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Ben Miller   20 March 2009

Testimonial Media

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Testimonial Media

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An abstract of
a dissertation submitted to the Faculty of the Graduate School of Emory University
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Abstract

Testimonial Media
By Ben Miller

Testimonial Media explores the ways in which the recording methods and

material histories of magnetic and antecedent media have shaped witness accounts of

traumatic events. This exploration suggests that a medium's influence reveals itself in the

figure of the mediated witness, or witness subject. Reading the figure of the witness

subject will show that explanations of survival are contingent upon aspects and of the

recording, preservation, and distribution media used in their construction.

This reading necessitates the contemplation of diverse and ambitious witnessing

projects, as well as the study of more speculative media that have been applied to the

problem of documenting survival.   The most historically significant of those projects and

technologies are the Works Progress Administration's Federal Writers' Project Ex-Slave

Narratives, the Fortunoff Archive for Holocaust Video Testimony, Yale's Genocide

Studies Program's Cambodian Genocide Project, Eadweard Muybridge's Zoopraxiscope,

and Vannevar Bush's Memex.

These projects and technologies, and the contemporary incarnations of the

mediated witnesses they produced, were enabled by the development of three figural

practices: aggregation, association, and interpolation. Combined, these practices describe

the development of the dominant modes of address to traumatic events. Each chapter of

this study details one of those figures, and the kinds of witnessing it brought into being.

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INTRODUCTION

Testimonial Media

Digital Memories of Survival

Testimonial Media argues that magnetic and antecedent technologies of

mediation, when applied to the task of representing and organizing narratives of the event

of survival, instil within those narratives traces indicative of a medium's nature. Those

traces alter the ways in which users of the technologies construct representations and

narratives of events. These alterations, and the availability of new affordances of

representation, in turn affect the content of those mediated narratives – an affect that

ultimately shapes witnesses' narratives and scholars' ideas of time, technology, evidence,

and survival. Testimonial Media argues that those affordances have led to the

development of three medium-dependant novel figural practices: aggregation,

association, and interpolation. Each of those practices forms the basis of one chapter's

interrogation into the influence of media upon witnessing.

That suggestion will be developed through readings of texts produced in response

to survival, and through readings of the mechanisms and material histories of the

technologies enabling the production of those texts. These texts are drawn from diverse

and ambitious witnessing projects, such as the Works Progress Administration's Federal

Writers' Project Ex-Slave Narratives, the Fortunoff Archive for Holocaust Video

Testimony, and Yale's Genocide Studies Program's Cambodian Genocide Project. This

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diversity allows for a broad perspective on testimonial practice. They are drawn from

individual accounts of survival, such as Maurice Blanchot's L'instant de ma mort, and

thus allow for an encounter with one writer's highly crafted excursus which will be

shown to relate a theory of language to a theory of survival. They are drawn from the

mechanisms and material histories of technologies that have been applied to the problem

of representing witnessing. Reading Eadweard Muybridge's 1884 motion capture

photographic device, the Zoopraxiscope, and its direct technological descendent, John

Gaeta's 1999 cinematographic assemblage, Bullet-Time, will allow for the explication of

a technical counterpoint to the melding of theories of language and survival seen in

L'instant. In the material history of that unique technology of vision, this dissertation

argues that just as L'instant bound its theory of survival to a theory of language, this

technology bound a theory of survival to a theory of vision. Technologies aimed to

organize information, such as Vannevar Bush's 1945 mechanical computer, the Memex,

will be read as a testimonial response to the complicity of a discipline in the scale of

violence of World War II – a response which will later enable wholly new forms of

testimony. And most importantly, a material history of magnetic media that begins with

Valdemar Poulsen's 1899 theorization of magnetic recording, and follows its subsequent

development into analog and digital magnetic memory, will show how that technology

has been instrumental in the creation of large-scale archives of testimony, a creation that

has embedded within those testimonies the logic of the medium.

The following questions prompted this study, and aim to frame the relationships

among these magnetic and precursor media technologies as relates to the work of

constructing, recording, preserving and distributing narratives regarding the event of
survival. What possibilities have magnetic media, such as audiotape, videotape, and hard
drives, and antecedent media, such as typewriters and dictabelts, offered for the
preservation of witnessing? How have those affordances been systematically applied,
and what have been the consequences of that application for the practice of witnessing?
What influence might the medium's representational affordances have on the content of a
given testimony? What possibilities do these technologies offer for novel organization
and representation of testimonial memory and autobiographical utterance? How may
practitioners best read the material histories of those technologies so as to understand
their potential for mediating and archiving autobiographical stories of survival? What
can the material history of a medium contribute to understanding that medium's potential
to organize and represent memory? When does that history of development itself
constitute a testimonial response? And most critically, how has the application of media
new to the work of testimony served to enable and proscribe the witnessing of events?

Consider the situation of the survivor. Confronted by an event that refuses
articulation, an event that resists narrative integration, the survivor finds him or herself
continually confronted by fragments of memories. In response to the pressure exerted by
these fragmentary, intrusive memories, that survivor begins the work of producing their
own testimony. In the formation of that testimony, survivors take on the character of the
witness, the one who speaks to the history of an individual in an event. Autobiographical
witnessing such as this necessitates the choice of a medium with which to convey the
narrative, or with having that medium chosen by an institutional project aimed to aid

survivors. Often that project was begun by an organization such as the Fortunoff Archive

for Holocaust Video Testimony, and the medium was selected because it provided novel

affordances for the expression and representation of narrative subjectivity.[1] Frequently,

the medium chosen to aid in the representation of traumatic, lost memories is new to the

work of witnessing.

New media, such as analog magnetic audio or video tape, film, photography,

digital magnetic storage devices, and computational media, enable the recording of

testimonial speech acts at their moment of conception. Temporal proximity to the work

of memory creates the illusion that when one encounters the testimonial work qua text,

one is also encountering the work of testimony. It creates the illusion among readers of

testimonial texts that one is present to the scene of witnessing, rather than just to the

representation of that witnessing. In that mediated encounter with the witness, one can

for the first time see the survivor recollect what happened in an event at the same time as

one listens to the narrative of that recollection. In effect, new media present the witness

within a temporal frame that binds the lost event, the scene of witnessing, and the

moment of reading. Older media, such as typewritten print and photography, do not offer

this merged temporality; rather, they separate the survivor, the witness, and the viewer by

foregrounding the aesthetics of the representation over the event of witnessing that

produced the representation. Magnetic and computational media, when applied to the

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[1]An affordance is a possible use of a given object or technology. With simple and familiar
technologies, like chairs, one can easily recognize the possible uses of the technology: sitting, breaking,
stacking, painting, throwing. With more complex technologies, such as a computer, perceived and
available affordances are too numerous to list. This idea was developed by Donald Norman in The
Psychology of Everyday Things, (New York: Basic Books, 1988).

problematic of witness accounts of survival, present the witness remembering

simultaneously with the product of that remembering. To watch a Holocaust video

testimony is to be presented with the scene of remembering simultaneously with the

constructed narrative. In that presentation, one finds the creation of the mediated witness

subject.

The use of new media technologies for the production of testimony has existed

since Works Progress Administration writers mobilized typewriters to preserve the

narratives of former slaves throughout the American South during the 1930s. The

application of magnetic media for the production of witness accounts of survival became

an essential component of preserving memories when the nascent Fortunoff Archive

applied videotape to the problem of recording the stories of survivors of the Holocaust.

Writers such as Geoffrey Hartman, Dori Laub, Lawrence Langer, and Shoshana Felman

have all explored the highly imbricated role of the video camera in the production of

testimonial memories of the Holocaust. With the application of digital magnetic media

for the development of evidentiary archives such as the Cambodian Genocide Project's

Databases, researchers and historians are currently creating wholly new ways to preserve

and encounter mediated witnesses.

Contemporary digital magnetic media technologies offer novel affordances for the

memory work of testimonial autobiography by enabling new representational and

organizational schema. Those affordances emerge from the manner in which digital

technologies coopt and store prior media forms, thereby allowing users to integrate and

manipulate forms that were formerly distinct and immutable.[2] This function was written

into digital media at the moment of its inception in the mid-1940s. Remarkably, that

moment itself can be seen as a type of witnessing to the discipline's complicity in the

development of the organizational and military technologies which enabled the scale of

violence exhibited during World War II. In projects utilizing the affordances of digital

magnetic media for the work of witnessing, one can begin to see the potential and

consequences of digital memory for witnessing.

Each chapter of this study develops around one of the primary medium-dependant

figural practices that were brought into being as new media were applied to the problem

of witnessing. Chapter One, "Collective Magnetic Witness," considers the figure of

aggregation that emerged from the imbrication of oral history and magnetic memory.

Aggregation, as applied to the work of testimony, describes a process by which

increasingly minute and self-contained stories are brought together to offer the collective

experience of an event. As the devices used to capture and organize testimonies shifted

from symbolic media, such as the typewriter, to analog magnetic media, such as the

videotape, and finally to digital magnetic media, such as the hard drive, aggregation

enabled the constitution of witness subjects from increasingly minute fragments.

Aggregation allows for and encourages the assemblage of fragmentary evidence into

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[2]Lev Manovich discusses the features and principles which distinguish digital new media from other media in The Language of New Media (Cambridge: MIT Press, 2000). In the section, "Transcoding," digital media are recognized as both a substrate and a process which "computerizes" or translates other media forms into data. Once translated into data, that object can then be operated upon in an environment where all media forms are equal and reactive. The constituent elements of what was a videotaped testimony becomes the same constituent elements of what was a typewritten narrative, and thus similar computational and organizational operations can be performed on each. Digital media is distinguished by this ability to transduce representations between formats.

meaningful structures. Whereas meaning in narratives dependant upon older media forms, such as print, necessitated an internal coherence, magnetic media imposes its own coherence and structure. Increasingly, mediated witnesses do not offer fully explicated narratives of their survival – those narratives are stitched together by the medium from seemingly insubstantial fragments.

Three ambitious witnessing projects define an arc that led to this imbrication, and consequently to contemporary forms of witnessing. The first of those projects, the Federal Writers' Project's Ex-Slave Narratives, resulted from interviews conducted between 1936 and 1938. Each interview writeup was brief – often no more than four typewritten pages – but combined they offer a 9,300 page collective portrait of the final years of slavery in America. In those pages, readers are confronted with the often perfunctory stories of roughly 2,300 former slaves. The reasons for each narrative's brevity are the result of institutional decisions and media technology. Most importantly, in that collection this study finds the first tendentious example of a collective witnessing based upon the aggregation of fragmentary narratives. The second project under address in this chapter, the Fortunoff Archive for Holocaust Video Testimony, collected approximately 10,000 hours of footage from 4,300 interviews with Holocaust survivors. In that project, aggregation explodes, drawing together coherent, fully-developed narratives into a collection too vast to take in. This sublime aspect to the collection was a direct result of the application of analog magnetic media, and offers a technological parallel to the temporal, geographic, and inhuman vastness of the event itself. The Cambodian Genocide Program (CGP) completes this arc, and provides readers with a set

of databases detailing the atrocities committed by the Khmer Rouge in Cambodia from 1975 to 1979. Four databases were compiled by the CGP, organizing biographic, bibliographic, geographic, and photographic evidence. The mediated witnesses presented in this collection differ from those offered by older media; they represent those who did not survive. Aggregation, in this most contemporary format, connects truly disparate evidence and nearly insignificant signs into meaningful arrays, thus allowing for the construction, or simulation, of witnessing.

Chapter Two, "Traumatized Logics of Association," looks back into the material history of the media technology enabling the aggregative practices of the CGP, and finds that the machinery allowing for the establishment of a second figural practice, association, was itself a kind of witnessing to atrocity. Association, or more accurately, mechanical association, is the figural process by which an individual's idiosyncratic connections between ideas and fragments of ideas can be represented in machinic form.

The material history of the media enabling this figure begins with "As We May Think," an article published in July 1945 by Vannevar Bush, the director of all U.S. wartime research during World War II. In that article, Vannevar proposes that the next great American project will be a device, the Memex, with which to store, sort, and connect the documentary knowledge of the human race. That project, it will be argued, offered not just a mechanism with which to better enable research through the construction of trails of linked information, but a prosthetic that can return logical thought to those engineers violently affected by their complicity in the development of weapons of mass destruction. "Traumatized Logics" finds that the operational and

descriptive language of "As We May Think" reveals that the Memex' promise of a return

to logic is itself a technological testimonial response embedding in all subsequent

technologies a call to witness. Although the Memex was never built, its proposal became

a touchstone for later generations of information scientists and led directly to the

affordances of contemporary digital media.

Chapter Three, "Interpolated Figures of Near-Execution," compares two moments

of survival narrated with very different technologies, and finds in each that the

explanations for that survival are echoed by the logic of their media. The first of these

two moments is drawn from Maurice Blanchot's autobiographical piece L'Instant de ma

mort. In that short narrative, Blanchot relates a moment from his experience during

World War II in which a Nazi Lieutenant brings him before a firing squad. For some

inexplicable reason, his execution fails to take place, and Blanchot finds himself

temporarily lost. The second moment examines the material history of John Gaeta's

visual technology, Bullet-Time, and its application to represent a scene of near-execution

in the Wachowski brothers' speculative fiction, The Matrix. That scene focuses Gaeta's

newly enabled relation of time and vision on the confrontation between a young,

unarmed woman named Trinity, and an armed police officer.

Comparing these two moments allows for the recognition and explication of a

figural process drawn from mathematics and computational media: interpolation.

Interpolation describes the process by which one can, on the basis of a sequence of

known events, construct likely middle terms to fill in the gaps in the sequence. For

simple sequences, the logic of interpolation is identical to the rhetorical logic of the

truncated syllogism. Given the beginning and end of an argument, a reader can readily

construct a reasonable middle. However, by definition, survival always presents a

fractured, complex sequence that resists ready integration; survival is never simple. The

moment of survival constitutes itself as a resistive, problematic gap in experience. One

survives, but without access to the memory of that moment of survival, and thus is unable

to construct an aetiology of the event. Survival thus persists as a rupture, or trauma,

without clear cause, and hence without a clear narrative. In place of a memory of an

event, the survivor is faced with disruptive, fragmentary images of a moment too

traumatic to integrate. L`instant can be seen responding to this disruption as if in a spiral,

where event and explanation circle each other without resolution. Bullet-Time, reliant on

the process of computational interpolation and the scientific modes of vision which

preceded it, fills in the gaps of the sequence of survival. By creating likely sequences for

the lost moment of survival, this technology of vision offers a convincing simulation of

survival, and thus provides the narrative necessary for a fantasy of integration.

Ultimately, the mediated witnesses presented in these two moments of survival

each demonstrate a theory of survival contingent upon the propensity of their enabling

media for the practice of interpolation. Blanchot survives by way of the accident of

linguistic slippage, as the middle term of his execution resists a likely interpolate. Trinity

survives because she is mediated as one able to actively exploit the gap between

moments, gaps revealed by computational interpolation in a process enabled, and

subsequently populated, by digital media. In their contrast, and in the development of the

figure of the mediated witness subject throughout Testimonial Media, one sees the way

new media influences witnessing through the figures of aggregation, association, and

interpolation.

CHAPTER ONE

Collective Magnetic Witness

Mediated Witnessing

The production and preservation of witness accounts of survival relies on a tripartite tension among the technical mechanisms of recording devices, the material histories of those devices, and the rules testimony projects establish to govern their recordings. Each of these three aspects of witnessing depends upon the others for the production of those accounts, but each also imposes limits, resisting the operation of the others. From this interplay of forces generated by the capabilities of a medium, the aetiology of its development, and the institutional proscriptions of a genre, one finds the genesis of the subject of the witness, the foundation of the archive, and the possibility for trauma studies.

"Magnetic Witness" examines the witness subjects who emerge from this tension of affordance, history, and genre. The term *witness subject* describes a problematic that imbricates in the figure of the survivor issues of memory, representation, reception, content, form, language, and application. What principally concerns this study is the mediated nature of these subjects, and what that nature can tell readers about the consequences of mediated witnessing. That examination takes place across the technology and rules of three testimony projects as each sought to best exploit the potential of three media formats: typewritten print, analog videocassette, and databases

on digital magnetic hard drives. Those projects are the Works Progress Administration's Federal Writers' Project Ex-Slave Narratives, the Fortunoff Archive for Holocaust Video Testimony, and Yale's Genocide Studies Program Cambodian Genocide Program. From this collection of projects and technologies, one can begin to address the emergent character of the mediated witness, and the intellectual response that figure demands.

This chapter begins an overall study of the witness subject's emergence that will continue in chapter 2, "Traumatized Logics of Association," with a reading of the mechanized logic and mnemonic trails of Vannevar Bush's 1945 Memex. In this chapter, that emergence develops with reference to the telegraphic organizational patterns brought into being by 1930's typewriters, the continuous recording of witness subjects enabled by 1970's videotapes, and the aggregated databases of 1990's collective digital witnessing. The patterns for digital witnessing described by this and the subsequent chapter will lead to a kind of witnessing touched both by the fantastic and the rupture of history as made apparent in the visual imaginations of John Gaeta's 1999 Bullet-Time.

For an example of how the technical limits of a recording substrate both enable and proscribe the enactment of the rules of a documentation project, consider the Fortunoff Archive for Holocaust Video Testimony. Empowered in 1978 by newly available UMATIC videocassettes, interviewers such as Dori Laub and Laurel Vlock told survivors to speak freely and for as long as they felt able. The first recording lasted over six hours, and volunteer interviewers would record upwards of six sessions in one day (Rudof 2, 4). This methodological encouragement derived from the founding principles of the project: witnessing must take place with as few formal constraints as possible. The

resulting testimonies are foundational materials for any study of media and oral history. Yet technical constraints and consequences existed; the tapes used to record that speech only last for one hour, and often end mid-sentence. One can see the collision of rules and technical limits in longer testimonies such as <u>Bessie and Jacob K., HVT-206</u>.

<u>HVT-206</u> stands out amongst the Fortunoff Archive because of the complexity of its witness subjects, the insights they offer into the destruction of European Jewry during the Holocaust, and the critical attention this witnessing has received. It is also one of the longest Holocaust Video Testimonies, and one of the few to feature two subjects. The interview was conducted by Laurel Vlock on May 20, 1983 in one recording session. The interviewer is heard, asking questions, giving direction, but never seen. The resultant testimony addresses Bessie and Jacob's lives in Vilna and Zwoleń, Poland, prior to the start of the Holocaust, survivals during the event, and subsequent life and family in America. Although both subjects speak at length, offering reflective observations and specific descriptions of various events in their lives, Jacob's comments often tend towards historical interpretation and significance, while Bessie's comments tend towards psychological explanations and metaphoric language.

The relatively short recording duration of early videotapes, a limit resulting from a complex tradeoff of speed, wavelength and distance that will be addressed below, left survivors such as Bessie K. waiting as cassettes were changed before the witnessing proceed. In her case at the end of hour one of <u>HVT-206</u>, the machinery interrupted her remembrance of the liquidation of the Kovno Ghetto. That section of the video begins as

a wide shot showing both Bessie and Jacob K. sitting on their yellow couch. As Bessie

speaks, the camera slowly transitions to a medium shot that only shows her.

> [T]hey robbed and they took everything. And we had, we were lost, helpless
>
> creatures like a little fly. We had nothing to do anymore with our lives, we had
>
> nothing to do with our professions. They took us down and they put us in two...
>
> in one ghetto. Then they took out the old people, they cleaned them out. Then
>
> they took out intellectuals, doctors, lawyers, all kinds of intelligent people. Then
>
> the ghetto was smaller so they shifted us to a smaller ghetto. Then of course they
>
> put us in one room, a few families – (HVT-206 0:57.40)

As she finishes the last word in a series of allusory diminutions, "families," the screen

cuts to static. At 1:02.00, the picture returns from static, displaying a color test pattern.

That 4 minute 20 second gap is not reflective of the actual time between the beginning

and the end of the interruption. Rather, it indicates the length of tape, roughly 780 cm,

spooled out on a master later constructed from the four tapes used to record the original

session (Hoff 346). A moment after the color test was shown, we again have a wide shot

portraying both Bessie and Jacob. They look quiet, disturbed. Upon resuming, Bessie

tacitly refused to pick up that broken thread. A new question was proffered, and her

husband, Jacob, began speaking.

At the unexpected tape break at hour two, it was Jacob K. who was interrupted.

He had been speaking about how he came to Buchenwald, the concentration camp at

which he was interned for three weeks.

It was in 1944. I had survived the death march until I came to Sudetenland, to [inaudible]. Over there they put us in a barracks and we were surrounded by barded wire, but from there, there was no more place to go, because the Russians were on one side, the Americans on the other side. (HVT-206 2:04.59)

After the tape change, when filming resumed, he began again, saying, "Let me get my thoughts together" (HVT-206 2:06.00). His phrasing is telling, given that his thoughts and narrative were broken by the mechanism intended to preserve them.

The interviewers' explicit encouragement to speak without limits combined with the unexpected nature of the cessation – that it is allowed to interrupt the telling of a potentially traumatic memory – indicates the novelty of the technology. Interviewers were sent into the field not knowing how to manage the limits of their devices. Guided by rules derived from a psychologically sensitive theory of witnessing, yet insensitive to the operations of the technical recording devices which would instantiate those rules, interviewers led survivors to difficult moments of recall only to be surprised when mnemonic technology failed. But this type of interruption does not indicate a limiting failure in the conventional sense.

