographs were connected.

By 1890, the telautograph was in its third reincarnation. Gray was very content with its quality of writing but did not yet find it "sufficiently simple and reliable for public use."[1] Transmission and reception were still combined within one device so that both Gray's and the technician's writing ended up together on the two continuous rolls of paper produced by the telautographs upstairs and downstairs, respectively. Each writer used a common lead pencil whose tip was attached to the transmitting machine by two silk cords. The tension of these silk cords created a number of electrical impulses depending on the length of cord moved which at the receiving end guided two aluminium arms holding a fountain pen. At this end, then, the moving pen created an astonishing handwritten duplicate. While producing a facsimile of the original handwritten text, the telautograph, in fact, transmitted not simply an image of that text but the movement of the hand writing it.

On that day, the two men exchanged random lines ("it is fast growing dark"), doodles (e.g., Gray drawing an umbrella with the words "I expect that umbrella needs some repairs"), numbers, poems ("let fate do her work, there are

relics of joy - Bright dreams of the past, which she cannot destroy"), etc., while always commenting on technical issues (e.g., "that came good except that it ran up hill about 1/8" here" or "This P.L. [pen lifter] and P.S. [paper shifter] does not work well this a.m."). They tried different writing speeds ("This is written at a fair speed. And this a little faster. And this still faster and here is a line quite fast, and here one of the fastest.") and sometimes adjusted the sending and receiving mechanisms as they proceeded.

Later that day, Gray's neighbours, Thomas H. Spencer and his wife, dropped by the workshop, where the assistant engaged them in the ongoing experiment. The following figure shows the exchange, Gray's original (written by him in lead pencil) with his technician's writing transmitted from the other room (and written out by the telautograph in green ink):

[Gray] I will stay here till you call me up. E.

[assistant] All right -- Now Mr Spencer and his wife are here. Write on.

[Gray] How are you Mr Spencer and his wife." I cant write well but I can write with a long arm. Since Adam Sat neath Edens trees, It's been the fate of man to sneeze." etc.
How does it come? Shall
I send my picture? E.

[assistant] Send your picture by all means.

[Gray] (sending doodle of a head) Well here I am.

[assistant] You left your pen in the field. The drawing is all right. Now let Mrs Spencer try.

[Mrs Spencer] You have greatly aged since we last met.

[Gray] Good people always progress. Thomas try thy hand. Elisha.

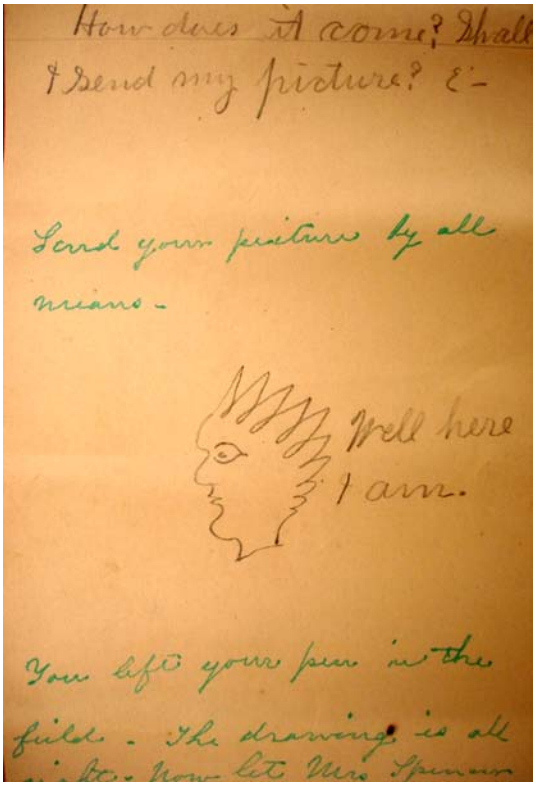

Fig. 001

Thomas H. Spencer was an affluent citizen of the newly developing Chicago suburb of Highland Park and possibly helped to finance some of Elisha Gray's inventions.[2] However, his visit to Gray must have had a single important purpose: to witness the newly improved third generation of telautographs. Elisha Gray used every opportunity to demonstrate the device to colleagues, his church community, friends, and neighbours. The purpose of these many events was to ensure that the telautograph was closely – and at best exclusively – associated with his name.

While other inventors preferred to protect their developing projects through secrecy, Gray went public with his telautograph plans first, with an early patent application in the summer of 1887 and second, with an extensive campaign of numerous public announcements and demonstrations. Already in April 1888, two years before the Spencers' visit and two generations of telautographs before the barely satisfactory model of 1890, Gray went on record saying:

> On next Saturday I shall give an exhibition of my new telautograph to some gentlemen from the East. I have already tested it to my own satisfaction over and over again. By my invention you can sit down in your office in Chicago, take a pencil in your hand, write a message to me, and as your pencil moves, a pencil here in my laboratory moves simultaneously, and forms the same letters and words in the same way. What you write in Chicago is instantly reproduced here in fac-simile. You may write in any language, use a code or cipher, no matter, a fac-simile is produced here. If you wish to draw a picture it is the same, the picture is reproduced here.[3]

In August of 1888, the granting of the first telautograph patent as well as the founding of *Gray's National Telautograph Company* were reported in *The New York Times* and elsewhere, often on the front page.[4] As we will see, Gray's way to proceed had several reasons and several perhaps unexpected outcomes.

In the second half of the 19th century, typewriters appeared on the mass market, the postcard became popular and the telephone started spreading in the business world. Within this media landscape, Elisha Gray developed a device that transmitted the movement of a writing or drawing hand over telegraph lines to a remote fountain pen which moved almost simultaneously creating a duplicate in the author's handwriting. The telautograph was hailed as "a beautiful invention"[5] and expected to alter handwriting applications in various areas. And although it eventually found widespread use in banks and train stations, for instance, it apparently never fulfilled its potential as a generally used telecommunications device. The following section seeks to historically situate the telautograph within its time and explore this discrepancy between potential and actual application in relation to historical, economical and personal aspects of the story of Elisha Gray's telautograph.

Transmitting Handwriting

The series of telautograph samples available at the Smithsonian Institution beautifully illustrate the arduous process of an inventor and his technicians from their initial idea through the grinding series of failed experiments to their first working apparatus and on through continuous fine-tuning to a marketable product.

Particularly the early samples show how far Gray and his head technician, Leon O. McPherson, were from being able to reproduce handwriting. Their attempts in 1887 produced hardly legible angular scribbles at 45 degrees from the lines on the paper (s. fig. 002). The fountain pen did not create a steady line and

must have been moving at varying speeds, thus creating thinner and thicker lines of ink, sometimes blotches. Moreover, the pen at the receiving end did not lift off the paper, causing letters and words to be written continuously. The changes in the design of the apparatus around this time, then, seem to have revolved around the paper feeder mechanism as it did not give the writer sufficient time to remain writing on the same line as well as on the pen-lifting feature.

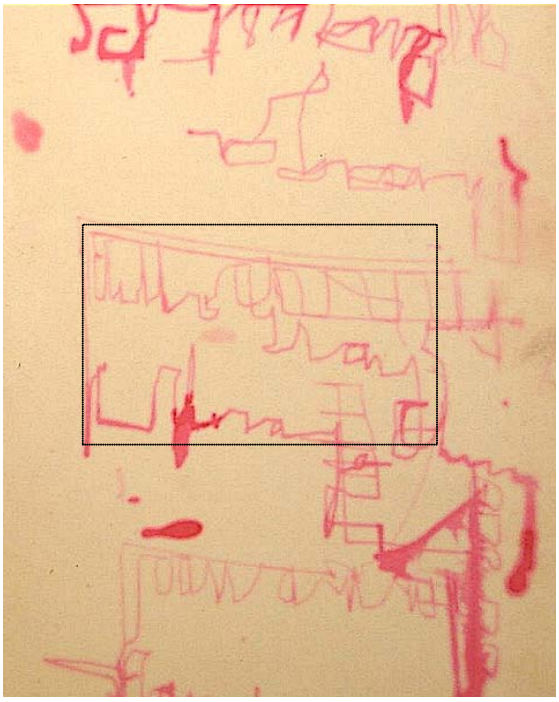

Fig. 002 - How the receiving telautograph wrote Elisha Gray's name (box) in this early experiment, ca. 1887.

The frustrations of this early stage were often expressed in Gray's and McPherson's correspondence. For example, on August 23, 1887, his technician sent the following report to a travelling Gray:

> My Dear Professor,
> Were it not that you are expecting something, I could not encourage myself sufficiently to write, because I have nothing but failure to record. […]
> The organization is 'the string plan', made in what I consider the best possible manner, and thus far I am utterly at sea as to why I cannot reproduce such work as samples X & Z indicate

> were possible with the old straw lever combine. […]
> I am pursuing the subject and may, at least I hope I shall, find the root of this evil before your return.
> Cushing + Bolton were here Sunday p.m.
> I had the machine all in pieces so there was nothing to show them.
> […] It is cold, cloudy & disagreeable today.
> Yours truly,
> L.O. Mac[6]

The transition from a pen movement being guided by a stiff mechanism ("the old straw lever combine") to one being moved by strings ("the string plan") appeared to not work out smoothly. On top of that, two visitors had to be sent away without a proper telautograph demonstration. On a different occasion, on February 7, 1888, Elisha Gray wrote to a friend: "The Telautograph is so long winded I am beginning to lose my courage. I was younger when I first talked about it and more enthusiastic."[7] Fortunately, Gray could not know yet that it would take another five years before the telautograph would become not only a publicity success but also an economic success. In 1893, finally, the inventor, summing up the experience, wrote that the telautograph "was not the result of a happy thought, dreamed out in a night and put to work the next day, but it was an evolution."[8]

Slowly, by adjusting mechanisms such as the paper shifter and pen lifter, the writing became first, legible, and by 1890, clearly recognizable in either Gray's, McPherson's, or in one of the other assistants' hands. The telautograph samples visually illustrate this process of approximation. During their experimental exchange in 1890, Gray and his assistant continuously criticized the telautograph's output. Yet one of the handwritings transmitted by telautograph that day clearly is Gray's as it can easily be compared to his correspondence or notes and can be distinguished from his technician. Moreover, we can clearly

establish that it was not McPherson who assisted him that day. McPherson's lab diary is composed in a very different script. At that time, then, the development of the telautograph must have passed the point when the writing produced was impossible to assign to one of the two writers.

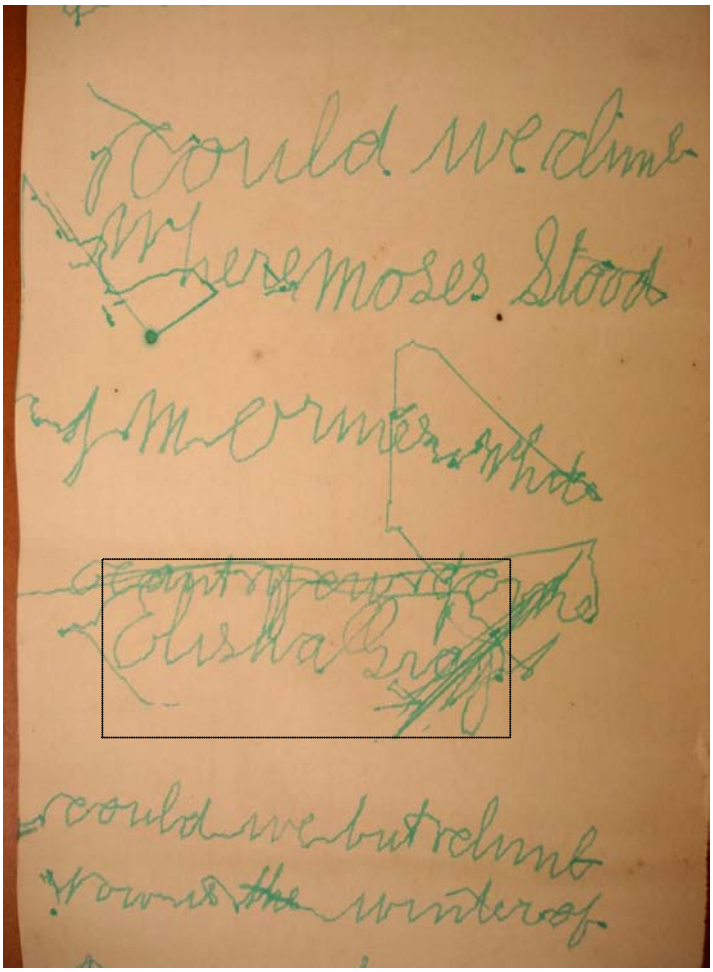

Fig. 003 - Continuous writing of the telautograph, ca. 1889. Remote copy written by Elisha Gray: "*could we climb - where Moses stood* - ??? - *cant you come - Elisha Gray* (box) - *could we but climb - now is the winter of*"

The need for improvements and adjustments to the paper shifter and pen lifter must have been derived from the men's visual assessment of what the telautograph produced. Based on what they saw printed out at the receiving end, they decided to redesign the properties of the receiving pen, for example. On August 15, 1887, McPherson recorded the following entry in his lab diary:

> Trying a Solenoid for receiving properties. [drawing] The upper 1/3 of cone is of light nonmagnetic substance also the lower 1/3, while the remaining 1/3 or middle is of iron. The thus compounded core moves in delicately mounted pulleys. Movements are good but has too much inertia to be useful in our purpose now.[9]

He then noted that the receiver now had "perfect motion but not enough power to drag the pen." He did not have a standard measure to compare this power to previous pens, however, and again had to rely on visual control of the outcome. If Gray, too, concluded that the received writing looked faulty due to a lack of pen power, McPherson had to return and redesign the receiving pen.

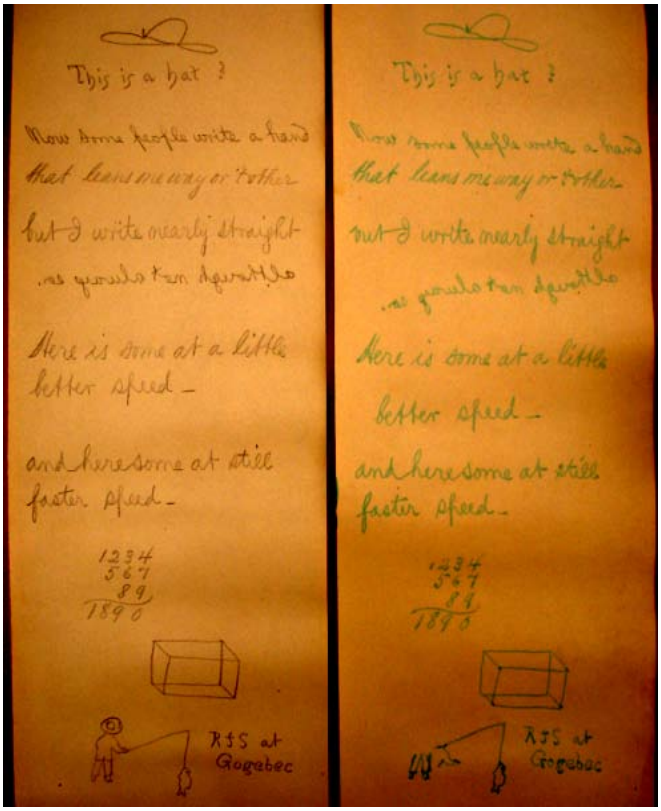

Fig. 004 - Transmitted (lead pencil) and received (green ink) writing by Elisha Gray on his telautograph, ca. 1891

This process of visually assessing the writing produced by the telautograph receiver and adjusting the device's parts and mechanisms continued for years (s. below for a summary of Gray's several telautograph generations between 1887

and 1893). Until 1890, Gray was unhappy with what he saw on the paper in respect to hand recognition. Rather, up to the time when the Spencers stopped by the workshop, the telautograph had created its own type of handwriting which barely resembled any of the writers'. Yet nowhere on the many meters of samples nor in McPherson's lab diary nor in any of Gray's technical records can we find a comment in the sense of "this just doesn't look like your writing, Elisha" or "I can't recognize my own handwriting."

Writing with the telautograph

A list, typewritten by Elisha Gray, of the main features that had been improved between March 1887 and May 1890 solely mentions technical issues. Instead of describing the problem of continuously connected letters and words or the square appearance of individual letters, the inventor focuses on "clock-train-Escapement. Used in penlifting" and on "soft rubber frictional esc[apement]," respectively.[10] McPherson's lab diary similarly contains only technical descriptions and drawings all of which focus on the telautograph's mechanisms. Yet in 1890, Gray finally decided that the current telautograph produced excellent writing. What prompted him one day to be satisfied and confident about what he saw? How big or small was the difference between the day he saw 'excellent writing' and the day before?

The very early samples also seem to suggest an interesting reversal between the men's handwriting and the telautograph's reproductions. During early experiments, the writers often repeated letters and words over and over and

produced seemingly frustrated scribbles with big movements. McPherson's lab diary from the same period, however, displays quite beautiful handwriting. But then the handwriting appears childish and crude when he struggled to get the apparatus to reproduce a text legibly. On the other hand, with the advanced telautograph, the samples show orderly structures and the men drawing dainty flowers, a hat or umbrella. The written exchanges between Gray in his office and McPherson in the workshop even became light-hearted and humorous, now also paying attention to content rather than to appearance only.

These observations reveal some of the subtle interactions between writer and writing device. In the beginning, the writing to be transmitted and the telautograph's output appeared equally rough. The men used big letters and movements which the telautograph transmitted as just that: big letters, big lines and hardly decipherable content. Over time, Gray and his assistants wrote increasingly refined messages while the apparatus transmitted them with increasing likeness and detail. Would a forensic handwriting analyst be able to tell whether Gray's handwriting in his letters differs from his handwriting with the early telautograph? How would this assessment change with improved machines? In broader terms, we should wonder whether a user does adjust his or her handwriting when working with such a technology. This could, ultimately, have legal consequences if we consider (digital) writing systems and, particularly, signing technologies and their judicial applications.

Elisha Gray took handwriting as a technical challenge. He and his assistants visually judged what the telautograph produced and this provided the

impulse to change certain parts of the device. They always found the solution to an undesired output in adjusting materials, levers, pulleys, and other mechanisms. In one instance, Gray revealed some consideration regarding the specific way the writer had to use the telautograph pen:

> In writing, your pen or pencil is attached to two small wires, and these wires regulate the currents which control the pencil at the other end of the [telegraph] wire. But these wires give you no trouble. You hardly know they are there, and can write with as much facility as if they were absent.[11]

During experiments with the machine, however, Gray was of course extremely conscious of the writing process. The mechanics of the telautograph were his foremost concern: "I have put a little more friction on promp. and am watching the strings as I write. Did it make a break in the word 'strings' I thought I saw string on right hand side slack up when I started to go upward from" he noted during one experiment. Would it become possible for the common user to overlook these aspects and learn to use the telautograph with the same degree of awareness as other handwriting tools?

We have to wonder whether the comment in the newspaper report above was not made in response to some form of criticism. From the beginning – as most newspaper reports show – the telautograph was most often perceived as a direct competitor not of the typewriter but of the telephone which was in the process of establishing itself as a major means of communication. The typewriter had already received its share of criticism: it was technically difficult to master and required a brand new form of training. Speaking on the telephone, on the other hand, did not require any technical training. In times of media technological transitions, then, when instrumental aspects of the communication process come

to the fore and when instrumental possibilities are multiplied, a sense of competition and the obligation to choose are heightened as well.

In a newspaper article in 1888 on the novelty of Gray's telautograph, a writer predicted that thanks to the telautograph "a Man Can Escape All the Horrors of the 'Hello' Machine." In the same piece, Gray foresaw that

> [t]his telautograph will supplant the telephone for many purposes. It can be worked in exchanges, just as the telephone is, or by private wire. It has many advantages, too. It is noiseless and devoid of the many annoyances so common to the telephone. It will be much less affected by induction. There will be no trouble in catching words or syllables, letters or figures. No misunderstandings will result. Besides, it leaves a record at both ends of the wire, and there can be no dispute about what was said. For all commercial transactions this would be an invaluable feature. […] it would save many of the delays and annoyances incident to telephonic communication.[12]

The horrors of the telephone were its public character at that time (shared lines, operators, etc.), its proneness to technical affliction (for example, interference and, thus, misunderstandings and delays) and the unprecedented intrusion of privacy (neighbours and operators listening in, the telephone apparatus ringing in the living room, strange voices in the private home). Gray's remarks are thus directly in response to criticism of the telephone and are, of course, especially interesting considering his involvement in the development of the device.

Elisha Gray and the Telautograph

Elisha Gray was born in 1835 near Barnesville, Ohio. His parents were well educated Quaker farmers. His father died when Elisha was 14 and schooling became more difficult. He began to work for a blacksmith, a boat-builder and over

time became a talented mechanic. He managed to study for several years at Oberlin College, Oberlin, Ohio, while supporting himself as a carpenter. Always struggling with his health, he considered joining the ministry. His future mother-in-law, however, seemed to have decided Gray's career path when she exclaimed that "it would be a pity to spoil a good mechanic to make a poor minister."[13] Gray left Oberlin College in 1861 without a degree. In 1867, he finally had a (financial) break-through as an inventor with a self-adjusting telegraph relay which gave him the opportunity to link up with other inventors and, more importantly, with manufacturers. Although his academic training was limited, Gray became a successful inventor of numerous improvements to the telegraph. He became closely integrated in the structures of the Western Electric Manufacturing Company, Western Union and other established companies. He became part of a network of experts and authorities in the field of telegraph invention and application. He was quite successful in running his own business (together with a partner, Enos Barton), as a board member or superintendent. He always seemed to have had affluent supporters for his experimental work so much so that in 1874, he became an independent inventor focusing on musical telegraphy, multiple telegraphy and voice telegraphy.[14]

Elisha Gray moved to Hazel Avenue in the Chicago suburb of Highland Park in 1871. There, his family inhabited a Victorian house, the first on Hazel Avenue and one of the first in Highland Park. In addition, Gray owned a house on the same street with a workshop and residence for his technician and a study for

himself. He was all set for a successful career as an inventor: he had years of invaluable experience, knew the right people and had sufficient financial backing.

In the early 1870s, only one message composed of dots and dashes could be transmitted at one time over a single telegraph wire using intermittent direct electric current at one time. The telegraph network, though constantly expanding, was used close to capacity. Moreover, the logistics of organizing this one-way, one-at-a-time traffic was extremely cumbersome. Western Union promised a reward of $1 million dollars to the inventor of a system that would be able to carry multiple messages over the same telegraph connection. Gray designed a combination of telegraph transmitters each sending messages in different tones. Unscrambling or receiving the differently toned messages at the other end proved to be more complex. However, Gray knew that this system eventually would be able to transmit and receive the human voice and over the course of time he designed a receiver based on a vibrating diaphragm and an electromagnetic receiver.