Rather, an implicit argument made by Testimonial Media is that those concerned with witnessing are surprised when the technology used to preserve those acts demonstrates that it operates under a different theoretical rubric, a different theory of memory. Technical artifacts in the recordings, such as the breaks described above, reveal traces of an underlying logic of a medium. That logic, and the technical limits through which it communicates, derive from the developmental history of a medium. That often

unknown history speaks to the embedding of a theory of storage, communication, and memory within a device. Despite providing the substrate which makes mediated witnessing possible, these devices embody principles counter to the applications to which they are put. In the material history of a device, and the technical details of a medium, one finds a counter-narrative resistant to the core tenants of testimonial practice and application.

Even as scholars and survivors place the remembering of a past genocide as the necessary condition for the prevention of a future one, the magnetic traces of the videotape fade, leaving static as a precursor to the eventual erasure of the speaking subject. Even under ideal conditions, modern videotapes begin to physically degrade after 15 years. The fading of the magnetic trace begins immediately, and at a rate that can be quantified according to complex figures known as hysteresis loops.[3] That fading progresses more slowly. But if one watches tape from as recently as 20 years ago, one can see the consequences of this magnetic and physical fading: garbled voices, muddled borders, low-contrast images, static. The softening of the boundaries of perceivable historical narrative is a direct result of the softening of the boundaries of imperceptible aspects of the storage medium. To put this argument in the terms of the OED definition

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[3]Hysteresis, Greek for "lagging behind," is defined by the OED as follows. "A phenomenon observed in some physical systems, by which changes in a property (e.g. magnetization, or length) lag behind changes in an agent on which they depend (e.g. magnetizing force, or stress), so that the value of the former at any moment depends on the *manner of the previous variation* [emphasis added] of the latter (e.g. whether it was increasing or decreasing in value); any dependence of the value of a property on the past history of the system to which it pertains." What this definition does is relate an observed change to the pattern of the change which influenced its creation. Rather than a simple system of aetiology where one action leads to a changed state, where history is charted as a set of discrete moments, this concept emphasizes the dynamism and sensitivity of the process by which magnetic recording, and by extension, testimony, takes place.

of hysteresis, the witness subject is itself the property dependant upon the history of the videotape system. And as these slowly fading tapes stand in an archive, offering the promise of first-person accounts of history to future generations, technology responds to these limits by moving on, leaving behind archaic, increasingly inaccessible media objects.[4]

Reading accounts of survival produced with various media across a set of testimony projects allows for a recognition of tensions such as these, and a demonstration of the fundamental influence material aspects of testimony have on the act, study, and archive of witnessing. The most apparent, and consequential signs of that influence appear in the figure of the witness.

Preserving The Witness Subject

For a witness to speak in a way that persists necessitates a set of related technologies with which to represent and record that speech, and a channel through which that representation propagates to an audience. In short, a medium. Take as an example the propagandistic outreach effort of the *Frente Farabundo Martí para la Liberación Nacional* (FMLN), a Salvadoran leftist guerilla army later turned political party. In the late 1980s, the FMLN mobilized a video production unit of three camera

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[4]The consequences of these technical advances are felt keenly by the archivists tasked with preserving these media objects. Jean-Pierre Wallot, the President of the International Council of Archives from 1992 to 1996, and Normand Fortier, an archivist with the National Archives of Canada, comment on this issue. "Sound and visual recordings on magnetic media – and even, to a lesser extent, on film, – pose difficult and costly preservation problems. ... one must take into account the variety of recording formats, which are usually incompatible, and rapid technological change, particularly in the case of video recordings. Consequently, archives have to constantly recopy documents in a common format" (Wallot 373). Film is somewhat exempted from this forced obsolescence because it relies on a less incantatory, mimetic process of representation.

crews that supplied first-person reports and stories of their (always successful) operations to the populace through an eight VCR distribution network (Ganley & Ganley 98, and Brooke C-17). This type of assemblage of recording substrate – the videotape – and correlative distribution network – the duplication and passing of cassettes through hands – serves as a demonstration of a medium in its form as both substrate and channel. Media implicitly serve to define the boundaries of a community.

For a medium with longevity, like magnetic tape, that substrate has a representational potential which is made to evolve throughout its material history. At their best, material histories of media addresses the relationship between a cultural milieu and a technology's history of development and usage. Critical texts which address that complex relationship have ushered in new frontiers in the study of media and culture: Marshall McLuhan's <u>Understanding Media</u>, Friedrich Kittler's <u>Aufschreibesysteme 1800/1900</u>, N. Katherine Hayles' <u>How We Became Posthuman</u>. Yet these texts principally address cultural production and the new relations enabled by communications technology, not the patterning influence storage and communications technology have had upon witnessing and the practice of historiography.

Understanding the patterns of that influence necessitates that aspects of that material history be described with reference to the technical characteristics of the substrate. One of those characteristics is the dynamic range, or breadth of a sound's volume. Although volume is most commonly considered a parameter adjusted at the point of playback, dynamic Range is dependant upon characteristics of the recording medium more so than on any playback mechanism. Metaphorically, one can imagine this

characteristic as analogous to contrast for a printed page: paper can only be so white, ink

only so black. To make "louder" text would be to bold that text, producing fatter, more

insistent letters. But, at some point, those letters would begin to lose their distinctiveness

– their boundaries that define them one from another. Analog sound recording on

magnetic media functions similarly. The figures portrayed with the videotapes used by

the Fortunoff Archive or the FMLN are visually and aurally limited to a range their first-

generation tapes can preserve.

Specific assemblages of limitations, combined with the aging of the substrate and

the medium serve to reenforce the authenticity and situationalness of the witness subjects

recorded therein. This aspect of a mediated witness subject encourages viewers to

appreciate the artifacts that result from specific limitations of a technical medium, and

therefore to recognize the history of the objects which instantiate the mediated witness.

The aged technical object thereby becomes one of the temporal lodestones of testimonial

practice in that it situates the witness' recollections to a particular historical moment. In

that often intuitive, unappreciated doubled recognition, the witness subject emerges as an

assemblage of performance, representation and substrate.

A Temporary (Magnetic) History

The importance of medium affects, such as contrast and dynamic range, for a

consideration of the witness subject / substrate assemblage requires a continued

excursion into the material history of magnetic recording. The first magnetic recording

devices could only preserve a narrow dynamic range without overwhelming that sound

with noise. That device was imagined by Oberlin Smith following an 1878 visit to

Thomas Edison's laboratory. Smith's motivation would oscillate between improving the

phonograph or the telephone, but his descriptions yield more significance to the former.

Although his device was not realized, Smith's described a cotton string either

coated with metal filings or impregnated with steel wire passing through an

electromagnetic coil. In a 1901 letter to the US patent office, Smith included a diagram

that resembles nothing so much as two spools of thread, one feeding the other, with a

metal wire coiled around the thread in transit. That coil would, according to this

imagined description, make the metallized thread into "a series of short magnet grouped

into alternate swellings and attenuations of magnetism" (qtd. in Engel 2006, 17).

Magnetic recording, for Smith, was imagined as a "purely electrical" method whereby

one could remove the hiss and pop from sound recordings that resulted from mechanical

deformations. Smith's first full description of the device appeared in "Some Possible

Forms of Phonograph," published in the September 8, 1888 issue of <u>Electrical World</u>.

That article would go relatively unnoticed until mid-1941, as magnetic media became

more necessary and feasible (Engel 1989, 173).

The first working model of a magnetic sound recorder appeared in an 1899 patent,

number 661,619, filed by Valdemar Poulsen. At the time, Poulsen was a mechanic for

the Copenhagen Telegraph Company. Scholars debate which of these two engineers

deserves credit for the invention, but it was Poulsen's work and writing that would prove

more influential. Partly, Smith's ideas exerted less influence on the material history of

magnetic recording because they remained only ideas. His devices were only ever

experiments of the mind. Partly, Poulsen's significance derives from his imagined

application for the technology.

Physically, Poulsen's device resembles a lathe. In the case of patent 661,619, the

carving tool is replaced with an electromagnetic head, and the blank (the object to be

carved) is replaced with a thin metal wire wrapped in a tight spiral around a spindle. The

spindle rotates, passing the wire beneath the head. A varying electric current is

introduced to the head as its assembly travels vertically down the spindle. That current,

influenced by vibrations picked up by the receiver of a telephone, varies in proportion

and time to the sound of a person speaking. As the receiver sends its varying current to

the electromagnetic head, a corresponding magnetic field is created in response to that

charge. As time passes and the head travels, a magnetic field whose amplitude and

length describe a waveform is produced along the spooled wire. That field, preserved in

its varying intensity, is a representation of a sound, a voice. The structure and action of

Poulsen's device translated a physical modeling process into an electrical one.

The limits placed on the intensity of the magnetic field by characteristics of the

metal wire determine the maximum undistorted volume of a recorded scream, and the

minimum perceivable differentiation of a recorded whisper from background noise. No

record exists of the dynamic range of Poulsen's device. But, in November 1936,

Allgemeine Elektrizitatsgesellschaft (AEG) produced the first recording using magnetic

tape, a direct descendant of metal wire recordings. It was a concert in Mannheim,

Germany by the London Philharmonic Orchestra (Camras 664). The dynamic range of

that recording, made 37 years after Poulsen's first device, was only 30 dB

(decibels)(Ritter 10-12). Contemporary videotapes used by the Fortunoff Archive have a dynamic range of approximately 70 dB (Capelo 126). By contrast, human hearing extends beyond a painful 120 dB (Russ 11). These numbers describe not a scale, but a ratio. Perceiving a range of 120 dB would be equivalent to capably judging distances ranging from a millimeter to a million kilometers. From a technical standpoint, to be recorded to analog magnetic media is to be translated from a physical phenomena to a varying magnetic field, and to be constrained to a substrate's potential to preserve that field.

Other aspects of that change can be described with new applications for the medium made possible by material improvements. The first computer magnetic storage medium was a magnetic tape not dissimilar in principle to Poulsen's device as described above, and somewhat similar to the design of the AEG tape used for recording the London Philharmonic. Remarkably, in the case of these early data tapes, information was stored audibly. A series of clicks were recorded on the tape, which were to be played back in order to retrieve stored programs and documents. Naturally, this process was slow. In 1949, the fastest analog data tapes could record or play back approximately 200 clicks, or characters, per second (cps)(Daniel 252). Consumer models, like the one that served as the drive for the 1977 TRS-80, transferred in the range of 200-400 cps. Both were vulnerable to many corrupting influences. If a tape deck's volume was set too low, the data would be inaudible to the magnetic pickup. If the volume was too high, noise would obscure the moments of silence between the clicks, and again, the resulting data would be corrupted.

The shift from mechanical to electronic computation demanded faster information transfer rates and higher densities of information storage which could only be provided with digital magnetic media. These two shifts would facilitate the growing appetite for data collection and analysis, such as was applied during the Viet Nam conflict to track U.S. Air Force bombing missions. As will be addressed below, the datapath enabling that collection and analysis began with pilot interviews and coded punchcards, progressed through the first generally programmable computer, and ultimately returned as a central rhetorical element in the Cambodian Genocide Program's Database (CGDB).

Listening to History

These are the tools upon which rely the practice of oral history. The changing potential of these tools and the history of how that change was accomplished act to influence what does and can be said by a witness using that mechanism. Along with documenting the altered properties of a substrate, material histories serve to chronicle the complex relationship between what was technically feasible and what developers believed communities needed.

Poulsen's magnetic recording machine, the precursor of audio and video tape, was first described in 1899 as an answering device that would allow one to speak and listen in absentia. Likely, the impetus for this description came from Poulsen's work for the Copenhagen Telegraph Company.

The invention is of great importance for telephonic purposes, as by providing a suitable apparatus in combination with a telephone communications [sic] can be

received by the apparatus when the subscriber is absent, whereas upon his return

he can cause the communications to be repeated by the apparatus. (Poulsen 1)

Narrowly conceived as an extension to telephony, magnetic recording would soon be

applied to music, then vision, and eventually, data. In its instantiating case, the operative

underlying meme for this technology would be the preservation of an event through a

period of absence and return.

From this point of origin – magnetic recording as a temporal bridge between

absence and return – video must trace its development. Although roughly similar to film,

the two rely on entirely different technologies, have entirely separate histories, and

somewhat different affordances. Film takes as its origin the photograph and a chemical

process aimed to replicate through automation the difficult work of portraiture. Even in

their later application with a scientific eye, photography, and therefore by extension, film,

are at their origin memorial technologies. Magnetic media, however, were imagined as a

temporary mnemonic bridge for communications.[5] Notwithstanding its application and

utility for the work of oral history, this temporary nature of magnetic media has acted to

sabotage its application to memorialization.

These late 19th century magnetic lathes had sufficient range to capture a rough

approximation of a human voice, and sufficient capacity to temporarily preserve a few

messages such as the example that Poulsen offered with his patent application; "The

subscriber is not at home at present, but will return at four o'clock, at which time please

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[5]That difference, and the coming together of digital video and filmic image are further addressed in the following chapter, "Interpolated Figures." The third application of magnetic recording, that of data, emerges as a response to the different need as chronicled in Chapter 2, "Traumatized Logics of Association."

ring again" (3). That example is categorically different than what Smith imagined his device would preserve.

> The Lord's Prayer could be written upon a few feet of thread or string, while a young lady receiving a small spool of cotton from her lover would think herself abominably neglected if it was not "warranted 200 yards long." (qtd. in Engel 2006, 18)

Although obscure, Poulsen's first magnetically stored message is as significant to the structure of contemporary memory as Alexander Graham Bell's first electronically transmitted voice was to the structure of contemporary space. Poulsen's absent subscriber heralds the future preservation of all signs as clearly as Bell's voice heralded the future of distant, near-instantaneous aural presence. Yet Poulsen's practical device featured a very limited, unspecified capacity for memory.

48 years later, in 1946, the first commercially available magnetic recording device was presented to the public. That device, the Brush Company's BK-501 Mail-A-Voice had a 3-minute capacity (Clark 76).[6] It was a commercial flop: too expensive for consumers, too flimsy for businesses. The Mail-A-Voice relied upon foldable paper records which had been coated with a ferromagnetic dust. Users were encouraged to file these recordings away in cabinets, or ship them off to loved ones. Unfortunately, the rotational timing and electromagnetic characteristics of each Mail-A-Voice varied, and so

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[6]As Poulsen is considered the inventor of magnetic recording, so the developer of the Mail-A-Voice, Semi Joseph Begun is considered the inventor of magnetic tape. It was his work before World War II, during the war for Military Intelligence as part of Vannevar Bush's National Defense Research Council, and after, as Chief Technical Officer for Brush, that made possible flexible magnetic media. That tape would be necessary for later developments, such as practical audio, video, and data recording.

voices preserved on one BK-501 were often incompatible with every other BK-501. Of
interest here, however, is that unlike prior recording devices which depended on a stylus
inscribing permanent trails in a plastic or wax disc, belt or cylinder, this device permitted
an infinite number of rewrites.

One could argue that given the tendency of magnets of Poulsen's period to lose
their organized magnetic charge over time, that his machine necessitated that frequent
reinscription. In essence, Poulsen created a mnemonic technology that acted as a limited
memory continually, slowly, forgetting.[7] Again, this situation was reasonable because
magnetic media was theorized only as a temporary mnemonic bridge. One could not,
using that early magnetic recorder, leave a message for the ages in the manner of
Edison's phonograph or John F. Kennedy's plastic dictabelts. Yet even the permanence
of supposedly indelible media should be suspect.

Dictabelts, developed by the Dictaphone Corporation in 1940, but not
manufactured until after World War II, offered the first practical technology for a direct
recording of daily events. Operating according to principles drawn from the phonograph,
the device used a metal stylus to carve a track in a wide loop of acetate. Dictaphone
marked these loops "Dictabelt Visible Record," (NARA "History") as if they made one's
very speech visible and authoritative. These belts traveled in a continuous circle, and the
resulting track directly represented the amplitude and frequency of a sound. Because of

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[7]As opposed to conventional, human memory, the speed at which a magnetic medium forgets is
quantifiable. The quality is called Magnetic Retentivity (Mr) or Magnetic Remanence. Mr is a quality of a
substrate that describes how quickly and completely a substrate goes back to an unorganized state after
being saturated, or organized, by a magnet. This characteristic was one of the primary attributes focused on
by early engineers of magnetic media. It also made early magnetic recording devices, like the Mail-A-
Voice or 3M's first commercial magnetic audiotape, Type 100, compelling but impractical. It is one of the
parameters that describe the curves in hysteresis loops.

the materiality of the medium, each belt could only be recorded on once. The result was an analog, mechanical recording of an indelible, seemingly permanent nature. Because of these unique, permanent characteristics of dictabelt recordings, and despite the device's time limit of 15 or 30 minutes, dictabelt recording machines were common in law and government offices.[8]

Presidents John F. Kennedy and Lyndon Johnson used dictabelt machines in the oval office to record some of their phone conversations. JFK's recordings range in historical significance from possibly the most revealing, belt 32.3, to the least, belt 46.0. The first lets us listen in to JFK and Roswell Gilpatric on October 23, 1962 as they discussed a possible naval blockade of Cuba. The second is blank, but still preserved. These novel recordings are now maintained by the National Archives, and each president's respective library. However, belying their permanent nature, the JFK recordings were almost lost twice.

The first near loss occurred in the aftermath of JFK's assassination. His secretary, Evelyn Lincoln, had been responsible for operating the machine for JFK. When a call came in which he wanted recorded, he would signal her to begin the machine. Often, she neglected to shut the machine off, resulting in belts recording ambient Oval Office conversation or subsequent phone calls. After JFK's death, Lincoln took both the dictabelt machine and the 70 belts containing the recordings. Oddly, she had numbered those 70 belts "1-28," meaning many different belts carried the same

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[8]Virginia required circuit courts to have Dictabelt machines record all proceedings. Some of those recordings, like the 130 belts of the 1963 Danville Civil Rights Case, are historically significant and have been converted to more accessible formats. ("1963 Danville").

identifying number. Lincoln folded the belts flat, paper clipped them together, and took them with her to her new job at the National Archives. Unlike modern plastics, acetate ages quickly into a brittle, unforgiving form. Yet they survived. Upon her retirement in 1965, Robert Kennedy took the belts from the Archive. They would not be seen again until 1973.

The second near loss happened after the return of the belts to the JFK presidential library, and ties in to the increasing inaccessibility of archaic media. By 1992, the Dictaphone Corporation was long gone, along with their devices and designs. Without an original dictabelt player, the library was unsure it could retrieve the recordings. Engineers at IBM were able to bring back into service a dictabelt player from their archive, and the sounds inscribed on the belts were transferred to analog magnetic tape. A year later, the waveforms on those analog magnetic tapes were transferred to digital audio tape (NARA "Processing").

Two points demand attention. First, just 30 years after the recordings were made, the device used to make them was a difficult to find antique.   And second, each of these transformations forces the recording into a new format, a new structure. As with the pushing of poetry from language to language, pushing recordings from medium to medium forces a reformatting that leaves an object wholly new and disturbingly familiar. Artifacts such as noise, breaks, and the dynamic range of the medium are not

characteristics which always improve. Rather, each medium acts like a palimpsestic

substrate whose fibers show through from translation to translation.[9]

 This process of continual reinscription acts to eradicate recognizable artifacts

from a recording, and leaves the witness subjects preserved on these translated materials

somehow suspect, inauthentic. Absent the implicit cues that demonstrate a medium's

authenticity, the subject takes on an aspect of dissimulation that threatens the credibility

of the scene of witnessing. Absent those cues, one finds a weakening of the bonds which

connect a given witness to a particular moment, a moment denoted with the artifacts

produced by the devices which instantiate it.

The Testimedial Dependance

 A channel to record and propagate a witness' account of survival often exists

because an institution recognized in those material histories and representational

potentials a possible connection between the affordances of a medium and the needs of a

community. Seeing beyond the limited suggested use of the early magnetic recorders to

the possibility of those recorders for oral history field work is to creatively match the

needs of a population to the affordances of a device. What emerges from that creative

recognition of a need and a possibility is often a project in which people armed with

technology are sent out to collect the stories of a community. This happened with the

Federal Writers' Project and typewriters, it happened with the Fortunoff Archive and

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[9]To further complicate the picture of the automatic recording of the Oval Office, JFK and LBJ
used early magnetic recording as well. However, it was not until magnetic media became more practical
that LBJ would fully transition away from these loops of acetate towards the more recognizable medium of
audiotape.

VCRs, and it happened, to wider application but a more limited creative extent, with the Shoah Foundation Institute, as each acted to record and preserve those mediated testimonies. These three objects – the medium, the channel, and the institution – describe a sociotechnical milieu that exerts force on the act of witnessing. That force influences what is said, what can be said, what can be heard, and how what is heard is interpreted. Yet as mentioned above regarding a medium's embedded theory of memory, the extent of this influence goes further.

That subject, the witness, in the act of witnessing takes on the character of the medium upon which its being depends. That dependance has led, for example, to witnesses whose representations and remembrances resemble film, collections of narratives organized by last name as if located in an encyclopedia of suffering, and a discipline geared towards transforming the readings of scenes of storytelling of liminal events into beneficial theories of memory and mourning.