Already in 1869, rumours and accounts circulated about a German engineer, Philipp Reis, having developed a telephone, an apparatus transmitting the human voice. This invention was commonly described as “a mere scientific, although highly interesting, curiosity”[15] and no practical applications could be conceived. Whether Reis’ design was ever operable is disputed, but insiders like Gray and Alexander Graham Bell must have known of his work. Consequently, Gray decided to focus his energies on combining musical, multiple and voice telegraphy and second, to make a considerable fortune from this. The second

reason, of course, attracted other inventors as well, among them Alexander Graham Bell. Both Bell and Gray filed a number of patents pertaining to multiple and voice telegraphy in the years from 1874 to 1876. For a long time, however, multiple telegraphy – making use of an extensive network of well-established telegraph lines and offices – was expected to become a profitable business while telephony was not based on an existing market and its needs. Gray himself oscillated between his dedication to telegraphic devices and his interest in the revolutionary, yet so far unwanted, speaking telegraph, a scientific curiosity rather than a profitable investment.[16]

Gray's oscillating often was in response to what he heard about Bell's work. As it happened, both men submitted their telephone patent applications within one hour of each other on the same day, February 14, 1876. When finally, in 1877, Gray and his group of fellow-telegraphers, financiers, and patent lawyers realized the enormous commercial value in the telephone, they decided to contest Alexander Graham Bell's original 1876 patent on the grounds that Gray had submitted that very same day a caveat which subsequently had been thrown out by patent authorities. It was too late and Gray was entangled in a long legal battle with no benefits of any kind for him.

Gray was then, of course, completely consumed by the development of the speaking telegraph which blew up into one of the most infamous patent disputes in telecommunications history. Gray travelled extensively in order to demonstrate to various parties how to simultaneously transmit composite tones. In Washington, he exhibited the instrument to an examiner of electrical inventions in

the Patent Office. This examiner had previously doubted the practicability of the device. The dispute lasted several decades. Gray struggled for years in court to prove the timing and details of what he thought was the first filing of a patent describing the telephone by himself.[17] The dispute over the invention of the telephone, an enormously profitable device, left Gray bitterly disappointed but ultimately, I believe, it made him a more aggressive businessman. The inventor went through 'patent hell' and came out steeled and extremely conscientious regarding the processes of patent filings and going public with a new invention.

In sum, an accumulation of factors caused Gray's telephone debacle, according to Hounshell:

> A number of influences caused Gray to make this misjudgement: his extensive experience in telegraphy, his sensitivity to problems facing telegraphic development, his association with and respect for the leaders of the telegraph industry, his close personal relationship with his business partner, the pressure from his financial backer, and his trust in the expertise of his patent lawyers. All of these contributed to Gray's not even having a model of his telephone until July 1876 – over two years after he had concluded such a device was possible. In short, Gray was an expert and a member of a community of experts. Paradoxically, he was handicapped by these credentials. […] So we see a twist of […] 'technological momentum,' a tendency of technologists to perfect and maintain their familiar systems at whatever the cost.[18]

After the telephone debacle, Elisha Gray turned, not surprisingly, again to working on improvements of the existing telegraph infrastructure. Only parts of the technological momentum changed when Gray ventured into the telautograph project. We will see that his attempt at redefining the momentum had a somewhat better outcome.

From the time he moved to Chicago, Elisha Gray completely or partly invented a self-adjusting telegraph relay, a type-printing telegraph, a telegraphic repeater, a telegraph switch, a hotel and elevator annunciator, and many other telegraph-related improvements. He applied and was granted more than 70 patents for these innovations. It appears that from 1887 on, he dedicated himself to a large degree to the development of the telautograph. At that point, the telegraph had established itself as an unprecedentedly fast, global communications network.

Instantaneous communication was in place as early as 1846 over 2000 miles of telegraph wire between Portland, Maine, New York, Cincinnati, Chicago and New Orleans.[19] The transatlantic cable enabled the same in 1886 between the European telegraph network and North America. In 1887, at the beginning of Gray's telautograph project, the Western Union Telegraph Company alone transmitted over 40 million messages. Moreover, in contrast to its commercial twin, the railroad, the telautograph's installation and maintenance costs were extremely small.[20] Economically, through its speed, low cost and wide availability, the telegraph offered "a new means of cutting costs and increasing total factory productivity."[21] Mind you, for most of the time sending a telegraphic message was more expensive than sending one by postal service or by railroad. However, speed was highly desired for many users so that they were willing to pay for it.[22] The telegraph was also fundamental in synchronizing commerce, industry, news reporting, etc. It is within this context of this influential and continuously growing telegraphic network that the excited expectations and predictions for the telautograph have to be seen.

In 1890, at the time of the Spencers' visit to Gray's workshop, the telautograph was in its third stage. Gray had begun experimental work in February 1887. In the fall of the same year, Leon McPherson started as his full-time technician dedicated to the telautograph. Together, they built the "first rough experimental machine" which operated "on the variable resistance plan" and with which "some writing [was] accomplished."[23] In March of 1888, Gray was happy with a much improved second generation telautograph and considered it their first successful machine. This machine was demonstrated to journalists in order to seek general publicity. A third model in 1890 produced excellent writing. By now, however, Gray was dissatisfied with the fact that transmitter and receiver were combined in the same apparatus resulting in both sent and received writing on the same paper. Keeping the sent message and the received message on separate paper would simplify their filing and storage. Gray went back to work and designed a telautograph set-up with separate receiver and transmitter. By 1892, he had developed a fourth type of telautograph, the telautograph that would become a great success at the 1893 Chicago World's Fair.

The most important records documenting the development of Gray's telautograph are his technician's lab diary from 1887 and 1888 and early samples of their experiments, ca. 1887 to 1896. Together, the records create a picture of two men entirely dedicated to improve Gray's initial plans of a pen whose movements could be transmitted over telegraph lines to a remote pen executing the same movements, thus reproducing the same handwriting. While McPherson's diary consists of very technical descriptions and sketches of rheostats, levers,

glass pens, etc., it also contains rather personal entries. For February 7, 1887, it states "Wife arrived Chgo Saturday 5th. We came Highland Park today. Goods been in several days. Gray not returned yet."[24] The passings of McPherson's as well as Gray's mother within three weeks in the fall of 1887 are briefly mentioned. In October 1887, McPherson is joined by his brother to assist in telautograph experiments. The brother is hired for six months and, according to Gray, longer "if he suits."[25] Most of Gray's trips and conference attendances are recorded. We learn of the professor's man Tom, who seemed to have been looking after Gray's house and family. In a few cases, the diary entries are complemented by letters or other documents.

Parallel Invention

As described, the fact that telegraph networks became global, widely used communications networks rendered any new way to use them enormously potent. Elisha Gray did not work on the telautograph in a vacuum, rather, the competition was fierce and the struggle to get parts or mechanisms patented was all-important. And yet Gray managed to associate himself closely with long-distance handwriting so that many other inventors have almost been forgotten. Here, I will briefly mention other attempts at developing a device to transmit handwriting at-a-distance.[26]

The Swiss inventor Gustav Adolf Hasler (1830-1900) described in 1873 a 'Pantographe éléctrique,' an electric pantograph which transmitted the movement of a pen over a telegraph connection.[27] *Pantograph* is a collective term describing

any device that duplicates writing or drawing through a series of connected mechanical arms. Hasler's invention, however, was intended to duplicate at-a-distance, more precisely between a telegraphic transmitter and receiver. The device does not appear to have been commercially used. In 1878, Edward A. Cowper was granted a patent in England for an 'autographic telegraph.' Subsequently, he applied for a patent in the U.S., where he described the workings of his invention:

> In operating according to my invention the pen or other style is held in the hand of the operator writing, who writes upon a strip of paper that is caused to travel steadily under his pen […]. The pen or other style is connected by two light connecting-rods (or it may be by threads, if springs are added to keep the threads always tight) to the contact apparatus for sending the currents of the required strengths. […] I claim the method of effecting at a receiving-station the reproduction of characters written or marked at a sending-station, by means of electric currents varied in force by the movements of the sending style or tracer so as to produce correspondingly-varied movements of the receiving style or tracer.[28]

These mechanisms generally seem similar to the ones realized by Elisha Gray ten years later. Both science magazines and newspapers reported about Cowper's machine at the time.

In 1885, James H. Robertson applied in the United States for a patent for an autographic telegraph. Robertson filed several more patents pertaining to this invention over the next ten years. He was reportedly unaware of Cowper's device when he started working on his own.[29] In his patents, Robertson is described as the 'assignor to the Writing Telegraph Company of New York.' In an advertisement in 1888, a crucial year in Gray's telautograph project, the *Writing Telegraph Co.* was looking for investors: "This company owns controlling patents

in all prominent countries. […] Having perfected its instruments, it is ready to extend its business, not only for the distributing of news, but for private lines and the establishing of exchanges similar to those of the telephone."[30] Robertson and Gray, then, appear to have been in a head-to-head race, both in patenting and in developing a business for their inventions.

It is not clear when Gray first conceived of the idea of a telegraphic writing machine. Perhaps the earliest allusion can be found in Gray's own publication, *Experimental Researches in Electro-Harmonic Telegraphy and Telephony*, published in 1878. In parts written as a diary, the text mentions Gray's "experiments upon the general subject-matter of transmitting and receiving electrical vibrations." In an entry entitled "Return to Chicago – Resumption of Experiments – 1874," he formulates possible applications of this type of research:

> […] Up to this point my experiments had been mostly of a general character, with a view to determine in what line to first direct my efforts; for, as I have before stated, I foresaw as early as May [of 1874] the probable outcome of the invention in several of its ramifications; more particularly I saw its immediate application in the direction of multiple Morse telegraphy; its adaptation to a printing system, an *autographic system* and the transmission of spoken words.[31]

Although made in the context of his work on the telephone, this quote for the first time reveals Elisha Gray's long-time vision of an "autographic system" or telegraphic signing and handwriting device. It also reveals that, in 1874, at least the idea of the future telautograph already existed, what Gray calls "the invention." The element connecting this latest invention and the vision of an autographic system was the discovery and application of the transmission of variable resistance over telegraph lines.

One of Gray's many technical sketches contains the following handwritten note: "Elisha Gray – Invention – Sept. 15 - 1890 – Invented in 1887 – First machine 1888." After taking up his position as a technician with Gray, McPherson wrote on February 21, 1887: "Have got fixed up in pretty good shape, commence experiments on the telautograph machines, of which Mr Gray told me Oct 28th or 30th [1886] last."[32] We can assume, then, that Gray conceived of the idea sometime in the 1870s, perhaps prior to or simultaneous with Cowper and begun practical work on the telautograph in 1887, perhaps inspired by Robertson's activities.

From the material collected we can conclude several points pertaining to the business side of the invention. It appears that Elisha Gray filed a first patent application for the telautograph the moment he decided to pursue the development further and he had a first experimental device, in July of 1887 (s. Appendix 1 for a list of Gray related telautograph patents). Only in February 1887 had his technician Leon O. McPherson begun regular experiments. Gray applied for another patent with a revised design in May 1888. For this device he received his first telautograph patent (granted July 1888). (Curiously, his first patent application of 1887 was not granted until April 1893, when Gray finalized preparations to introduce the telautograph to the world at the Chicago World's Fair.) Also in 1888, he founded *Gray's National Telautograph Company* whose objectives were to "promote, establish and maintain the general business of a telegraphic, telephone, and telautographic company […] particularly by means of what is known as the 'Telautograph System' invented by Prof. Elisha Gray."[33]

This was at a time when they had a barely workable machine and years before a marketable product.

Yet, from an economic point of view, these early patent applications may ultimately have prevented this 'beautiful invention' of the telautograph to become a mass medium. By protecting his developing invention (Gray's first patent application in July 1887, in fact, was so early that we might talk about protecting his *intention*), Gray effectively shut potential competitors out and created a near-monopoly for his model, a monopoly similar to the one Alexander Graham Bell achieved when he was awarded the first telephone patent.

Keeping the balance between keeping one's invention secret and making it public has always been a challenge.

> By the early 19th century it was a common theoretical justification, offered by both British and North American writers, to regard a patent as a contract struck between the public and the inventor, who was awarded a temporary monopoly in return for disclosure of his secret.[34]

Yet it was a common assumption that "patenting and diffusing an invention were necessarily antithetical – the assumption that lay at the heart of the pejorative identification of patents with monopolies."[35] In other words, a yet unpatented invention had to be kept confidential in order to disable competition. However, if the contents of a patent became public, yet were very broad, potential applicants again were unable to get involved in a developing invention that had already been patented, thus inhibiting further improvement and diffusion. It was a delicate balance between confidentiality and publicity.

Others, however, kept developing their own models of long-distance handwriting machines and the competition continued. The close race between Bell

and Gray over the telephone apparently took also place over the telautograph. As Gray's successor at Oberlin college wrote,

> Bell and Gray also worked on the development of what has since come to be called the *telautograph*, a device for transmitting handwriting, line drawings, etc., by wire. Their competition over this device seems never to have become as acute as it was over the telephone and the harmonic telegraph, however.[36]

Gray was considered the insider, the professional and expert while Bell was the amateur, the outsider and teacher for the deaf. Following Michael E. Gorman's approach, the different mental models and their mechanical representations by the two men resulted in rather different problem-solving processes and thus suggest that their respective devices and patent applications were the result of unique design strategies rather than the result of copying from each other.[37] In general, starting in the early 1870s, long-distance handwriting seemed a highly desired invention and – as set forth in this chapter – considerable effort in respect to engineering, economic resources and patenting went into the project.

Gray's early going-public created a lot of hype, praise and thus, expectations. Gray himself, however, was not entirely satisfied with his apparatus and continued intensely to improve it. In 1888, when the first wave of press reports rolled out, Gray answered question regarding the commercial value of the telautograph as follows: "It will not cost more than $15 or $20, and is easily kept in order. I have tried it again and again, and it works more perfectly than the telephone, and is much less liable to have its usefulness interfered with by induction."[38] He even won a Grand Prize at the Paris Universal Exposition of 1889 with his invention.[39] Still, the inventor did not have a product to sell. If

public demand existed, he would not have been able to satisfy it. Not surprisingly, the press went quiet and only in 1893, in the context of the telautograph exhibition at the Chicago World's Fair, did a second wave of newspaper and magazine reports hit the public. By 1895, apparently, "the Gray Telautograph Company of America had been spending money like water in the prosecution of this invention, without so far attaining the desired result."[40]

World's Columbian Exhibition, Chicago, 1893

Sufficiently happy with the workings of the fourth generation of the telautograph, Elisha Gray decided to make a big splash at the 1893 World's Columbian Exhibition in his hometown of Chicago where the machine was demonstrated to the masses. Gray went to great lengths to make his exhibition stand out. He rented a substantial amount of floor space. Within the fair's Electricity Building, the exhibit was located on the upper floor and many of the photographs of the building's interior show an immense illuminated sign stating 'Gray's Telautograph, head to stairs.' The person responsible for the entirety of exhibitions in the Electricity Building, the chief of the Electric Department at the Fair, J.P. Barrett, wrote in his final report:

> At the Exhibition, the telautograph exhibit was one of the most interesting and instructive in the Electrical Building. Prof. Gray made the exhibit in a handsome pavilion in ivory and silver finish, carved with allegorical electrical figures. There were half a dozen instruments in constant operation before visitors, and as many operators in attendance to answer questions and demonstrate the uses of the machine.[41]

This was the telautograph's big coming-out, the careful and elaborate staging of a new way of communicating and doing business. Underlining the importance of the Exhibition was the fact that Elisha Gray was chair-man of the simultaneously held International Congress of Electricians. The telautograph exhibit was a great success discussed in numerous positive reviews in visitor guides to the Exhibition, in newspapers and scientific journals alike.

The exhibit benefited tremendously from the overall success and popularity of the Electricity Building which held many spectacular events. In the words of one observer: "there is no place where the crowds go so early and so often and linger so long."[42] Electricity, being still a novel phenomenon with novel applications, was applied in ways that visitors had previously not seen or expected.

> What a log of things there were besides! There was an electric cooking-apparatus where water was boiled upon a flat iron plate; there were clocks so contrived as to note the times a watchman touched a button on the front; there was Professor Gray's telautograph, which merits some description […]

lists *The Century World's Fair Book for Boys and Girls*.[43] The building was equipped with electric elevators and at night displayed a dazzling light show. A Ferris wheel studded with light bulbs made sure that "many visitors saw more artificial light in a single night than they had previously seen in their entire lives."[44] With more than 20 million visitors and favourable publicity, the 1893 Chicago World Exhibition was an enormous success of which Gray's 'electric marvel' was a part.

Other evidence from visitors' accounts indicate that Gray's initial vision must have been that first, the transmitting unit could become a mobile device and second, that the receiving unit would be found in private households. One visitor of the Fair got these impressions from witnessing the telautography demonstration:

> Professor Elisha Gray's sensational invention--the telautograph--in active operation, attracted many spectators. It is a very ingenious contrivance. […] Furthermore, should circumstances compel the active business man to part with his wife for a long time, the marvelous inventions enable their mutual intercourse during the separation as if time and space were unknown factors. The lady need not suffer long from inquietude concerning her husband's safe arrival; for the receiving instrument of her telautograph reproduces instantaneously his own handwriting.[45]

Another observer of the telautograph demonstrations noted:

> Professor Elisha Gray's telautograph is also on view, and the experiments are very exhaustive, although the wire coils, representing miles of distance, are merely theoretical devices, and it is pretty certain that the inventor will not dare to attempt to send a drawing by telegraph from Chicago to New York. But in the Electricity Building handwriting and simple pictures are transmitted by wire constantly.[46]

Visitors perceived this long-distance handwriting device as a potential rival for the telephone but also for print. Yet witnessing it in person also triggered very emotional responses:

> There is something distinctly weird and creepy in the sight to the onlooker who watches this pen gliding, without human touch, over the sheet, while a well-known handwriting stands out, word after word, in its swift, silent track. A sum is set down, figure by figure, and worked out, a sketch made, in the same wonderful way. Then the pen stops, the bell rings twice, and the message is done, and the paper rolls itself in place ready for the next call.[47]

Watching the LongPen, the 21st century re-incarnation of the telautograph, in operation has prompted similar descriptions. Mary Lou Finley, host of the CBC radio show *As It Happens*, described witnessing the LongPen at a bookstore as 'spooky.'[48]

In 1901, 14 years after its 'coming out' (i.e., patent applications, news reports, public demonstrations in 1888) and seven years after the renewed extensive publicity (at the 1893 world exhibition), a popular science article still described the telautograph with these words: "seeming miracle," "marvellous machine," "ingenious," "amazing little instrument," and "wonderful potentialities."[49] The main reasons for this long-winded process of breaking into the market have been discussed: it was the delicate interplay between going public and stifling competition by patenting the device; it was the lack of a purchasable product when publicity was at its height.

However, the telautograph also suffered from severe technical limitations. The distance of transmission was always quite limited. As the above quote from the 1893 Exhibition confirms, doubts existed over the invention's ability to transmit writing over great distances. Technically, this remained the biggest limitation to the telautograph's success. In 1889, Gray believed that "it can be worked over any length of wire."[50] Yet Gray and his assistant McPherson only experimented within a limited range. McPherson noted in 1891: "these two instruments being connected by one thousand feet of underground [wire]."[51] In 1893, an assistant wrote during an experiment: "Telautogram - Sample of work done on Prof. Elisha Gray's Telautograph on a line 6000 ft. long."[52] However, due

to its particular set-up transmissions by even the most improved model appear to have only been possible up to about 800 miles. Transmissions also appear to only have been possible between directly connected stations, unlike regular telegraph transmissions which could be repeated and relayed. The outcome of long-distance experiments with the telautograph was therefore always risky and uncertain.

A handwritten report including a sketch was sent over 431 miles from Cleveland to Chicago in 1895. The longest reported communication took place on March 21, 1893, between New York and Chicago, which is ca. 800 miles.[53] These were considerable distances at the time but they were not able to exploit the extent of the telegraph network at large. The very first inter-city telegraph line built in the United States in 1844 between Washington and Baltimore was ca. 40 miles in length. By 1884, the Indo-European Telegraph Co. used telegraph lines between London, England, and Calcutta, India, a distance of almost 5000 miles.[54] Therefore, although the telautograph project benefited greatly from know-how of a well-established technology, separate, rather short, direct lines were always necessary. The telautograph could thus only partially and indirectly take advantage of the global telegraph network.

Despite or because of its limited range, it became thus useful in sending handwritten texts within the same building or to neighbouring locations. The Ford company, for example, still in 1955 ordered vehicles between dealership and office by telautograph.[55] The only routine use over longer distances appears to have been the military version of the device. No other long-distance applications could be found after 1900. In-house and short-distance uses became standard,

even though it was technically possible to transmit telautograph messages over much longer distances.

Conclusion

The experimental demonstration of the telautograph in Elisha Gray's house in Chicago in 1890 explains several points about the process of invention. It illustrates how the inventor and his assistants worked on the novel device, the literally thousands of times they tweaked and adjusted the mechanics, tightened a screw or added a new relay. The scene shows that prior to these adjustments, a series of assessments and decisions had to be made. How did the machine work so far? How was its usability? Was the handwriting it produced just acceptable or actually a facsimile? Did it need to and how could it be improved? These assessments and decisions were not only dependent on the machine and its performance but also on the dynamics between inventor and assistants.

The scene in 1890 also illustrates Gray's business strategy. While a number of previous inventions and mechanical developments by different inventors enabled the invention of the telautograph, starting with Gray's filing of his first patent, the device became very closely tied to the name Elisha Gray. He actively and early on ensured this close association of his name with the telautograph. As soon as he had a design, he filed a patent application. This step and its timing were not unusual. However, as soon as he had a working – albeit rather primitive – model, he showed it to the public. He announced his invention in newspapers and created additional coverage by inviting journalists and various

other groups to countless public demonstrations. Of course, early feedback usually reported amazement and were very favourable. We have to ask, however, whether this strategy did not fire back in the long run. Early promise and praise were combined with the absence of a marketable product. Moreover, the early patent together with the close association of the name Gray with the telautograph might have inhibited competition. The lack of a purchasable product certainly inhibited diffusion. Then, the years between 1890 and 1893 were rather quiet and the telautograph almost completely disappeared from the public radar. In 1893, things finally came together: Gray had a workable product and the Chicago exhibition provided the perfect platform to bring it back into the public consciousness. By then, the telephone and typewriter, two increasingly useful office devices, had made crucial progress in establishing themselves in the office world, ultimately the target market for the telautograph as well.

The telautograph, in several instalments from 1887 on, created itself a particular niche among other communications applications. In order to analyze the telautograph's process of *niche construction* within the ecosystem of late 19th century media, we will look at its intended as well as actual applications. Why was it used in the business realm but not in the private realm? Why did bankers routinely use it at work but did not bring it home?

The apparatus was not simply released into the 'wild' without any conditions. Rather, the specificities of its design and, most importantly, its intended applications put a certain spin and direction on the way the telautograph subsequently established itself in the media landscape. Moreover, the media

landscape into which the telautograph entered already defined and restricted possible niches. These possible niches were not 'there' for the machine to move into but were created and shaped in the continuous interplay between the telautograph and other communications technologies. I will discuss theoretical aspects of the dynamics of these processes and the field of media ecology in the following chapter.

Before the establishment of the telautograph as a valid office device, Elisha Gray and others had certain preconceptions about where it could best be used. Elisha Gray envisioned his apparatus to become used in office work, education, and news reporting. In 1887, he entitled one of his earliest drawings with "Mechanical Telautograph for Desk work and lecture purposes,"[56] thus indicating two potential areas where he thought the device could be used. However, hinting at the possibility of writing coded messages, he must also have anticipated military applications. In 1888, announcing one of his first public demonstrations, Gray was quoted saying:

> By my invention you can sit down in your office in Chicago, take a pencil in your hand, write a message to me, and as your pencil moves, a pencil here in my laboratory moves simultaneously, and forms the same letters and words in the same way. What you write in Chicago is instantly reproduced her in fac-simile. You may write in any language, use a code or cipher, no matter, a fac-simile is produced here. If you wish to draw a picture it is the same, the picture is reproduced here. The artist of your newspaper can, by this device, telegraph his pictures of a railway wreck or other occurrences just as a reporter telegraphs his descriptions in words.[57]

Here, of course, Gray is suggesting an entirely new way of using the telegraph network. So far, the code – Morse code – used to transmit messages had been a

public code and anybody could potentially learn to read and write it. Yet it had been exclusively used by trained telegraph operators.[58] With the telautograph, on the other hand, users could not only directly send messages without the intermediary of an operator, but could also choose their own standards for sending and receiving, for instance, the type of code or time of transmission. The *New York Times*, reporting on Gray's first patent in 1888, stated that due to its mechanics, the telautograph was actually "doing away with skilled operators."[59] The fact that no trained operator was required to send or receive a message or that users could write or doodle in any way or code were characteristics built into the design of the telautograph. These characteristics, then, led Elisha Gray, his investors, and companies to market the machine for certain applications. Yet prior to the Chicago World Fair in 1893, I was unable to find examples of actual uses. With the enormously popular and successful demonstration of the telautograph in 1893, a new wave of advertisements and promotions finally set marketing and sales in motion.

A *Gray National Telautograph Company* pamphlet, ca. 1920, advertised the telautograph for a number of uses:

> The Telautograph is in general use by the foremost
>
> Banks, Trust Companies, Bankers and Brokers.
> Insurance, Indemnity and Realty Companies.
> Wholesale, Retail and Department Stores.
> Commission Merchants, Jobbers and Manufacturers.
> Hotels, Apartment Houses, Restaurants and Clubs.
> Railroad Terminals, Light, Power and Traction Companies.
> Mines, Steel Plants, Coal Companies and Warehouses.
> Wholesale Drug Merchants and Chemical Laboratories.
> Newspapers, Theatrical Managers, Lawyers and Doctors.

> To all of these and other customers the telautograph service has proved invaluable. For secret, prompt and accurate communication the Telautograph is indispensable.[60]

In 1914, an article described how the telautograph was used in hotels. The machine was located close to the telephone switchboard where, "by use of their telautograph equipment, the operators can forward guests' orders promptly and accurately in writing to the department which executes them." The article also lists other applications:

> The telautograph may also be used in department stores, by electric light and power companies, in newspaper offices, in offices, and in many other places which readily suggest themselves, and it is extensively used in railway terminals.[61]

Its most common use was probably in banks, where the telautograph helped cashiers and tellers to discretely inquire information from the bookkeepers, or request signatures from other departments.[62] Being a silent machine, it was used in railway stations to dispatch departure and arrival times from a central point to several receiving stations, for example, baggage and mail handlers or different platforms.[63] Few sources detailed how the telautograph could be used in the military. I found, however, many military mentions of the device, proving that it was indeed using the telautograph. For instance, telautographs were "helping [the United States] win the war [of 1914 to 1918] by providing accurate, trustworthy and secret means of communication" between government and army.[64] One source described the 'service telautograph,' a version built for outdoor and night use, designed specifically for the military.[65] It was silent and at the same time unaffected by, for instance, the noise on a battlefield.

In sum, early expectations for the telautograph were that the machine was going to be most useful in office work, relaying stations within the same building or between branches, in libraries,[66] in news reporting, and perhaps even in private homes. In fact, the telautograph found widespread use in banks, railway stations, the military, in the hotel and restaurant business and in news agencies. Some of its features were taken up in the literature, most notably in a short story from 1911 in which the telautograph, "the mute recorder of the tragedies and failures of life," logs at the police headquarters the events of a night in the city and brings together two lovers.[67]

Two main features of the telautograph, then, were usually promoted in advertisements and favourable reports. The first feature was that telautograph transmissions offered a high level of secrecy. They were inaudible, unaffected by background noise, and could not be wiretapped. The second feature was that the telautograph created a written document, thus eliminating the types of misunderstandings possible in oral communication, even in the absence of a person at the receiving end and providing a record for later review. Both features obviously addressed the most prominent concerns about the telephone. Gray stated that it was "not safe to buy or sell, run railroad trains, or, in fact, do anything that requires accuracy or a record, by telephone,"[68] the telephone, nota bene, being the most prominent invention of his career. While in 1888 Gray stated that he expected the machine to "supplant the telephone for many purposes,"[69] in 1893 he had come to see the telautograph not simply as a replacement:

> It should not be regarded in any sense as a rival to the telephone, but rather, as the inventor judiciously puts it, as a supplement to it, supplying in innumerable situations and circumstances what the latter lacks – namely, an unmistakable record, and hence filling an important requirement for which the telephone is unsuited.[70]

Emphasis on the 'picture power,' the capacity of the telautograph to send and receive pictures and symbols drawn by hand,[71] underscored the differences between written and oral communications devices. With the arrival of the telautograph in the media landscape, then, the telephone and general telegraphy were responding and adapting to the new pressures and demands:

> Telegraphy has undergone a change since the general introduction of the telephone. The public uses the telephone as much as possible for all communications where a direct exchange of ideas is indispensable, even if it is necessary to *send a telegram to make a telephone appointment*. Even the newspapers prefer a telephone message taken down stenographically. The telegraph is only now used in cases where, the quickness of transmission being equal, it is important to have a written record of the communication.[72]

The telautograph brought the need for a written record to the fore. Previously, telegraph and post offices kept records of the messages sent or received. With the telephone, the parties now had to make a conscious effort to create a written version of a conversation. The telautograph's original and its facsimile instantiated the conversation thus re-emphasizing the advantages of a written record in long-distance communication.

Its most outstanding feature, the capacity to transmit signatures, would determine its most important application: signing. A picture of a telautograph in 1914, for instance, was simply described as "commercial form of telautograph as used in banks, for transmitting signatures."[73] We can safely assume that the

telautograph never became that machine connecting wives with their travelling husbands. Perhaps the costs were too high or it was never marketed for this use or the consumer's desires and imagination did not exist.[74] Lewis Coe notes that even though Gray assistant Foster Ritchie much improved and commercialized the old-type telautograph in 1900, it still was technically challenged:

> This was the machine that was marketed for the next 30 years. At this time, telautographs were normally short-range instruments. They had technical limitations that prevented reliable performance at distances much over five miles.[75]

Gray's dream of the long-distance transmission of handwriting remained handicapped by his own design.

After Gray's death in 1901, later generations of his telautograph have been developed and used until the mid-20th century. The primary users were banks and companies with in-house written communication needs, and hospitals, where the ability to simultaneously inform several departments of discharges, diet changes, etc. made the telautograph indispensable. In the 1950s, the Electrowriter by Victor Comptometer Corp. presented the first (and only) differently designed competitor for the old-type telautograph.[76] By the 1980s, both types of long-distance handwriting machines had disappeared.

In the next section, I reflect on the mechanisms by which the telautograph moved into the media landscape of the late 19th century and on the general interplay between handwriting, writing technologies, the human body and the self.

Notes

[1] From Gray's only own publication on his invention: Elisha Gray, "A Revolution in Means of Communication." *The Cosmopolitan* 15.1 (May 1893): 126.

[2] Thomas H. Spencer is mentioned in "Our suburbs: a resume of the origin, progress and present status of Chicago's environs" (*Chicago Times*, May 4, 1873) as one of the "more noteworthy residents owning and occupying elegant and substantial residences," indicating a certain level of affluence.
[3] "A Telautograph," *The Manufacturer and Builder* 20.4 (April, 1888): 85/86.
[4] "To Telegraph Handwriting," *The New York Times* (Aug. 5, 1888): 4; "A New Telegraph Company: The Telautograph System to be Introduced into Virginia," *The New York Times* (Aug. 8, 1888): 1.
[5] "Electricity As an Artist," *New York Times* March 22, 1893. 1.
[6] NMAH 14, box 2, folder 11.
[7] NMAH 14, box 2, folder 11.
[8] Gray, "A Revolution in Means of Communication," 125.
[9] NMAH 14, box 4, folder 1, p. 32
[10] NMAH 14, box 2, folder 12.
[11] "Beats the Telephone: Elisha Gray's Latest Invention," *[Chicago?] Herald* March 21, 1888. [1].
[12] "Beats the Telephone," [1].
[13] Cited in *Album of Genealogy and Biography, Cook County, Illinois: with portraits*. Chicago: Lasalle Book Company, 1899. 80.
[14] Some of the biographical sources used here: ibid. 1899; "Professor Elisha Gray," in: *A Biographical history, with portraits, of prominent men of the great West*. Chicago: Manhattan Publ. Co., 1894. 116-120; Julia Johnas, "[Elisha Gray]," in: *Highland Park: Settlement to the 1920s*. Chicago: Arcadia Publ., 2007. 116; A. Edward Evenson, "Elisha Gray," in: *The Telephone Patent Conspiracy of 1876: The Elisha Gray - Alexander Bell Controversy and Its Many Players*. Jefferson N.C.: McFarland, 2000. 12-17; Lewis Coe, "A Man from Oberlin," in: *The Telephone and Its Several Inventors: A History*. Jefferson N.C.: McFarland, 1995. 67-74; Lloyd W. Taylor, "The Untold Story of the Telephone." *American Journal of Physics* 5.6(1937): 243-251.
[15] "The Telephone," *The Telegrapher* 5.39 (May 22, 1869): 309.
[16] David A. Hounshell, "Elisha Gray and the Telephone: On the Disadvantages of Being an Expert." *Technology and Culture* 16.2 (1975): 155-157.
[17] The first person to address the potential shortcomings of the popular view that Alexander Graham Bell was the first and sole inventor of the telephone was Lloyd W. Taylor, a teacher at Oberlin College (where Gray taught many years before him): Lloyd W. Taylor, "The Untold Story of the Telephone." *American Journal of Physics* 5.6 (1937): 243-51. Several publications in recent years have attempted to rewrite the story of the invention of the telephone. See, for example, Lewis Coe, *The Telephone*, 1995; Burton H. Baker, *The Gray Matter: The Forgotten Story of the Telephone*. St. Joseph, MI: Telepress, 2000; Edward A. Evenson, *The Telephone Patent Conspiracy of 1876*. Jefferson N.C.: McFarland, 2000; Seth Shulman, *The Telephone Gambit: Chasing Alexander Graham Bell's Secret*. New York: W.W. Norton, 2008.
[18] David A. Hounshell, "Elisha Gray and the Telephone: On the Disadvantages of Being an Expert." *Technology and Culture* 16.2(1975): 133-161.
[19] Ronnie J. Phillips, "Digital technology and institutional change from the gilded age to modern times: the impact of the telegraph and the internet." *Journal of Economic Issues* 34.2(2000): 272.
[20] ibid., 272.
[21] Alexander James Field, "The magnetic telegraph, price and quantity data, and the new management of capital." *Journal of Economic History* 52.2(1992): 401.
[22] See, for example, Field 1992; or Joanne Yates, Robert I. Benjamin, "The Past and Present as a Window on the Future," in *The Corporation of the 1990s*, Michael S. Scott Morton (ed.). New York: Oxford University Press, 1991. 61-92.
[23] Gray, "A Revolution in Means of Communication," 126.
[24] According to *Highland Park Local and National Landmarks* (2008), Gray lived at 461 Hazel Ave, the first building on the street and one of the first in the Chicago suburb of Highland Park. McPherson and his wife presumably resided at 333 Hazel Ave which is described as "Elisha Gray studio" (2008: 2). There, according to McPherson's lab diary, "[Gray] has front room down stairs for study and we have front room up stairs for shop. Remainder of house for my residence" (NMAH 14, box 4, folder 1, 22).

[25] NMAH 14, box 4, folder 1, 36.
[26] I will not consider the history of what we now know as fax or facsimile transmission, that is, where a handwritten document is in some way scanned and then transmitted as an image at-a-distance. This history starts only a bit earlier, with Alexander Bain who developed an experimental facsimile device in the 1840s.
[27] Gustav Adolf Hasler, "Pantographe éléctrique." *Journal télégraphique* 2.22 (October 1873): 344-46.
[28] Edward A. Cowper, "Improvement in Autographic Telegraphs." *Patent # 217,588*. United States Patent Office, July 15, 1879. 4.
[29] "A Curious Invention: Writing in Chicago Reproduced in New York by Telegraph," *New York Times*, Jun 22, 1891: 1.
[30] "Writing Telegraph Co.," *New York Times*, Oct 28, 1888: 15.
[31] Elisha Gray, *Experimental Researches in Electro-Harmonic Telegraphy and Telephony: 1867-1878*. New York: Russell, 1878. 33.
[32] NMAH 14, box 4, folder 1, p. 22.
[33] "A New Telegraph Company," (1888): 1.
[34] Christine MacLeod, "The Paradoxes of Patenting: Invention and Its Diffusion in 18th- and 19th-Century Britain, France, and North America," *Technology and Culture* 32.4(1991): 895.
[35] ibid., 897.
[36] Lloyd W. Taylor, "The Untold Story of the Telephone." *American Journal of Physics* 5.6(1937): 243-251; and Taylor, final draft 1936, chapter II 'Bell and Gray,' NMAH 14, box 6, folder 6; emphasis in original.
[37] Michael E. Gorman, "Mind in the World: Cognition and Practice in the Invention of the Telephone." *Social Studies of Science* 27.4(1997): 583-624.
[38] "Beats the Telephone," 1888.
[39] Mark Steadman, "Objects and Observers: telecommunications, the nineteenth-century International Exhibition and the public." *International Journal for the History of Engineering and Technology* 80.2(2010): 244.
[40] H. Morgan-Browne, "How to Telegraph Handwriting." *The Windsor Magazine* 14(1901): 305.
[41] J. P. Barrett, *Electricity at the Columbian Exhibition: including an account of the exhibits*. Chicago: R.R. Donnelley, 1894. 321.
[42] Benjamin C. Truman, *History of the World's Fair: Being a Complete and Authentic Description of the Columbian Exposition From Its Inception*. Philadelphia, PA: J. W. Keller & Co, 1893. 355.
[43] Tudor Jenks, *The Century World's Fair Book for Boys and Girls: being the adventures of Harry and Philip with their Tutor, Mr. Douglass at the World's Columbian Exposition*. New York: The Century Co., 1893. 205.
[44] David E. Nye, "Electrifying Expositions, 1880-1839," in*: Fair Representations: Worlds Fairs and the Modern World*, Robert W. Rydell, Nancy Gwinn (eds.) Amsterdam: VU University Press, 1994. 146.
[45] Johanna S. Whistaler, *By Water to the Columbian Exhibition*. [s.l.]: [s.n.], 1894. Available at: http://www.gutenberg.org/etext/9408.
[46] Henry Davenport Northrop, *The world's fair as seen in one hundred days: containing a complete history of the World's Columbian Exposition : captivating descriptions of the magnificent buildings and marvelous exhibits : such as works of art, textile fabrics, machinery, natural products, the latest inventions, discoveries, etc., etc., including a full description of Chicago, its wonderful buildings, parts, etc.* Philadelphia: Ariel Book, 1893. 248.
[47] Priscilla Leonard, "Writing By Wire," *The Youth's Companion*, Sep 29, 1904: 453.
[48] As It Happens on Januar 7, 2005. Regarding experiencing a machine creating a person's handwriting; creepy vs. spooky, see also L.A. Rickels, "Spooky Electricity: An Interview with Friedrich Kittler," *Artforum* December 1992: 66-70.
[49] Morgan-Browne, 1901.
[50] "Superior to the Telephone." *[?] Tribune* 8 September 1889: [1]. NMAH 14, box 9.
[51] NMAH 14, box 4, folder 2.
[52] NMAH 14, box 10.

[53] The Gray National Telautograph company issued a 4-page flyer compiling the highlights of the press reports on this experiment which was carried out between the telautograph room at the Chicago World's Columbian Exhibition and a receiving station in New York City. The *Philadelphia American,* for instance, wrote: "[The telautograph] completes the intellectual annihilation of space." NMAH 14, box 10.
[54] On the telegraph and its effects on distance – and thus, time –, see, for example, Annteres Lubrano, *The Telegraph: how technology innovation caused social change*. New York: Garland, 1997; Phillips, 2000; Frederick T. Andrews, "The Heritage of Telegraphy." *IEEE Communications Magazine* August 1989: 12-18; Carlene E. Stephens, "The Impact of the Telegraph on Public Time in the United States, 1844-1893." *IEEE Technology and Society Magazine* March 1989: 4-10; Menahem Blondheim, *News Over the Wire: the telegraph and the flow of public information in America, 1844-1897*. Cambridge: Harvard University Press, 1994.
[55] See "Teletypewriter and Telautograph Machines," http://forum.love-fords.org/showthread.php?1188-Teletypewriter-and-Telautograph-Machines.
[56] Elisha Gray, 1887, NMAH 14, box 9.
[57] "A Telautograph," *The Manufacturer and Builder* 20.4 (April 1888): 85/86.
[58] In 1846, Royal E. House invented a telegraph which wrote out messages in the letters of the alphabet. It was a complicated machine, requiring two operators to run it and rather rare high-quality connections for transmission. The House printing telegraph never made it onto the market. Lewis Coe, *The Telegraph: A History of Morse's Invention and Its Predecessors in the United States*. Jefferson: McFarland, 1993.
[59] "To Telegraph Handwriting," *New York Times*, Aug 5, 1888: 4.
[60] "The Telautograph," a pamphlet by the Gray National Telautograph Company, New York, ca. 1920.
[61] "Some Points on Electricity - The Telautograph," *Telegraph and Telephone Age*, Nov 1, 1914: 584. Other mention of the telautograph in hotels and restaurants, see, e.g., "Electric Wonders Shown In a Hotel," *New York Times*, June 22, 1908: 12.
[62] See, for example, Herbert T. Wade, "Electricity at Home and in Business," *Harper's Weekly*, July 1, 1905: 944; "Moves Into Modern Bank," *New York Times*, February 21, 1913: 16; Richard N. Germain, Dollars *Through the Doors: a pre-1930 history of bank marketing in America*. Westport: Greenwood, 1996. 22.
[63] Charles A. Brown, "High Tech Stuff," *Shoreliner* 28.2 (1997): 5; Coe, *The Telegraph*, 1993. 21.
[64] "The Telautograph: What It Is," *Electrical Experimenter*, April 1918: 876.
[65] H.I. English, "The Telautograph," *Journal of the Franklin Institute*, 160.4 (October 1905): 250. Further sources on the use of the telautograph by the military and navy are, for example, "Wireless Feats and Perils," *New York Times*, December 27, 1905: 8; "Navy Has World's Most Powerful Wireless Station," *New York Times*, October 20, 1912: SM8. The telautograph was in wide use at the very beginning of the 20th century but was phased out after 1910: Christopher H. Sterling, *Military Communications: from ancient times to the 21st century*, Santa Barbara: ABC-CLIO, 2008: 83. It also allowed to disseminate symbols, e.g. weather, not available on keyboards.
[66] Richard Garnett, *Essays In Librarianship and Bibliography*. London: George Allen, 1899.
[67] Newton A. Fuessle, "The Telautograph," *Blue Book Magazine*, January 1911: 622-627.
[68] Elisha Gray, "A Revolution in Means of Communication," *The Cosmopolitan*, 15.1 (1893): 124.
[69] "Beats the Telephone," [1].
[70] "Impressions of the World's Fair," *The Manufacturer and Builder*, 25.10 (October 1893): 233.
[71] Most sources describing the general features of the telautograph mention the possibility to send drawings and doodles, e.g., "The Telautograph in Journalism," *Chicago Times-Herald*, June 24, 1895: 8.
[72] M. Joseph Hollos, "Comparison of New Telegraph Systems," *Telegraph Age*, June 16, 1909: 406 (emphasis added).
[73] Homer Vanderbilt, "How to Build an Electric Writing Machine or Telautograph," *Electrical Experimenter*, 3.4 (August 1915): 149.
[74] On public imagination, see also chapter 3.
[75] Coe, 1993. 21.
[76] Guitry, "Dead medium: Telautograph" *Dead Media Project*, December 7, 1999. http://www.deadmedia.org/notes/44/447.html.

Chapter 3: Media History

Why did the telautograph – despite a dedicated group composed of inventor, technicians and investors and generally glowing reviews across the board – remain a fringe medium? Why did it never fulfil the prediction by most that it would become the perfect device complementing the shortcomings of other dominant media? Why then, several decades after the old telautographs were retired, did basically the same idea of long-distance handwriting resurface in the form of the LongPen? Is long-distance handwriting perhaps a strong, lasting desire in our culture but the devices built for the purpose do not fulfil the desire? I will explore two approaches to these questions: media ecology and theories of writing and embodiment. Combined, they will provide insights both into *how* events unfolded around the telautograph and *why* certain events unfolded and others did not unfold.

Introduction

The general *Schreibszene* in Elisha Gray's workshop involved not only the telautograph (instrumentality/technology) and the texts that Gray and his technician sent back and forth (semantics/content). It also involved their gestures, their training and practice of handwriting. As noted, the two men were able to produce qualitatively different handwriting. In personal letters, sketches or notebooks, they used their every-day handwriting, legible yet efficient. When experimenting with the telautograph, they often used their most beautiful

handwriting, conscientious and careful. (Sometimes they would also scribble and write intentionally fast and frowzily.)

Body and technology and their intersections were arranged in altering fashion in penmanship training during the 19th century. Character formation in both senses, suggests Thornton, was achieved by disciplining the body via mental self-development:

> In their extended discussions of writing posture, hand position, and physical movement, Victorian manuals portrayed the will and body locked in struggle, with the victorious penman ultimately able to master the latter by means of the former.[1]

The Spencerian script of the mid-century, the one in which Gray and his technicians were most likely trained, "entailed contemplation of ideal forms based in nature. The penman would begin with those ideals in his mind, then reproduce them with his hand. [...] It allowed writing masters to claim moral benefits for penmanship,"[2] a rather common notion in Victorian America. Learning to write was, however, a physically challenging process entailing endless copybook drills. Corsets and other means of restriction were used with the intention to ultimately allow the self to freely express itself:

> Because writing was conceptualized as an act in which the will masters the body to conform to a standard prototype, penmanship was a natural for creating the model male self of Victorian America, the generic man of character.[3]

Training in the Palmer method at the end of the 19th century, on the other hand, was often very much aimed at making handwriting automatic. The rigorous drill in practising was meant to physiologically 'inscribe' a habit into the neuro-muscular structure of the human body. This step was not thought to obliterate

mental control but to subject the body to mental control, and thus, to "imprint the memory of motion into the muscles."[4] This motion was not simply the use of fingers in moving the pen but the constant movement of shoulder and arm as well. The newly emerging – and even more automatic – practice of typewriting contributed to rendering handwriting an apparently conscious practice. After being trained to be writing machines – fast, reliable, always legible – through the Palmer method,[5] in light of the typewriter, handwriters became again individuals, producing unique writing. The manuscript writing movement at the beginning of the 20th century, for example, sought to counteract the rigours of 19th century handwriting techniques and to teach handwriting again as a means of expression of the individualized self.