The consequences of that dependence necessitate further description. The first example mentioned witness subjects taking on aspects of the medium used to preserve their witnessing. In a segment of the Shoah Foundation Institute's interview of Hy Abrahms, viewers see a man with arms crossed narrate one segment about a moment of survival. The telling begins with Abrahms' four-part framing. First, he provides the historic moment, "1944, when Hitler took over Hungary," giving viewers a chance to fit this piece into the wider context of the war. Second, he provides an emotional context, "My father was very scared," preparing viewers for the difficult task of listening. Third, he provides the authoritative voice of his father. "He told us, he says, 'I know what

Germans are.'" By giving his story the legitimacy of another's respected voice,

emphasized as it tells and says simultaneously with the beginning of a meta-narrative,

Abrahms' repetition of speech, first in past tense, then present, contextualizes this

witnessing as an attempt to preserve others' speech through his voice. He speaks in that

moment on behalf of an absent other. And fourth, Abrahms pauses, breathes in, and

provides the opening moment, "Night. The last day of Pesach."

As Abrahms speaks, confidently, slowly, with a storyteller's emphasis, one

watches the verbal performance of a memory tagged to small movements of the eyes,

face, body. That performance is structured, constituting a shorter scene in the larger

work of his 2 hour testimony, and has a fairly normative narrative structure. From the

opening moment to the conclusion of the story, the temporality of the telling progresses

simultaneously with the temporality of the event.

What helps mark this moment as filmic is twfold. First, the visual continuity of

the narrator persists through various shifts of temporality and voice. The viewer's aural

imagination is never allowed to drift away from the visual insistence of the speaking

subject. As the story begins to unfold simultaneously with its telling, viewers experience

the same time-scale. Time becomes a touchstone for reality, and for the realistic framing

of this scene of witnessing. Although time dilation is an affordance of the medium, here

its synchronicity becomes a strength reinforcing the authenticity of the witness. Second,

the interviewee gives prominence to the absence of light as the opening movement of the

events of his story. What occurs prior to that opening moment prepares the viewer –

what occurs in that break, breath, and one subsequent word, "Night," is the viewer's

entrance into the event which will be survived. That entrance has three primary valances.

First, it provides a visual cue from which the narrative will emerge. Filming a survivor

pushes the survivor to think in metaphors, moments and structures common to and

sensible to film. Second, that emergence leans on the Judaic tradition of stories,

holidays, and testaments beginning at night. And third, that single word has a strong

presence within Holocaust literature because of Elie Wiesel's canonical testimony of the

same name. That resonance between literary testimony and oral history could, if

correlated with other similar resonances, marks Abrahms as a witness knowledgeable in

the rhetorical and linguistic traditions of a genre.

The second of those characteristic dependencies spoke of the organization of

narratives within an archive. The first large, technologically enabled witnessing project

was the Federal Writers Projects' Slave Narratives. Initially, testimonies in this

collection were categorized according to two pieces of data: the state that served as the

site of the interview, and the last name of the interviewee. One need only look at the

table of contents of one of that collection's volumes to see opaque lists of "surname,

given name," each located in alphabetic order, each divorced of meaning beyond that

surname. Those categories of organization are particularly problematic and emblematic,

given the history of slavery in the United States with regards to population relocation and

the impermanence of surnames. To site an oral history of an ex-slave to Arkansas means

first to elide the history of how the person got there. To cite that interview as one of the

fourteen under the surname "Brown" in Volume II, Part I of the Arkansas Narratives is to

passively elide the problem of naming in relation to slavery in America and a population involuntarily transported and renamed.

Yet these problematic, simplified, functional categories of organization were all that was available. Prior to Vannevar Bush's call to arms for information science, as will be addressed in Chapter 2, "Traumatized Logics of Association," no technical recourse existed for organizing information other than according to fixed, singular, basic categories of sortable metadata. In essence, the organizational technology of the time limited the options available to the archive for sorting and referencing their growing collection of oral histories. That limitation seemed to have resulted in a cataloging system simultaneously foregrounding and ignoring two awful traces of slavery.

And finally, the third characteristic dependency mentioned the interpretive framework and subsequent academic discipline engendered by this material. This turn towards a therapeutic, or at least psychologically informative interpretation of another's story of survival has its roots at an origin of trauma studies, Sigmund Freud's Beyond the Pleasure Principle. In the second chapter of that text, Freud works to understand the gestural story being told by a young boy as he tosses away and drags back a small toy attached to a string (Freud 12-17). One can properly call that game of toss and return a story because it is accompanied by language – the boy's early use of language, interpreted by Freud as *Fort* and *Da*. Upon throwing the toy away, the boy made a sound Freud would interpret as *Fort*. Upon dragging the toy back, Freud heard the boy say *Da*. Those words, "gone" and "there" in German, are for Beyond, the boy's story of the loss and return of his mother as she went about her day. In essence, Freud interprets for us a

story of the child's survival of that absence. That interpretation of a daily loss and return would provide Freud the seed around which to describe a later, more permanent loss.

To read the boy's story as such is to look for a theory of memory and mourning. To canonize that style of reading, that search, is to begin the creation of a discipline aimed towards an understanding of memory through the interpretation and interrogation of narrative content and structure. With two exceptions, scholarly work performing that interrogation has not yet addressed the structuring influence of communication and storage media technologies on witnessing. One of those exemptions relates the study of mnemonics to the methodologies and application of oral. The other generally discusses how video recording affects the methodology of oral historiography.[10]

Even when that affect is addressed, the material history of the medium was neglected. This oversight has left unnoticed basic observations on how the material histories of media reveal their structuring influence on the witness subject. One such observation derives from drawing together two prior examples: the language of Poulsen's patent on magnetic recording and Freud's *Fort-Da* game.

The foundational moments of the psychoanalysis of trauma and of the principles of magnetic recording take place in a parallel articulation of absence and return. For Poulsen, that absence and return concerns improving a commercial transaction with the creation of a system of deferred communication. The perception of a need to bridge that

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[10]Examples of the first can be found in Raphael Samuel's "Perils of the Transcript" and Charles T. Morrissey's "On Oral History Interviewing," in The Oral History Reader. An example of the second can be found in Geoffrey Hartman's "Holocaust Testimony, Art, and Trauma," in The Longest Shadow: In the aftermath of the Holocaust and Donald A. Ritchie's chapter "Videotaping Oral History" from Doing Oral History.

deferral is what spurs the development of the strange idea that information can be retained by grossly manipulating the a subatomic characteristic of metal wires wrapped around wooden spools. For Freud, the boy's game of absence and return, of *fort* and *da*, speaks from an attempt to narrate, and through narration control the feelings resulting from the uncontrollable loss of another.

Although the gestures and language of the boy's game developed in response to the his need to cope with the daily, normal absences of his mother, that game would become more tragic, and more significant upon her too early death. It would provide both the boy, and later Freud, with a mechanism to describe a psychological attempt to cope with loss. In developing that mechanism, Freud would also be constructing an intellectual method through which to redress loss. That doubled mechanism of playing and reading focuses on mastery through repetition and control. By controlling when the object was cast away, when it was lost, and controlling when it was drawn back, when it returned, the boy learns he has a measure of control of the objects that make up his world. By formalizing a method by which one can understand how loss situates itself in memory, the theoretician learns a structured manner with which to encounter and remember loss.

This pattern of mastering an event through repetition is one of the strengths of magnetic media, and should feel familiar to anyone who has used a VCR. Playback, whether it be of a favorite tv show, a language lesson, or a home movie, is a central affordance of the technology. It also echoes what studies have shown to be conventional

habits of users of the technology.[11] Those studies emphasize that viewer's habits of watching, rewatching, and watching the same recorded programs serves to establish a "locus of control" (Rubin 98). Along with time-shifting, control over mediated reality is one of the two central affordances of the technology. Users acquire libraries of favored videos, and gain a measure of comfort and empowerment from the collecting and the collection. This pattern speaks to something essential about the technology, and along with Poulsen's direct articulation of absence and return, closely connects it to Freud's articulation of how one copes with loss.

One should exercise caution prior to dismissing Poulsen's absent subscriber as 'trivial' compared to Freud's *fort-da*. Rather, these two articulations offer an imbricated entry into the problematic of memory, deferral, and loss. The latter provides us with the foundational reading of how, through the use of screening activities and language, loss insinuates itself memory. The former offers insight into the enabling discourse of the foundational technology of contemporary memory. To dismiss Poulsen's articulation would be to dismiss the devices we rely upon to defer loss. Dismissing this point of origin for magnetic memory would be tantamount to dismissing the technologies, and hence the methods, through which society preserves memories and narratives both personal and historic.

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[11]For examples, see Julia R. Dobrow, "The Re-Run Ritual: Using VCRs to Review," in <u>Social and Cultural Aspects of VCR Use</u>, edited by Julia R. Dobrow (Hillsdale, NJ: Lawrence Erlbaum Associates, 1990): 181-193 and Barbara Klinger, "Once is Not Enough: The Functions and Pleasures of Repeat Viewings," in <u>Beyond the Multiplex: Cinema, New Technologies, and the Home</u> (Berkeley: University of California Press, 2006): 135-190.

The technologies emergent from this formulation of absence and return have been instrumental in the development of the contemporary mediated witness. The action of how media in general, and magnetic media in particular, "remembers," serve to shape the action of a witness' memory. Magnetic media, whether analog and digital, acts to translate, atomize, and aggregate information by transducing it into data. In the case of the subject matter under consideration here, that data was witnesses' stories of survival. However, the principles of aggregation in relation to witness narratives of survival and trauma were operative long before magnetic media were first applied to the problem of how best to create and preserve testimony.

"I was born in Lithonia, Georgia..."

Although many projects inform this study, three testimony projects can be seen at the points of practice describing the origin, emergence, and current state of the growing magnetic collective. The first, the Works Progress Administration's Federal Writers' Project (FWP) Ex-Slave Narratives, comprises 2,194 short narratives based upon interviews collected across 17 states in the American South between 1936 and 1938. As will be argued below, this project was the incipience of collective witnessing. The narratives were collected in Slave Narratives: a Folk History of Slavery in the United States from Interviews with Former Slaves, principally assembled by Benjamin Botkin and published by the Library of Congress in 1941.

A typical example of the collection is the interview of Harriett Hill by Irene Robertson. No date was associated with the interview or its writeup, but based on other

interviews from this collection conducted by Robertson at the same location, it was likely undertaken in May of 1938. That date would place it towards the end of the project's collection period, after a majority of the project's interviewing and writing guidelines were established and distributed. The finished narrative runs 4 pages, is 93 lines long with a line width of 69 characters. That width allows for approximately 10 words per line. These figures of length and format are typical for interview writeups from this collection.

Hill is presented as speaking for herself throughout a narrative free from the interviewer's questions or narration. She covers topics from pre- and antebellum periods, and relates stories and information regarding her birth, sale, husbands, emancipation, work after freedom, knowledge of the Ku Klux Klan, birthplace and age of her parents, and current situation during the height of the depression. That information is delivered quickly. "Master Jake Chup owned mammy and me too. He sold me to John George. Jim George sold me to Sam Broadnax. When freedom come on that was my home" (Narratives vol. 23, 259). As is common with these short interviews, most moments of profound inhumanity are delivered extremely briefly.

One moment, however, stands out by virtue of its virulent tone, mix of harsh and evocative language, and length. That moment is when Hill speaks on the Klan. She was likely responding to FWP suggested question 16, though the exact format of the question is unknown because no interview transcript exists and the interviewer's speech was excised. The suggested phrasing from the FWP guidelines is as follows. "Tell what work you did and how you lived the first year after the war and what you saw or heard

about the KuKlux Klan and the Nightriders [sic.]. Any school then for Negroes? Any

Land?" (Narratives vol. 1, xxii).

> My folks was livin' in Decatur, Georgia when the Ku Klux was ragin'.
> We sure was scared of em. Mighty nigh to death. When freedom come on the
> niggers had to start up their churches. They had nigger preachers. Sometimes a
> white preacher would come talk to us. When the niggers be havin' preachin' here
> come the Ku Klux and run em clear out. If they hear least thing nigger preacher
> say they whoop him. They whooped several. They sure had to be mighty
> particular what they said in the preachin'. They made some of the nigger
> preachers dance. There wasn't no use of that and they knowed it. They must of
> had plenty fun. They rode the country every night for I don't know how long and
> that all niggers talked bout." (Narratives vol. 23, 260).

Analysis of material like this from the FWP collection is difficult for many reasons, first

among which is the abstraction of character that is a feature of FWP narratives. We

know Harriett Hill for less than 1,000 words. By way of contrast, the typical rate for a

conversation is 280 words per minute (Silverman). We know almost nothing about her

interviewer, except for that she was a local hire by the Works Progress Administration

office in Arkansas, and conducted a series of interviews of former slaves living in that

state. But in the narratives of those interviews, her words are always excised. Limited

exposure to a character creates a situation where the reader is required to insert their

imaginative details. Limited exposure to a witness creates that same required, but

affiliates it with the tension of recognizing the potential for fictive insertions to a testimonial context.

Along with the aforementioned constraint, two connected mechanisms stand out from this passage in relation to the idea of collective witnessing and the witness subject. Both work to emphasize the credibility of the resultant witness subject. One mechanism does so with framing, and one with language use patterns. Framing in this short section relies in part upon the pattern of pronouns, from "my," "we," and "us," to a series of "they," and concluding with "I." That pattern can focus attention on a central difficulties faced by the FWP, the Fortunoff Archive, and many other testimony projects. Recognizing the need to record witnessing of an event often does not occur until practitioners recognize that the population with firsthand knowledge of the event has aged and will soon be lost. Harriett Hill was said to have been 84 years old at the time of the interview. That would place her date of birth to sometime in 1854. What insight can be provided by a witness who was only 11 when the institution, the event of slavery, collapsed? Even more problematic, in the wider case of all FWP Arkansas ex-slave narratives, 40 percent of the interviewees were born during or after the Civil War (Blassingame 1985, 90).

Hill responds to that potential criticism regarding her lack of firsthand knowledge by framing her telling of the activities of the Klan. The knowledge and authority derives from locating the story in the context of her family. She leads with "My folks." Her framing is closed with an emphasis of how she came to thoroughly know what was taking place, "that all niggers talked bout." That framing is necessary for deferred witnessing

because it responds to a widespread criticism leveled at aged and temporally distant witnesses. Although many formulations exist for that criticism, it essentially questions the veracity of a witness' testimony: too old to remember, too far from events to recall details, and too influenced by the intervening years to remember without a lifetime of false insertions.

Two aspects of witnessing directly respond to this criticism. The first response is the mediated collective witness subject. The process of mediating testimonies from a sample of a population is the attempt to forestall the uncertainty that comes from only knowing events through the words of individual witnesses. The extent to which that uncertainty is forestalled depends of the efficacy and appropriateness of the medium used to preserve the testimony. Although a difficult research task because of a lack of indexing and the FWP's necessary reliance on poorly organized text, Hill's observations of the activities of the Klan can be found repeated throughout the testimonies collected in Georgia. Her anecdotal evidence from 40-70 years after the event can be buttressed with the words of other witnesses. Her testimony only takes on the non-fictive qualities of a testimony when contemplated in terms of the collective witness.

The second response comes from scholars' and researchers' critical encounters with witness subjects. One often addressed aspect of a trauma is that the causal event was never properly experienced. The explanations for that lack of presence have changed since first formulated by Freud. His explanation described the survivor's sense of *Nachträglichkeit*, or belatedness in relation to the event. One is always late to the experience of one's survival, as if something essential to the event forestalled the

possibility for a memory of the moment. His explanation for that something focused on the term *Bedeutung*, or cathexis. The event was too overwhelming, and the nervous system was incapable of processing the stimuli into a conventional memory. The mind's capacity for sensation was overfilled by the intensity of a stimulus, and thus could not properly process the event and construct a memory. Instead, the excess of the moment recurred upon later encounters with triggers and the body repeated its attempts to process the overwhelming event, thus remembering it.

Contemporary explanations focus on the biophysical, and generally relate the physiological effects of chronic stress to short-term memory formation and long-term memory intrusion (Elzinga 2). In the presence of too much stress, such as accompanies moments of survival, traumatized people develop a variety of seemingly oppositional memory disorders. Some experience intrusive memories in which aspects of the event return accompanied by the same overabundance of emotion as took place during the initial traumatic moment. Some experience a variety of kinds of declarative memory loss or failure, erasing memories of the event as well as memories wholly separate. The moment of survival compels a biochemical and emotional response that derails all normal memory functions.

To criticize the accuracy of a witness account by virtue of its temporal distance from the moment of survival is to fundamentally misappreciate the nature of testimony. The event resists description from the moment it took place, and intrusively returns throughout the survivor's life. Temporal distance is not the factor which makes accounts of survival unreliable evidence: survival itself is. Hill responds to that criticism by

constructing a supporting narrative and rhetorical frame for her memories. That frame

consists of parents, community, and the ever-present repetition of shared, communal

knowledge. Hill's ever-present communal oral repetition of knowledge, has with the

prevalence of magnetic media become a process disaggregated communities conduct

through mediation. That frame is principally constructed with language use patterns that

convey authenticity, emotion, and mastery.

In between the bookends of parental and communal authority, an authority that

hearkens back to Hy Abrahms invocation of his father's voice, Hill's pronoun pattern

places the material into a distanced context: always, "they." They heard, they talked,

they whooped, they were careful, and ultimately three final "they"s: they lynched, they

rode, they had fun. Hill as a witness subject perceived through an impossibly narrow

channel has little space to define character, establish authenticity, express opinion,

communicate emotion, and establish a historical grounding for the events of her life. By

focusing her story of lynching on that frightening, disjunctive, colloquial euphemism,

"[t]hey made some of the nigger preachers dance," yet pairing it with language that

oscillates between innocuous and rough, Hill and Robertson create a witness subject

evincing knowledge, credibility, and an angry ease that communicates in that moment

briefly, clearly, and to a subject population with sufficient background knowledge to

understand the significance of her words. If one fails to recognize the specific, genre-

dependant valance of "dance," then the horror of that moment and the significance of

Hill's testimony is lost. If one fails to recognize what appears in that vile adjective

almost as a voice of the other – a speaking from the position infected by the hate and fear

circulating throughout that story – the complex character of this abbreviated witness subject is lost.

Overall, Hill's narrative is inflected with dialect. However, by mid-1938 FWP interviewers would have received directives from Botkin and Alan Lomax regarding "suggestions for simplifying the spelling of certain recurring dialect words" (Narratives vol. 1, xvi). The instructions continue: "This does not mean that the interviews should be entirely in 'straight English' – simply, that we want them to be more readable to those uninitiated in the broadest Negro speech" (ibid.). The phrasing of the instructions almost read like those for a translation, and serve to highlight the problem of reproducing speech in symbolic form. They also draw a relation between the simplicity of spelling and the readability of the resultant narrative.

Although it is not possible to know the frequency of Hill's dialect usage, based on small cues that remain in the narrative, one can assume Robertson acted to "simplify" the language. Single words express a sense of dialect authenticity through abnormal spellings or abbreviations: "lack," for *like*, "sich," for *such*, "'cluded," for *included*, "turns," for *returns*. Those alternative spellings occur without strong emphasis by the narrative, and are similar enough to conventional spellings as to present no obstacles to reading. "It lack selling a calf from the cow. Exactly, but we are human beings and ought to be better than do sich" (Narratives vol. 23, 258). Robertson manages to inflect the language with dialect, yet retain the readability of the narrative. That balance speaks to a constructed, edited text, rather than a direct transcription of speech.

These examples constitute two separate strategies of dialect transcription. The first two pairs denote an othering accent, the second two pairs an abbreviative, familiar shorthand denoting comfort and competence. Robertson also "simplified" the language by including the parenthetical definition of *turns*. However, as has been suggested by Blassingame, the WPA initiative to simplify expression also worked to normalize transcription across narratives. This normalization led to interviewers altering the language of the witness subjects to contain *more* alternative pronunciations so as to deliver a presumably "authentic" dialect-rich language (Blassingame 1985, 88). Again, the representational limitations of a testimony project's medium conflict with the rules established to govern production. In this case, transcription rules intended to create more readable narratives resulted in exacerbating a witness' perceived authenticity, and hence the historicity of an entire collection of narratives.

Consider the technology upon which this collection was dependant. The interview narratives presented in this collection portray witness subjects via a medium, typewritten print, according to rules suffused with a telegraphic sensibility towards symbolic representation. Although the telegraph and the typewriter evolved along separate technological tracks, the operations of each informed the development of the other. Each treats the letter as a single symbolic unit, divorced from its neighbors, preserved in a holding cell that the symbols which precede and follow can not contaminate. Each acted to disaggregate symbolic language to allow for its mechanical production.

Along with this shared tendency toward creating a string of symbols from what were strings of words, that shared sensibility affects how the system should be applied. As regards an individual message, words are expensive, and brevity important, and as regards the collective, the system is expensive, and should be fully utilized. As a result, individual FWP narratives generally run only a few typed pages, but aggregate into 19 volumes and 9,500 pages.

The FWP collection is only one of the three major oral history projects of the period dedicated to collecting narratives from former slaves. However, the FWP effort is the most widely addressed in the literature on ex-slave narratives because it is the most widely available. The two other projects, both begun in 1929, were undertaken at Southern University and at Fisk University. The Southern University project was directed by a historian, John B. Cade. The Fisk University project was a result of the work of Charles Johnson, a sociologist, and Ophelia Settle Egypt. These two projects are notable in that they predate the FWP collection efforts, and in the case of Fisk, predominately relied upon the work of Ophelia Egypt. Her role in collection the Fisk narratives is notable because the collection was almost entirely based on her interviews, and because she was a former slave. That reliance has allowed for comparative studies of interviewer technique across the100 interview narratives she collected – something the other project's methodologies do not allow. Additional material currently housed at Southern University was collected by John Cade as part of project at Prairie View State College conducted from 1935-1938 (Yetman 2000, 343-344, 540, and Blassingame 1977, liv).