Calligraphy, probably equally in response to machine and machine-like writing, enjoyed a revival starting in the 1890s with the Arts and Crafts movement. It was part of the general nostalgic sentiment which deplored the human alienation through technology. In this view, machine writing and even overly-trained handwriting had lost "the beauty and individuality natural to the hand of the craftsman-scribe."[6] Quill and parchment and letter forms pre-dating mechanical reproduction were favoured.

Like on a seesaw, mind and body and individuality and conformity tip to one side and then to the other side at different times in the history of handwriting. Handwriting is a product of both mental and physical processes. It represents therefore the product of an individual writer but also the imitation of a standard

model. Deeply ingrained in Western notions of handwriting in general – and not only in its epistolary form – is

> a provisional contiguity of body and soul: a contiguity of inscribing hand to letter sheet, which receives and bears a text whereby one soul speaks to another by virtue of the artifact's eventual contiguity with the addressee's body and (hence) soul.[7]

Again, both physical and mental processes allow handwriting to connect writer and reader. It is, in its own particular way, responsible for the success (or failure) of the communicative act between two selves. When Steadman states about the 19th century that "the handwritten word, especially the signature, carried with it notions of authenticity, intimacy and spontaneity,"[8] we have to remember in a media ecology sense the succession of communications tools at that particular time and how they affected each others' reputations. I will later continue to describe the process of how handwriting came to be associated with these attributes precisely through the continually remediating assemblage constituted by handwriting, print, the postal system, telegraphy and the newcomers telephony and typewriter. Within this changing technological melee, the 'struggle' between body and mind refashioned avenues for the self to be formed and expressed.

Long-distance communication at the end of the 19th century

The evolution of the media landscape of the late 19th century included quite a few seminal innovations, many of which are still in use today. Others that have since moved to the fringe nonetheless have had a fundamental and lasting impact on how business was conducted and people communicated. The electric

telegraph and its network, for instance, changed not only the way business was conducted and people communicated with each other, however. The world of telegraph operators and engineers with its numerous organizations and publications also helped establish new communities of technical experts, as Marvin suggests:

> Late-nineteenth century electricians constituted a self-conscious class of technical experts seeking public acknowledgement, legitimation, and reward in the pursuit of their task. […] They distinguished themselves from mechanics and tinkers, their predecessors, and from an enthusiastic but electrically unlettered public by elevating the theoretical over the practical, the textual over the manual, and science over craft.[9]

These communities dictated the terminology with which novel technologies were talked about and shaped the metaphors with which society thought about them.

Victorian America saw a series of other significant innovations. In 1868, Christopher Sholes patented the first typewriter in the United States.[10] In 1873, the postcard was introduced in the U.S. – the picture postcard not until 1905 – and the Remington typewriter went into mass production. Three years later, the telephone was patented and immediately the installation of sets grew almost exponentially.[11] The world of telephone and switchboard operators came into existence. By the 1890s, typewriters had become common office tools. The world of secretaries emerged.[12]

Only with Marconi's wireless telegraph, or radio, at the very end of the century did the linearity of all these communication tools come to an end. From operator-mediated communication by telephone to peer-to-peer use of the telegraph (and, thus, telautograph), the shape of the growing telecommunications

networks changed from fan-shaped to spider webs. But only with wireless radio did blanket coverage emerge. Thus, for Elisha Gray and his fellow inventors, communication was still firmly set up from a sender to a receiver along an established, wired connection.

However, many technologies that we now take for granted had not been invented yet and the popular imagination in some cases had not stretched enough to encompass them. 19th century science fiction inspired some of the popular imagination.[13] It was very much concerned with technological transformations. Electricity and magnetism were represented as commonly harvested physical phenomena and technology in general was a dominant trope. In fact, as Williams writes, in 19th century science fiction

> the technology need not be only a marvellous new energy source, or some industrial resource of that kind, but can be also a new set of laws, new abstract property relations, indeed precisely new *social machinery*.[14]

In short, technology became almost synonymous with the (advanced) state of society.

When Elisha Gray began promoting the telautograph, instantaneous long-distance communication was still finding its way into the public's daily routines. Telegraphy and telephony were still in formative stages, influenced by growing usage but also elaborately staged at international exhibitions. Particularly the telephone was still a novelty. Its protocols and applications were in the process of being negotiated. Handwriting was still an activity practised on paper that was intended to stay in the same place (e.g., in a notebook in a school bag) or to be mailed in an envelope. The "practice of writing and awaiting a reply"[15] still

involved inactivity over the course of days or weeks.[16] We have thus a media landscape in which several niches at various stages were simultaneously being constructed (telegraph, telephone, typewriter). However, handwriting had occupied basically the same niche for almost centuries.

Media ecology

Media ecology is a way to study the media landscape and the resources it provides. It is based on the idea that the various media making up the landscape or media ecosystem form complex arrangements with diverse forms of interactions and interdependencies. Using media ecology, we can explain, for example, how media adapt to each other (for example, how print altered manuscript tradition and in turn became what it was) or how media are distributed and used across society (for example, the spread of social media like Facebook). Within media ecology, the notion of niche construction explores the way a medium moves into a media landscape and changes it. Based on classic evolutionary biology, this is not simply a process of adaptation. Rather, "organisms do not adapt to their environments; they construct them out of the bits and pieces of the external world."[17] In other words, a new medium interacts with an existing media system by way of mutual influences. Both the new medium and the media system evolve and change in the process. Accordingly, the new medium plays an active role in constructing its niche or place in the media landscape. It selects, shapes and even eliminates or replaces other media and their characteristics.

Like other media, the telautograph started this process with a lot of baggage. The apparatus was not simply released into the 'wild' without any conditions. Rather, Gray's design and his intended applications put a certain spin and direction on the way the telautograph moved into the media landscape. For instance, Gray chose to advertise it to certain business types but not to others. What is more, the media landscape into which the telautograph moved already defined and restricted possible places for the machine's establishment. These possible niches were not simply available for the machine to move into but were created and shaped in the continuous interplay between the telautograph and other communications technologies.

Elisha Gray developed and demonstrated to the public different telautograph models over several years. While this process certainly built awareness and perhaps a certain level of need in some potential customers, it also allowed Gray to respond to feedback and to adjust the machine accordingly. Thus, when in 1891 he decided to separate the transmitting and receiving part of the telautograph, this move might have been a reaction to what he had learned from the public. The fact that the telephone, the most dominant new communication device on the market at the time, did not create a written document, could have added selective pressure on the telautograph's capacity to create such a document. The ability to keep the sent message and the received message on separate paper obviously enhanced filing and storage and was without a doubt an enormous improvement of the device.

Similarly, the telephone and telautograph were juxtaposed within the media ecosystem not only in terms of materiality/tactility (telautograph) versus immateriality/intactility (telephone), but also in terms of silence/inaudibility (telautograph) versus noise/audibility (telautograph). The audibility of the media landscape had changed dramatically since the arrival of the telephone. As a co-inventor of the telephone, Gray must have been keenly aware of its comparative advantages and disadvantages. In his descriptions of the telautograph, then, he clearly emphasized certain characteristics and played others down. For example, the inescapable 'Horrors of the Hello Machine' which invaded the privacy of homes (e.g., the new sound of the phone ringing in the living room; hearing a strange voice in one's home; sharing of party-lines, etc.) were compared to the silent writing of secret codes by the telautograph (see chapter two).

From among the long-distance communication technologies at the end of the 19th century, that is, the postal service, the telegraph, the telephone, and the telautograph, users selected each of them for particular reasons and applications. In turn, each technology came to occupy its own niche within the media assemblage of the time. Through this process of co-evolution, different media developed different traits. The way the telegraph network was set up, for example, it was possible to send a written message anywhere, anytime as long as the destination was a telegraph office open for business. Telegraphic communication was structured by a network of connected offices manned by trained operators. With the telephone, for a long time only few subscribers could be reached. However, no mastering of any codes was necessary. Yet people had to learn to

use the telephone in other respects, as Carolyn Marvin describes: they had to learn not to yell into the receiver; they had to remember to articulate and enunciate properly as transmission was often unclear, and so on.[18] Anonymity, perhaps for the first time, turned out to be a possibility in long-distance communication. When using the postal services, on the other hand, delivery times had to be taken into consideration. Yet these appeared more prominently long when instantaneous communication became possible. Today, handwritten letters are considered more personal and aesthetically more pleasing, yet more expensive than electronic mail. E-mail, in turn, is considered fast and cheap, yet superficial and easily ignored.[19] The advantages of one tool become the disadvantages of the other and so allow only a limited substitutability.

As I tried to show, it is important to expand on the classic definition of media ecology. Neil Postman, for instance, wrote that media ecology "tries to find what roles media force us to play, how media structure what we are seeing, why media make us feel and act as we do." Further,

> The word ecology implies the study of environments: their structure, content, and impact on people. An environment is, after all, a complex message system which imposes on human beings certain ways of thinking, feeling, and behaving.[20]

However, these are integrated circuits with two-way processes. No environment exists apart from human beings and vice-versa. No human being exists apart from communication tools and vice-versa.

Media ecology, in sum, offers an integrative approach that a medley of older and newer theories on the effects and uses of communication and its tools used to represent. For mass communication (direct effects theory, critical theory,

etc.), medium related theories (gate-keeping, agenda-setting, etc.), message related theories (propaganda, message construction, etc.), or receiver related theories (uses and gratification, diffusion of innovations, etc.), media ecology could come to encompass these various approaches under one roof. Classic evolutionary biology offers numerous fruitful concepts which can easily be applied in communication studies.

By exploring Elisha Gray and his network of technicians and financiers, his process of inventing and developing the telautograph, and the subsequent particularities of its adoption, I attempt to demonstrate that people play a significant role in shaping media and, thus, the media landscape. We create and design them with certain ideas and preconditions in mind; we create their contents; we use them in certain ways and situations and not in others. Therefore, human aspects have to be included in the description of a particular media landscape. We want to find out what human beings impose on media like writing technologies and not only the other way around. The following section will thus explore the distinctly human side of writing technologies.

Theories of writing and embodiment

Until today, writing and writing technologies have been completely dependent on that one particular body that each of us is and has, from relying on the body for the conception and production of the written text to ergonomic aspects which often are considered in the design of writing tools. I believe it is essential to explore the body and embodiment as the organic foundations of being

human. A body allows us to *recognize* someone across a room without hearing or speaking to the person. But my body is more than my business card. It provides the space within which my thoughts and feelings arise. It provides the filters, channels and outlets through which I interact with my environment. It mediates between my self and the world. It is my self and it is the world. By striving for authenticity in communicating, we are hoping for the successful communication of our physical and cognitive genuineness.

Moreover, technologies are key tools in this exploration of the body. Media and technologies in general are often seen as outside of the body, as external attachments. They are viewed as supplementing humans. At the same time, they often are so near to our existence that they seem to be encroaching our lives beyond what we feel are the proper limits for something that is external to our bodies. As much as medical interventions like in vitro fertilization or organ transplants challenge our notions of what it means to be human and to have one particular body, communication technologies have at least as intensely challenged our views on the 'naturalness' or 'artificiality' of using that body to express our selves in conjunction with the technology. What is natural about the human body? What is not human about technologies? Bodies and technologies at least provide the opportunity to think about the boundaries between them.

This section is an exploration of how we have investigated these boundaries and will review three discourses on the intersection between the body and technology, that is, media as extension of the body, the body as machine, and the ontological and political opposition between body and technology. I will

examine them first, in respect to the degree to which they include or exclude technology in the idea of what it means to be human and secondly, in the context of the room they allow for the problematization of the self.

The first of three possible approaches to the intersection of the body and communication technology considered here is the notion of media as *extensions of the body*. Marshall McLuhan's vision of new media saw them extending our sense and nerve systems, thus extending the reach of human perception. By knowing and also feeling what was going on in distant parts of the world through television and other forms of telecommunications, his vision implied, humans would extend their empathies and bring them back into a global village: "As electrically contracted, the globe is no more than a village. Electric speed in bringing all social and political functions together in a sudden implosion has heightened human awareness of responsibility to an intense degree."[21]

In fact, new media stimulate a dual movement: they simultaneously extend and aggregate man's capacities:

> During the mechanical ages we had extended our bodies in space. Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extension of man – the technological simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media.[22]

For McLuhan, this extension was approaching its maximum by enveloping the entire globe to the most intense degree possible.

An important variation of the 'media as extension' theme is represented by models of prosthetic technology. Prosthesis in the sense here denominates an extension or augmentation rather than a replacement of something missing as in the case of an artificial leg replacing an amputated leg. For McLuhan, technical extensions change the balance between our different senses: "Any invention or technology is an extension or self-amputation of our physical bodies, and such extension also demands new ratios or equilibria among the other organs and extensions of the body."[23] For example, the transition from an oral culture to print culture caused a shift to a visually dominated sense ratio. Not by exchanging information do we become aware of the world we live in but by sharing the experience of living in the same media environment and thus, sense ratio. This is how we become extended men and women.

This sensory balance is often achieved outside of our bodies, says Gregory Bateson.[24] Humans cope with environmental challenges by extraregulating their bodies. Whether we construct artificial limbs or cultivate new sorts of bananas, millions of our species depend on our ability to extraregulate. I believe that the technological and intellectual extension of man in McLuhan's model is very similar to the explanation of our evolutionary survival as formulated by Bateson. Both models rely on technologically mediated action as a species. Both define the human body as the locus where the action is carried out.

Also on an evolutionary scale, Douglas Engelbart pursued the idea of a co-evolution between human intellectual capacity and the tools we create and use. Only in combination do humans and tools form an 'augmentation system,'

increasing both in their capacities.[25] Similarly, N. Katherine Hayles has written about our integration into wider collective, cultural processes, processes which include our cognitive capacities. Based on Andy Clark and Edwin Hutchins, she argues that "cognition should not be seen as taking place in the brain alone." Instead, it is "a systemic activity distributed throughout the environment and actuated by a variety of actors, only some of whom are human."[26] Moreover, she acknowledges that these are mutual processes: "while the evolution of language changed human brain structure, human brain structure affected the evolution of language."[27] We create both the technologies and actors who will become part of this interactive environment.

These models, of course, are considerably extending the notion of extension. The mutual capacities to influence have the power to alter the very structure of each respective realm, the structure of human cognition as well as the structure of our environment, including technologies and media. Brian Massumi elaborates on this updated notion of extension. If we conceive of prostheses and technologies as external to our bodies, then we presume that our bodies are known organisms with well-defined boundaries. Thus, in this traditional sense, our bodies' extensions are similarly limited to a pre-established definition. Instead, Massumi suggests,

> if it is remembered that the body-organism and its objects (and even matter) are mutual prostheses, then what is being extended is that reciprocal action. The extension, whether off-world or not, is no longer a colonization but a symbiosis. The body is opening itself to qualitative change, a modification of its very definition, by reopening its relation to things.[28]

The extendibility of the human body becomes an expression of its capacity to perceive. This move enables us to switch the perspective from looking out of the body to looking at a more contextualized body in its symbiotic interactions with the environment. Tim Armstrong, then, separates the following two definitions of prosthesis: on the one hand, a negative prosthesis supplements a missing part, filling a void so as to restore the status quo; on the other hand, a positive prosthesis expands a human capacity. Armstrong attributes this notion to a "more utopian version of technology" in which the interplay between culture and technologies embodies the very idea of evolution.[29]

From McLuhan to Hayles, these models firmly link technology to the body, albeit in various ways. The degree of integration between the two realms differs substantially: while for McLuhan, Bateson and Hayles, for instance, human cognition/capacities and their environment inhabit one integral realm, for Friedrich Kittler, however, humans are apart from the tools they create. Gramophone, cinematography and typewriter not only re-engineer and extend the human psyche, they do so in a corruptive manner. Humans and nature inhabit separate realms, separated by technology.[30]

Yet, the conceptual link between technology and the body has also been conflated into their absolute congruence in the case when they represent the same type of 'organism.' The notion of the *body as machine* has its roots in Cartesianism, where the body is the tool for the thinking subject, the physical place where the thinking mind is at work.[31] In his studies in *Cybernetics*,[32] Norbert Wiener proposed mainly functional but also morphological similarities

between the human nervous system and modern information-processing technologies and machines. For example, he compared nerve synapses in organic bodies to vacuum tubes. The performance of the human body, Wiener concludes, is paralleled by similar processes in the performance of machines (feedback loops, servomechanisms, etc.) for a common purpose, that is, avoiding entropy. He notes that "the physical functioning of the living individual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback."[33]

First, both humans and machines are communicative organisms. Furthermore: "theoretically, if we could build a machine whose mechanical structure duplicated human physiology, then we could have a machine whose intellectual capacities would duplicate those of human beings."[34] The complexity of the mechanical structure equals human cognitive complexity. From this follows the observation that classic cybernetics is concerned with the probabilities of information transmission and its control and so has little use for the material specificities of the medium, e.g., the body in human communication.

The boundary between humans and machines is no longer separating them but encloses the same type of organism made up of one set of components and operating according to one set of mechanisms within a network of machines, bodies, and societies. For example, the female pregnant body is often viewed in public (yet highly medicalized) discourse to be at constant risk of malfunction or failure. It is seen as requiring continuous monitoring and management. Its organs and processes are viewed as always potentially defective but also as a possibly

repairable or replaceable assemblage of parts. Modern medicine compartmentalizes the pregnant body into sub-problems and deals with each separately with foetal monitors, hormone medication, blood tests, etc.[35] This is one instance where a clearly cybernetic rhetoric is dominating other forms of rhetoric in an area relevant to our exploration of the intersection between technology and the human body.

I perceive the finality of cybernetic systems as their biggest negative. They are (necessarily have to be) restrictively defined models which do not allow for 'real' complexities. The role of humans in a cybernetic system, however, does not necessarily have to be that of devices devoid of psychological, sensual, or political complexity. One way to avoid this is to choose the system's limits differently. Especially Gregory Bateson promotes a quite different version of cybernetics. For him, the context of a communication situation is paramount and includes man-made experience within a system whose boundaries lie outside of the physical boundaries of the human body: "experience of the exterior is always mediated by particular sense organs and neural pathways."[36] He thus emphasizes the reflexivity of human interactions with their environment within a flexible network of interactions.

From the body-as-machine to the mind-as-machine analogy it could only be a small step. Describing his 'Mystic Writing Pad,'[37] Sigmund Freud uses machinic metaphors to explain the functioning of the mind. The pad describes the two functions of memory: the top layer – from which inscriptions can be erased – represents our continuous capacity to perceive and so stands for consciousness.

The bottom layer retains these same inscriptions, even after they have been erased from the top layer and represents the unconscious. Freud emphasizes, however, the insufficiency of this analogy between an actual, living system and its metaphorical representation: "There must come a point at which the analogy between an auxiliary apparatus of this kind and the organ which is its prototype will cease to apply. It is true, too, that once the writing has been erased, the Mystic Pad cannot 'reproduce' it from within; it would be a mystic pad indeed if, like our memory, it could accomplish that."[38] Clearly, the living mind is the prototype while the machine is but an 'auxiliary' representation. Yet, Freud continues on to "press the comparison still further"[39] and associates two specific actions to both the organ and the apparatus, that is, feeling/perceiving of and withdrawing from the external world. In sum, the pad is not simply a parallel to the mind as prototype but only in light of the limits of the writing pad can we gain access to the specificities of the psyche, the mystic writing pad.

Freud or cyberneticians like Wiener used their analogies not to see humans as machines or machines as humans but, instead, to compare and design machines according to a human exemplar of autonomy and self-regulation. Others (including Freud) have noted the limitations of these often simplifying one-to-one comparisons. Similar to Massumi's critique of the notion of extension, cybernetic machine-metaphors presuppose well-defined categories and entities. In order to be able to compare them, both humans and machines as well as their processes require established boundaries and components.

When first-generation cybernetics proposed that the sender-message-receiver constellation operated regardless of the physical characteristics of a carrier, communication theory, in a way, lost its materiality and, thus, the body. In sum, without, of course, putting them all in the same category, the extended man and cybernetics tend to disregard the individuality of the experiential impact of technology. Additionally, none of them offers a consistent meaning of either the body or technology which coalesce in our embodied connections with our environments and in contemporary subjectivity, a significant notion which I will discuss below.

Body and technology have historically been separated, says N. Katherine Hayles.[40] Contemporary subjectivity (the posthuman) is aggregated through a deep-rooted tension between an abstract notion of the body as a basic ontological component of identity and the rejection of this body, often as a form of resistance to power. The 'loss' of the body (as the carrier of information) in cybernetic discourse, thus, threatens long-held notions of identity while at the same time inspiring celebrations of its liberating force. The idea of a denial of embodiment heavily influences thinking about the cybernetic analogy between body and technology. Hayles points out the variations within the different stages of cybernetics yet demonstrates how the decontextualization of the disassociation of material carrier and information content still dominates many opinions on new communication technologies. Historically, "[c]ybernetics problematized body boundaries at the same time that the culture was generally anxious about communist penetrations into the body politic." Here, we see a concrete

acknowledgement of two discourses, one within technoscientific and one within practical political rhetoric.[41]

The liberating appeal of disembodiment, however, has come to dominate subsequent attempts to conceptualize the intersection between bodies and technologies. Its appeals and reasons are manifold. For example, Käte Meyer-Drawe[42] looks at religious and metaphysical motivations that lead humans to search for immortality and answers to other existential questions. By externalizing and materializing this search, humans focus on the mind (or, in another terminology, information content or process), thus leaving behind the body (or, material, carrier) as a manipulable husk.[43] God and machines as sources for existential answers are here in direct competition. The always popular utopian views of new technologies provide another well-used example, for instance those waiting for the liberating powers of the Internet to relieve our drab lives by enabling us to explore multiple disembodied identities online.

Dichotomies possess fundamental existential powers. They have to be contrasted, though, with embodied processes and experiences that resist these dichotomies. First, *the body* as a generalized norm has to be distinguished from individual *bodies*, the diverse and particular material substance of human beings. Then, the body as an ontological fundament of identity has to be distinguished from *embodiment*, the practical experience or quality of 'being a body.' Being posthuman, as Hayles suggests, means that the body is "the original prosthesis we all learn to manipulate, so that extending or replacing the body with other prostheses becomes a continuation of a process that began before we were

born."[44] Technology, in this sense, is an implicit ontological component of posthuman subjectivity that enables a process of becoming something we have always been.