Any address of contemporary oral history collections must address the antecedent projects which informed their methodology, goals, and genre conventions. Analysis of this particular collection is a focal point for this study on magnetic media testimony for two reasons. First, the FWP collection established early principles and goals for systematized oral history work in the United States. Those goals are addressed by Mary Marshall Clark as a union of narrative therapy, mediated testimony, and oral history.

> Oral history is rooted in the creative act of speech, motivated by the hope that individual experiences can be transformed into historical and cultural stories that have the power to inspire action. The individual story, the life history, shapes the oral history narrative, but as *this story emerges out of the fractures of history* [emphasis added] it inevitably address suffering in its collective forms. It is no accident that the collection of narratives with ex-slaves during the Federal Writers Project of the 1930s marks the beginning of the oral history movement in the United States. (Clark 269)

The theme that testimony, or stories of survival, emerge from the fractures of history is a common one to writing on testimony. Here we find it mobilized to relate the story of individual suffering to the possibility of that particular experience informing readers of the state of a collective. The fracture of history, which could also be called the gap in collective memory, becomes a topoi by which one can draw together a set of oral histories into a collective history responding to a collective event.[12] One of the principles

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[12]The theme of fractures as the figure from which testimony emerges is one this study focuses on in relation to the visualization of survival. In chapter 3, it will be argued that the fractures of history are structurally paralleled by the filmic technology used to bring into being a fictional moment of survival, and by the embodied language theory of Maurice Blanchot's "The Instant of My Death." Testimonies, in both

established by the FWP collection is that each item, each testimony within the set, can despite its brevity add to the value of an archive. It is in that amalgamation that the individual story, however brief, becomes a work of collective value, a piece of data informing readers of a collective being. That idea will return in force with the Cambodian Genocide Database and contemporary magnetic witnessing.

Second, the FWP collection is important for an address of mediated testimony because this collection demonstrates how the principles of symbolic representation, visual imagination, and aggregation are enabled by contemporary technology. That process is easier to observe in a collection reliant upon the more familiar technology of the typewriter. Although revolutionary, the mechanics of a typewriter are easier to process than the operation of the helical scan analog magnetic tape recorders which empowered the Fortunoff Archive, yet understanding the first aids in understanding the second.

The representational strategies the typewriter enables, and the tensions those strategies evoke in the resultant narratives, rely primarily on conventions made familiar by the printing press. That familiarity is what allowed James Olney to delineate an uncannily accurate 17 point "master outline" of the guiding conventions for ex-slave narratives (Olney 152-153). As an example, the first of those conventions under the heading, "The Actual Narrative," goes as follows: "1. A first sentence beginning, 'I was born...,' then specifying a place but not a date of birth" (153). Harriett Hill's first words: "I was born in Lithonia, Georgia, at the foot of Little Rock Mountain, close to Stone

content and media, find themselves continually confronting the broken experience that led survivors to speech.

Mountain, Georgia. I been sold in my life twice to my knowing" (<u>Narratives</u> vol. 23,

258).

Additionally, interviewers' familiarity with the genre conventions of literature

and oral history narratives enable Olney to recognize parallels of framing between

individual slave narratives and classics of autobiography. Parallels between slave

narratives and Ben Franklin's <u>Autobiography</u> focus on the inclusion of a variety of

material as part of the narrative: letters, poems, illustrations. The WPA directed

interviewers, to when possible, collect folk tales, recipes, photographs, drawings, letters.

Parallels between slave narratives and Augustine's <u>Confessions</u> tend to point out the

inclusion of prayers, sermons, poetic epigraphs, or passages written in alternative styles

indicating different frames of mind or different relations to experience (Olney 151). The

prevalence of those conventions are what led interviewers to frame their subjects with

language drawn from <u>Othello</u>, and what allows Olney to recognize that sourcing. In

essence, the mediated subject becomes, in the process of a mediation, a figure within the

flow of a genre. As writers work their interviews into narratives, the figures within those

narratives take on the characteristics of the central figures from that type of work. Given

that the primary mode of representation enabled by the typewriter belonged to the

discursive world of the printing press, the character of the ex-slave took on attributes

from narratives wholly distinct from their lives. And in that adaptation, they also took on

characteristics from the devices through which their stories flowed.

The typewriter, in its mature form prior to 1941, put a selected symbol to

substrate by mechanically levering sculpted metal plates at a thin, narrow target of ink-

suffused fabric floating above a piece of paper. Early versions of the typewriter,

generally from the period prior to E. Remington and Son's delivery of the first

commercial models in 1873, relied on a variety of arrangements of ink, paper, arm and

icon to get symbol to paper (Wershler-Henry 70). Their variety and inventiveness would

have made Darwin proud. Every "standard" feature of the modern typewriter, from the

orientation and transit of the paper to the spatial arrangement and order of the keys, came

as the result of many trial devices from a host of inventors. "It's common for histories of

the typewriter to observe that the typewriter was invented at least fifty-two times;

[Michael H.] Adler argues convincingly that as many as 112 inventors may have beaten

Christopher Latham Sholes, the 'father' of typewriting, to the proverbial punch" (35).

The most famous early example of a typewriter was the Hansen Ball, first

released in 1865. Rather than featuring a flat, rectangular keyboard in the modern sense,

each letter button resembled a small plunger. Collectively, these plungers were arrayed

like pins around the surface of a hemisphere. Beneath the hemisphere, a mechanical jig

held the paper. The paper was curved to describe the shape of one half of a cylinder,

rotating along an axis as typing progressed. At the conclusion of a line, the paper would

advance away from the typist. Typing at a Hansen Ball resembled nothing so much as a

fortune teller laying on hands while consulting a crystal ball. At the time of the FWP

project, from 1936-1938, typewriters were a standardized, mechanical device whose most

salient two features involved their typesetting and character shapes. 1941 was a

landmark year for the electric typewriter, marking when proportional spacing models

were first made available by IBM. Proportional spacing broke the fixed-width grid that

aesthetically differentiated printing from typing. Material typed prior to 1941 always resembled a report. The FWP narratives more so, given that the typewritten reports would be directly compiled into the published volumes, rather than typeset and printed.

The principles above offer a way to read projects produced on this technology, but require further description as to the nature of the collection as a whole. Firstly, the protocol for the FWP collection was straightforward, if problematic. Interviewers were tasked by the FWP to find former slaves, interview them using a very loose protocol of recommended questions, topics, and later, writing style. Interviewers were then to work with regional supervisors and type up those interviews before sending them to the FWP. As each interviewer worked in a different area, they had access to different typewriters and worked with different local supervisors. In the 1941 edition of the collection, one sees the font, line spacing, kerning, strength of stroke, boldness, and clarity of character change with nearly every interview, along with many handwritten corrections.

Specifics of the interview procedure were left to the individual interviewers, who approached the work from idiosyncratic perspectives leading to very different final products. Some present the subject in what appears to be their own words, each paragraph encased in quotation marks, the interviewer's voice apparent only in an initial leading question yet guiding responses throughout.

An example of this style is the longer, 10-page piece, "Plantation Life, as Viewed by Ex-Slave," by Sadie B. Hornaby, edited by Sarah H Hall and John Booth, the local District Supervisor for the Federal Writers' Project.[13] At 10 pages, the interview writeup

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[13]Slave Narratives: A Folk History of Slavery in the United States From Interviews with Former Slaves. 1941. Volume 4, Georgia Narratives, Part 2. Pp. 1-10.

is approximately 2,250 words of double-spaced, fixed width text. The subject, Elisha Doc Garey, a resident of Athens, Georgia, is presented speaking idiomatically, in a style later FWP guidelines would address as excessive; "Us wukked lak hosses," (Narratives vol. 4, Georgia, Part 2, 2) she is reported to have said. Later guidelines would explicitly reject this type of excessive transliteration of dialect. "Do not write: Ah for I; Poe for po' (poor)" (Narratives "Introduction," xvii). During her interview, Garey makes one observation on the interview protocol, combining it with her precognition of the interviewer: "I had done seed you, writin' wid dat pencil on dat paper, in da Sperrit" (Narratives vol. 4, Georgia, Part 2, 10).

Other interviewers produced prose portraits, such as Joseph Jaffe's interview of Robert Heard, "Portrait of an Ex-Slave," edited by John Booth and self-supervised. "As we approached the little dilapidated, one-room cabin on the Jackson County hilltop, the aroma of frying bacon smote our nostrils" (170). Heard is presented similarly to Elisha Doc Garey; paragraphs of quoted text provide the subject's voice and except for the framing, the interviewer's overt voice is elided.

A third dominant style appears in Minnie B. Ross' "Ex Slave Milton Hammond," and in another piece by Jaffe, "Plantation Life as Viewed by an Ex-Slave," an interview with Robert Henry. In the second, a not atypical four pages long, the interviewer synthesizes and explains the results of the interview, presenting the subject's voice in short, one-line quotes surrounded by paragraphs of explication.

Naturally the question came to mind as to whether he found life more pleasant in his daughter's neat little cottage, with its well kept yards, or in the quarters on

"Ole Marster's plantation." He seemed delighted to have an opportunity to talk about "slave'y days"; and although he could not have been more than 11 years old at the time, he has a very vivid recollection of the "year de war broke and freedom came" (195).

It is not for no reason that Norman Yetman, when introducing the narratives for the Library of Congress, metaphorically describes the project as follows: "The Slave Narrative Collection provides a unique and virtually unsurpassed *collective portrait* [emphasis added] of a historical population" (Yetman 2003, 1). Individually, each interview yields little internally-verifiable information. Sparse content is provided for each witnessing, but in their aggregation, a figure of the American ex-slave emerges. In the constitution of that collective witness, even from the brief examples above, one can see the strangeness regarding the process of mediation that invited the descriptor, "portrait."

Mediation, as regards a FWP narrative, describes a channel filled with intermediaries. Hornaby depicts herself through her interviewee's words as taking handwritten notes during the conversation, but the process by which she transcribed her notes and typed up the interview is elided from the narrative. In the case of Minnie Ross' forty-eighth interview, "A Story of Slavery as Told by Emmaline Heard - Ex-Slave," the interviewer passed the handwritten manuscript to her typist, J. C. Russell. Jaffe writes of his experience in encountering the subject and their witnessing, so as to frame those memories. Interviewees' "very vivid recollections" are presented as assertion by interviewers, in Jaffe's case buttressed by an insertion of quoted material.

In each of these cases, and for every other testimony preserved in the FWP Narratives, the witness is required to speak through at least one other. That interlocutor is a manifestation of the physical and temporal distances imposed by the social and technological forces enabling this collection. Often, one can see the action of social forces such as institutional racism, played out through the problematic necessity of an interviewer occupying a formative linguistic role between the ex-slave and the reading public. More problematic, however, is the interlocutors presence between the witness subject and the ex-slave, which given the nature of the genre, must align or forego authenticity. The interviewer was required by their protocol to both elicit memory through questions, but also to formulate the responses into a narrative. Although the FWP presents witness subject who overlap with the interviewee, the first is a construct of genre, author, and technology.

Technological forces, however, are always imbricated with socials ones. Typewriting is no different. No fewer than two people inhabit the channel created by this medium. As shown by the example of J.C. Russell, alongside the interviewer who dictated the course of the exchange was the typist. Studies such as Wershler-Henry's <u>The Iron Whim: A Fragmented History of Typewriting</u>, and Kittler's <u>Gramophone, Film, Typewriter</u>, discuss at length how this new device necessitated an intervening person between author and word. That person was known as a typewriter. "Writing machine and amanuensis are represented by a single word ('typewriter') because they are a package deal: each requires the other in order to function" (Wershler-Henry 88). A 1915 Remington advertisement for these mechanical marvels showed "Count Tolstoy and His

Three Assistants": two typists taking dictation and a typewriter (Reproduced in Wershler-

Henry 96).

One can see the social force of the typewriter in the statistics collected regarding

its professional usage. Just after the close of the Civil War, the Sixteenth Census of the

United States counted 154 typists and stenographers. Just prior to the beginning of the

FWP's interviewing, 811,200 were counted. Of that total, 95.6% were women (cited in

Kittler 184). The production of this collection relied upon the cultural shift of this new

career path required by mechanical writing. Typing became a commodity, a career to

aspire to, and thus every word had a cost that must be quantified by dividing an hourly

wage by the typewriter's number of words per minute. Through that channel and its

correlative economics, testimonies of slavery were created. In that channel crowded with

rules, economics, interviewers, typists, agencies, notepads, typewriters and telegraphs,

few words were permitted the individual survivor to describe a lifetime of hardship and

suffering.

Telegraphic witness subjects emerge from this collection, tainted by the medium

with a sense of unreliability. The effects of this medium's distancing, symbolic

restriction, and reliance on transcriptions of dialect play out by producing primary source

documents containing witness subjects of dubious fidelity.[14] Historical unreliability

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[14]Examples of general criticism can be found in Rawick, George P., "General Introduction," Alabama Narratives: The American Slave: A Composite Autobiography, supplement series 1, vol. 1, eds. Jan Hillegas and Ken Lawrence, Westport, Conn.: Greenwood Press, 1977, and in Preston, Dennis R., "'Riting' Fowklower Daun 'Rong: Folklorists' Failures in Phonology," Journal of American Folklore 95(1982):304-26. Those two pieces critique the collection for its editing and interview policies, noting that the final narrative products often were censored, or the result of poor interviewing methodology. Rawick addresses how the collection often presents a picture of life during slavery that was less harsh that other documentary evidence describes. Preston points out how the transcription practices of the FWP writers were irresponsible, and resulted in an occasionally comic presentation of interviewees.

emerges in this collection from the medium, sensibility and rules of the FWP as they worked together to create telegraphic witness subjects. These subjects exhibit little control over the final form of their spoken language, the structure of their narratives, or their described identity. Readers, therefore, are forced into an uncomfortable position. Either they unquestioningly privilege an imaginary witness, accepting the historicity of a testimony rife with technical and methodological flaws, or they questioningly accept the witness by devising elaborate quantitative and qualitative methods for cross-referencing aspects of the FWP collection to search for common truths across the set of testimonies. That approach has its own pitfalls, as it conceals how testimonies of survival represent idiosyncratic, individual encounters. A third position would be to recognize the limitations imposed by this telegraphic medium, and begin a search for alternative ways of recording, collecting, and understanding witnessings relative to mandate of testimonial speech.

Continuous Survival

The second project under consideration in this study implicitly responds to the limitations and criticisms brought to light by the above examination of the FWP narratives. Rather than rely on a chain of intermediaries to convey their witnessing, and thus introduce the question of symbolic fidelity, this collection mobilizes magnetic recording to allow subjects to speak for themselves. Testimonies produced by this project offer witness subjects with ownership, individuality, solidity, and continuity of presence. That project, the Fortunoff Archive for Holocaust Video Testimony, is

composed of 4,300 filmed interviews produced from 1979-1987 totaling approximately 10,000 hours of footage.

Witnesses to the Holocaust represented in this collection are accorded a measure of ownership of their narratives and individuality of their subject by the rules of access to the archive established by Fortunoff. Like a book, each tape is a singular object representing one testimony. That object is treated as a precious resource and is housed either at the Beinecke Rare Book Room and Manuscript Library at Yale, or in Special Collections at the Woodruff Library at Emory. Distant from the holding institutions' media collections, and unavailable on-line, the tapes are accorded status equivalent to a unique gift to the collection. That status runs contrary to the affordances of the medium, and derives solely from the rules established to protect the witness and the witness subject.

Protecting a representation, or even the media substrate that enables that representation may be the primary goal of archivists in relation to this collection, but the extent of this protective rule speaks to another motivation. Access to the unedited testimonies is granted only after filing paperwork designating to what use the viewings will be put, and even then the viewings can only take place on premises. Protections this comprehensive speak to a desire to shield the witness, and through that shielding, empower him or her. Viewers are reminded, through these rules that restrict access, that testimony belongs to the witness, not the collection. Use of a testimony, whatever that might mean, only occurs by those reviewed by the organization that collected the testimony. Despite working in a medium designed for reproduction and dissemination,

the Fortunoff Archive established a set of enabling and reassuring rules to curtail the medium. That effort to create witness subjects who psychologically own their representations, and the labor involved in a tape's production during an era when video recording was a novel undertaking, continually underscore the significance of these witnessings.

One significant result of this collection is that the concrete nature of these speaking, visual subjects, led scholars to an understanding of the traumatic event as a cyclical, ever-present mnemonic phenomena of eidetic imagery. Subjects recorded on video appear solid, bounded by the same reality as the viewer. When their witnessing takes place simultaneously with the viewing of a tape, that bounded reality extends to include the passage of time. The desynchronizing effect print had on subject populations, separating the moment of witnessing from the construction of a narrative and the eventual reading of that narrative, a desynchronization which highlight the temporal fragmentation typical of traumatic recall, is reduced with video taped witnessings. Fractured moments still appear in videotaped testimonies, but they have a different valance. Occasionally, the witness draws attention to them, as with the quote above from Jacob K., "Let me get my thoughts together," or as with Bessie K.'s observation, "When I start to talk I'm jumping from one place to another" (HVT-206 2:25.00). Video makes present the act of remembering simultaneously with the product of that remembering, enabling critics to watch survivors recall. That simultaneity also creates an illusion that time is orderly, linear, and cohesive, thus strengthening the appearance of a subject's solidity. However,

although time is a quality strictly regulated, measured, and controlled by VCRs, its linearity and solidity are pure illusion.

From the descriptions of early magnetic media and early audio recording technology, one beings to sense the complexity and manner by which magnetic media records events. Tape, a nearly infinitely more sensitive medium than the steel wires employed by Poulsen and Smith, allows for recordings of a much more realistic nature. For magnetic recording, realism directly translates into a formula relating wavelength, speed, and time.

Although too complex to fully explain here, the basic idea is that the maximum wavelength a machine can record to tape is determined by how small the head can be in relation to how quickly the tape can fly past the head: the smaller the head, the faster the tape, the higher the wavelength that can be preserved. Sound, as with the message from Poulsen's absent subscriber, only requires a bandwidth of 20 kHz (kilohertz), and therefore was feasible with his rough technology. Video, even when it just depicts two nearly static figures on a couch, speaking, requires roughly 4 MHZ to capture color images. That capture is impracticable with wire, and would be infeasible even with tape if not for two clever inventions. The tape to head speed is a relation, and if one can not move the tape fast enough, then one can simply move both. VCRs solve this speed problem by spinning the heads at an angle to the passing tape. The images presented on a screen do not get stored linearly on tape, moving as a continuous line from the beginning of a tape to the end. Rather, the tape is divided up into a nearly infinite amount of parallel, diagonal lines roughly 58 μm x 40 μm, each containing the information for one

line of one half of a frame. For <u>HVT-206</u>, roughly 206 million of these fragmented lines aggregate so as to represent the testimony of Bessie and Jacob K. The medium presenting survivors with solidity and continuity of presence is itself predicated on radically fragmenting both of those very aspects.

The pictures gets smaller yet. Those line images are stored by a magnetic head reorienting small regions known as domains within the ferromagnetic surface of the tape, thus creating a machine-perceivable contrast between sets of jumbled and organized domains whose orientations correlate to a given input. To imagine what the machine is attempting to perceive, it is useful to consult a technical definition of how domains function.

> Ferromagnetic behavior on a macroscopic scale may be understood through the nature of the magnetic domain substructure. An actual ferromagnetic specimen is composed of a number of small regions called domains, within each of which the atomic magnetic moments are held in parallel alignment. For this reason the domain represents a saturated region of magnetization. The directions of magnetization of different domains need not be parallel. The net magnetization of the magnetic specimen represents the integrated effect of these elemental domains. ... The domain structure is a natural consequence of the various major contributions to the total energy – exchange, anisotropy, and magnetic – of a ferromagnetic body. (Hoagland 49-50)

In effect, information is stored on magnetic media through the creation of uncomfortable regions of like magnetic charge. These regions are uncomfortable, because they are

organized, and would prefer to revert to a more random arrangement. Depositing information on magnetic media is a process that increases tension within the substrate, a tension which leads to the aforementioned decay rate which both enables and erases magnetic records. Each of those 206 million lines is always, continually fading.

Recordings such as these rely on incredibly precise timing. The problems faced by users of the BK-501 as they were unable to playback material recorded on other, nearly identical devices, are amplified by the complexity of the devices employed by the Fortunoff Archive. If the spacing between the parallel, diagonal line images changes, or is disturbed, then all a viewer sees is static. Occasionally, this happens even with perfect machinery as the tape ages and develops imperfects. Within each playback device there is a Dropout Compensation circuit (DOC). This circuit, in effect, watches for an absent line. When that absence occurs, and it always does, the DOC copies attributes from the prior line and redisplays it. The theory behind the device is that displaying a line or three of a similar brightness for one half of a second is less noticeable than a line of static. For damaged tapes, or tapes played on damaged equipment, the DOC provides filler until one percent of the screen would be repeated, and then simply sends whatever garbled information would otherwise appear. Every viewing of a testimony is predicated on the machinery filling in the blanks from a recording, substituting a repetition of information when images of the witness are no longer available. The machinery is designed not for an accurate representation of an event, but for a representation sufficient to allow for continued, uninterrupted viewing. In a highly technical manual on magnetic recording, Marvin Camras includes the following observation. "Altogether, if magnetic recording

didn't yet exist, the experts would predict very negative pessimistic prospects for this unnatural method of recording" (Camras 28).

Yet these survivors' performances of witnessing correlate with the creation of a theory that traumatic recall centered on the return of powerful images. The illusion of presence, individuality, and solidity afforded to contemporary witnesses by this technology enabled scholar's current understandings of trauma partially because the act of witnessing could now be watched and re-watched as it occurred and recurred at temporal distances from the events their testimonies address. Repeatability is one the primary affordances of video tape, and structures a predominate use-pattern for those who own VCRs. However, when material from the Fortunoff Archive appears in critical essays, it does so most memorably not in relation to the imagery of the speaking survivor, or the complexity of their representation, but in relation to a witness subject's symbolic representational content.

The most insightful reading of this type takes place in Nanette Auerhahn and Dori Laub's "Intergenerational Memory of the Holocaust." In that chapter, Auerhahn and Laub bring to light a moment from HVT-206. That moment occurs in one short, 3-minute section two and a half hours into the three hour thirty-eight minute testimony as Bessie K. describes her moment of selection upon entering a concentration camp.

> But the baby was short of breath, started to choke, and it started to cry, so the
> German called me back. He said in German, "What do you have there?" Now, I
> didn't know what to do, because everything was so fast and everything happened
> so suddenly. I wasn't prepared for it.

> To look back, the experience was – I think I was numb, or something
>
> happened to me, I don't know. But I wasn't there. And he stretched out his arms
>
> I should hand him over the bundle; and I hand him over the bundle. And this is
>
> the last time I had the bundle. (Auerhahn and Laub 24)

What Auerhahn and Laub recognize is that in Bessie's telling of the selection, she begins

by speaking of her baby, which she carried wrapped in a jacket. At the moment the baby

is taken by the camp guards, her language shifts and she begins using the word "bundle."

Symbolic substitutions of this kind signify, for Auerhahn and Laub, a category of

traumatic memory they refer to as an erasure of a memory by the witness, or a kind of

"not knowing." Auerhahn and Laub's recognition of the significance of that linguistic

shift for the general practice of witnessing demonstrates a high level of competence at

reading the semiotics of a narrative. That method of reading narratives of survival

resembles Olney's observations regarding the structure of an ex-slave narrative. It is

enabled by a sensitivity to the written word of a transcript, to the spoken word of a

patient, and to the genre of Holocaust testimony.

What a subject says, and how their speech is inflected and shifted by the trauma

of survival, becomes the focal point of a reading, more so than the fact of their speaking,

the devices which enable their speech, or the possibility that secondary witnesses distant

from the scene of witnessing are now able to see a subject speak. Readings, to this point,

focus on the words of the survivor, and make of those words the body of a discipline.

Evocative phrases become touchstones for an address of trauma, survival, or the event

itself, the Holocaust. Moments, such as when Bessie K. describes when she began to lose

touch with reality, are allowed to metonymically represent vast psychological processes and historic events.

"The scars are there, like snow. When the snow comes, I hit the ceiling."

"Why the snow?"

"Because when they took us out of the ghetto – when I start to talk I'm jumping from one place to another."

"... A little water! [Bessie K. drinks from a nearby glass]. And we shoveled the snow. They took us in the fields, the empty fields, and the empty fields was only the sky and the snow. And this did it for me – the snow. I wasn't in contact with nobody. I was alone. Only the snow, and the sky, and I think mentally, it affected me. My aunt started to work in the kitchen and she brought a few potatoes and traded for soup" (HVT-206 2:24.50).

Small turns of phrase, like Bessie's biographical correlation between snow and a traumatic event, or Wiesel and Hy's invocation of "night,"push the valence of a survivor's idiosyncratic language towards the status of symbol. Reading their words from a critically aware position becomes like watching an entire discipline speak. In part, the witness subject does speak metonymically for all those who can not. In part, the witness subject speaks through theoretical essays seeking to uncover theories of memory and loss to prevent and redress future loss. And in part, these iconic phrases become iconic because, paradoxically, the collection of testimonies has become so vast.

At 10,000 hours, the Fortunoff Archive is dwarfed by the Shoah Foundation's 104,000 hours of testimony. To trace back these hours of speaking witness subjects to

the number of individual lines and frames of information would be to produce a number so astronomical as to be meaningless. Magnetic media has enabled the creation of collections of witnessing too vast for anyone to encompass. Additionally, arcane rules of access restrict the time viewers can spend with a collection. Ultimately, this results in viewers being compelled to access video testimonies as one would an encyclopedia: briefly, and only to retain some key phrases with a general sense of the shape of an entry. In their vast scale, the collections have come to resemble in one way the events to which they refer, and in turn, contemporary understandings of the events take on the character of the collections which document them. Unapproachable vastness has become a signature mark of collective magnetic witnessing, and is a direct consequence of the media substrate upon which it depends.

The Universal Reference Language of Traumatic Events

Sublime encounters with archives of genocidal events reach their contemporary maximum with the third set of testimonial media under address in this study, the Yale Genocide Program's Cambodian Genocide Program (CGP). The CGP, founded in 1994, along with its partner project, the Documentation Center of Cambodia (DC-Cam), were the primary sources of documentary evidence for the 2007 UN/Cambodian tribunal indictments of former Khmer Rouge (KR) leaders and facilitators. The DC-Cam continues to provide evidence for the ongoing Extraordinary Chambers in the Courts of Cambodia (ECCC) as they try the indicted, such as Ieng Sary, the Deputy Prime Minister, and Khieu Samphan, President, for the genocidal crimes committed by the KR regime.

These documentation projects are in use by the tribunal and the ECCC principally because they aggregate in a searchable, data based environment, a convincing and reliable representation of the vast, overwhelming atrocities committed in Democratic Kampuchea from 1975-1979.

Strictly speaking, the CGP does not contain individual testimonies of survival. The majority of those whose stories are reflected in the photographs, official documents, geographic information, and biographic data of the CGP databases (CGDB) did not survive. What it does provide is a more complex version of the "collective portrait" offered by the FWP narratives. In this case, the CGDB gathers together traditional and fragmentary evidence so as to offer a collective witnessing of an event. Comprised of the 100,000 page archive of the Santebal (KR secret police), 22,000 biographic and bibliographic records, 6,000 photographs, and a geographic database representing 13,042 villages, 115,273 bombing sites, 158 prisons, 309 mass graves and approximately 19,000 grave pits, and 76 memorials, the existence of the CGDB is wholly dependant upon the affordances of digital magnetic media (CGP "The CGP, 1994-2008"). Without the storage density of digital magnetic media and the affordances of computational media, these elements would have no expressive power.

This collective portrait is developed through a kind of "propping" which exploits the affordances of digital media to imbue meaning in fragments through their aggregation and organization. The various types of mediated information included in the CGP databases lean upon each other as each encourages ready access to the other through proximity and low effort links. This encouragement allows for disparate material of

dubious individual benefit to aggregate into a clear, communicative symbol. Global

Positioning System (GPS) coordinates for a communal grave mean little as regards the

prosecution of war crimes until one logically connects it to the state-sponsored program

that directed people to create and fill those graves. The CGDBs allow one to chase

across the archives the thread of a lost life from name to portrait to order to internment to

bibliographic citations to grave location across a four year period and a range of original

media. Digital media's defining characteristic, as addressed by Lev Manovich in The

Language of New Media, and by Jay Bolter in Remediations, is its propensity to absorb

and re-present all prior media, thereby normalizing the distribution channels of older

media. The same technical mechanism that provides a list of victims of Tuol Sleng, the

most infamous of KR prisons, contains the processing photos of those victims, affords

access to a variety of maps displaying the locations of their graves, and provides the

interface for querying more detailed information from the archives' structured database

on mass grave sites.

This propping of data types acts to reenforce the validity and fidelity each of the

other – maps show locations of prisons, portraits of prisoners remind viewers of the

humanity of the victims, bibliographic references afford scholarly engagement, and

government documents place all into a system of bureaucratic genocide. This

reinforcement of fidelity occurs because the storage medium and format normalize

differences of content type while privileging connectivity and archivization. To produce

fake evidence in one medium is difficult work – to fake a grid of interrelated evidence

across a variety of media offered through a distribution network which encourages easy

transitions from one piece of data to the next is impracticable. The CGP collection's reinforcement of fidelity occurs because the chosen storage medium and organizing format, and the project's distribution mechanism, all serve to normalize and filter out differences while privileging connectivity, access, and the production of a vast descriptive dataset.

For the CGDB, this privileging operates within the medium from its highest, most interactive and human levels to its lowest, most technical. One of the CGP's collections demonstrate this point most strongly: the Interactive Geographic Database (CGEO).

The CGEO allows viewers to display various maps of Cambodia, such as the 1962 and 1972 topographical and the 1973-76, 1990, and 2000 landsat, and then populate those maps with information from various datasets, such as US bombing sites, political boundaries for zones, or the locations of prisons, and memorials. As mentioned, one overlay provided by the map data served by the CGEO is a visualization of mass grave sites. When made visible, a layer of blue dots a few pixels across appear on the map of Cambodia. Each dot represents one site. This type of visualization is considered one-dimensional, as the dot represents only one piece of information – the translated GPS location of the site. A larger dot does not represent a larger grave, nor does a dot of a different shade represent differing characteristics of the site. The overlay, called up by selecting a radio button from a list of filters to the right of the map, pulls its information from a database separate from the maps themselves. Users, by selecting a tool from a pallette to the left of the map, can call up the item in the database that contains the data item related to a dot. Each item in the set is pinned to a clickable location on a map, and

conceals a table revealing a few bits of information organized into descriptive categories. For a mass grave, the information is sorted into the following fixed categories, "Rec / ID Code / Province ID / District ID / Type / Execution? / Mass Graves / # of Bodies" (CGP CGEO).

Although additional data must be held in the system to designate the position of the site, the numerical values representing that data are hidden from the user. Instead, those values go through a complex process of translation so as to enable their presentation over an image of a map. Ben Fry describes this type of process in his programming manual, Visualizing Data. Geographic coordinates for each point in a dataset related to the Cambodian Genocide are translated from degrees, minutes and seconds into relative Cartesian decimal values on a scale from 0 to 1. These new numbers are then scaled according to the size of the map they will cover, so that each number is tagged with a point on the map (Fry 155-8).

Sources of error for this process take place along the entire evidentiary chain, from the impossibility of viewers locating a salient feature under a dot 20-miles wide, to the fact that the dots maintain their position when different map images are called up, to the surveyors who scoured the Cambodian countryside collection the initial data. Even transcribing their devices' native GPS data introduces unavoidable positional errors as formats are changed and numbers rounded. What one encounters through this overlay combines images of maps, mathematical recreations of contoured landscapes, tables of relevant data encapsulating the scale of the genocide, and the technical artifacts that enable the amalgamation and visualization of these objects. Those technical artifacts

imbue the material they present with an authority older media did not possess, principally

because of the complexity of the enabling technology. Much as with the precision

required by a VCR to interpret the hundreds of millions of individual magnetic moments

as a speaking witness subject, the CGDB relies on technology precisely drawing together

a vastly larger scale of infinitesimal points. The precision required by the device serves

as a rhetorical appeal to ethos, or character. Complexity, for this visualization, masks the

omnipresent imprecision of testimonial data.

As with all data based projects, the logical ordering of categorization takes place

based on the what questions and answers designers of a system imagine the data will be

applied towards, as well as the organizational capabilities of a system. In this case, both

the CGP and DC-Cam used the UN's Computerised Documentation Service - Integrated

Set of Information Systems (CDS/ISIS) database format. CDS/ISIS was designed to

primarily store text and words, rather than numbers, and to allow for the description of

entities known as *records* through the amalgamation of defined *data elements*, known as

fields. Each field has an associated number which describe what type of content it stores,

and unlike in other database formats, each field can be of any length. For the CGDB, that

allows for one field to contain a descriptive number, and another paragraphs of a witness

narrative. A field, such as for describing the story of an individual victim of a genocidal

act, could contain both the primary, two digit "event code," followed by a more

descriptive 5 or 6 digit subfield. The following list is a very small subset of Category 5,

Torture, of the coding manual for the CGDB, which the DC-Cam drew in part from

HURIDOCS Standard Formats – A Tool for Documenting Human Rights Violations:

05.21   Beating

05.211   Slapping, kicking or punching

05.212   Blows with rifle butts, whips, straps, heavy sticks, wet

towels, etc.

05.213   Attacks with knives or other sharp instrument

05.214   Maiming or breaking bones

05.219   Particular beating techniques:

05.2191   "Telefone" - clapping on ears with the mouth shut.   (Cross

54)

The logic instituted by the information format developed within the free,

configurable, widely-implemented CDS/ISIS framework encourages summations and

comparisons across, in these examples, mass grave and prison sites, and concise storage

of their abbreviated textual representations on digital media. The aggregation of these

representations results in a collective witnessing of traumatic events in a manner which

compresses disparate events to its singular, collective event: the genocide of roughly 1.7

million people in Democratic Kampuchea (DK) under the Khmer Rouge.[15] Aggregating

fragmentary narratives into a collective numeric witnessing, made possible here with

digital magnetic media, demonstrates a trend in testimonial production suggested by the

FWP Narratives.

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[15]Although exact statistics on the number killed in DK from 1975-1979 are unobtainable, this
approximate number from "The Cambodian Genocide – 1975-1979" by Ben Kiernan, available in Century
of Genocide, is reflective of the consensus that roughly 20% of Cambodia's population of 8 million people
were direct and indirect victims of genocide (348).

That trend towards aggregating in a digital medium the indexical traces of genocide extends the possible utility of readings of witnessing from academic theory and therapeutic practice, to a juridical recourse to the traumatic event. The CGP and DC-CAM collected fragments of individual crimes spaced out over 70,000 sq. mi. and four years. That collection was conformed into a group of structured CDS/ISIS datasets. That data, related across the fields and tables which define units of information in a database, adhering to a set of logical rules on how each piece of data can relate one to the next, was stored on magnetic hard drives which drew on the principles for magnetic recording established by Poulsen and his absent subscriber.

Rather than recording data as varying fields, such as was done by Poulsen and the devices enabling the Fortunoff testimonies, the devices employed by the CGP use magnets that float above spinning discs coated with complex flakes of metal to align and randomize domains. When aligned, a small cluster of domains reads back as a 1, when randomized, as a zero. The trail comprised from billions of those domains groups, each a hemisphere roughly 0.6 μm across (Takata 1889), results in a pattern yielding a name, an image, a location, a number, a stored voice. To span the typical thickness of a piece of copier paper (0.081 mm) would require 13 million magnetic domains. In that columnar span from the front to the back of a single page, a column so narrow one would never notice its absence, a high performing hard drive could store 25 out of the 5,192 black and white portraits contained in the Tuol Sleng Image Database out of the 30,000 inmates of that prison. That number, 25, is 8 larger than the number of inmates who survived. Years later, the material organized on those drives into well-behaved fields and forms

returned in a public setting, and allowed for the comprehension, presentation and prosecution of genocidal crimes.

Crimes do not take place without evidence, yet this evidence was invisible, or rather inaddressable in front of the world's face prior to its collection and organization as a magnetically housed database of indexical fragments. The magnetic database of the CGP gives that genocide an address.

Conclusion

In the enforcement of aggregative representation, one finds the conclusion of a trend began by the telegraphic narratives of the FWP and legitimized by the continuous recording of the Fortunoff Archive. This trend towards vast collections of testimonial evidence predicated on fragmentary representations has yielded witness subjects less able to provide narratives of events, than to buttress the existence of an event. Witness subjects, mediated through definitions of fields and subfields, through symbolic restriction and magnetic translation, through a procedure of propping and aggregation, serve to construct a kind of authorized presence of event.

In these collections, we find the marks of trauma – of slavery, of the holocaust, and of the Cambodian genocide – borne through the generations, carried through a process of fragmentary, episodic, and ultimately, necessary mediation. What these projects, their rules, and the witnessings they make possible, is an embedding within the material histories of media technologies a purpose their practically minded inventors could not have foreseen: the establishment of an aggregated collective memory necessary

for the continuation of the witness. In their instantiation, typewriters become tools for civil rights, video becomes a mechanism for the prevention of genocide, and the hard drive offers the potential for a juridical response to genocide.

CHAPTER TWO

Traumatized Logics of Association

As They Thought

In July of 1945, an article by the director of American military research posited that one could build a mechanical device capable of a novel method of recording, describing and organizing documents and data. The article, Vannevar Bush's "As We May Think," offered the promise of a machine capable of linking information in a manner structurally similar to how the human brain organizes information, as it "snaps instantly to the next [item] that is suggested by the association of thoughts" (106). Those snapping, quicksilver associative linkages, reflective to Vannevar of the way we think, now recorded mechanically in a device which he names "Memex," promised to make the work of specialized research more manageable and efficacious. The device "As We May Think" describes is the antecedent of the personal computer.

The promise of the Memex is given during the closing days of World War II by the man responsible for managing all U.S. research and engineering during the war. The language which offers this device bears the traces of the burden of managing these scientific projects – projects directly enabling and resulting in wartime atrocities such as the fire bombing of Dresden and the atomic destruction of Hiroshima and Nagasaki – projects indirectly enabling and resulting in the Dambuster Raids of the Royal Air Force (RAF) and the population censuses at the heart of the Wannsee Declaration and the Final

Solution. The language of "As We May Think" reveals an awareness of the burden carried by those who worked on those projects. It bears those traces at levels figurative and descriptive, as well as in the hypothetical logic of the device itself. Those traces speak to a pressure to respond, and place at the conceptual heart of this new device a compelling recognition of the scale and scope of violence technologists have enabled. That recognition, and the voice given to it, imbues within Vannevar's device and all of its descendants the burden of testimony.

The Logic of Testimony, 2007

Readers are familiar with the many forms used to convey an individual's narrative of survival, a narrative often produced as an autobiographical response to a traumatic event. These narratives of survival work to contextualize in an integrative manner events which threatened the physical and psychological integrity of the person, as well as the ongoing effects of that threat. This narrative integration takes place through the perspective of the individual and is collectively known as a sub-genre of autobiography called testimony.

Naming the sub-genre testimony emphasizes the historical, juridical and truth value of the individual witness' narrative. One can not read testimonial literature without recognizing that the space occupied by these works was carved out of unspeakable events and carried by a survivor. Testimonies are statements of truth, even if at no more objective a level than that of the perspective of the survivor. This fact holds whatever the form of the testimonial work.

The forms taken by or given to witnesses' honest recollections vary widely.

These forms include short, single-page narratives like those collected by the Federal

Writer's Project as it interviewed former slaves across the American South between 1936

and 1938.[16] Witnesses have also produced long documentary and literary narratives of

survival such as Primo Levi's Survival in Auschwitz[17] and Charlotte Delbo's Auschwitz

and After, each dealing with life before, during and after the events each author

experienced individually in the collective assault on humanity of the Holocaust.

New recording technologies such as audio and video tape, and later digital video

and hypertext have allowed for testimony to be given new forms. Since the late 1970s,

organizations like Yale's Fortunoff Archive, and later Spielberg's Shoah Foundation,

have taken advantage of the narrative possibilities enabled by these new types of

composition and recording.   As a result, this pair of archives alone can offer researchers,

students and the lay public almost 55,000 videotaped testimonies of Holocaust

survivors.[18]

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[16]Many of these narratives are available in the volumes under the title, Slave Narratives, a Folk History of Slavery in the United States from Interviews with Former Slaves, produced in 1941 by the Federal Writers' Project. The full collection of FWP interviews is available in the 31 volumes of George Rawick's The American Slave: A Composite Autobiography. The first volume of Rawick's collection is particularly interesting, as it includes the instruction letter describing interview protocols, rules for transcribing dialect, and the description of interview priorities as given to interviewers dispersed throughout the South. That inclusion shows the project manager's recognition of the constraints and issues of this project's chosen medium as regards the subject population.

[17]The original, Italian title of Levi's testimony, Se questo è un uomo (If This is a Man) more directly privileges the individual nature of the testimonial perspective over the historical, site specific title of its English translation. The original title also foregrounds questions of the survivor's identity during periods of survival and trauma.

[18]More information about The Shoah Foundation is located on-line at http://tc.usc.edu/vhftc/(xs0lsv2lamehrg55qevycr2l)/terms.aspx.   The Fortunoff Archive for Holocaust Video Testimonies has an informational homepage located at http://www.library.yale.edu/testimonies/. Fortunoff currently holds approximately 4,300 interviews. The Spielberg collection holds approximately 50,000. Methodological differences between these two projects sparked fierce academic debates, yet

Along with these two prolonged atrocities, single, unique events which traumatically affected individuals and groups of people have resulted in the production of narrative accounts in a variety of media using iconic, symbolic and indexical representational strategies.[19] One look to the annual commemoration of the atomic blasts at Hiroshima and Nagasaki shows images depicting the event, stories and poetry recollecting the event, and absent spaces testifying to what the event erased.

Survivors and those who support them work to discover and create the media which they feel can best capture and express the difficult work of their witnessing. Old media find themselves put to new uses. Yearly commemorations of World AIDS Day feature literary and fine arts created by survivors of HIV and those killed by AIDS. Yet the most iconic medium used for testimony produced in response to this disease is the historic American craft of the quilt.[20]

Individual and collective responses to genocidal events over the last 60 years have resulted in canonical literary works, lasting stage performances, installation performance art and memorial work by survivors and secondary witnesses[21] such as artists and scholars, vast archives of video recordings, and even databases of information such as

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represent only a narrow range of affordances of their chosen medium.

[19]Iconic strategies of representation rely on conveying meaning through images and visual rhetorics, symbolic strategies use words, language and formula, and indexical strategies emphasize aetiological and forensic readings by revealing the traces ideas and objects leave behind.

[20]More on quilting as a testimonial form as it relates to HIV/AIDS can be found in Cindy Ruskin's 1988 book, The Quilt: Stories from the NAMES project.