In many of the models presented here, the body (as opposed to bodies, see above) is conceptualized as controlled by an external agency (be it discourse or technology). The body displays these agencies and is so presented as a product of them. What I often dearly miss, then, is the consideration of bodies (here, as opposed to the body) as constitutive not only of perception but of human experience at large. More thorough examinations and definitions of the concepts used would frequently alleviate misunderstandings with many of the previously presented models of human-technology interaction.

The body has been lived differently over the course of time.[45] It has been brought into being in very different material cultures within very different technological and political systems. It has been explained, represented and conceptualized in many different ways at various times. In the sense that we have always been posthuman, we have always had multi-dimensional bodies. According to Ian Burkitt, technologies invest us with new powers and thus turn us into hybrid or prosthetic beings. Through this mediated interaction, we are always embedded in a "transformed materiality and sociality:"

> There is no absolute separation between nature and culture, body and mind, materiality and knowledge, for these can be understood as dimensions, interconnected through relations and practices mediated by artifacts, involving the thinking bodies of persons and selves. However, relations of communication and relations that transform the real are also interconnected with relations of power, and these not only help to produce capacities in the human body, they also

> attempt to limit the proliferation and application of those faculties.[46]

Bodies and technologies, in short, neither operate nor can be conceptualized in separate spheres, rather, they are interconnected dimensions in our experiences.

Embodiment, subjectivity and (writing) technology

The question 'Who is using technology?' will also bring us to issues of subjectivity, the self, and identity. These issues are paramount in discussing technology, media, as well as writing. Moreover, they are intrinsically bound together by hopes for and fears about authenticity. Are technologies corrupting our selves by adding something artificial to bodies and selves that are conceived apart from technology? Are technologies part of what it means to be human and what sets us apart from other animals? I have come to understand that the definitions of the terms (self, subjectivity, identity) are not completely discrete, their boundaries, rather, are permeable and fuzzy. The following is a whirlwind attempt at summarizing some of the most prominent uses.

The subject knows, as Descartes says; by thinking we become subjects. For Kant, the subject is the source of self-consciousness. Being a subject is constituted by social forces and relationships, says Foucault, and thus depends on political, social and cultural factors. Who and what am I? The basic discoveries here are first, that I think and second, that I have a body with which thinking is taking place. For centuries, these two discoveries led to the contested distinction between mind (thinking) and body (material being). Why, we might ask, and how can we separate the process of thinking from the body? What leads to the assumption that

thinking is an autarchic activity, if not completely independent from the body then at least occurring with a high degree of self-sufficiency from material circumstances?

We find contrasting ontological approaches to the nature of the self from those separating the mind or soul from the body (e.g., Plato, Descartes) to those associating 'I' with bodily sensations and experiences (e.g., Hume, Merleau-Ponty). Others deny any ontological weight to the self and the connection between the process of thinking and a self but rather, perceive the latter as a product of human culture (e.g., Nietzsche, Foucault). Closely related are notions about identity. Here, too, they range from approaches that hold that the self is something autonomous from external influences and stable (e.g., Descartes) to others who conceptualize identity as a response to something external and 'other' (e.g., Hume, Mead, Foucault). Consequently, ideas of the self and identity affect ideas about society and the relation between the two.

I would like to look in more detail at some models about subjectivity and its interconnection with embodiment. For example, a simplified version of Cartesianism portrays the body as a closed one which is subordinated to cognitive rationalization by the mind – the subject as a distinct homunculus in an object-body. Even though much of the social, religious, and political context within which this epistemology originated has changed,[47] it still has considerable influence on particular fields today, e.g. cognitive sciences and neurosciences.[48] I would like to move on to a phenomenological explanation for the modern subject,

however, as this has given rise to more challenging and fruitful ideas about the intersection between technologies and bodies.

Maurice Merleau-Ponty's phenomenology denies the mind an existence as a dominating homunculus, an 'inner man:' "Truth does not 'inhabit' only 'the inner man', or more accurately, there is no inner man, man is in the world, and only in the world does he know himself."[49] The self is a union between the soul or mind and the body and is "enacted at every instant in the movement of existence."[50] The united 'I' is the point of departure for all experiences. It is worth stressing the importance of this insight because it also applies to the philosophers and thinkers themselves who write about the intersections of the body and technology. The first and foremost vantage point from where they and everybody else explore the world and make judgements is the self. It becomes central, then, to investigate whether this is the only point of view possible.

While our thinking bodies represent these unique vantage points, they exist in environments that we share with others. For Merleau-Ponty, then, bodies are the basis of understanding and meaning but also the basis of a certain capacity to picture ourselves in imaginary situations. He explains this latter potentiality by way of the distinction between the body image and the body schema.[51] The body image is the body as an external object, the experience of the "undivided possession … of each of my limbs"[52] in space. The body schema, on the other hand, emerges from experiencing the body's being and operations. Thus, "by giving priority to the internal perspective of the organism, [it] paradoxically includes what is outside its body proper."[53] By including actions and interactions

of all kinds, Hansen suggests, Merleau-Ponty's phenomenology of embodiment offers us "a philosophy of embodied technics in which the excess constitutive of embodiment – the horizon of potentiality associated with the body schema – forms a ready conduit for incorporating the technical at the heart of human motility."[54] This particular notion of an extended body, I would argue, also offers a ready conduit for sharing an environment and its tools and thus, for sharing the vantage points for our experiences.

In sum, Merleau-Ponty extends the individual's body to a body-subject, that is, a perceiving subject in a material body. In other words, we live an embodied subjectivity where the mental and material are intimately united. Moreover, in this view we are not passive recipients of external objects or sensory images. Instead, it is entirely possible that different persons see different aspects of the same picture, for example. In the process of perceiving, inner and outer are inseparable and therefore, our subjectivity is both constituting and constituted within our environment.[55]

Although Merleau-Ponty includes symbolic meaning and language in his approach, he does so in a very limited sense. For him, speech is thought[56] but he does not develop any notion of how speech is linked to our bodily existence, i.e., how we use a particular language. It is helpful to turn to Mark Johnson and George Lakoff[57] who explain that our physical existence informs and shapes symbolic and linguistic concepts. In combination, Lakoff and Johnson and Merleau-Ponty contribute to a phenomenology that explains how technology and language mutually affect our physical experience and our understanding of the

world. Language and technology, then, are two 'readily conduits' through which we embody our selves and also through which we are able to share similar aspects of our embodiments with others.

What is missing in Merleau-Ponty's phenomenology (and, for that matter, Lakoff and Johnson's approach as well) is a sense of time, that is, how social and historical processes affect our embodiment over the course of time. Obviously, the world continuously transforms materially and symbolically (as we perceive it) and so at least the body schema and therefore our selves certainly change in the process. Michel Foucault[58] and Norbert Elias[59] traced these historical transformations of the body and the self in what– inspired by media ecology – we could call discursive ecologies. While Elias focuses on the European Middle Ages up to the Renaissance period, Foucault juxtaposes ancient Greek and Christian notions of self. Foucault separates these two notions with the 'Cartesian moment' when Stoic care of the self was replaced by knowledge of the self.[60] In both Elias and Foucault, increasing regulation and control of bodily functions are presented as having major effects on the formation and experience of the subject.

In *The Civilizing Process*, Elias contrasts inner and external constraints imposing certain behaviours on men and women. Often, these constraints were placed on emotions and therefore, they acted on a more basic, physical level. Emotions became increasingly psychologized (self-constrained and self-observed) and bodies more closed to external – quite literally – influences. This is the process leading up to 18th century 'civilized' manners and interactions and the results correspond to the Cartesian notion of an internalized subject in a closed

body. Similarly, Foucault discusses the evolution of techniques used in the formation of subjectivity. Again, the body is the object targeted by diets, medical procedures, or moral norms. Foucault makes techniques of self-examination the focus of his comparison between pre-Christian and Christian hermeneutics of the self. He distinguishes three types of self-examination, each located within a particular socio-historical context:

> first, self-examination with respect to thoughts in correspondence to reality (Cartesian); second, self-examination with respect to the way our thoughts relate to rules (Senecan), third, the examination of self with respect to the relation between the hidden thought and an inner impurity.[61]

This latter way of relating to one's self implies a variation on classic dualism, this time between the flesh and the spirit. Together with the Christian obligation to confess and disclose oneself and accompanying penitential practices, the self becomes the object of self-knowledge: "in the modern world, knowledge of oneself constitutes the fundamental principle."[62] I believe that in the end, Foucault convinces us that between care of the self (primarily of the soul via body) and knowledge of oneself (primarily of the body via mind) we find continuation rather than rupture.[63] Slight shifts from a pedagogical to a medical way of observing, from master/disciple relations to self-mastering, for example, brought about these transformations in the formation of the self. To sum up, at the roots of these Cartesian and Christian dualisms we find wider social and political changes.

In returning to my discussion of 'the body' versus 'bodies' and 'embodiment,' Elias and Foucault both focus on the body (although it is contrasted with the social body, i.e. populations). On a point I previously made,

Hayles writes that "whereas the body can disappear into information with scarcely a murmur of protest, embodiment cannot, for it is tied to the circumstances of the occasion and the person."[64] Without resorting to further binary distinctions, I would like to suggest for now that all abstractions and generalizations are made up of particularities. In other words, analyzing the body should bring us back to the specificities of embodiment while embodiment in turn should allow us to deduct certain generalities about the body.

In these historical – albeit still prevalent – models which divide the body from mind (or soul or spirit), the mind is always in control and in charge. More recent models of subjectivity have contributed to the notion of *embodied subjectivity* which encompasses mental and material aspects of interacting within a socially and culturally structured environment. For example, Elias points to the ways power emerges as a product of a certain dynamic ('figuration') between different social groups. Power, then, affects people as wholes. Moreover, subjectivity includes embodied power relations which are also physically expressed in gestures, behaviours like spitting, etc.[65] What Foucault and Elias have shown is that embodiment is societally produced. What Merleau-Ponty contributes is that this social production of embodiment has a biological basis. Mauss, specifically, illustrates how – through 'techniques of the body' – our biological bodies are taught to move and operate in very particular ways in the process of growing up and being socialized.[66]

The writing subject

The above considerations of various subjectivities have led me to the following conclusions: first, subjectivity is existence, that is, being existent in conjunction with the world around me. This subjectivity is unique to every being. Moreover, issues of identity come into play here because identity arises in the context of my relationship to the world. Second, this existence is endowed with active features which enable a certain mediation or choices between objects and subjects. This mediation occurs on many levels and includes an active participation in the world based on my physical existence and my cognitive capacity. Third, this active existence or agency is possible through a subjectivity that includes different means of reflexivity and expression, in other words, a political subjectivity. This *speaking or writing subject* uses language and communication technologies to exchange itself with others in a process that is also historical.

In this context it is worth to briefly consider the notion of meaning, behind or beyond language. Language is not the only means we have to share meaning. For instance, John Durham Peters suggests that we can always only attempt to approximate our selves and make our selves only partly known through communication. Both speech and text require a negotiation between speaker/writer and listener/reader and one can never be entirely sure whether the two parties derive the same understanding from one utterance.[67] When watching a child growing up, it is obvious that objects and events exist for the child in a meaningful way even before she or he masters the words that conventionally describe the same objects and events. I would argue, then, that our use of

language actually leads us to make a distinction between 'meaning' and 'language.' The fact that we use different words might make them different entities. Language can construct some concepts, but they are merely empty concepts. Deploring the arbitrariness of choosing and using a word like 'snake' or *Schlange* to describe that animal, Nietzsche writes:

> What arbitrary differentiations, what one-sided preferences for one then another feature of a thing! Placed side-by-side, different languages prove that they never invoke truth or adequate expression; for there would not be so many languages. The 'thing in itself' (that would mean the pure truth without consequences) is likewise incomprehensible to the language creator and not at all his goal.[68]

Writing as an arbitrary system of differences between signs and between signs and things (e.g., Saussure, Nietzsche) can be contrasted with a dynamic, evolving system (e.g., Derrida[69]). Within this system, selves exist in relation to other selves; being embodied also means sharing this system, an environment and the means of communication available. When using 'writing' in a Derridian sense as inscription, several points can be made: cultural inscription or internalization of cultural norms and ways of using the body (Mauss) and language (Nietzsche) have an immediate impact on our embodiment. They affect what and how we eat, how we move and carry our bodies, etc. (Elias, Foucault). Consequently, cultural inscription also has an impact on our selves, how we perceive and experience our selves in the world. I would like to suggest that this latter impact is not immediate but is always mediated through the body. The nature of our selves depends on their relations to other selves and to the world. Selves are relational.[70]

Given the relational constitution, material aspects become as important as immaterial aspects in self-formation. Our perceptions of other selves and of the

world have a biological basis. Moreover, the world includes material as well as immaterial objects to which we relate. Therefore, cultural inscription is a very physical form of inscription. Gitelman defines inscription as "a form of intervention into which new machinery continues to interpose. Ink is imposed on paper, while pens and keyboards intrude into the posture of hands,"[71] resulting in what Jonathan Goldberg calls the "human written."[72]

When using 'writing' in the more applied, practical sense of inscribing symbols on a surface, writing relates to subjectivity in the following way. As previously discussed, subjectivity can be seen as relational. Its existence and specific characteristics derive from having certain connections to others in a shared environment. The means to establish and maintain these connections include language and communication technologies. Writing here, then, is one of the tools with which subjectivity is constructed, shaped, and expressed to others. This process can occur on many levels, for instance, in the way a written document is exchanged (privately or publicly, etc.), how it has been composed (as a response, on time or belated, etc.), or its material aspects (on paper, electronically typed, handwritten, etc.). Taken together, these features will first, form the basis for any negotiations of meaning between author and reader, and second, contribute to the formation of the author's as well as the reader's selves.

From this, one can imply that different writing technologies contribute to the constitution of different kinds of selves. I would like to turn to a more historical examination now, taking handwriting as the basic form of writing and adding subsequent writing techniques in order to look at the changing views of

how they affected writers, readers, and society at-large. To start, however, I will briefly address the debated difference between speech (orality) and writing (literacy). I have two reservations about this distinction. First, a number of characteristics of speech and of writing that have been used to create the distinction seem rather inconclusive to me. For example, with alphabetic writing, the focus is often on the fact that letters simply represent (most of) the sounds of spoken language and hence, that – because of its presumably later emergence – writing is copying speech in a different medium. These types of investigations, in my view, remove both spoken and written language too far from the body, the body that generates both of them. Our writing system, however, does not only contain letters but also other characters and symbols (punctuation, spaces, question marks, accents, etc.) which are not always properly integrated in and accounted for in the speech/writing distinction. Questions remain about how these other characters are produced or what their relation is to the body.

My second reservation derives from another related shortcoming of many of these discussions, that is, that they frequently neglect considering how speech or writing relate to thought in general.[73] Although he did not sufficiently elaborate on it, McLuhan brought up a crucial point in this regard with the notion of sense ratio (s. below). In my understanding of communication, the various technologies mediate our thoughts differently, among other things because they engage our senses and bodies differently. In other words, it is problematic to directly juxtapose communication technologies without examining their relation to thought and vice versa.

Walter Ong, for one, investigates how literacy transformed thought and consequently, also speech. For him, however, writing seems to consist solely of vowels and consonants[74] and is but an artificial representation of spoken language. As is well known, Derrida juxtaposes writing as graphic language to writing as inscription in the sense of cultural and even biological inscription as discussed above. Jacques Derrida rejects, of course, the hierarchy within linguistics which prioritizes spoken over written language. Still, "language is not merely a sort of writing" but "language is a possibility founded on the general possibility of writing."[75] He thus also rejects the idea of being able to establish differences between language systems. Instead, he finds traces of the written in spoken language and suggests, that "'original,' 'natural,' etc. language had never existed, never been intact and untouched by writing, that it had itself always been a writing."[76]

Hence, I would like to propose two conditional premises in relation to writing. First, that communication technologies mediate both speech and writing in different ways: for instance, a telephone conversation is distinct from a face-to-face conversation in the way it engages the participants, their bodies (sense ratio) and in the way it invokes meaning; a telegraphic message is distinct from a handwritten text with the same content, and so on. From this follows that earlier forms of writing (be it marks on cave walls or ancient pictographic writing systems) already had continuous impacts on the formation of subjectivities and on the effects of communication on human interactions. Second, in order to make a more cohesive argument about these impacts, I will use the term 'inscriptive

media' in a rather limited way as referring to 'classic' media that inscribe language materially rather than in the Derridian sense of cultural and biological inscription. The cumulative effects of using writing technologies, however, reach far beyond individuals and result in societal shifts as I will discuss below. Inscriptive media, then, have effects on two levels, on an individual level on the formation of selves and on a societal level in a cumulative fashion.

Today, 'writing' is a concept which lumps together practices that are associated with diverse technologies. Handwriting is seen as the prototypical form of writing and other forms (typewriting, print, etc.) are often perceived as derivatives thereof. While this has led to the debatable division of the evolution of writing into periods firmly associated with specific media (instead of, for example, assuming an autonomous evolution of writing which has been punctuated by various media along the way), the concern has also always been the wider effects of written communication on what it means to be human.

Written memory

The idea of writing as a technology, as an extension of the body (in space and time) and thus of the mind has also been implied in the notion of technology as memory. One early example is Plato, who was arguing that man's mnemonic capacities were about to be transferred to the new practice of writing.[77] In more general words, man delegates tasks that are culturally passed on to machines and tools who then 'remember' these tasks for future generations. The emergence of handwriting, then, has perhaps brought a shift in focus on the body and its

capacities like remembering to a deterministic focus on technologies as such. How have subsequent writing technologies informed our conceptualizations of handwriting and its interrelations with notions of the self and the body? Ong starts out to describe general effects of writing on speech. For example, spoken words are not signs and only really count as contributing sounds within a larger, meaningful series of sounds.[78] The visual representation of a word in writing, then, is also the word's creation.

In line with McLuhan's concept of sense ratio,[79] Ong discriminates rather simplistically between speech as sound-based communication in time and writing as vision-based communication in space. Again in line with McLuhan, Ong defines culture through the dominant communication technology. Both writers tend to pay little attention to the many times when the regimes of certain technologies overlap, Ong in particular by neglecting the transition from oral to literal culture during the period of medieval manuscripts. Both Ong and McLuhan portray the phonetic alphabet as exactly transcribing speech (as opposed to pictorial writing, which translates – rather than transcribes – spoken language).

Unlike Ong, McLuhan emphasizes the crucial role of school and education in inscribing certain ways of using and applying writing technologies. From Mauss and Foucault, for instance, we have learned about the importance of institutionalization in informing our bodies about particular ways to feel and behave. Thornton, Kittler and Goldberg[80] illustrate this specifically in relation to literacy and handwriting. The involved institutions certainly participate also in the formation of the relational self. Goldberg offers examples of how pedagogic texts

in the 16th century had class expectations and values built in so that children learning to read and write with them did so in a very specific way.[81] Thornton, on penmanship instruction in the 19th and 20th century, writes that "[e]ducation was habit formation, plain and simple: the use of repetition to ingrain behavior into the physical organism so that it becomes automatic."[82] Together with Mauss' analysis, these studies explore how (cultural) intent, normativity and corporeality are fused within the embodied subject. Instructional books and courses aimed at rewriting and reproducing hierarchies of power. First, they created the need to learn to write and then shaped society's young subjects, thus producing a technologically mediated form of social memory.

With the spread of documents produced by moveable type and print, the negotiations about meaning between author and reader changed. The linear alignment of uniform letters increased the speed at which texts were read. Hence, "the reader of print, that is, stands in utterly different relation to the writer from the reader of manuscripts. Print gradually made reading aloud pointless, and accelerated the act of reading till the reader could feel 'in the hands of' his author."[83] By sheer numbers and ease of reading and circulation, printed texts created publics, "fame and perpetual memory."[84] Consequently, handwriting became associated with 'new' opposites, laboriousness, privacy, etc.[85] By the same sheer numbers and ease of reading and circulation, handwriting's claim to authenticity experienced a shift. As previously discussed, Fraenkel suggests that the link between handwriting and authenticity is a more recent phenomenon.[86] Cuneiform and even medieval scripture often kept the author anonymous,

primarily because the texts were intended to be duplicated but also because of the limited range of movement with writing tools like the stylus.[87] Therefore, we cannot make a clear distinction between manuscripts as individual and unique and printed books as standardized and formalized. Individual scribes became distinguishable only with later scripts and writing tools and, thus, with their ductus (see chapter one).

With typewriting, too, it was the perceived effects of changed sense ratios on mental activity that were problematized. Somehow, typewriting appeared to circumvent the mind by almost exclusively engaging the hands, i.e. the body. Writers experimenting with automatic writing reported that they frequently were not able to recognize the words and sentences they created when typing.[88] Automatic, here, meant that the actual generation of letters and symbols on the paper supposedly did not require human attention but was performed by the mechanical device and the mechanical use of finger muscles.[89] Yet penmanship training at the end of the 19th century very much aimed at making handwriting automatic. The drill in practising was meant to physiologically 'inscribe' habits into the neuro-muscular structure of the human body, thus delegating mental control to the body.

Hence, we are back to square one where the body and the mind inhabit separate spheres and where they seem to only operate independent of each other. This claim of a mind that is switched off in the process of writing, then, is a familiar one. It is repeated whenever notions of mnemonic capacity or authenticity appear to be challenged. One example is Kittler's *Discourse*

Networks 1800/1900 which neatly divides two periods of communication media into one that promotes continuous handwriting and one that promotes separate, isolated letter types; a period that integrates all senses internally as opposed to differential signs on separate external channels; a period that supports sensuality and focuses on individual authorship as opposed to a human being which is simulated, ill and serving as a physiological machine.

Like print and typewriting, hypertext has recalled some of the same recurring concerns about writing, authenticity and subjectivity that have been stated when handwriting emerged, print evolved, or typewriting spread. Discussions about hypertext have always revolved around fantastic if not utopian ideas about alternative forms of writing and reading. It has been hailed or cursed for challenging the linearity if not visuality of classic types of writing. The typology of hypertext has been seen as an active narrative protagonist and the interactive nature of hypertexts has been invoked to question roles of authors, readers and characters in the plot.[90] Yet as with other new textual tools, hypertext did not arrive with a splash. Incunabula were designed to imitate the letters and layout of manuscripts. Similarly, hypertext still is more engaged with traditional forms of text rather than playing out its own features independent of classic print products.

Writing with stylus, quill or in cuneiform has hardly been perceived as an unmediated, direct manipulation of a text. Instead, these techniques were laborious and time-consuming to learn and practice. Thus, a first disclaimer in the history of inscriptive media is that handwriting is not all equal and many periods

and practices have to be separated within the concept. What is more, the conceptualization of handwriting has undergone many transformations with every new emerging writing technology. When the printing press created mass markets and audiences, handwriting became associated with individuality and privacy. This is perhaps even more the case today with the widespread use of electronic texts. As previously discussed, however, cuneiform and medieval scripture created uniform documents as much intended for dissemination as printed documents.