[21]Secondary witnessing is an idea developed by Geoffrey Hartman. The theory states that even those who work at a distance from a traumatic event, such as academics or psychologists, can be psychologically wounded from their encounters with survivors and their narratives of traumatic events. One of the places where the concept is best explained is in "Witnessing Video Testimony: An Interview with Geoffrey Hartman," Yale Journal of Criticism, Volume 14, Number 1, Spring 2001, pp. 217-232.

those used by the Cambodian Genocide Program at Yale to produce the Interactive

Geographic Database.[22] One should strongly argue that these databases and visualizations

constitute a form of forensic testimony by those who did not survive. In effect, not only

has the period from 1927[23]-2007 seen the archive increase in volume, but as new

recording and mediation technologies diversify, become more widely available, and are

applied in systematic, serious ways towards the problem of producing testimony, the very

types of texts which are included in the readable archive have also increased in variety.

As the texts accepted for inclusion within the archives of testimony increase in

number and variety, consequently so too does the character of the collective which reads

these texts:[24] a collective now including historians, literary theorists, clinical

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[22]The Cambodian Geographic Database (CGEO) offers an archive composed of "a searchable, interactive database of maps, satellite images, and detailed information on 130,000 locations across Cambodia" (http://www.yale.edu/cgp/maplicity.html). This geographic visualization tool and collection of statistics includes data and maps on the mass graves, prisons, bombing locations and damage assessments, and memorials left behind by and in response to the Khmer Rouge. These maps and data are not of one point in time, but represent the changing understanding of Cambodia and the genocide which took place there. One can call up and examine the political and environmental data on Cambodia at various points between 1962 and 2000.

[23]The Federal Writer's Project grew out of A.P. Watson's 1927 and Ophelia Settle Egypt's 1929-1930 interview projects of former slaves while both were at Fisk University. These projects were part of an effort at Fisk by multiple researchers to produce the first large archive of interviews and testimonies.

[24]During 2006, The New York Times posted two collections of testimonial works, one related to September 11, 2001 and one related to the second Iraq War. The first archive was of transcripts made from audio recordings taken in the months following 9/11 by the New York City Fire Department of first responders who had been at the scene of the World Trade Towers collapse. The second archive, entitled "Casualties of War: Faces of the Dead," details American soldiers killed during the Iraq War. From a highly pixilated blow-up of a soldier's thumbnail portrait, a user would click on any of the individual cells composing the enlarged image. Doing so would pull up another soldier's image and data. The cells are various shades of gray to compose the primary image – the enlarged portrait – and are organized like text, line by line from left to right, by date of death.   Clicking on a cell of the soldier's face pulls up a new image pair and five data fields: name, age, branch of service, date of death and hometown. For some soldiers, like Angel Rosa, USMC, 21, d.o.d. 3/13/2007, a black head-shaped design fills the image space. The database, whose information was provided by the U.S. Department of Defense, is searchable by last name, home state and home town. The design and accessibility of both of these archives encourages reading by a wide audience of the general public and by academic and civic researchers.

psychological and medical practitioners, artists, and many others. That diversity of

methodological perspective has broadened the acceptable ways in which these narratives

of survival can be read. Testimonies can now legitimately be considered both factual

documents of events, and psychologically true documents of perspectives. They can

teach readers how to critically deconstruct the oral histories of times, places and events,

how to construct materials and memorials which evoke that loss, and how to

empathically approach the difficult work of a survivor's attempts to build new

communities and new ties to people, language and art.

What binds these narratives and the diverse methodologies used to read them

under the rubric of testimony is that this class of memorial texts aim to depict objects as

well as reveal the fact of their own writing. These texts and their readers seek to reach

out towards an absent other, an absent but still haunting event, and depict that other with

sufficient detail and precision to demonstrate their absence. In effect, these texts and

readings focus on an evocation of the other through representation. Often, the manner of

representation and the chosen medium reinforce that evocation.[25] In their creation of an

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[25]An example of this reinforcing interplay between medium and event can be seen in the Dori Laub
and Lorel Vlock's decision to record Holocaust survivors on VHS tape. Although a pragmatic decision,
that medium also directly counters aspects of the event to which testimonies making use of it refer. One of
the testimonies they recorded, HVT-206, "Jacob and Bessie K.," shows an elderly couple sitting side by
side on a couch. The very fact that one can see these survivors testifies against the Nazi project to erase
European Jews. In addition, VHS is not a rarified visual media, like film. It is common to the point of
ubiquity. Theoretically, it allows for wide, cheap distribution. Although the rules of the Fortunoff Archive
proscribe the limits of viewership, the medium does not. An event that sought to erase a population and
deny the potential for the construction of new narratives instead gave rise to a generation of survivors
whose aspect could take advantage of a medium of the home. The ubiquity and familiarity of VHS as a
medium allows for viewers to personally reflect on the testimony in ways which film would not.
Familiarity with the medium also structures the way in which people approach it. VHS was the medium of
home movies, summer vacations, and genealogical interviews with aged relatives. It comforts in ways film
cannot. It also allows for a mediated face-to-face encounter with the survivor whose image is the constant,
speaking reminder of survival. The illusion presented by those speaking subjects is the illusion of
permanence. Aged, but always needing and willing to patiently and wisely tell the story of what took place

evocative encounter with the loss of the other, testimonies take shape as speech about one's own survival and one's own memory. Framed through a diversity of methodological frameworks, that speech is read as referential to both lost worlds and shattered internal objects.

Memorial Technology, 1945

This chapter argues that there exists a second category of testimonial objects, one with a non-referential character. Although very much a memorial technology, these objects do not seek to evoke a loss – they seek to perfectly occupy the space of the absence. This character takes shape by reading the details and developmental arc of the technical descriptions which motivates Vannevar Bush's July 1945 article, "As We May Think." What exactly a non-referential testimonial object is, and how it functions will be addressed below. In that article seminal to the development of personal computers, hypertext, email, the internet, user interfaces, and information technology, lay hidden a proposal for a memorial technology.

The surface proposal of "As We May Think" was to design and construct a machine that could record links between research materials in an associative manner, thus making the products and process of research more efficacious. What can be read as motivating that proposal was a technologist's dream to develop an interface among people capable of eliminating the need for violent resolution of difference. In essence, Vannevar can be seen mobilizing and subverting Michel Foucault's dictum:

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one more time. Rewind, there it is again: the lure of video.

> Humanity does not gradually progress from combat to combat until it arrives at universal reciprocity ... humanity installs each of its violences in a system of rules and thus proceeds from domination to domination. (Foucault 151)

"As We May Think" sought to establish a machinic interface essential to research and communication, bound by a set of rules modeled on associative logic that would compel individuals and groups into non-violent resolutions of difference. The origin of "As We May Think" and the style and structure of its construction all point towards a technologist's answer to the technological violence, and universal absence of reciprocity that characterized the experiences of World War II.

The technical definitions and descriptions of Vannevar's 1945 mission statement aim towards answering President Roosevelt's question of what to do with 6,000 soon-to-be unemployed engineers and scientists who up to that point had been working on the war effort. In response to that question, Vannevar recommends the construction of a tool by which research could be better organized, consulted and extended. However, this chapter will argue that the language of "As We May Think" reveals that Vannevar's device had as its primary impetus something highly divergent from its stated purpose of better organizing the record of war-time research. Alongside the purpose of "As We May Think" to pitch a project worth the efforts of the nation's scientists and engineers, of its primary goal to imbue those scientists and engineers with the desire to construct the proposed device, there lay a tacit purpose of producing a functional machine that would, in plastic, metal and glass, offer an engineer's equivalent of testimony.

I referred to the theorization and construction of this device as a project aimed at a non-referential testimony, a term that is something of a double-bind. For a memorial, a story or a device to function as testimony, it must narratively integrate the events of an individual's survival through that individual's perspective. Yet "As We May Think" seeks not to sculpt this identity-based memorial response. It does not, on the surface, even seek to establish a memorial at all. It does not inscribe in a medium a particular moment or set of moments from an event, but simply suggests a machine that will improve the efficacy of research. The proposal for that machine can also be read as an attempt to perform two tasks. First, address and resolve the central problem of humanity's tendency towards the violent resolution of difference. That tendency, when read through the conclusion of "As We May Think", emerges from a failure to empathically comprehend the manner in which another thinks. Second, return hope and function to those who have been psychologically damaged by the participation in war-time research.

Continual recourse to violent resolution produced the compelling need for the technological devices imagined, designed, and constructed under Vannevar's oversight during the war. Those devices included novel military technologies as small as the proximity fuse and as unprecedented as the atomic bomb. That circuit of aggressive attack and aggressive response, of violent resolution and incessant casualty, in turn

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demanded the non-referential testimonial response that demonizes[26] the language of "As We May Think."

This device does not offer a referential history of an event per se; it offers a testimonial response through the patterning effect its mechanism and logic inscribe on those who will eventually engage its operations. That patterning originates with Bush's modeling of associative logic in machinery. In effect, every user of his imagined technology would be participating in a circuit that runs agonistic to the violent resolution of difference. They participate in the edification of a technology whose ultimate goal is a utopic eradication of violence, a technology whose foundation rests in the mind and history of an individual technologist responsible for the management of devices of unimaginable destructive capabilities. This new, pacifistic device emerges as the methodological perspective capable of integrating the events surrounding the prior imagination and production of technologies aimed towards increasing the efficacy of conflict.

Yet in that integrative effort, "As We May Think" avoids direct reference to the traumatic nature of the events of the day of its birth – traumatic events enabled by the technologies it rightly must claim as progenitors. And as such, in that denial of reference

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[26]Frequently, modern physicists use natural, descriptive language to characterize their discoveries. From subatomic particles like the Strange Quark to a boson known as the "God Particle," creative examples in the literature are common. One early example of this habit, Maxwell's Demon, described a thought experiment involving an atomic scale gatekeeper. That demon was a motive force that stood watch, silently gathering high-energy warm atoms on one side of a barrier and low-energy cold atoms on the other. Its actions described an impossible system in which entropy, the process by which a cup of hot tea slowly cools to room temperature, fails to take place. Instead, the tea gets warmer and the room gets colder without any additional energy being put into the system. Years later, that Demon and its impossible relationship to entropy would contribute to Claude Shannon's founding of the discipline of cybernetics. For more on Maxwell's Demon, see Clerk Maxwell's 1871 Theory of Heat, or Thomas Pynchon's 1966 The Crying of Lot 49.

to the machines that preceded it and whose mental models enabled its conception, one

encounters embedded in its design a machinic logic derived from a collaborator's guilt.

That machine whose design is colored by that demonic guilt provides a perspective with

which to integrate unspeakable events – a testimony – yet provides no memorial access in

its implementation to the events it emerges from: a non-referential testimonial

technology.

Vannevar's recording technology has its roots in the pre-war period of the 1920s

and 30s in a mechanical indexing machine aimed to serve the needs of both library

science and military codebreaking. From an idea rooted in those early mechanical plans,

"As We May Think" will offer that the next national technology project will not result in

a bomb, as did the Manhattan Project whose development he oversaw,[27] or in an another

intelligent munition, as per the result of his successful supervision of the proximity fuse's

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[27]Vannevar humbly describes his role regarding this project in his 1970 history of research during World War II, Pieces of the Action. "Since I am no atomic physicist, most of this was over my head, although I could understand some of the technical problems. In my summary presentations to Mr. Stimson and to President Roosevelt, my job, as usual, was to furnish the best, most reliable, opinions of those in a position to analyze fully" (60). Henry Stimson, the Secretary of War, was the primary authority below the President in authorizing the use of the atomic bomb against Japan. He defends that action in his 1947 article, "The Decision to Use the Atomic Bomb," published in Harpers Magazine. The organizational history of this invention can be found in chapter 18 of Irvin Stewart's Organizing Scientific Research for War, published in 1948. Stewart was the Deputy Director and Executive Secretary of the Administrative Office for the Office of Scientific Research and Development (OSRD), and authored its four volume organizational history.

development,[28] but in an odd machine that will enable people to create more useful

research indices.

This machine will enable the joining of research materials in a manner that

parallels how the mind logically connects related information, by association, rather than

in the manner of mechanical, or as "As We May Think" terms it, "simple selection"

(106). Rather than forcing the medical researcher of the future to browse through, in an

alphabetic series, all publications organized according to one or another limited category

of metadata such as title, or author's last name (i.e., Darrell Salk, Erwin Salk, Jane Salk,

Jonas Salk), one can create an enduring web of connections of varying types comprising

all relevant research on a given topic (i.e., the references in a research paper on polio are

"live," allowing seamless access to documents on vaccine research, maps of regions

affected by polio, hospital patient records, population statistics, and other relevant data

and research). Even more amazing, that research would be able to manipulate existing

linkages and tailor ones reflective of his or her own research style and interests. It is no

coincidence that this second state of affairs seems familiar to those who construct and

whose work depends upon the metadata and link fields of items listed in modern research

technologies such as on-line library catalogs. According to "As We May Think," the

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[28]The proximity fuse enabled the first "smart" munitions. Comprised of a radio transmitter and receiver, this fuse would, when enabled, emit a signal. When that signal bounced off a target and returned over a short duration indicative of a nearby object, the munition would explode. Prior to this device, munitions were either set to explode on contact, a timer, or at a set altitude or depth. That setting, based upon measurement and guesswork, took place prior to firing, often in the midst of combat operations. Consequently, the proximity fuse enabled for mechanical targeting system, and a far more accurate delivery of explosives on a target. As late as November 1944, the German military was still trying to develop this technology. Vannevar's Office of Scientific Research and Discovery perfected the device in 1942. From not even having conceived of the device at the start of the war, at the peak of production in 1944, 10,000 workers were producing 2 million fuses per month (Baxter 233). A full history of this device and the OSRD's development of it can be found in Scientists Against Time, written by James Phinney Baxter III, the official historian of the OSRD.

machine's stated value to Bush, Roosevelt and the scientific community will be in its efficacy as a research tool.

This chapter's reading of "As We May Think," however, addresses the non-technical impetus for Vannevar's project to create a machine capable of representing and recording both the product of research and the manner in which an individual researcher thinks. For some reason, "As We May Think" considers it important to retain not only the products of research, but also the methodologies and intellectual wanderings that produced that research.   A paper would make visible not just the final product, but the style of thought and work that went into its production. "The inheritance from the master becomes, not only his additions to the world's record, but for his disciples the entire scaffolding by which they were erected" (108).   The incorporation of modes of thought into the device begins to suggest that this device serves some purpose beyond that of an effective research tool.

This non-technical impetus appears in small phrases in "As We May Think" as it reveals a recognition of a collective need to expurgate in wood and steel, in microfilm and glass – in the same tools, devices, training and methods that were their cause – the memory and guilt of the 6,000+ engineers and scientists of varying notoriety from Herman Hollerith to Barnes Wallis to Robert Oppenheimer whose technological achievements enabled the scale and efficacy of the violence of World War II. One must not forget that many of these achievements on the Allied side were developed under the management of Vannevar Bush. In that impetus, this chapter argues, lay the second category of testimonial objects: the engineer's non-referential testimony laying etched

into the imagination and affordances of the technology that empowers contemporary research and communication. This etching goes beyond a palimpsest, as it describes not an erasure and rewriting upon a stable substrate, but the very composition of the material upon which a kind of writing will take place: the direction of the fibers, the forces that bind each fiber to its neighbor and the constant wear which works to tear them apart. In this reading, the digital fibers upon which modern researchers produce their work, upon which they conduct their research, and upon which that research is housed, bear the traces of Vannevar's inventiveness, and quietly, "As We May Think"'s proposal for a non-referential testimony.

In effect, Vannevar's technical descriptions for a technological analog of human, associative logic can be read as responding towards the technological devastation that he and his discipline's tools, devices, training and methods enabled and empowered. This reading will suggest that, in its final rhetorical moves, "As We May Think" posits a technology to represent and record the product and the manner of a person's thought as a mechanism creating an immediate empathic understanding between people sufficient to enable the non-violent resolution of difference.

Phrases such as "to wield that record for his true good," (108) and "man's spirit should be elevated," (ibid.) reveal "As We May Think"'s trajectory for this utopic device. A rhetorical question on the topic of mediation gives suggestion as to how welded to human thought and sensation this device will eventually become: "Must we always transform to mechanical movements in order to proceed from one electrical phenomenon to another?" (108). The electrical phenomena Bush refers to here are the thoughts and

ideas of human beings. The mechanical movements he references are both speech and

writing, and the mediation of those communicative activities.

In essence, "As We May Think" offers sweeping material for an utopic argument

on machinic logic. This chapter's reading of "As We May Think" suggests that the

machinist's logic that resulted in the Hollerith numbers iconically tattooed on the arms of

inmates of Concentration Camps throughout Europe, and physicists' tools that

temporarily erased Hiroshima and Nagasaki, will eventually be the same logic and tools

to produce the devices that will enable peace as overwhelmingly as they once enabled

conflict. What Vannevar offers in this article is a machine to enable victory over war.

Yet, the closest the text will come to that celebratory conclusion of science and

engineering's pivotal role in the Allied victory of World War II occurs in first and third

paragraphs of "As We May Think." The article restricts itself to two seemingly proud

assessments of the work of physicists during World War II; "It has been exhilarating to

work in effective partnership," and "[t]hey have done their part on the devices that made

it possible to turn back the enemy" (101). The official historian of the OSRD, the office

that oversaw the development of those devices, wrote the following regarding one of

those devices. "The explosion in southeastern New Mexico on July 16, 1945, however,

blasted the web of history and, like the discovery of fire, severed past from present"

(Baxter 419).

That blast occurred eight days after "As We May Think" was published. One

would not be wrong to read that article as a pre-emptive response to the world's

inevitable awareness of the atomic bomb. "Turn back," writes Vannevar

euphemistically, his language seeking to revise an erasure through a gentle trope. Yet this mechanism severed past from present, rendering impossible memory's work of organizing events into coherent narratives. Recognition of that impossibility – of the impossibility of turning back towards a time before the bomb or towards one's own memories – could also force a reflective author to mask unconditional victory behind euphemism. In the course of this chapter's argument regarding "As We May Think," Vannevar will describe a utopic machine capable of restoring humanity's memory, a mechanism through which users will be able to turn back. And in constructing that device, "As We May Think" offers a mechanism capable of alleviating the collaborative guilt of 6,000 engineers and scientists who were less than fully shielded from World War II's assault on humanity: an assault made possible only by and because of their technical work.

Documents of Policy and Technology

"As We May Think" was published twice. It first appeared in print in the July 1945 issue of The Atlantic Monthly. The second time was as an illustrated reprint in the November 1945 issue Life. The first printing occurred simultaneously with Vannevar Bush's July 5, 1945 formal report to President Roosevelt entitled Science: The Endless Frontier. That influential committee report called for a federal funding of basic scientific research and education, and resulted in organizations many in academia are familiar with today: The National Institutes of Health, the National Science Foundation, the Defense

Advanced Research Projects Administration, the National Endowment for the

Humanities, and every other federal level research granting organization.

As the founder and head of the Office of Scientific Research and Development

(OSRD) during World War II, Vannevar's voice had influence sufficient to deliver a

report that significant eight months after its November 17, 1944 request by President

Roosevelt. The congressional bill that sought to enact Bush's recommended

organizational structure and would turn his committee's proposals into law were set

before President Truman in 1947. That bill was vetoed, as it called for funding and

educational priority decisions to be placed solely in the hands of an expert committee of

scientists and engineers. According to Claude Barfield's reading of the exchanges

between Bush, Truman, Harold Smith, who was Truman's Bureau of the Budget Director

and advisor on science funding, and Sen. Harley M. Kilgore (D-WV), the primary

opponent towards expanding federal-university research partnerships, Truman refused to

"accept the establishment of an executive agency with so little control by the chief

executive" (Barfield 4-5). However, he would "happily sign a bill that placed the

foundation under the president's authority" (ibid). This position is remarkable, given that

Truman was neither a New Dealer like Roosevelt, and thus was not in broad favor of

large federal projects, nor a proponent of scientific research in general. It would take

another three years before an acceptable version was passed into law. That such a

fundamental change in the way basic research was organized and funded could take place

in only six years, against strong opposition, and at the instigation of just the one report

testifies to the power of that report, and to its timeliness.

In many ways, "As We May Think" serves as the less authorized version of Vannevar's reflections on the nation's priorities relative to research both pure and applied. Unlike Science, a document introduced by Vannevar but written by committee, Vannevar was the sole author of "As We May Think." In addition, Science was written with an audience of policy makers and research managers in mind, whereas "As We May Think" was targeted for an educated lay public. And although the framing of both pieces is drawn from the letter of request issued by President Roosevelt, unlike Science, "As We May Think" uses that framing to reflect only Vannevar's priorities. The priorities and categories of Science regarding the bureaucracy that had grown to manage engineering and research during the war were established by President Roosevelt's November 1944 letter. First; publish the results of war-time research. Second; continue the fight against disease. Third; assess the role of government in pure research. Fourth; improve on science education.

"As We May Think" focuses on one of those priorities, one Science leaves least addressed. Yet the strategy by which the article address this priority leads to a very different goal: the construction of a device, rather than the establishment of an enabling bureaucracy. It does not seek to motivate policy makers to craft sensible legislation, but to motivate technicians by appealing to the kinds of problems that encouraged their entry into technical fields.