The arrival of new writing technologies is very often seen as transformative both in relation to the interactions between the new technology and society and between older technologies and society. This is reflected in the common statement that electronic texts will bring the end of the printed book, for instance. However, what frequently happens is that characteristics are re-invoked that have always been associated with a particular medium. A technology often is a complex rather than a one-dimensional tool. It is comprised of a variety of agents, sites and material tools. Hence, despite its presence, the effects of a new technology might initially not be noticeable at all. Moreover, within the complex, a variety of characteristics and associations could potentially be chosen but only a few become prominently attached to it. What we conventionally term ‘arrival’ of a new technology is itself a varied process. Many technologies evolve slowly (here, notions of time are relative as well) over a long period of time and their impacts often remain dormant or little investigated until further technologies

arrive on the scene. This has happened, for example, with the revival in research on the telegraph that was triggered by an increasing interest in the Internet.

Conclusion

More generally, 'technology' is often used to set humans apart from animals. The concept 'body' is more problematic; it is a trope to think with, a site to carry out valuations of the meaning of being human. The tendency to separate mind from body has certainly contributed to the frequent association of the body with nature. If technology has enabled us to be distinct from animals and to control nature, technology can also be regarded as a means to control the body as part of nature. Simultaneously, technology holds the potential to damage or corrupt the body. These are some of the different meanings of technology that I have sought to discuss here.

We have to remain aware of the sweeping generalizations in this discussion that will render many of its points too removed from personal experience. Both models of media as extension of the body and the body as machine are interested in generalities if not universalities. Cybernetics, for example, attempts to strip communication from message context and embodiment in order to arrive at broadly applicable mechanisms. It might still posit the human body as the site where biology and society, nature and culture intersect but does so not by putting the living body at the center but by decoupling these spheres, thus separating them as distinct. As a result, sensual aspects of communication are missing in the cybernetic view of the body as a (communication) machine. The

differences in the materiality of information and their different effects on our sensory channels are factored out. Similarly, the idea of media as extensions of man makes very broad claims about humanity, media, and global cultural patterns. These generalizations have little direct appeal to individual experiences and thus, always seem to at least partially be missing the point.

Yet the body is not an object like other objects, even when medical, political, and lifestyle choices are sometimes directed at it as such. Daniela Vallega-Neu, for instance, is wondering "whether it is at all possible to think the body reflexively without objectifying it."[91] The answer is probably negative, but could be different if we would start wondering about 'thinking our *bodies*' rather than 'the body,' as I have tried to indicate in my discussion. Bodies are the basis of who we are and what we are as subjects. What we know about them derives from our having one particular body. Our bodies are the figureheads of our selves by which others easily and immediately recognize us. This leads to the conclusion that we need a notion of embodied subjectivity which includes biological aspects. I am convinced that any other account of subjectivity would be reductionist and essentialist. The design of a comprehensive model of embodied subjectivity is, of course, beyond the scope of my discussion here. Rather, I have attempted to review approaches to the body, bodies, and subjectivity which offer partial answers if not fruitful points of departure.

Tracing the individuality of our embodied experiences, I hope, would open the possibility of a genealogy of these generalizing models. This endeavour would work with a definition of subjectivity as embodied and historically constituted. It

would include technologies as integrated components. Moreover, it would assume a certain conceptualization of the practice of writing as essential to the notion of embodied subjectivity. Writing in this sense, would be a prime channel for the expression of embodied subjectivity in its use of language (content) and the body (composition). Here, the concept of authenticity is linking together the various considerations of technology, the self, and writing.

Ideas of technologically extended men, prostheses, or distributed cognition challenge assumptions about the authenticity and integrity of our bodies and selves. If we use writing technologies to extend our reach, do they enable better communication of our present selves or, rather, do they reshape and thus corrupt what we perceive as our integral selves? Are distributed cognition or extended man synonymous with leaky cognition, leaky personality? Is an extended body a leaky body and thus, an inauthentic body? We can start by looking at language, a tool that is intimately close to our being human and yet has not always defined us as human creatures. Andy Clark describes language as an artifact, a supplement both outside and inside of our authentic selves:

> Language is in many ways the ultimate artifact: so ubiquitous it is almost invisible, so intimate it is not clear whether it is a kind of tool or a dimension of the user. Whatever the boundaries, we confront at the very least a tightly linked economy in which the biological brain is fantastically empowered by some of its strangest and most recent creations: words in the air, symbols on the printed page.[92]

Taking Lakoff and Johnson's analysis of the derivation of metaphors from their physical basis, we can see that language is in fact very much embodied. Language necessarily has to follow conventions in order to be useful to many. It is, then, only a limited way of communicating embodied subjectivity. Writing and the use

of inscriptive media could provide that more individual aspect because they engage in specific ways our particular bodies in the process of communicating. At the same time, we have to analyze how, throughout time, our bodies have been taught how to write and use writing technologies. Even handwriting, as previously noted, is a standardized practice whose training aims at suppressing most personal characteristics.

I would like to suggest that by allowing concepts like self, body, and authenticity to cross the obviously permeable boundaries between mind, body, world, and tools, these concepts will enable us to experience them as 'dimensions of the user.' As the idea of authenticity is constantly remediated by our use of changing communication technologies, we can study writing as a hypermediated practice calling attention to the multiplied mediation of previous and subsequent writing technologies. This way, it can potentially promote a fuller and more saturated communication experience. We can also study authenticity as a hypermediated concept calling attention to its multidimensionality based on previous and subsequent understandings of its meaning.

All our attempts at communicating are attempts at manipulating the distances between us. Some attempts are successful, others are not. Peters, for example, is trying to respond to attitudes towards communication which portray it as an insurmountable obstacle and associate it with "longing for shared interiority, the horror of inaccessibility, and impatience with the humble means of language."[93] Authentic communication might indeed be unattainable because authenticity is itself such an elusive and dynamic notion. Nevertheless, we will

always try to communicate our selves the best we can if only because we embody our selves and want to communicate with all we are and have. Still, we have to acknowledge the overwhelming success rate of regular communication which is equally the case because we embody our selves and communicate with all we are and have.

Notes

[1] Thornton, 53.
[2] ibid., 49.
[3] ibid., 55.
[4] ibid., 69.
[5] The Palmer method of learning to write by hand is the main focus in Thornton's (1996) historical study.
[6] Thornton, 179.
[7] Decker, 15.
[8] Steadman, 243.
[9] Marvin, 61.
[10] The history of the typewriter's innovation began long before this date, though. See Wershler-Henry, 2005. Sholes's patent of 1868 signifies the beginning of the marketing of the technology to the North American public.
[11] Evenson, 124; Claude S. Fischer, *America Calling: a social history of the telephone to 1940*. Berkeley: University of California Press, 1992. chapter 4.
[12] In 1892, a patent for a portable typewriter was issued to George C. Blickensderfer whose company subsequently mass produced a series of models. Many typewriter models had names as if they were female secretaries, like Iris, Corona, Gisela, etc. The Blickensderfer family also published a company history under the title *The five-pound secretary*. Robert Blickensderfer and Paul Robert, *The Five-Pound Secretary: An illustrated history of the Blickensderfer Typewriter*. Paul Robert: 2003. According to this book, the market was not ready for the simple Blickensderfer model. This was partly, I would assume, due to the lack of standardized keyboards. The portable Blickensderfer No. 5 used the letters DHIATENSOR in the bottom row of keys, the most commonly used letters. Some early printing telegraph machines used a key layout similar to the keys of a piano; typewriter keyboards evolved from Sholes' QWERTY design of 1878 which is still in use today to the Caligraph keyboard of 1880 to the Fitch layout of 1886, etc. See, for example, Torbjörn Lundmark, *Quirky QWERTY: the story of the keyboard @ your fingertips*. Sydney: University of New South Wales Press, 2002.
[13] For literature discussing Science Fiction of the second half of the 19th century, see for example, Raymond Williams, "Utopia and Science Fiction." *Science Fiction Studies* 5.3(1978): 203-214; Bruce H. Franklin, *Future perfect: American science fiction of the nineteenth century: an anthology*. New Brunswick: Rutgers University Press, 1995; Darko Suvin, "Victorian Science Fiction, 1871-85: The Rise of the Alternative History Sub-Genre." *Science Fiction Studies* 10.2(1983): 148-169; Nadia Khouri, "Lost Worlds and the Revenge of Realism." *Science Fiction Studies* 10.2(1983): 170-190.
[14] Williams, 208. Emphasis in original.

[15] William Merrill Decker, *Epistolary Practices: letter writing in America before telecommunications*. Chapell Hill: University of North Carolina Press, 1998. 3.
[16] In another time and another place I would like to conduct a study on how particular communications technologies, either real or invoked in science fiction, inspired public imagination and dreams in the late 19th century. My own inspiration would be Andrew Piper, *Dreaming in Books: the making of the bibliographic imagination in the Romantic age*. Chicago: University of Chicago Press, 2009.
[17] R.C. Lewontin, "Gene, organism, and environment," in *Evolution from molecules to men*, D. S. Bendall (ed.). Cambridge: Cambridge University Press, 1983. 280.
[18] See chapter two in Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century*. New York: Oxford University Press, 1988.
[19] For a poll on Swiss people's assessment of handwritten mail versus electronic mail, see Neue Zürcher Zeitung, "Für Liebeserklärung eher einen Brief." *NZZ* 29 May 2007. [1]. http://www.nzz.ch/2007/05/29/il/newzzF2A42G8Z-12.html.
[20] Neil Postman, "The Reformed English Curriculum," in *High School 1980: The Shape of the Future in American Secondary Education*, A.C. Eurich, (ed.). New York: Pitman, 1970. 161.
[21] Marshall McLuhan, *Understanding Media: the Extension of Man*. Cambridge, Mass.: MIT Press, 1994[1964]. 5.
[22] ibid., 3/4.
[23] ibid., 45.
[24] Gregory Bateson, *Steps to an Ecology of Mind*. New York: Ballantine Books, 1972.
[25] See, for example, Douglas Engelbart, *The Human-Augmentation System Interface*. Stanford: Stanford Research Institute, 1962.
[26] N. Katherine Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," in: *Data Made Flesh: Embodying Information*, Robert Mitchell and Phillip Thurtle (eds.). New York: Routledge, 2004. 232/233.
[27] ibid., 233.
[28] Brian Massumi, *Parables of the Virtual: Movement, Affect, Sensation*. Durham: Duke University Press, 2002. 126.
[29] Tim Armstrong. *Modernism, technology, and the body: a cultural history*. Cambridge: Cambridge University Press, 1998. 78.
[30] See Friedrich A. Kittler. *Discourse networks 1800/1900*. Stanford, Calif.: Stanford University Press, 1990, and *Gramophone, film, typewriter*. Stanford: Stanford University Press, 1999.
[31] The notion also has parallels in contemporary promotion of strong Artificial Intelligence which holds that the human mind (information content) can function independently from the brain (physical carrier) in that our mental capacities can be mirrored outside of our bodies, particularly by a computer.
[32] Norbert Wiener, *Cybernetics; or, Control and Communication in the Animal and the Machine*. Cambridge, Mass.: MIT Press, 1948.
[33] Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society*. Garden City: Doubleday, 1954. 39.
[34] ibid., 57.
[35] On the power of the body-as-machine metaphor as "a massive experiential structuring," see Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press, 1987. 130.
[36] Gregory Bateson, *Mind and Nature: a necessary unity*. New York: Dutton, 1979. 31.
[37] Sigmund Freud, "A Note upon the 'Mystic Writing-Pad'." In" *The Standard Edition of the Complete Works of Sigmund Freud*. London: Hogarth Press, 1958[1925].
[38] ibid., 230. This explanation has been rejected, for example, by Derrida: Jacques Derrida, "Freud and the Scene of Writing." In: *Writing and Difference*. Chicago: University of Chicago Press, 1978. 196-231.
[39] ibid., 231.
[40] N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press, 1999.

[41] On rhetorical analysis of technology see also Lisa Gitelman, *Scripts, Grooves, and Writing Machines: Representing Technology in the Edison Era*. Stanford, Calif.: Stanford University Press, 1999.
[42] Käte Meyer-Drawe, *Menschen im Spiegel ihrer Maschinen*. München: Wilhelm Fink Verlag, 1996.
[43] ibid., 177/178.
[44] Hayles, 1999. 3.
[45] See, for example, Michel Foucault, *The hermeneutics of the subject: lectures at the Collège de France, 1981-82*. New York: Picador, 2005; and Norbert Elias, *The Civilizing Process*. Oxford: Blackwell, 2000.
[46] Ian Burkitt, *Bodies of Thought: Embodiment, Identity and Modernity*. London: Sage Publications, 1999.
[47] On the social context of the subject, see, for example, Burkitt, chapter 3; Elias, 2000; Foucault, 1988 and 2005.
[48] See Don Ihde, *Bodies in Technology*. Minneapolis: University of Minnesota Press, 2002. chapter 5.
[49] Maurice Merleau-Ponty, *Phenomenology of Perception*. London: Routledge, 2003[1945]. xii.
[50] ibid., 102.
[51] One could argue that Massumi (2002) integrates these two bodies into the 'body without image.' His terminology also prefers 'relation' over 'interaction' between pre-given terms and concepts.
[52] Merleau-Ponty, 112/113.
[53] Mark Hansen, *Bodies in Code: Interfaces with Digital Media*. London: Routledge, 2006. 39.
[54] ibid., 39.
[55] Merleau-Ponty, part II, chapter 3.
[56] ibid., 209.
[57] Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. Chicago: University of Chicago Press, 1987; and George Lakoff and Mark Johnson, *Metaphors We Live By*. Chicago: University of Chicago Press, 1980.
[58] Foucault, 2005; and Michel Foucault, "Technologies of the Self; The Political Technology of Individuals." In *Technologies of the Self: a seminar with Michel Foucault*, edited by L. H. Martin, Huck Gutman, Patrick H. Hutton. Amherst: The University of Massachusetts Press, 1988.
[59] Elias, 2000.
[60] Foucault, 1988.
[61] ibid., 46.
[62] ibid., 22.
[63] Especially with his work *Hermeneutics of the Subject.*
[64] Hayles, 1999. 198.
[65] Foucault (2005) includes practices of freedom in his notion of power, e.g. practices of care of the self which render the body a site of power *and* freedom.
[66] Marcel Mauss, "Techniques of the body." *Economy & Society* 2.1(1973): 70-88.
[67] John Durham Peters, *Speaking into the Air: A History of the Idea of Communication*. Chicago: University of Chicago Press, 1999.
[68] "Welche willkürlichen Abgrenzungen, welche einseitigen Bevorzugungen bald der bald jener Eigenschaft eines Dinges! Die verschiedenen Sprachen, nebeneinander gestellt, zeigen, daß es bei den Worten nie auf die Wahrheit, nie auf den adäquaten Ausdruck ankommt: denn sonst gäbe es nicht so viele Sprachen. Das 'Ding an sich' (das würde eben die reine folgenlose Wahrheit sein) ist auch dem Sprachbildner ganz unfaßlich und ganz und gar nicht erstrebenswert" (my translation). Friedrich Nietzsche, "Über Wahrheit und Lüge im außermoralischen Sinne." In *Sämtliche Werke - kritische Studienausgabe*, edited by G. Colli and M. Monitari. München: DTV, 1988[1873]. [2].
[69] Jacques Derrida, *Of Grammatology*. Baltimore: The Johns Hopkins University Press, 1997[1967].
[70] The 'networked self' is another way to describe the self as "being interrelated or connected," particularly through new media: Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media*. Cambridge, Mass.: MIT Press, 1999. chapter 15-17.
[71] Gitelman, 3.

[72] Jonathan Goldberg, *Writing matter: from the hands of the English Renaissance*. Stanford: Stanford University Press, 1990. 24.
[73] One interesting case is Brian Rotman who recounts the evolution of the alphabet (including letters and other symbols). He creates a direct connection from thought to gesture to their alphabetic representation. Brian Rotman, "The Alphabetic Body." *parallax* 8.1(2002): 92-104. See also Derrida on the link between gesture and speech: Derrida, 1997[1967]. particularly 235.
[74] Walter J. Ong, *Orality and Literacy: The Technologizing of the World*. London: Routledge, 1982. chapter 4, especially 83-93.
[75] Derrida, 1997[1967]. 52.
[76] ibid., 56.
[77] See Peters, 1999; Ong, 1982; and Jacques Derrida, "Plato's Pharmacy." In: *Dissemination*. Chicago: University of Chicago Press, 1981. 149. In the same piece, Derrida finds evidence for his broader view of writing (arche-writing, see *Of Grammatology*, 1997. 57) as "inscription of truth in the soul."
[78] Ong, 1982. 61.
[79] As elaborated in Marshall McLuhan, *The Gutenberg Galaxy: the Making of Typographic Man*. Toronto: University of Toronto Press, 2002[1962].
[80] Tamara Plakins Thornton, *Handwriting in America: a cultural history*. New Haven: Yale University Press. 1996; Kittler, 1990; Goldberg, 1990.
[81] Goldberg, 45-47.
[82] Thornton, 156.
[83] McLuhan, 2002[1962]. 125.
[84] ibid., 131.
[85] In a general sense, this is an example of 'remediation,' the phenomenon of repercussions of new writing technologies for old technologies, a topic started in chapter one.
[86] Fraenkel, 1992.
[87] ibid., 224.
[88] Automatic writing was separated from the phenomenon of mental or spiritual writing as in mental telegraphy and spirit communication. See Thornton, chapter 5; Gitelman, chapter 5; Armstrong, chapter 7; and Jeffrey Sconce, *Haunted Media: Electronic Presence from Telegraphy to Television*. Durham: Duke University Press, 2000; Maximilian Bergengruen, "Das reine Sein des Schreibens: Ecriture automatique in der Psychiatrie des späten 19. Jahrhunderts und im frühen Surrealismus." *Berichte der Wissenschaftsgeschichte* 32(2009): 82-99.
[89] A view that led to the feminization of professions like typist, telegraph operator and others.
[90] see Jay David Bolter, *Writing space: the computer, hypertext, and the history of writing*. 1st ed. Hillsdale, NJ: L. Erlbaum, 1991. Especially chapter 10, for example, discusses how computer programmers are willing authors of their programs but not of the output of these programs.
[91] Daniela Vallega-Neu, *The Bodily Dimension in Thinking*. Edited by D. J. Schmidt, *SUNY series in Contemporary Continental Philosophy*. Albany: State University of New York Press, 2005. xiii.
[92] Andy Clark, *Being There: Putting Brain, Body, and the World Together Again*. Cambridge, Mass.: MIT Press, 1997. 218.
[93] Peters, 16.

Chapter 4: Futures of Handwriting

Introduction

Most often, the authenticity of a handwritten text or signature is verified by visually comparing it to other writing by the same person.[1] Scripts written by members of my generation (i.e., with similar training in handwriting) can be easily differentiated and associated with a particular person. I have never seen two handwritten scripts which looked alike. Elisha Gray's assessment of the telautograph's performance, too, was based on the assumption that the machine performed well when the writing produced could visually be assigned to a particular writer. The impressionistic analysis of handwriting together with the observed differences between handwriting styles led to the acceptance in North American courts in the first half of the 19th century of handwritten documents as proof of a person's identity.[2]

For some, however, this connection between a person and his or her handwriting went further. Despite the more often than not rigorous methods in handwriting instruction, handwriting was seen as originating in – and thus reflecting – a person's one-of-a-kind personality or character. Physiologist and psychologist Wilhelm Preyer, in 1895, claimed that, once he had learned how to write,

> whether I use my hand or foot, my chin or knee, my mouth or nose or tongue or elbow, my toe or thumb or any finger to write, even without a pen – the writing is still in my hand with its unique majuscules and minuscules, punctuation and other marks.[3]

According to Preyer, handwriting instruction creates a mental picture of what letters are supposed to look like. However, both motor and sensory processes are involved in writing and Preyer went to great lengths to demonstrate these two distinct areas in the writing centres in our brains by comparing blind, deaf and other writers. Therefore, each individual recreates this mental picture according to his or her own motor and sensory capacities. By analysing a person's handwriting, a graphologist in turn can deduct certain individual traits. The handwritten script, in this view, really is a mental script.

What, then, is the role of the hand in creating writing if other body parts produce the same script? What, then, happens to a script when it is produced or reproduced by a mechanical device? It is not the hand alone that writes, but it is part of a complex writing system, notes Armin Schäfer.[4] What the writing hand is performing within this writing system lies beyond the realm of self-observation. Rather, feedback mechanisms between hand and brain report on visual cues, finger pressure, etc. In other words, the hand is not simply the device executing the brain's script but is a crucial contributor to the system creating the script.

Until the arrival of the first pantographs in the 17th century, no other device that could copy or duplicate handwriting was known. 'By hand' was the only method creating a copy of a handwritten text. Moreover, pantographs did only copy handwriting 'locally,' in other words, in the writer's (and observer's) immediate presence. Rather, the writer's body and specifically his or her hand always directly produced the letters. Popular imagination presumably did not

include the vision of a machine that could create a handwritten duplicate at a considerable distance in the absence of the writer.

A lawyer in 1895 stated on the agency of long-distance writing that

> the newly invented telautograph, by which a signature may, by an electric device, be duplicated at a distance in the very act of writing, illustrates the same extension of the personality. If by means of the telautograph I should write my name in Boston while actually seated in New York, the signature is as much made in Boston as if I should use a pen two hundred miles in length.[5]

'In the very act of writing' is an important phrase here. The telautograph did not have the capacity to delay or store the movement of the writing hand. Rather, it immediately set the receiving station in motion. While the writer could not be seen in the act, without a doubt the person had to be physically present at the moment when sending and receiving station were connecting. It is also important to note that this lawyer specifically referred to writing one's name, that is, signing. Signing was exactly the practice for which the telautograph was most often used.

Signatures, then and now

While the practice of handwriting is regularly perceived as endangered by print and typewriting, handwritten documents continue to be viewed as more personal and authentic than electronic texts. Signing, on the other hand, is a largely uncontested and powerful legal practice. Physical (as opposed to semiotic) authenticity emerges as the central hinge around which this continuing cultural appreciation of handwriting and signing revolves. Attributing physical

authenticity to handwriting is a response to typewriting on black box-like technologies with a perceived potential for fraud. While handwriting and signing appear to have evolved from separate practices, the valuation of the physical bond between the writer and a text or signature seems to derive from common historical and cultural developments. This section pays particular attention to recent forms of electronic signing where physical authenticity anew is problematized, thus suggesting that much insight can be gained by looking to the fringes of a prevailing cultural practice in order to learn about its past, present, and future.[6]

Although more than 1000 letters of condolence sent by the Pentagon in 2004 to families of soldiers fallen in Iraq contained the signature of former U.S. Defence Secretary Donald Rumsfeld, Rumsfeld had never touched the letters. His signature was mechanically produced and added to the letters with a fountain pen by a device called Autopen. Critique mounted from families and politicians alike who felt that the otherwise typed letters were rendered insincere by an automatic signature and that the Defence Secretary had lost touch with his own policies and their consequences. Rumsfeld issued a written statement promising to sign such letters in the future by hand.[7] A recent study conducted by the Swiss postal services found that three quarters of the polled population considered handwritten letters on paper more personal and aesthetically more pleasing than e-mail messages. Most people (66%) preferred receiving a personal note from a friend or relative rather than an electronic message. Yet only 22% indicated that they enjoyed writing personal letters more than writing e-mails.[8] British and US studies yield similar results.[9]

Obviously, a considerable gap exists between the *appreciation* of handwritten texts and the *practice* of handwriting. Today, handwriting is valued as more personal and aesthetical than other forms of writing and much is being written about the thrill of finding a handwritten letter in one's mailbox or the unique historical value of a diary penned by hand. At the same time, people increasingly transfer the practice to other means, to typing electronic documents, e-mail and text-messages on cell phones. And at least as much is being written about the relief some people experience when being freed from the cumbersome work of writing by hand or the ease with which electronic texts can be read and exchanged as opposed to texts written with a pen.

Despite, and perhaps also because of electronic competition, handwriting continues to be viewed as a relevant signifier of authenticity. On one hand, a handwritten signature or document is generally viewed as proof of a person's presence at the time of its conception. On the other hand, the signature or the content of a text is supposed to authentically represent the writer's intention. Print has already questioned the perceived intimacy between a written document and a sense of the bodily ego of the author, sitting at her desk and conjuring up these words and stories on the pages now before us. Electronic forms of writing and signing challenge anew our assumptions about the bond between a text and the presence of a particular writer.

The gap between the general appreciation of handwriting and its declining practice and, thus, the notion of physical authenticity quickly proves to exhibit a high degree of historical elasticity. Rather, the gap has varied over time with

every change in the composition of the general media landscape. The perceived pattern 'new writing tool = decline of handwriting' does not hold up. It almost appears to be a generally accepted pattern that assumes that handwriting is about to disappear due to the prevalence of typing on keyboards.[10] This pattern implies that handwriting is in direct competition with other writing technologies. Hence, it is challenged whenever a new technology for interpersonal communication becomes widely used, e.g., when the typewriter, telephone or cellular phone appeared on the scene. However, the initial application of the medieval printing press, for instance, was not to replace but to emulate handwriting as faithfully as possible. A 1867 source predicted that "the weary process of learning penmanship in schools will be reduced to the acquirement of the art of writing one's signature" thanks to the newly available "type writing machine."[11] This has not come true for the last 140 years. Why should it be different now, why should handwriting disappear this time around?

A brief look at these moments reveals not a history of handwriting's disappearance but a different dynamic: emerging new writing technologies generally serve not as catalysts of handwriting's decline but rather, they offer critical opportunities for its redefinition. What is being redefined in these instances is the cultural purpose of handwriting within a historically specific media landscape which includes the changing interplay between its valuation and application. In other words, when a new writing technology creates its niche, existing niches like the one handwriting occupies, are redefined in the process. New technologies tend to cause handwriting to be symbolically associated with

the past and with past values. As discussed before, the link between handwriting and authenticity is a more recent phenomenon. Different forms of writings – apart from handwriting – often are accused of breaking a direct connection between author and text. As mentioned, this break was at times intentional and viewed as beneficial in the case of the dissemination of manuscripts. In the context of print and typewriting, however, it has been problematized as a rupture removing reader from writer and text from author. Handwriting, in turn, has become viewed as an unmediated writing technique through direct manipulation of the text itself.

I would like to elaborate on the valuation of the physical connection between a writer and her handwritten document. The five theses on handwriting which lie at the core of my study (see first chapter) elucidate how this valuation has evolved. Briefly, they state that handwriting is produced by the body/hand while typewriting is produced by a machine; a handwritten text leads to an individual while a typed text leads to a device; handwriting reflects our thoughts while typing leaves doubts in this regard; handwriting cannot be copied while typing creates only copies; handwriting implies presence while typing implies absence. These theses lead me to define here more precisely what I understand as the physical authenticity of a signature or handwritten record. I will then present signing as an example of a historically separate practice from handwriting where the same cultural appreciation of physical intimacy also has legal consequences. Finally, I will discuss how these same issues of authenticity in handwriting and signing play out in the electronic realm.

The signature and its relation to handwriting has to be given particular attention in the context of self-authentication, identity, presence/absence, and authorship. From the debate around speech act theory between J.L. Austin and Jacques Derrida, we learn that on one hand, the signature can be seen as an exception to handwriting, as a necessary addition to put a written utterance on par with an oral utterance and that, on the other hand, the signature can simply be seen as part of writing in general. Austin stated that the handwritten signature was necessary as the guarantor of the authenticity or originality of a written utterance. The signature was – in the absence of the writer – standing in as the proxy for the speaker's body. Because writing is iterable and citational, an individual's signature is required to guarantee a document's authenticity. On the other hand, the signature is used as a means to prove (from Jacques Derrida's rebuttal) "the putative 'origin' of oral or written utterances, and thus, the constant and indispensable recourse of all speech act theory."[12] In other words, signing here is put on par with all writing and speaking. For Derrida, all communicative acts, whether written or spoken, are iterable and citational. A handwritten signature, in this view, does therefore not show any fundamentally different relation to an author than speech or writing in general.

Signing includes a variety of practices, ranging from signing as a legal act to fans collecting autographs of celebrities. Despite standardized handwriting through penmanship training and other forms of disciplining in schools, signing derives its status and importance in contemporary culture and legal practice from the fact that it is perceived as an authentic marker of individuality, much like a

fingerprint. The history of graphology and of similar attempts to conceive of handwriting as a graphic trace of individual expression sheds light on this ray of thought.[13] Yet writing is a corporeal practice that involves mastering very particular bodily movements learned over the course of many years. During this training, much care is directed towards norms and standards so that each person's handwriting is legible and conforms to the same aesthetics of letters and signs. Paradoxically, the signature both complies with and defies this attempted uniformity. By writing her signature, a person is expected to legibly write her name (conformist) yet in a unique way specific only to her (non-conformist). According to Thornton, then, penmanship training for a long and dominant period meant character formation in both the graphic as well as the psychological sense.[14]

Passports are documents in which signatures play a pivotal role in respect to self-authentication. To complete the owner's profile, a handwritten signature is always required. In his comprehensive *The Passport in America*, Robertson writes that

> [t]he value of the signature in the verification of identity derived from a specific understanding of the relationship between presence and repeatability. […] In the case of the bearer the signature tied the document to his or her hand making the individual an active participant in the verification of their identity. As an identification technology this signature depended on the possibility of the bearer repeating his or her signature in the presence of any doubtful official and doing so in such a fashion that the official was satisfied that the two signatures were identical. This is based on the assumption that people have unique handwriting and that they sign their name consistently.[15]

In the past, authorities representing the nation issuing passports often signed the documents by hand. For example, the secretary of state in the United States used to personally sign each newly printed passport. Only in 1905 was his signature permanently engraved onto the printing plate.[16] Now, passports, birth certificates, etc. often contain a stamp or printed picture of the signatures of secretaries of states or registrars of civil status. The mass-produced signatures are tokens of the presence of these officials at the moment of production of the respective documents and are still intended to authenticate the documents.

Passports, then, derive part of their authenticity from their standardization. However, the owner's signature is perceived to be his or her most standardized yet individual mark and is still required to complete the passport's dual claim to authenticity, the standardized authenticity of the issuing authority and the individualized authenticity of the owner. The photograph is used to simply identify the owner, the signature, however, is used to authenticate, thus certify and vouch for the owner.

Signing a document manifests that a writer has been in the document's presence and, hence, the writer's awareness of the document. Historically, the practice has little to do with writing. Signets, seals, and specific handwritten signs have been used in the past as evidence of a document's physical association with an individual. Only with the democratization of literacy at the end of the Middle Ages did the handwritten autograph become more important than other markers.[17] Signing thus continued the practice of using seals etc. to document the co-presence of writer and record. "Sealing and signing serve essentially the same

purpose: to provide a bridge between body and text whereby the physical act of sealing or signing attests to the act itself," writes Lauer.[18] Fraenkel adds that, like a seal that produces the same impression with the help of a matrix every time, a writer is expected to act like a matrix capable of repeating the same form every time.[19] However, a signature differs in an important way from a seal: while a seal is *marking* a surface, the act of signing is intended to leave a *direct trace* of the writer's body. This distinction is important in respect to physical authenticity, where the physical presence of the writer is rendered permanent in his or her signature. A seal – and, as we shall see, a cryptographic key – only proves that a person is in its possession. A fingerprint, for example, can be left unintentionally or a seal can be applied by the wrong person. The handwritten signature, by the proper writer, at least requires a certain degree of attention through physical action and thus, intention.

Signing has no semiological equivalent in face-to-face encounters. Both speech and writing deal with paradoxes. As mentioned, the handwritten signature has to conform with the norms of our writing system yet it has to do so in an individual fashion. In handwriting in general, though, legibility is paramount and overrules too much individuality. Similarly, speech is produced by individual voices complying with standard sounds to compose intelligible utterances. Even when we sing a song, the lyrics should be comprehensible. However, I cannot think of any face-to-face situation when a spoken utterance similar to the written signature is required when the utterance per se would identify me as a person and afford the situation a certain degree of authenticity and intentionality. While the

signature itself might be illegible, it always contains the writer's name as a recognizable image. As Roy Harris suggests, however, we know of "no social or legal occasion in which protocol demands or allows an inarticulate grunt to substitute for the 'normal' pronunciation of one's name."[20]

Rather, even when my voice is mechanically recorded or transmitted over the phone, the utterance is perceived as genuine and authentic. The value of the fact that speech is directly produced by a person's body appears to carry over to other communication channels. In other words, recorded or transmitted speech, regardless of the technology involved, benefits from the physical authenticity generally attributed to speech that is produced by an immediately present person. Handwriting transmitted by the 19th century telautograph, by today's fax or LongPen is equally perceived as authentic due to the notion that a writer's direct physical action has produced it. While the telautograph and the LongPen transmit the actual movement of a pen creating a text, the fax simply transmits an image of a text. As signing inhabits a borderland between writing and drawing, between word and image, it comes as no surprise, then, that these long-distance writing technologies have specialized in reproducing signatures. The LongPen technology, for example, "picks up pressure, speed, cadence, and pauses with 100% accuracy,"[21] emulating physical and procedural properties of handwriting virtually unnecessary to produce the signature at the other end (with the exception of pressure, of course). Typewritten texts transmitted by long-distance technologies, on the other hand, comply with different aesthetics and modes of

creation. Here, the writer's body appears removed from the product, its actions intercepted by a complex of hard- and software.

Like handwriting, a signature, then, is both performative and preservative in that it "displays the moment of enactment" which so is "materialized and made permanent."[22] The signature, then, is – often more so than handwriting in general – taken to be an authentic and legitimate representation of the physical action of an individual. Although written by a secretary, a letter in the 16th century, for instance, gained the necessary social credibility through the noble's signature. Not a part of the letter, the signature's authenticity derived from elsewhere, namely from the display of a privileged education in the form of italic letter writing which was limited to professional scribes and the nobility.[23] In short, the signature is both an individual bodily trace as well as a social mark that can be traced back to a specific moment and place even if it was simply added to a typed text or to a document which had been written by another person.

This historical detour serves to argue that the value of the signature perhaps lies somewhere between Austin's and Derrida's position, between the signature as proxy of the writer's body and the signature as a communicative act like any other. While practically, signing benefits from attitudes similar to those toward handwriting, historically, it is a phenomenon separate from handwriting. It is a cross between intentional, directed physical action and repeatable, automatized motion. However, the requirement that a signature be recognizable as a repetition introduces the possibility of a machine as part of the practice of signing at the same time as it eliminates the need for any particular intention at the

time of signing.[24] The example of Rumsfeld's condolence letters illustrates the complexities of this paradox. These issues exacerbate in the context of physical authenticity in the electronic sphere.

Electronic signatures

Electronic signatures are widely used in government and corporate organizations. They include a range of technologies, for example, SIG files, the blurbs that automatically attach to the end of your e-mail messages and scanned images of handwritten signatures. I am not concerned with public-key infrastructures (PKI), where one party uses a private cryptographic key to create a 'signature' while the other party requires a public key to read the 'signatures.' Although often called a digital signature technology, PKI does not use any form of a signature by hand, digitized or not, but rather creates digital certificates. Electronic signatures, in most cases, store handwritten signatures as encrypted files together with various biometrical data (pressure, cadence, etc.) and are reproduced as images of the handwritten signatures.

Since the mid-1990s, many countries have adopted similar legislation dealing with electronic signatures. The 1999 U.S. Uniform Electronic Transaction Act states that

> [t]his Act establishes, to the greatest extent possible, the equivalency of electronic signatures and manual signatures. Therefore the term 'signature' has been used to connote and convey that equivalency. The purpose is to overcome unwarranted biases against electronic methods of signing and authenticating records.[25]

The Uniform Electronic Commerce Act of Canada from 1999 contains the general statement that "[a] requirement under Canadian law for the signature of a person is satisfied by an electronic signature."[26] The similarity between most countries is that electronic signatures – provided they comply with certain regulations and security standards – should have the same validity and enforceability as handwritten signatures.

It is important to emphasize some essential differences between a handwritten signature and an electronic signature. On SIG files, Grusin writes,

> [t]he handwritten signature has a temporal, indexical function, with the graphic inscription attesting that the signatory had been present at the writing of the letter. The SIG file, on the other hand, has a spatial, locational function, attesting to the institutional position, geographical location, and telecommunicational coordinates of the signatory.[27]

Moreover, while a traditional signature is added usually at the bottom of a document as the last step in its creation, electronic signatures – very much like seals – often precede the existence of the document they are intended to sign. Electronic documents, in a sense, become pre-authorized by the already existing electronic signature mechanism. The goal of electronic signatures really is to authenticate the owner of a private cryptographic algorithm, much like the owner of a seal. The owner, here, then, is the combination of some data storage device with the software and the necessary password or code, most likely and hopefully managed by an individual. While it is probably impossible to forge such an algorithm, like a seal, it could end up in the wrong hands. (Whereas in the past the seal was destroyed or added to the owner's grave after his death, the destruction

of a cryptographic key or algorithm leads to the invalidation of all associated electronic signatures and documents.)

It will be interesting to see whether electronic signatures will find application outside of the current areas (i.e. business and government), in private households, for instance. Moreover, the widening gap I described in the context of the appreciation of handwriting and its practice could unfold in some form around the status of the signature and its electronic applications. In turn, I would expect these changes to lead to a re-negotiation of the way we perceive the authenticity of a document written and signed by hand. If now we associate a signature with an individual's presence at the moment of signing, a new form of what we could call *distributed authenticity* might replace this traditional notion. Distributed authenticity would be the idea of a complex of human and non-human factors, a cryptographic key, for example, known to be responsible for the physical creation of the signature.

By discussing the status of handwriting in contemporary culture and the history of signing, we have looked at handwriting and signing as evolving from separate practices but benefiting from the same cultural appreciation of physical authenticity. Physical authenticity has become the type of connection we associate with a handwritten document's creation and the presence of its author. With increasing use of other writing technologies, we perceive these newer technologies as less conducive to the physical author-document connection. Physical authenticity, then, can be a response to the typewriting on black box-like technologies and their potential for fraud. While electronic signatures become

more and more common, the perception of the physical bond between writer and signature in this context is certainly challenged and it will be interesting to see how the notion of physical authenticity will be redefined yet again. Handwriting has weathered all kinds of technological storms and has adjusted to their challenges. Signing, on the other hand, has a distinct history linking this practice directly to the use of seals, signets and other pre-mediated tools of authentication. In this sense, electronic signatures evidently are a continuation of this history.[28]

Futures of handwriting and authenticity

> Digital writing is nostalgic for the body. *It misses the hand.* The invention of fonts imitating personal or generic 'handwriting' is only one among many manifestations of what I am calling digital writing's 'nostalgia' for the handwritten. Others include animation and dragging techniques made possible by software programs such as Director and Flash,

says Carrie Noland.[29] Electronic emulations of handwriting include computer fonts based on actual handwriting or imitating a generic type of handwriting, online stationary maintaining the aesthetics of handwritten mailings, and encrypted or scanned electronic signatures. All these digital applications remediate classic handwriting with a pen. They imitate, emulate, and mimic the look of the handwritten script with all its connotations. An app for iPhone and iPad, for example, allows users to trace 'handwritten' letters on-screen for practice. Fonts have already been likened to expressions of personality in a similar way as handwriting has been portrayed. "My Favorite Font" or "What's your

typeface?" are magazine articles about what the preference for certain computer fonts says about a writer.[30]

What is more, this nostalgic body and hand might degenerate without the practice of cursive handwriting according to occupational therapist Agathe Bieder Börlin.[31] A host of recent studies suggest that cursive writing is practised less and less while an increasing number of people write exclusively by printing in block letters.[32] Bieder Börlin expects that the shortened time when cursive is taught in school will cause students to return to the aesthetically and visually familiar printed letters. These letters are more familiar because of their prevalence in printed and electronic media. I interviewed Bieder Börlin in the context of her project which will investigate the physical differences between children who have learned to write in cursive script and children who have not. Her research group will be scanning these children's brains in the process of handwriting. The following are some of the preconceptions they will be examining.

A more limited repertory of scripts might limit the ways we can express our personalities. Without a cursive script, our perceptive skills could suffer. Perception is made up of tactile-kinetic, auditive and visual aspects and writing techniques combine these senses in different ways, thus enriching or depriving sensory experiences. More importantly, because of the proximity of writing centre and language centre in the brain, this limited repertory could have consequences for our linguistic skills. Already, according to Bieder Börlin, the continuous conditioning of finger performance in handwriting training has consequences for our motor skills. The movement of our fingers when writing is one of the finest

and most subtle bodily performances possible. If we stop practising to write certain loops and curls with cursive script, Bieder Börlin says, we might loose the ability to sew fine stitches or execute similarly delicate movements.[33]

In 1955 an observer noted on the failing dexterity of a hand no longer writing:

> Nowadays people compose all their letters on a typewriter, or dictate them to a tape recorder, or sign them with a rubber stamp, and, as a result, the muscles of the thumb and forefinger which were formerly employed to grip a pen have fallen largely into disuse, except for picking olives out of Martinis or occasionally pinching stenographers in crowded elevators.[34]

Our thumbs, however, are certainly experiencing a revival. Most people writing text messages on cell phones enter the texts with one or both thumbs. On the other hand, our handedness, the preference to use either the left or right hand, could decrease with less time spent using a pen.

Bieder Börlin's work touches on all three aspects of the contemporary scene of writing: she looks at handwriting and its connection to language (semiotics, content), she looks at different writing tools and their consequences (instrumentality, technology), and she looks at the movement of the hand and fingers within the complex of the human writing 'apparatus' (gesture, corporeality, training). She argues that handwriting is closely associated with authenticity because it allows internal as well as external authenticity to be expressed with the highest degree of freedom. Internal authenticity or creativity might be the same in another writing environment. External authenticity, however, is more limited by a software that only allows predetermined options,

for instance. Within the contemporary scene of writing, in this view, the instrumentality of the process is mostly responsible for notions of authenticity.

Around the time Gray was dreaming of writing with wires that nevertheless seemed absent (see chapter 2), Nietzsche was also struggling with a writing machine, and reflected on the manner in which writing tools work upon our thoughts. Years later, Heidegger would raise a similar question. Neither were referring to the telautograph, but both raised the question of the relationship between writing tools, writing practices and the problem of authenticity, a problem that was already present in Gray's machine.

Nietzsche would have hardly agreed that our writing tools can simply be ignored and that they allow us to write "as if they were absent," as Gray suggested on the use of the strapped-in pen of the telautograph. Struggling, like Gray, with a non-compliant writing device, a typewriter in 1882, he famously typed that "Unser Schreibzeug arbeitet mit an unseren Gedanken," our writing tools are also working on our thoughts.[35] His original statement contained a typo through which Nietzsche's sentence further proved itself. On a writing machine Nietzsche writes about writing machines. The challenge of separating between what is being written and the act of writing itself is posed.[36] Heidegger diagnosed the mechanical incursions into the realm of the word and wrote

> Meanwhile we still adhere to the appearance that man is mastering the language machine. The truth might be, however, that the language machine is operating the language and thus is mastering the essence of man.[37]

Nietzsche thus commented on the various nibs with which he experimented for his fountain pen. His writing tools created all kinds of

mechanical obstacles, blotches, scratches, jammed keys, etc. which he had to overcome in order to reproduce his thoughts on paper. The comfort and ease with which we write might increase with growing awareness of the technological restrictions and of the limitations in formulating texts.[38] This is especially true in times of media technological transitions, when instrumental aspects of the communication process come to the fore. When instrumental possibilities are multiplied, a sense of competition and the obligation to choose are heightened as well.

Consequently, face-to-face communication becomes the 'ideal' and we tend to compare and contrast it to long-distance communication. By doing so, the 'ideal' becomes a situation where the message and other cues can be directly perceived while all other situations appear to force us to interpret and interpolate bringing about that "some texts are more orphaned than others."[39] Similarly, Stanley Fish, reflecting on finding a book with a dedication by an unknown writer, states:

> I found myself a very emblem of the difficulties or infelicities that attend distanced or etiolated communication: unable to proceed because the words were cut off from their anchoring source in a unique and clearly present intention. That is to say, I seemed, in the very moment of my perplexity, to be proving on my pulse the superiority of face-to-face communication, where one can know intentions directly, to communication mediated by the marks of writing and in this case by a writing that materialized without any clues as to its context of origin.[40]

The telautograph straddled many of these issues of absent authors, 'distanced or etiolated communication' and invisible cues. It provided a novel and quick way to communicate long-distance but was thus unprecedented as a writing

technology. It produced writing in the absence of the writer, thus challenging notions of authenticity, 'context of origin,' etc. However, it transmitted handwriting, clearly a familiar and trusted technology and clearly attributable to an individual person. Its niche was thus uniquely but awkwardly located between familiarity and strangeness; presence and absence; closeness and long-distance.

More recently, the Canadian author Margaret Atwood has helped to re-invent a long-distance handwriting device, albeit based on an entirely different technology. Rather than connecting two electro-mechanical devices with a telegraph line, her LongPen connects an electro-magnetic tablet with a robotic arm manoeuvring accordingly over the Internet. In addition, video streaming provides image and sound between the writing author and the receiving reader and book owner, since the device was primarily conceived for remote book signings. Similar to the telautograph, the LongPen requires several mechanisms controlling the motion which imitates the moving hand. One moves the pen into the field (the writer's hand moved the telautograph pen into the field), two mechanisms move the pen on the X-Y plane across the field, and the fourth lifts the pen up and down.

Similar to the telautograph, the LongPen is mostly used to transmit signatures, more precisely autographs of authors to remote readers. Again, it appears that the signature is the most trusted and resilient use of handwriting and as signing inhabits a borderland between writing and drawing, between word and image, the telautograph's paper and the LongPen's tablet provide conducive

surfaces. For Atwood, a signature duplicated by the LongPen, then, does not lose any of its authenticity:

> The mind is the device that is thinking out the signature. The hand is the extension of the mind, and the pen is the extension of the hand – so the pen is at two removes from the author's mind already. This thing is just another remove.[41]

Like Bieder Börlin, she seems to make a distinction between an internal authenticity and its physical, external execution and manifestation. Vilém Flusser, too, observed that all forms of writing are the product first, of a form of 'listening' to one's inner thoughts and second, of the motions reproducing this listening on paper.[42] The notion that the physical link between a writer and the handwritten text she creates is responsible for handwriting's generally high regard could thus derive from this idea that we have an internal authenticity, a sort of mental template for what we then physically (re-)create by hand. We assume, then, that different writing tools afford different degrees of fidelity to this mental template.