The rhetorical framing from which Vannevar argues for this new device emerges nearly verbatim from Roosevelt's letter of request for Science, and mirrors the language of both of those other documents. Where Roosevelt had written on the OSRD as, "a

unique experiment of team-work and cooperation," (Bush, Science, 2) "As We May

Think" responds with "[i]t has been exhilarating to work in effective partnership" (1).

Where Roosevelt wrote of "the war of science against disease," "As We May Think"

responds with "a progressive freedom from disease" (2). Vannevar writes so as to turn

neutral statements of fact into authoritative statements of accomplishment. Where one

points towards the war, the other points towards the victory.

Yet while Science's priorities emerge from Roosevelt's commissioning letter, it

addresses only policy and bureaucratic organization, falling mostly silent in regards to

Roosevelt's first request:

> What can be done, consistent with military security, and with the prior approval
>
> of the military authorities, to make known to the world as soon as possible the
>
> contributions which have been made during our war effort to scientific
>
> knowledge? (2)

Vannevar's policy document does not responds to that request for a recommendation on a

mechanism to publicize the results of war-time research. "As We May Think," on the

other hand, devotes itself entirely – if only in a superficial reading – to the specifics of

that mechanism. The simultaneous promise of the device lay in its ability to organize and

disseminate research while best utilizing and preserving the newfound collaborative

relationships among science, military, industry and federal government.

Vannevar's parallel production of these two documents drew upon ideas apparent

in his 20 years of professional life as a engineer and scientific administrator. The Memex

offered in 1945 was an expansion on devices Vannevar had been working to design and

construct since the 1920s.[29] The first of these, the Differential Analyzer, was the

Massachusetts Institute of Technology's first computer[30] and was built with the help of

Claude Shannon, among others.[31] Shannon would soon after write a landmark master's

thesis connecting his field, electrical engineering, to an obscure branch of mathematics:

Boolean Algebra. Although the Differential Analyzer relied upon analog, mechanical

methods to evaluate equations, it opened the way for Shannon to see the relationship

between logical relations of figures and the construction of electrical circuits.[32] What

Vannevar and Shannon barely constructed at the centimeter scale is now fabricated by

the billions at the nanometer scale. Yet that revelation of how grammatical logic could

allow one to conceptualize the actions of switches and relays is still embedded in the

hardwired logic of AND, OR, NOR, NAND and XOR[33] enabling all computerized

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[29]A bibliography of literature on Analyzers in general, and on Bush's Differential Analyzers can by found in the notes of Chapter 5 of E.C. Berkeley's Giant Brains, or Machines That Think, (New York, 1949).

[30]For more on the construction and history of this device, see David Mindell's Between Human and Machine: Feedback, Control, and Computer Before Cybernetics (Baltimore: Johns Hopkins University Press, 2002).

[31]Reports have Bush in 1925 directing one of his electrical engineering graduate students to work on the problem of constructing a machine with which to solve integrations for a particular engineering problem. The device was called a Product Intergraph (Owens 68-9).

[32]Very soon after the end of the war, Bush's mechanical computers would be overtaken by electronic logic circuits enabled by Shannon's work. The Differential Analyzer into which Bush poured so much effort would be supplanted and made technologically obsolete. The principles of the devices remained similar. For more on the Analyzer's path to obsolescence, see Larry Owens' "Vannevar Bush and the Differential Analyzer: The text and context of an early computer," (Baltimore, 1986).

[33]These primary and secondary functions derive from George Boole's 1854 An Investigation of the Laws of Thought, on Which are Founded the Mathematical Theories of Logic and Probabilities. Each describes a logical relationship between two terms. Boole used the symbols representing these terms, and the terms themselves to construct a grammatical mathematics. For a good example of how Boole's logic works in modern digital circuitry, see Chap. 3 of David L. Wagner's Digital Electronics, (New York: Harcourt, Brace, Jovanovich, 1988).

electronics. Vannevar's other major technical projects, the Comparator and the

Automatic Selector, were begun in 1937 and 1938, respectively. Both machines were

designed as code-breakers for use by the Navy. The troubled history of each is covered

in detail in Colin Burke's <u>Information and Secrecy: Vannevar Bush, Ultra and the Other</u>

<u>Memex</u>.

That each document synthesizes Vannevar's decades long thought on organizing

pure and applied research, and on machines capable of quickly processing large amounts

of information, suggests both a temporal simultaneity of thought and a necessary overlap

of content. And although each document served different audiences and privileged

different priorities and methods, the impetus for both pieces were the conditions of war

related research. As one Bush scholar wrote of <u>Science</u>'s suggestions for organizing

federal funding of basic research, "the model ... grew out of a national military crisis"

(Cole 2). Thinking on that model inflected the writing of "As We May Think."

An example of that inflection occurs in the article's only fully described use of

the proposed device. In that example, an interested investigator takes to his Memex to

research a topic of interest. Out of all possible topics to demonstrate the utility of this

novel technology, Vannevar chose a researcher "interested in the origin and properties of

the bow and arrow" (107). This example provides the article's sole case study of the

fully explained device. And for that case study, one selected to best incentivize 6,000

soon to be unemployed scientists and engineers, Vannevar chooses as his researcher a

weapons analyst. The example continues, and complicates matters further. "Specifically,

he is studying why the short Turkish bow was apparently superior to the English long

bow in the skirmishes of the Crusades" (107). To select an example with echoes of

Gallipoli, with connotations of West versus East and clashes of civilizations is to

politically charge his example so that it resonates with the conflict ending at the time of

his article's publication. The most potent example "As We May Think" provides to

demonstrate the value of this device grows out of a crusade, a national military crisis, and

provides the researcher with ammunition sufficient to argue for the relative superiority of

one weapon over another.

Evidence abounds that Vannevar's two documents respond to the national

military crisis of World War II. However, to limit discussion to that point would be

negligent. This chapter argues that the character of "As We May Think" was not a

response to the crisis of the *war*, per se, but a response to the crisis of *witnessing* faced by

those who participated in the war from a distance.

"As We May Think" responds to the crisis of the technical enabler's guilt. It

responds to the three-part crisis faced by toolmakers whose wares were used to enable

the scale and efficacy of the conflict. One; how can such widespread misery have been

inflicted by a discipline that held so much promise? A discipline whose work produced

tools Vannevar will describe as having, "increased [man's] control of his material

environment. They have improved his food, his clothing, his shelter; they have increased

his security and released him partly from the bondage of bare existence" (101). Two;

how can Vannevar's science be redeemed? This problem faces "As We May Think"

squarely, given what it will test in the desert of New Mexico eight days after this article's

publication, and use one month later on Japan, and given what it has enabled throughout

the war in the Pacific and Europe, and what that participation has cost its practitioners. Three; how can Vannevar provide the engineers and researchers who participated in the war effort a channel appropriate to them through which they can function as witnesses and produce testimony reflective of their burden?

A Trojan "All"

In order to respond to President Roosevelt's request and what is herein described as a crisis of technical witnessing, Vannevar wrote two separate documents. The first was introduced by Vannevar and included sections written by specialist committees. That report, Science: The Endless Frontier, was destined for an audience of policymakers and reads absent of the above crisis. The second document, destined for the educated public, "As We May Think": a mission statement steeped in the burden of an engineer's complicity.

"As We May Think" was a brief, eight-page article composed of eight short numbered chapters. Each chapter carefully advances the argument that the next national project should be the construction of an information storage and retrieval device. What follows is a quick overview of the eight chapters, and how each chapter furthers the article's overall argument.

The first chapter offers the premise and supporting examples that scientific research has improved society. Against this background of material value, Vannevar suggests that the research process has broken down. One can no longer effectively find current, relevant information. Vannevar's is not the complaint of the bibliophile feeling

her mortality upon viewing endless volumes she's denied the time to read. His is the

complaint of the technician. There exists not too much material, but too much

disorganized and inaccessible material. As a result, valuable work is being "lost to the

world for a generation" (102). To counter this generational amnesia, a device to conduct

research and organize information must be constructed. Vannevar postulates that the

construction of such a device is now possible.

The second chapter outlines technologies current in 1945, the course of their

development, and their likely future. Photography is examined along a developmental

progression from Civil War era wet albumin plates to a future miniature camera with

infinite storage and instant display of images. Radiation and electrical current based

media such as thermal faxes and cathode ray tubes are discussed. These technologies are

mentioned so as to first address the issue of compression, and then to shift the discussion

from materials science, a macro-medium, to electronics, a micro-medium. However, this

shift is not fully accomplished, and Vannevar's device remains firmly a mechanical

engineering solution to the problem of information technology, rather than an electrical

engineering solution.

The third chapter begins by detailing ways in which data can be entered into the

record and concludes by suggesting that certain kinds of mental work are the province of

the machine. This detailing of media types begins with pen, paper and typewriters and

briefly addresses voice recording, transcription and playback. Ultimately, this discussion

of voice recording and stenographers yields to the expressed need for better languages

with which to represent information. In essence, Vannevar quietly refers here to the work Claude Shannon began with Boolean Logic eight years prior.

The fourth chapter, the shortest of the article, centers on one powerful proposition; "[r]elief must be secured from laborious detailed manipulation of higher mathematics" (105). The rest of that chapter elaborates what is meant by detailed manipulation, how a machine could provide that relief, and finishes by discussing the need to relieve researchers of rote, repetitive logical tasks.

The fifth chapter describes different types of selection, continues the argument that logic must become the province of the machine, and eventually shows how one would access and manipulate the record. That example takes place in a store at the point of sale. We have here not an example of the device in action, but of how fast selection and data entry would smooth accounting transactions.

The sixth chapter begins with all but one organizational problem solved: metadata. One can sort information according to classes of data such as "Author's Last Name," or "Title," or "Year of Publication," but these organizational systems are labeled awkward, "artificial," and difficult to navigate. This chapter lays out the machine capable of solving the metadata problem, describes its construction and components, names it, and even creates a commercial industry to supply it with material.

The seventh chapter is the above mentioned case study of the machine's first user, a weapons researcher. It returns the article to the concept of associative indexing, raised in the first chapter, and concludes with the researcher distributing his efforts to interested colleagues.

The eighth chapter projects this work forward, both into our current age of information networking, and beyond into a hypothetical future. These projections are based on research contemporary with Vannevar into technologies such as bone conduction, a precursor to the cochlear implant, a device that translates physical sound waves into electrical neural impulses. In eight we read science fictional goals for the next generation of this proposed device, as well as the concluding hopes that this device will carry. Those hopes are bifurcated, and describe a future in which "man's spirit should be elevated" (108) through processes of remembrance and forgetting. That ambivalent pair reinforces the split mentioned above between Science, the document of public policy, and "As We May Think," the article of technological utopia.

The marks of this split reveal themselves most strongly in the first few paragraphs of "As We May Think." It opens with a gesture of humility and inclusion: "This has not been a scientist's war; it has been a war in which all have had a part" (101). Yet, in many ways, World War II *was* a scientist's war. Whether considering technologies of fighting disease or man, without research provided by the National Defense Research Council (NDRC) and the ORDC[34], the prosecution of the war would have been vastly different.

One must consider the industrial research success from which emerges Vannevar's "As We May Think." Consider that low estimates for malarial infection among U.S. soldiers without proper prevention were around 50 percent. In 1943, with insufficient quinine and weak eradication procedures, the infection rate was reported at 20.6 percent. With the NARC research on alternatives to the anti-malarial quinine, such

[34]The NRDC, founded in 1940, would in 1941 become part of the newly formed OSRD.

as the highly toxic atabrine, the U.S. army infection rate in malarial areas in 1944 was 7.6

percent (Baxter 315). When multiplied over the 3,000,000 soldiers sent into malarial

areas during the prosecution of the war, that difference allowed for a vastly more able

army. In addition, chloroquine, a treatment for malaria until the development of

mefloquine in the 1970s and an anti-viral potentially useful in combating HIV/AIDS[35]

was developed during the same period (Baxter 318). The features that made chloroquine

attractive to the military during World War II, its ease of manufacture and low cost,

continue to make it attractive as a third-world HIV/AIDS treatment.

Most remarkably, before 1941, when Sir Alexander Fleming took his 1929

discovery of penicillin to the NARC's Committee on Medical Research (CMR), that

nearly miraculous drug was a laboratory curiosity impossible to synthesize in quantities

sufficient to treat more than a few people. By the time "As We May Think" was

published, production was at almost 650,000 doses per month. That increase directly

resulted from manufacturing research performed by CMR scientists (ibid. 350).

The first paragraph of "As We May Think" recognizes these successes. That

recognition allows the article to exempt this discipline's researchers from its area of

address; "For the biologists, and particularly for the medical scientists ... their war work

has hardly required them to leave the old paths" (101). In essence, the motivating factors

and products of their work prior to the war were identical to the same during the war.

Vannevar continues: "Many indeed have been able to carry on their war research in their

familiar peacetime laboratories" (ibid.). These scientists have been left undisturbed, both

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[35]Savarino et.al., "The Anti-HIV-1 Activity of Chloroquine," in J. Clin. Virol., 2001 Feb; 20(3):
131-5.

intellectually and physically, by the events of the war. More importantly, they have been

left undisturbed by their discipline's contribution to the war effort. Their research has

perhaps even helped to insulate them.

Medical science focused on curing disease and treating wounds, and in those

areas the war-time efforts were remarkably successful. Even their iconic contribution to

the psychological horror of World War I, gas warfare, was exempt from the prosecution

of World War II. Although gas munitions were researched and stockpiled, they went

unused (Baxter 266-281). Despite being included in the "all" above, those who pursued

biological sciences were shielded by their research goals from the disruption and shock

affecting the other group of whom Vannevar will write.[36]

Fracturing of "All"

As regards technologies for fighting man, World War II concluded, arguably,

with history's single most evocative conflagration of mathematics, physics, avionics and

electrical engineering: the nuclear devastation of Hiroshima and Nagasaki. It concluded

not with millions of soldiers using devices and strategies similar to those used throughout

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[36]It is impossible to use the language of "shock" and "shield," and not hear the resonance with Sigmund Freud's Beyond the Pleasure Principle. In that text instantiating the study of traumatic psychological injuries, a model is developed to explain how an event can overwhelm some witnesses, but not others. "We may, I think, tentatively venture to regard the common traumatic neurosis as a consequence of an extensive breach being made in the protective shield against stimuli" (Freud 35). That shield, which is Freud's psychological defense analogous to the defense of skin as a barrier against excitation, can offer some defensory measure against a perceived "threat to life" (ibid). Among the shield-like defenses listed in that chapter are "preparedness for anxiety," (36) and "hypercathexis," (ibid) a term descriptive of a neurological system already drowning in stimuli. In many ways, these researchers were shielded in just this manner.

the conflict, but with a novel, unique, first of its kind event. 60 years later, that event, the use of an atomic weapon on a population center, is still unarguably unique.

In addition, that conflict's most devastating erasure, the Holocaust, was procedurally and theoretically enabled by another engineer's invention, the statistical tabulating machine. Herman Hollerith's mechanical tabulator, referenced in Chapter Three of "As We May Think," was developed at the end of the 19th century to aid in all counting operations. It was particularly suited for the tasks necessary for conducting censuses. Its automation of statistical methods enabled a broader application of counting and sorting operations over large populations with high accuracy. This application of statistics and data in turn made normative new relationships between individual and group, and between groups. In essence, these new relationships are what Vannevar refers to obliquely immediately following his mention of Hollerith. "Some types of complex businesses could hardly operate without these machines" (104). These devices were present in each of the major Lagers, and were serviced by the company Hollerith helped found, IBM.[37] These tabulating devices were pervasive throughout German industry and infrastructure. "[C]ustom-designed IBM programs [run on Hollerith machines] helped the Nazis to locate and deploy the locomotives and boxcars," (Segal 3) vehicles iconic of the twisted relationship between humanity and transport during the Holocaust.

The relationships that statistical tabulating machines enabled, relationships visible in practices ranging from identification and cataloging to transport and selection can only

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[37]The detailed history of IBM's role in the Holocaust can be found in the 2001 study by Erwin Black, IBM and the Holocaust: the strategic alliance between Nazi Germany and America's most powerful corporation.

be called fascistic. A relationship enabled by technology can be described as fascistic when it functions to reduce individuals to populations, and populations to ordered columns of ticks on a page. That reduction allowed for the rhetorical usage of statistics found throughout the Protokoll der "Wannsee-Konferenz", and for the fantasy of a numerical realization of *Judenfrie*. One cannot guarantee zero, i.e. free, unless one can count down from a certain number.

This point bears repetition; one must consider the industrial research setting from which emerges Vannevar's "As We May Think." Yet, in the first line of that document, Vannevar obfuscates the possibility for a reading that only indicts technologists. He explicitly involves "all" in the success of victory, and in the success of the violent pursuits of the last seven years. By opening with that seemingly humble gesture of inclusion, "As We May Think" precludes the reader's ability to assign specific blame to a separate research class. It precludes a line of logic that would argue that without Hollerith's counting machines, without an accurate census, without the machinery to convert populations into data and make normative a "bit-think" of presence and absence, of 0 and 1, without the regional population counts that enabled the logic of the Protokoll*'s* argument,[38] the Holocaust could not have been conducted on such a scale and with such efficacy. Genocide is still clearly possible without these inventions. However,

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[38]The document detailing the Final Solution was a slim 15 pages. Population counts by region pepper the document from the bullet points of page four which list populations already, "Auswanderung gebracht" ("forced to emigrate") ("Protokoll" 4).

vom 30.1.1933 aus dem Altreich	rd. 360,000
vom 15.3.1938 aus der Ostmark	rd.147.000
vom 15.3.1939 aus dem Protektorat Böhmen und Mühren	rd. 30.000 (ibid.)

to the tabular chart of page six. That table, broken into two columns, lists regions in the left hand column and figures representing populations ranging from 200 (Albanien) to 5,000,000 (USSR). Demographic data was also provided as to the age of the population (8) and the occupations they pursued (7).

genocide as an industrial program, conducted in a logical, institutional manner is impossible without machines to tabulate the living and the dead.

Vannevar's "all" precludes the possibility of a technician's *mea culpa*, and serves to aggregate those whose discoveries changed the scope, goals, and mechanisms of war for the Allies with those who used the devices, the populations that enabled their research, and even those who merely knew of them. That "all" cuts both ways. For all the humility it expresses and professional accolades it defers, for all the unity it promises, it also expresses a need for complicity, and a text's desire to deflect the assignation of an awesome complicity to annihilation.

Recognition of that burden of complicity reveals itself in small phrases and a thematic tension indicative of guilt. That theme, and traces of that guilt begin to appear in the third paragraph, when "As We May Think" turns towards a second group of researchers. "It is the physicists who have been thrown most violently off stride, who have left academic pursuits for the making of strange destructive gadgets" (101).

The stories of those this line refers to are numerous. They include the historically central figure of J. Robert Oppenheimer, theoretical physicist and director of the Manhattan Project under Vannevar, misquoting the Bhagavad-Gita at the conclusion of the first successful test of the Atomic Bomb.[39] They also include more marginal

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[39]During the television documentary, The Decision to Drop the Bomb, broadcast as an NBC White Paper in 1965, viewers watched Robert Oppenheimer speak. His eyes stared down in a close shot as he slowly related what took place amongst those watching the test. "We knew the world would not be the same. A few people laughed, a few people cried, most people were silent. I remembered the line from the Hindu scripture, the Bhagavad-Gita. Vishnu is trying to persuade the Prince that he should do his duty and to impress him takes on his multi-armed form and says, 'Now, I am become Death, the destroyer of worlds.' I suppose we all thought that, one way or another" (Oppenheimer 1965). For a more detailed explanation of why the Gita resonates so strongly with that moment, see James Hijiya's 2000 article, "The 'Gita' of J. Robert Oppenheimer," in Proceedings of the American Philosophical Society, vol. 144:2 (June 2000), 123-

figures like Barnes Wallis, an elderly British aerospace engineer whose recognition of the basic principles of physics involving marbles and water gave the RAF the "Bouncing Bomb," and their first success of the war in the Dambuster Raids of May '43.

The "Bouncing Bomb" was a cylinder filled with 9,000 lb. of explosives designed to be dropped while spinning from a low-flying plane. The angle of incidence and high speed would enable it to skip across the surface of a lake like a flicked marble, and the reverse spin would keep it close to the wall of the dam. The test bombs had been spheres, reflecting the bomb's origins in Wallis' childhood games (Pugsley 616-7).

Upon receiving authorization to construct his novel bombs and send air crews on risky raids targeting German dams, Wallis offered the following reflection; "we were told to go ahead and I came out of that room feeling physically sick" (BWMT). Remarkably, this poignant comment of Wallis' was not referring to the impending destruction and consequent loss of life his experiment would result in, but to the remarkable pressure on him to deliver on the promise of a new munition in an eight-week time frame. That overabundance of anxiety was typical among researchers during World War II because of the pressing need for their inventions, the enormous stakes of their endeavors, and the constant pressure of time. Oppenheimer echoed Wallis' ambivalence of moral apprehension and performance anxiety during a 1949 interview with Life magazine.[40]

To Stride, To Think

167.

[40]See Lincoln Barnett's "J. Robert Oppenheimer" in Life, 10 Oct. 1949, 133.

When "As We May Think" writes of physicists being "thrown most violently off stride," and of constructing "strange destructive gadgets," the experiences of researchers like Wallis and Oppenheimer are the material to which it obliquely refers. Those references are delivered indirectly through a language centered on the physical principles of locomotion. When "As We May Think" shapes the reader's impression of the effects of the war on the distant participant through that language, it frames both the problem and its solution through a consistent set of metaphors. Those metaphors continually return to figures common to physics: motion, force, vectors. These metaphors help construct and act in a mental space of "trails," "bridges" and "mountains." Continually returning to a consistent set of metaphors allows for a coherent logic to emerge between the nature of the affliction and the relationship of that affliction to Vannevar's proposed salve. At times, all that allows for descriptions of the device to relate back to the violently disturbed physicists will be that language of physical motion. That same set of metaphoric descriptors that shape the linkages between physicists and the device proposal inflect the process with an awareness of their guilty burden.