Thus, different writing tools afford different potentials for fraudulence as well. If we assume, as we have so far, that the notion of authenticity takes shape when the possibilities for fraud, imitation and infidelity arise, we can take the telautograph and LongPen in this reversed sense and look at their potential for forgery. Handwriting with the telautograph appears to primarily have been assessed by visual comparison. Handwriting with the LongPen, on the other hand, is portrayed as being faithful to the original simply based on the technology involved. In other words, the source of authority in assessing the handwritten product is shifting from the observer (telautograph) to the apparatus itself (LongPen).

At one of Gray's telautograph demonstrations in 1893 visitors, after watching the re-creation of a handwritten message at the receiving station, were asked to "go into a room at the end of the corridor where the message was sent." There, they were shown the message at the transmitting station. This invitation to visually compare the two texts had the desired effect, as one visitor attested: "A forger could not have reproduced the original message with the fidelity displayed by the telautograph."[43] Gray himself operated with this method whenever he judged the machine's performance (see chapter two). He did, however, also emphasize the technology involved in order to underscore the fidelity with which handwriting was reproduced:

> The transmitting and receiving instruments are so related to each other that every motion of the transmitting pen or pencil, as the case may be, is accurately copied by the receiving pen, whether on or off the paper. In other words, it is a long pen, that writes in two cities simultaneously, making a double record, the one an exact fac-simile of the other […].[44]

The mechanism connecting the two instruments is thus responsible for the fidelity of the 'double record.' Gray and many reporters also repeatedly invoke the fact that the telautograph operates with electricity, the powerful, fairly new phenomenon which works according to incorruptible physical laws. The final assessment of the technology, however, is left to the observer.

With the LongPen, the machinery is given the authority and responsibility to faithfully reproduce handwriting. The user need not worry about this aspect of having his or her signature reproduced:

> The LongPen™ is a pen, like any other pen, except it operates over the Internet and through video conferencing. But from your perspective, it still works via your brain, eyes,

> arm, and hand, like any other pen. It's just that the nib and ink are at a different location from you.[45]

In-between your brain and the nib and ink at a remote location is the LongPen system. It is this system which offers the user live-stream video enabling him or her to see his or her signature being reproduced. What is more, "Not only does LongPen™ offer a legal signature, it can also capture a digital video of the signing using video conferencing, guarding against misunderstandings or repudiation."[46] The device affords both the means by which a signature is faithfully reproduced but also the means by which any accusations of the opposite can be deflected.

Returning to the idea of distributed authenticity, we could conclude, then, that the telautograph enabled this type of authenticity. By invoking technological authority as well as human judgement, the telautograph combined two sources of assessing authenticity. The machine, by way of sophisticated technology, created the handwriting but it was the observer who made the final decision about the product's authenticity. In the case of the LongPen, the machine is presented as so sophisticated that it becomes a black box. The visual assessment of a signature's appearance is, in fact, also delegated to the machine as it is its own video link which enables this option.

It is possible for Flusser, however, that inner thoughts find more authentic expression with a machine, particularly the typewriter:

> If we look at the typewriter, we can see materially, to some extend [sic], how one aspect of our mind works. But only to some extend [sic], because the typewriter is more rigid than is our mental structure. […] Longhand writing is thus closer to our mental structure, and expresses it more directly. But of course this is an argument which may cut both ways. We

> may hold that the typewriter is more faithful to our mind processes than is longhand writing, and that the irregularities of handwriting are technical imperfections which have been overcome by the invention of the typewriter. Which side of the argument we chose [sic] will reveal our attitude toward the gesture of writing.[47]

There is another argument to be made for 'black-boxed' writing and an increased sense of authority. Ever since I read Cervantes' *Don Quixote,* I have been amused by his narrative framing of the book. Throughout the many stories and adventures, Cervantes alludes to Cide Hamete Benengeli as the actual collector and narrator of the hildago's fate. By doing so, he seems to suggest that he himself is the mere executor of someone else's work and can thus not be blamed for any of its contents. Only recently, however, have I noticed another trick by Cervantes to re-assign the authenticity of the book. At the very end of the text, when returning to Cide Hamete's role as the 'actual' author for a last time, he writes:

> And the sage Cide Hamete said to his pen: 'Here you shall rest, hanging from this rack on this length of brass wire, O quill of mine – whether well trimmed or not I do not know – and here you shall live on for many centuries, unless presumptuous and knavish historians take you down to profane you.'[48]

What does this pen hanging from a kitchen rack achieve? It settles once and for all the disputed authorship between Cervantes and Cide Hamete: it was the pen that wrote the book, "a pen that is instructed to speak autonomously, without a hand to guide it, while hanging by a wire from an ordinary kitchen rack." It is the supreme pen, settling histories and destinies, writes López-Baralt. Cide's pen, – "necessarily Arabic given the lineage of its owner" – can be associated with the sacred writing of a God.[49] *It is written,* in other words, the ink has dried and

cannot be challenged or changed. This is how a text by an absent writer can gain authority and authenticity.

Flusser's essay examines the gesture of writing as communication and knowledge, enmeshed in the social fabric: "to write is to have been programmed by others, and cannot be a solitary action, but is always 'social.'" He points out that "to write is structurally the gesture of a historical and scientific being-in-the-world. Should this gesture fall into disuse, […] the universe of history and science will fall into oblivion, or at least it will cease to be the universe we live in."[50] Even the future of writing systems, the superiority of the alphabet, for example, cannot be taken for granted. Writing systems are enmeshed within a culture rather than technical solutions to the problem of visual representation of a language.[51] Handwriting, then, is a particular way of being-in-the-world and a particular contribution to the universe we live in.

Conclusion

The notion of Schreibszenen offers an analytical tool to examine the conditions of writing: the gesture, the hand creating a text; the writing tool involved; and the meaning (semantics) which remains through and after the process of creation. Different writing technologies facilitate different contents and they can change over time. For instance, the telautograph was used by its inventor for rather personal and carefree messages during the experimental stage and ended up being used by banks and the military, about as far removed from personal and carefree as imaginable. In other words, a writing technology itself can afford a

wide range of content applications. In the process of niche construction, however, it commonly finds a particular usage determined by other media and their applications in the general media landscape.

In order to use a writing technology, the body and most often the hand or hands have to be trained. Discipline and standardization, individuality, and style evolve from this training. Different writing tools engage our bodies to different degrees. Cell phones as a writing tool engage eyes and thumbs. No particular body posture is associated with cell phone use. Handwriting engages eyes, one hand and arm and a particular body posture. Keyboard and keypad writing have their own configurations. I can eat an apple while I type a text message with one thumb but the apple stays untouched while I write an email. I can write by hand or type while standing up or sitting down. For this project, I examined scenes of writing in the 19th century (the telautograph) and 21st century (signing and handwriting practices today) and analyzed the respective semantics, gestures, and instruments.

Gray wrote in 1893 that he was hoping the telautograph would one day "transmit in a measure the individuality of man himself."[52] Thus, I believe, he hoped for the authentic representation of the writer's thoughts with the help of his invention. After his own attempts at personal exchanges during the experiments, Gray saw the device being used for business applications and even military purposes, hardly applications reflecting the users' individualities. We can also look at authenticity as 'inner authenticity' as proposed in some form by Flusser, Bieder Börlin and Atwood, and relate it to the sense of self as discussed in chapter

three. There, I have concluded that the self is as much a contributor to the usage of writing tools as it is a reflection of this historical context. Gray's hope, then, has and will always only partially be achievable, but it is and remains partially achievable.

At the time when the telautograph was marketed to the public, telephone and typewriter were challenging the dominance of handwriting: written correspondence decreased as invitations and their confirmations, for example, were increasingly made by telephone. This development likely helped movements like graphology and manuscript writing at the end of the 19th century (see chapter three) to lighten up penmanship training and acknowledge every writer's individuality. At any moment in time have people communicated by whatever means happened to be available. For most, the question of options is not a complicated one. What we tend to forget, however, is how much training and disciplining is necessary in order to become a decent user of each writing technology. Although the time invested in it has fluctuated over time, handwriting training, without a doubt, is the most intense. Yet even today, handwriting training also provides motor skills used in other types of writing. This balance, then, will change with any changes in the training and practice of handwriting.

The telautograph, in several respects, inhabited an awkward borderland. It straddled dichotomies between presence and absence, proximity and distance, original and copy. It produced handwriting at-a-distance, meddling with familiarity, originality, authenticity at-a-distance. It instantaneously transmitted a person's handwritten letters and doodles, meddling with individuality, immediacy,

legitimacy. As Elisha Gray's experiments demonstrate, long-distance exchanges had the potential to be both spontaneous and intimate. This was absolutely unprecedented at the time. Other long-distance media available at the end of the 19th century, the telegraph, the postal service and the telephone, did not combine these aspects. They required shared lines, delays, operators, codes, etc. that rendered them much less conducive to spontaneity and intimacy. Of course, handwritten letters could be very intimate, their exchanges, however, involved long waiting times. Conversations on the telephone, of course, could be very spontaneous, but intimacy – due to operators or neighbours potentially eavesdropping – could be risky and come at a price. The telautograph, on the other hand, operated on a direct line between two devices and simply transmitted changing strengths of electric current. No one could interrupt or eavesdrop, thus the telautograph's sustained use in the military. It allowed for immediate transmission of messages, thus the light-hearted banter and spontaneous exchanges between Gray and his technician in 1890. Despite its technical limitations and premature publicity, then, the telautograph for many decades found sustained application in a limited field.

Handwriting and signing have an operative and performative purpose as a cultural technique. Both purposes have been deeply anchored in our culture. Even so, our historical detours throughout this project have demonstrated that the practice of handwriting does not own a specific, static niche in the media landscape. Rather, both the operative and performative aspects of handwriting are

dynamic and have changed with changed perceptions and usages of other writing technologies. This process is not one of disappearance or replacement.

> Bolter says that we must look up from our laptops to the books on our bookshelves and ask ourselves, in similar fashion, whether one will destroy the other. But that may be to make an unwarranted jump, for the printed book destroyed neither the cathedral nor handwriting. Nor did it replace them. Whilst it did not destroy or replace the cathedral's authority, it displaced it. Printing replaced the handwriting of the scribes, but it did not replace handwriting per se.[53]

Will electronic writing destroy, replace or displace handwriting? The emerging dominance of new writing technologies has – so far, anyway – not signified the decline of handwriting but has provided moments of its redefinition. The cultural purpose of handwriting within a historically specific media landscape is being redefined. This includes the changing interplay between the valuation and practice of handwriting. In other words, when new writing technologies create their niches, existing niches like the one handwriting occupies, are redefined in the process. This, of course, is not a definite statement but one based on the scenes of writing visited here. A variety of writing strategies, practices and concepts are constantly reconfigured and redefined. At any moment in time, the semantics, gestures and instruments of writing recombine in both familiar as well as new ways.

Notes

[1] I am referring here to every-day situations rather than expert (court, graphology) applications. Numerous automatic ways of recognizing handwriting have been developed; the journal *IEEE Transactions on Pattern Analysis & Machine Intelligence* (Institute of Electrical and Electronics Engineers), for example, has published many techniques.

[2] See Thornton's discussion in a section entitled "The legal mystification of handwriting," in Thornton, 88ff.
[3] "Ob ich mit der Hand oder dem Fuss, mit dem Kinn oder Knie, mit dem Munde oder der Nase oder Zunge oder mit dem Ellenbogen, mit der grossen Zehe oder dem Daumen oder einem beliebigen Finger schreibe, auch ohne Schreibstift – das Geschriebene bleibt meine Handschrift mit den ihr eigenen Majuskeln und Minuskeln, Interpunktions- und vielen sonstigen Zeichen," [my translation]. In: Wilhelm T. Preyer, *Zur Psychologie des Schreibens: mit besonderer Rücksicht auf individuelle Verschiedenheiten der Handschriften*. Hamburg: Leopold Voss, 1895. 37.
[4] Schäfer, 252-256.
[5] E.V. Abbot, "Of the Nature of Agency." *Harvard Law Review* 9(1895): 507.
[6] A short version of this section was presented on October 14, 2007, at the 2nd Biennial Conference, Canadian Initiative in Law, Culture & the Humanities; Carleton University, Ottawa.
[7] Dana Milbank, "After Outcry, Rumsfeld Says He Will Sign Condolence Letters." *The Washington Post* 19 December 2004: A05.
[8] PostMail (Schweiz), *Kommunikationsverhalten Schweiz*. Hergiswil: IHA-GfK AG, 2007. http://www.post.ch/de/pm-studie-kommunikationsverhalten-schweiz.pdf
[9] LaMotta Strategic Communications, *Most Prefer Sending and Receiving Written Communication*, 2007. http://www.daytimer.com/pressroom/press_releaseResearch07_0214.asp; IPA Institute of Practitioners in Advertising, *Pioneering TouchPoints survey gives new integrated picture of consumer lifestyles, behaviours and multi-media use*, 2006. http://www.ipa.co.uk/Content/Pioneering-TouchPoints-survey-gives-new-integrated-picture-of-consumer-lifestyles-behaviours-andmulti-media-use
[10] E.g., K. B. Florey, *Script & Scribbles: the rise and fall of handwriting.* New York: Melville House, 2009; blogs, newspaper and magazine articles with titles like "Disappearing Ink: the end of handwriting," "The Death of Handwriting," or "The Curse of Cursive."
[11] "Type Writing Machine." *Scientific American* 17(1)1867: 3.
[12] Derrida 1977, 197-198.
[13] See Schäfer, 2006.
[14] Thornton, 43.
[15] Craig Robertson, *The Passport in America: the history of a document*. Oxford: Oxford University Press, 2010, 55/56.
[16] ibid., 61ff.
[17] Another requirement for a signature, the proper name, had to be used as well.
[18] Lauer, 146.
[19] Fraenkel. 206.
[20] Roy Harris, *Rethinking Writing*. Bloomington: Indiana University Press, 2000. 83.
[21] *LongPen - writing around the world*. http://www.longpen.com/index.html
[22] Lauer, 146.
[23] Goldberg, 236.
[24] Jonathan Culler, *On Deconstruction: Theory and Criticism after Structuralism*. Ithaca NY: Cornell University Press, 1982. 126-127.
[25] United States of America. National Conference of Commissioners on Uniform State Laws. *Uniform Electronic Transactions Act*, 1999. http://www.law.upenn.edu/bll/archives/ulc/fnact99/1990s/ueta99.htm
[26] Canada. Uniform Law Conference of Canada. *Uniform Electronic Commerce Act*, 1999. http://www.ulcc.ca/en/us/index.cfm?sec+1&sub=1u1
[27] Richard Grusin, "Signature Identity Content: Handwriting in an Age of Digital Remediation," in S. Neef, J. Van Dijck, E. Ketelaar (eds.) *Sign here! Handwriting in the Age of New Media*. Amsterdam: University of Amsterdam Press, 2006. 97.
[28] To be sure, biometric methods (e.g., retinal scans, face recognition) are the most likely way individuals and their physical presence will be authenticated in the future. See, for instance, Kelly Gates, *Our biometric future : facial recognition technology and the culture of surveillance*. New York: New York University Press, 2011; Lisa S. Nelson, *America identified: biometric technology and society*. Cambridge: MIT Press, 2011.

[29] Carrie Noland, "Nostalgia for Handwriting," paper presented at *New Media Poetry: Aesthetics, Institutions, and Audiences*, Third Annual Paul Engle Day Festival. Iowa City: University of Iowa, 2002.
[30] "My Favorite Font: Anne Fadiman, Jonathan Lethem, Richard Posner, and others reveal what font they compose in and why," *Slate* May 25, 2007. http://www.slate.com/id/2166947/; Katrina Onstad, "What's your typeface," *The Globe and Mail* March 5, 2011.
[31] Personal interview with Agathe Bieder Börlin. Basel, Switzerland, October 16, 2008.
[32] See, for instance, Merry Gordon, "From Cursive to Cursor: The Death of Handwriting," *education.com* November 9, 2009. http://www.education.com/magazine/article/cursive-cursor-death-handwriting/; Katie Zezima, "The Case for Cursive," *The New York Times* April 28, 2011. A15.
[33] Many of these reservations are also mentioned in this recent newspaper article on the decline of cursive writing: Zezima, 2011. For counter arguments see, e.g., Sharon Arthur Moore, "The Devil's Advocate: curse you, cursive writing," *Reading Research and Instruction* 25.2(1986): 139-141.
[34] Cited in Thornton, 186.
[35] On Friedrich Nietzsche and his typewriter(s), see Kittler, 1999; Davide Giuriato, Martin Stingelin, Sandro Zanetti (eds.), *'Schreibkugel ist ein Ding gleich mir, von Eisen': Schreibszenen im Zeitalter der Typoskripte*. München: Fink, 2005.
[36] Gary Hall, Clare Birchall (eds.), *New cultural studies: adventures in theory*. Edinburgh: Edinburgh University Press, 2006. 99.
[37] "Inzwischen hält sich vordergründing immer noch der Anschein, als meistere der Mensch die Sprachmaschine. Aber die Wahrheit dürfte sein, dass die Sprachmaschine die Sprache in Betrieb nimmt und so das Wesen des Menschen meistert," [my translation]. Cited in: Giuriato et al. 2005. 71.
[38] I am also fascinated by a new type of writing instrument, a pen that can record what it writes as well as any sounds associated with the writing (e.g. an oral presentation). Handwritten notes and audio can be uploaded to a computer: "Introducing Livescribe's Newest Smartpen. Livescribe." 2011. http://www.livescribe.com/en-ca/smartpen/
[39] Jonathan Culler, *Structuralist Poetics*. Ithaca: Cornell University Press, 1975. 133.
[40] Stanley E. Fish, "With the Compliments of the Author: Reflections on Austin and Derrida," *Critical Inquiry* 8.4(1982): 693-721.
[41] Cited in Tad Friend, "Two Pens," *The New Yorker* March 7, 2005. [1].
[42] Vilém Flusser, "The Gesture of Writing," *Flusser Studies* 8(May)2009: 1-18.
[43] "Electricity As an Artist." 1893. *New York Times* March 22. 1.
[44] Gray, "A Revolution in Means of Communication," 124.
[45] *LongPen: How it works*, 2008. http://www.longpen.com/howitworks.html.
[46] ibid., 2008. The company promoting the LongPen also briefly advertised the device's capacity to store a signature and reprint it for extra copies to be sold after a book signing. This feature, of course, is technically still possible but legally absolutely taboo.
[47] Flusser, 3.
[48] Miguel de Cervantes Saavedra, *The Ingenious Hidalgo Don Quixote de la Mancha*. London: Penguin, 2000. 981.
[49] Luce López-Baralt, "The Supreme Pen (Al-Aalam Al-A'la) of Cide Hamete Benengeli in Don Quixote," *Journal of Medieval and Early Modern Studies* 30.3(2000): 506.
[50] Flusser, 18.
[51] See Andrew Robinson, *Writing and Script*. Oxford: Oxford University Press, 2009.
[52] Gray, "A Revolution in Means of Communication," 127.
[53] James D. Marshall, "Electronic Writing and the Wrapping of Language." *Journal of Philosophy of Education* 34.1(2000): 135.

Appendix I: Elisha Gray's telautograph patents

incl. G.S. Tiffany (Gray National Telautograph Co.) and L.O. McPherson (Gray European Telautograph Co.) (former Gray assistants)

US no.	*Title, submitted by*	*applied*	*patented*	*Canada no.*	*Title, submitted by*	*applied*	*patented*	*notes*
494,562	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses T.H. Palmer, J.J. Kennedy)	07/16/1887	04/04/1893					EG_1
386,814	Art of Telegraphy, by Elisha Gray of Highland Park, Ill. (witnesses Robt. V. Hughes, James M. Ormes)	05/31/1888	07/31/1888					EG_2
461,470	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses G.F. Benett, Mary A. Jennings)	06/13/1889	10/20/1891	CA 30839	Telautograph, by Elisha Gray (United States)		02/20/1889	EG_3
461,473	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses S. Winthal, J.J. Kennedy)	09/17/1889 08/13/1890	10/20/1891					EG_4
461,474	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses J.J. Kennedy, G.M. Borst)	09/22/1890	10/20/1891					EG_5
555,938	Individual call system for autographic telegraphs, by Harry Etheridge and Gray National Telautograph Company	02/01/1892	03/10/1896					HE_1
491,347	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses M.B. Philipp, T.F. Kehoe)	09/21/1892	02/07/1893					EG_6
522,892	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses W.L. ReQuo, Thos. A. Wheelwright)	03/08/1893	07/10/1894	CA 45320 CA 45319 CA 45317	Telautograph, by Elisha Gray (United States)		02/13/1894	EG_7
522,893	Telautograph, by Elisha Gray of Highland Park, Ill. (witnesses T.F. Kehoe, J.A. Dunn)	01/27/1894	07/10/1894	CA 45453	Telautograph, by Elisha Gray (United States)		03/03/1894	EG_8
570,112	Telautograph, by George S. Tiffany of Highland Park, Ill., assignor to the Gray National Telautograph Company (Richmond Va.)	06/07/1895	10/27/1896	CA 51660 CA 51659	Telautograph, by Elisha Gray (United States)	05/25/1895	03/16/1896	GST_1

US no.	*Title, submitted by*	*applied*	*patented*	*Canada no.*	*Title, submitted by*	*applied*	*patented*	*notes*
587,663	Telautograph, by George S. Tiffany of Highland Park, Ill., assignor to the Gray National Telautograph Company (Richmond Va.)	06/07/1895	08/03/1897					GST_2
587,013	Telautograph, by Leon O. McPherson of Highland Park, Ill., assignor to the Gray European Telautograph Company (Chicago Ill.)	10/9/1895	07/27/1897					McP_1
585,319	Telautograph, by Leon O. McPherson of Highland Park, Ill., assignor to the Gray European Telautograph Company (Chicago Ill.)	11/24/1896	06/29/1897					McP_2
610,274	Telautograph, by Leon O. McPherson of Highland Park, Ill., assignor to the Gray European Telautograph Company (Chicago Ill.)	03/13/1897	09/06/1898					McP_3
672,631	Telautograph, by George S. Tiffany of New York, assignor to the Gray National Telautograph Company of same place	11/22/1900	04/23/1901	CA 74119	Method of telautographic transmission, by George Steele Tiffany (Gray National Telautograph Co)	04/11/1901	12/17/1901	GST_3
				CA 74120 CA 74118 CA 74117 CA 74116 CA 74115 CA 74114	Telautograph, by George Steele Tiffany (Gray National Telautograph Co)	04/11/1901	12/17/1901	
	later patents filed by Frederick W. Cushing (US, 1900); Henri Carbonelle (Belgium, 1905); Foster Richie (UK, 1901, 1904)							
4,631,355	Telautograph System, by Joseph Federico, Sigurd G. Waaben	12/18/1984	12/23/1986					last telautograph patent filed in U.S.

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