To be thrown off stride by the "potent forces" controlled by the strange devices the physics contemporary to Vannevar could now produce, such as the thermionic tube,[41]

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[41]The Thermionic Tube was the first transistor. In Vannevar's time, it resembled a light bulb. He describes its appearance as, "[a] spider web of metal, sealed in a thin glass container, a wire heated to a brilliant glow" (AWMT 102). Transistors allow for current to flow, and in only one direction, when voltage is applied and are "capable of controlling potent forces under the guidance of less power than a mosquito uses to vibrate his wings" (ibid). This device enabled for the construction of switches that were wholly electronic instead of partly electronic and partly mechanical. Prior to this invention, a switch physically opened or physically closed when an electromagnetic relay was activated near the switch. That method yields large, error prone devices subject to frequent breakdowns. This new invention allowed for switches with no moving parts. Modern transistors are built on the nanometer scale by the billions, and form the physical substrate upon which digital logic plays out.

is to be affected by the very principles that enables one's own inventions. "As We May Think," in its closing chapter, comes up against an unimaginable future full of devices. According to Vannevar, these devices will "accelerate technical progress as violently as did the advent of the thermionic tube" (105). These forces, revealed for the first time in these new inventions, affect their creators in paragraph two as strongly as they affected "technical progress." The manner in which they (violently) affected their creators is hidden behind the metaphor of disrupted striding, of vigorous purposeful motion across a plane dangerously halted. And in "As We May Think," the action of striding stands in dramatically as the physical motion of research.

"Thus he goes, building a trail of many items. Occasionally he inserts a comment of his own, either linking it into the main trail or joining it by a side trail to a particular item" (107). So "As We May Think" describes the process by which the future researcher will conduct his studies. He will travel, constructing paths as he moves, paths upon which future scholars will walk. The word trail first appears in the article's second chapter when explaining how facsimile transmissions translate electrical signals into marks on thermal paper.

For fifty years impregnated papers have been used which turn dark at every point where an electrical contact touches them, by reason of the chemical change thus produced in an iodine compound included in the paper. They have been used to make records, for a pointer moving across them can leave a trail behind. (103)

This description enables the article to connect chemistry to physics, and then to bridge from an older medium, paper, to a medium based upon electrical potential. It mobilizes a

construct with which people are familiar so as to bridge the gap in their understanding as

they read. The familiar object is the facsimile machine, and the unfamiliar object will be

the "electron beams" used to record the handwriting of an investigator at his research

device. Using the word "trail" connects the products of research to the lines of text

burning themselves into the iodine laced thermal paper. To construct a trail now conveys

for this article the doubled meaning of conducting research and using new technologies

upon a new medium to inscribe without ever physically touching a page.[42] Trails stand in

for both a process of thought, and a process of recording.

The process of constructing trails, of conducting research, is analogized

throughout this article as the construction of routes through an endless "maze" of human

experience[43] and research materials.[44] By studying these routes, "disciples,"[45] scholars,

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[42]Possibilities for manipulating information physically distant from the user will again enter the article when "As We May Think" describes the physical properties of the Memex. "It consists of a desk, and while it can presumably be operated from a distance, it is primarily the piece of furniture at which he works" (107). That suggestive possibility, though hinted at casually, does not reappear in the article. This idea can be read two ways. It could refer to Shannon's growing interest in cybernetics and the networking of information sources. Or, it could prelude chapter eight's transition to a physical media-free communication environment wherein individuals can communicate through electrical potentials without physical contact. The second reading is both more hypothetical, and although suggestive, less realistic an interpretation of "As We May Think".

[43]"The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships" (AWMT 102). We find here yet another indication of physical travel as the text's dominant metaphor for the work of the intellectual. In addition, that travel takes place in a experimental environment both reminiscent of Shannon's work with pathfinding robotic mice, and strongly evocative of the one successful desperate search by Theseus in King Minos' dungeons. In that myth, a magical thread provided by Ariadne allowed for the explorer to experiment, fail, and retrace his steps back to the point of failure to try a new approach. What Vannevar offers, in the context of the Ariadne myth, is an improvement on the trial-and-error with a memory approach of that Greek myth.

[44]"He inserts a page of longhand analysis of his own. Thus he builds a trail of his interest through the maze of materials available to him" (VB 107).

[45]"The inheritance from the master becomes, not only his additions to the world's record, but for his disciples the entire scaffolding by which they were erected" (VB 108). This quote will be read in more depth on page "As We May Think", but indicates that the process of following a set trail establishes a

investigators and students can learn. To lose one's ability to move, to travel, to literally "stride," along these "trails" is to fundamentally lose one's ability to conduct research.

The article proposes two explanations for how this loss took place. In the first explanation, the sum total of human knowledge has become so expansive that investigators can not cope with the "growing mountain of research" (101). This description parallels the text's language of research, of striding and moving through sites, and in turn metaphorically constructs a formidable site at which to labor. This explanation draws its rhetorical force and authority from the incredibly productive period coming to an end when "As We May Think" was written. A reader believes in the idea of the mountain because of the wealth of new devices emerging from war-time research. In turn, that belief empowers the argument for a new device to, with better organizational tools, conquer the mountain.

To this point, the staging of the article's central problem solely rests on the intellectual gains to be found from improving the mechanisms by which one "produces, stores, and consults the record of the race" (108). Mechanically, the article sets forth points regarding the current state of information technology (IT), the needs of the research community, the historical consequences of antiquated IT, the devices necessary to imagine the new device, and the potential research boon resulting from the construction of that device.

The language is harsh. "Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate

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relationship with almost religious connotations.

for their purpose" (101). The stakes are enormous. "Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the few who were capable of grasping and extending it; and this sort of catastrophe is undoubtedly being repeated all about us" (101). Readers of "As We May Think" see a technical problem – finding the relevant piece of data at the appropriate time – and are offered a technical solution: a device to structure that task. This pairing fits perfectly with the first explanation for how researchers have come to lose their ability to work.

The quote, and the establishment of the first aetiology of loss continues: "[t]he investigator is staggered by the findings and conclusions of thousands of other workers – conclusions that he cannot find time to grasp, much less to remember, as they appear" (ibid.). This line enables a reading in which the aetiology begins its turn away from a strictly technical problem. Readers no longer simply encounter a mechanical problem of sorting and access, but a physical analog of a psychological breakdown. In this line, the sublime, overwhelming nature of human scientific experience renders weak those who consult it. Contemplation of these overwhelming research conclusions – meaning contemplation of the overwhelming devices produced through research – causes the investigator to stagger like the off-stride physicists of Chapter One. Debilitated further, those who choose to contemplate the mountain are shocked into an amnesic state, unable to hold onto logical thought nor their own memory.

"To grasp," in the parlance of "As We May Think" leverages the word's connotations of mastery and understanding while furthering the text's reliance on physical metaphors. "If scientific reasoning were limited to the logical processes of

arithmetic, we should not get far in our understanding of the physical world. One might

as well attempt to grasp the game of poker entirely by the use of the mathematics of

probability" (105). This quote demonstrates the linguistic equivalence between grasping

and intellectual performance, and of the physical approach to encountering knowledge

exhibited throughout "As We May Think." One only achieves understanding through

physical confrontations with material. Countering the crippling intellectual weakness felt

by those staggering before the mountain, and consequently returning to the investigators

their ability to "grasp," will only be possible if one can provide a device that makes

holding the mountain, and navigating its maze, both possible and safe.

The second explanation for what caused this loss emerges from "staggered" and

returns us to the third paragraph, and our physicists "thrown most violently off stride."

No direct source of force is revealed. But, for a physicist, that phrase strongly alludes to

Newton's fundamental Laws of Motion, the basis of classical mechanics. An object in

motion will stay in motion unless another force acts upon it. The amount of force an

object can transfer in a collision is a function of that object's mass and its change in

speed over time.[46] How massive, and with how much speed would an object need to be

traveling in order to disrupt the balance of some 6,000 researchers?[47]

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[46]Sir Isaac Newton, <u>Philosophiae Naturalis Principia Mathematica</u>, (Cambridge: Harvard University Press, 1972).

[47]Oddly, this highly metaphorized situation parallels a situation described by Freud in <u>Beyond the Pleasure Principle</u>. In that foundational text of the psychoanalysis of traumatic neurosis, Freud shares the observation that when a threat to life is accompanied by a physical shock, there is less of a likelihood that the survivor will develop a neurosis. This pairing of physical and psychical shock is echoed in "As We May Think"'s reliance on the metaphor of physical shock to the psychic shock of complicity in atrocity.

One massive object, "[t]heir war work," (101) is mentioned in relation to the biologists in paragraph two. It can be inferred from the structural similarities of the two paragraphs that this single source has acted very differently upon these two groups of investigators, even though it is not directly mentioned in relation to the physicists. Exempting medical and biological researchers, it can be read to have nevertheless exerted violent force upon physicists, unbalancing them sufficiently to eradicate their ability to conduct research. No longer capable of constructing the trails that order and allow progress through the maze of human experience, these scientists who have waged war from the laboratory now find themselves broken, unable to work.

A paradox presents itself in those few lines: efficacious work has eradicated one's ability to effectively work. In this reading, "As We May Think" then seems realign itself so as to respond to this central problem. Confronted by President Roosevelt's charge to assign a task worthy of the 6,000 who have won the war, Vannevar can be seen quietly offering this highly structured metaphoric answer. The only project worth pursuing is to return to these scientists their ability to conduct research. That return will be situated in a process of work: the construction of a pacifistic technology, and a process of reflection: using that technology to witness the way one's mind constructs narrative trails.

A Mirror with Which to Walk

When viewed through the filter of that reading of loss, the promise of the device offered by Vannevar is that, like a prosthetic, it will return function to those crippled by the war. That reading takes advantage of the language of "As We May Think" to

construct a parallel dialogue that lies outside of conventional readings of that article. The

conventional reading of this article stops far short of this second reading of loss – of any

recognition of loss in this article of technological fantasy – and takes at face value the

propositions in the article regarding the compelling need to sort and organize data. These

other readings of "As We May Think" focus solely on the document's contributions to

information technology.[48] However, the language the proposal uses to describe how this

new device will enable the construction of trails in mazes upon mountains strongly

supports both readings of loss.

This device, Bush's "Memex," will enable a researcher to create a trail of

permanent links between two sources. Those sources can be text or image based, and

will reside as photographs within the desk at which the researcher works.[49] The links will

be recorded as a pattern of dots alongside the original source, and some meaning will be

attached to those dots. Any source material can be linked to any other number of other

source materials, so long as all are contained within this Memex device. Those links,

instead of being proscribed to adhere to fixed categories of metadata, will be named and

given significance by the researcher. Connections will follow the patterns of a

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[48]For example, a typical usage of "As We May Think" occurs in Charles H. Traub and Jonathan Lipkin's 1998 article, "If We Are Digital: Crossing the boundaries." In that article, Vannevar's description of the Memex is used as a point of comparison to contemporary methods of organizing information in a digital environment. Following that comparison, Traub and Lipkin state that contemporary methods fall short of Vannevar's goal of developing a system that can, "facilitate and empower the creative interlocutor" (365). A similar methodology applies to Vannevar's writing regarding the organizing of scientific research. The most compelling example is the American Enterprise Institute's publication, Science for the Twenty-First Century: The Vannevar Bush Report Revisited. In the six essays comprising that publication by a politically conservative think-tank, one finds Vannevar's writing a foil for fiscal conservatism.

[49]That first feature, that the device can cope with multiple media, presages definitional arguments by new media theorists such as Lev Manovich and Jay Bolter. Each sets the defining characteristic of digital media as its totalizing relationship to past media. Digital media works by translating all prior media into equiavlent binary forms, and then manipulating media at that interchangeable digital level.

researcher's interests and methodology, and that pattern will be fixed as visible and permanent by the machine. In turn, after creating this visible trail through an infinite amount of primary and secondary sources, the researcher can print out the trail and distribute it to other interested parties.

The value of this device relative to the loss written about above is threefold. First, it contains material the researcher can no longer face, nor bear to remember: literally "the summation of human experience" (102). This easy access to "the record of the race" (108) will allow for a much freer and more efficacious exploration of sources. However, miniaturizing, duplicating, and relocating the mountain into every investigator's office does nothing to reduce knowledge's sublime affect. In fact, it simply brings the results of research into even closer, and infinitely more threatening proximity. Characterizing this material as particularly "human" experience also throws into relief the effects technological research has had, both positive and negative, resulting in the threat to memory. The combination of the material's two aspects – its scope and character – still serve to leave the researcher staggered and ineffective.

Second, the device allows for ready markup, glossing and commenting of all the material it contains. One can sit at the Memex and write upon glass plates, then have that writing recorded alongside primary research material with little effort. Insinuating an apparent willingness to accept revision into primary source material changes the relationship between investigator and source. It encourages a relationship of control and collaboration by allowing the reader to occupy the position of the writer. Walter Benjamin noted this phenomena in reference to the application of the printing press to the

press in "The Work of Art in the Age of Mechanical Reproduction." "At any moment,

the reader is ready to turn into a writer" (232). New media technology enables that

flexibility of position, which Benjamin terms a functional difference. Flexibility of

authorial and readerly roles in the age of the printing press is echoed here by the Memex'

encouragement of readers to annotate and re-author "the record of the race" in the age of

the electro-mechanical press. A researcher, having lost the ability to remember, now has

a machine with which to record thoughts as they arise regardless of whether they are

remembered. He now possesses "an enlarged intimate supplement to his memory"

(AWMT 107).

Third, the Memex' primary value lay in its ability to create permanent linkages

among any of the material it contains. Those links are not of a fixed character, like the

metadata descriptors guiding the logic of a card catalog. The reason for any particular

association emerges not from the organizational logic by which a text is cataloged, but

from the mind of the investigator. He is free to follow and record the connections that

arise among material as he is so inspired by his research. Whether those connections

resemble a concordance, following the usage of individual words from text to text, or

whether they follow no discernible logic whatsoever does not matter. Those associative

links emerge from the mind of the user, and with this device, he finally has a machine

that can record the way his mind works.

The inspiration for the technical capabilities of this device lay in a recognition

that the mind does not travel among its stored information according to classes.

It operates by association. With one item in its grasp, it *snaps* [italics added]

instantly to the next that is suggested by the association of thoughts, in

accordance with some intricate *web of trails* [italics added] carried by the cells of

the brain. It has other characteristics, of course; trails that are not frequently

followed are prone to fade, items are not fully permanent, memory is transitory.

(106)

What the user would now possesses is a device that will record the trails resulting from a

snapping mind, from a mind quickly traveling through ideas. But *to snap* also conveys,

colloquially, to travel into insanity. By extension, this device records thought, regardless

of whether that thought is rational, whether it adheres to the rules of logical organization.

"Trails" can now be seen taking on a third meaning, alongside the paths

constructed by the researcher and the lines burned into paper by the facsimile machine.

"Trail" becomes Vannevar's metaphoric descriptor of the connections present within the

mind. The mind collects, organizes, and remembers information according to physical

trails of cells. Staggering, and consequently losing the trail, because the force of one's

discipline's accomplishments means to not only suffer a setback in research ability, but to

suffer a far more grievous blow to one's psyche.

Thermal paper records information along trails revealing the indexical traces of

electrical potential. Researchers construct new trails, recorded in a device containing the

summation of human experience. And what is a researcher, a physicist, if not first a

human being?[50] No longer able to follow the trails of their own thoughts, the physicists

of "As We May Think" are left in a state of loss: from their profession, their discipline,

themselves, and their history. They have become, like the victims of traumatic

experiences, unable to recollect their experiences. Consequently, they have lost their

ability to form narratives that serve to make sense of experience. No longer able to

follow their trails, their lines of text on a page, means they can no longer access not just

the record of the race, but the record of their own mind. The reciprocating force of their

war work has left them amnesiac, bereft of tools with which to rectify the situation.

Machinic Therapy

Faced with a collective no longer possessing the ability to construct their own

internal trails, this reading finds "As We May Think" proposing the construction of a

device to bridge that loss. As described above, that device would provide a medium in

which to fix the snapping of a mind through topical research. Were the article simply a

collection of the technical definitions and descriptions necessary to conceptualize such a

device, there would no reading possible relating the "staggered" investigator. Yet as

quickly as the device is conceived and described, it was attached to the three definitions

of trails.

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[50]Examples of society working to humanize physicists are plentiful. From college courses on "Physics & Buddhism" (Phy 201, State University of New York at Albany Undergraduate Bulletin), to the plethora of anecdotes about famous physicists, society works to construct narratives that focus not on the mathematical and technical achievements of these individuals, but on their human elements. Oppenheimer could juggle. Feynman told funny stories. Einstein had crazy hair. Each of these men who developed sublimely frightening devices, devices that *were* the apocalyptic threat promised by the Cold War, were surrounded by stories aimed at humanizing them.

Overloading a critical signifier with variant definitions forces any reading of the

simple research trails inscribed in the medium of the Memex to take on the complex

character of all the meanings of that signifier. The trail that the investigator of the bow

and arrow constructs in Chapter Seven as he links "textbooks on elasticity and tables of

physical constants" (107) describes three very distinct processes. First, the pattern of

encoded dots serving as the symbolic descriptor of the connections between documents.

Second, the text composed of the aggregation of that material – the line burned into the

page. Third, the newly formed web of trails within the investigator's mind – his learning

of the material. "And his trails do not fade" (107). What Vannevar provides in "As We

May Think" is a metaphoric structure both for representing thought, and for representing

successful learning and retention.

Yet for those physicists thrown off stride, there can be no forming of new trails.

Violence has been done to them, and as described throughout this chapter, they have lost

their ability to create new trails and follow old ones. Their history has been severed.

What "As We May Think" offers is a device for those with a disrupted ability to

construct a logical order of events. In their use of this machine, they will find their logic

reflected back to them as an analyst reflects back language. And their logic will not fade.

It will not, once uttered, disappear into the air. Permanent trails will mark the paths their

logic led them on. And through a contemplation of those logical trails of paper, mind and

research, the researcher will have an opportunity to witness the structure of their mind.

"As We May Think" resists attaching a hope to this mirroring process. It limits

discussion, until the last two paragraphs of the article, to the machine's procedural use

and value: "the physician, puzzled by a patient's reactions," "the chemist, struggling with

the synthesis of an organic compound," a lawyer having, "at his touch the associated

opinions and decisions of his whole experience, and of the experience of friends and

authorities" (108). Each example drawn of a professional using this new device to

exercise their profession. If this line responds to the two readings of loss then this device

now serves to resituate the researcher in his work. Workers, staggered off the trail of

their research can now rely upon the machine, and the amplified trails left by "a new

profession of trail blazers" (ibid.). Following those preset trails returns to the individual

their ability to perform, and even amplifies that lost ability. The Memex, and becomes

the mechanism responsible for placing the staggered worker back upon the trail of their

work.

Yet this machine also performs a psychological function, at least in the case of the

lawyer. On each encounter with the glass plates and encoded dots of the Memex, the

lawyer encountering himself. Each of his decisions, each of his opinions is held

preserved and accessible, reflecting back upon him how he thought at any moment of his

life. In that reflection, the Memex offers up what Vannevar deems essential about

experience: logic, the ordering principles binding their memories and thoughts.

Although the reflected logic of research does not satisfy the same psychological

needs as the reflected narrative of experience, for this article they occupy parallel

structural roles. Being able to consult one's own mechanized narrative ability allows for

the possibility of ordering experience. One has been provided the tool set to do so: an

endless memory supplement, a mechanism with which to mark it up and order it, and an interface with which to consult it.

What results from recording logic in the Memex is not testimony. Readers of its texts do not find witnesses performing the difficult integrative work of a consciousness struggling through traumatic memories. One finds professionals struggling through difficult professional moments, relearning how to perform their jobs after the shock of their complicity. Yet the testimonial value of the device lay not in the work produced upon it, but upon the work itself, and upon the redirection of physicists and engineers efforts away from destructive technologies. The testimonial value of the work resides in the fact that following a conflict that severed history and shattered millions abilities to construct narrative, the enables of that violence build a prosthetic narrative device.

An Internal Supplement

Were the device to end there, as a desk containing the summation of human experience, then it would remain as a cane for the permanently psychologically injured. However, this external object that will return to its users their ability to construct narratives, to create order out of experience, will one day be internalized. What exists as an enlarged intimate supplement to memory, when projected forward in Chapter 8, becomes something more. "As We May Think" purses technologies that supplant the sense. Hypothesizing to a point at which Vannevar must distance his own writing for sounding too science fictional, the text follows the electrical vibration of the eye, the impulses traveling up the nerves of a typist, and ultimately sounds directly introduced

into the nerve channels of the deaf. This last technical description roughly correlates to

contemporary Cochlear implants. Consisting of a microphone, a sound processor, a

current source, and a wire that passes that current through the skull directly to the

auditory nerve, this device translates pressure waves into electrical impulses. Those

impulses are introduced to the brain in a manner similar to what it expects to receive

from that most internal of hearing organs, the cochlea. Cochlear implants physically

connect electronic devices to the human nervous system, extending the system beyond

the body, displacing the ear.[51] The "ear," that physical object through which sound finds

entrance to the brain, no longer resides just on the head.

This object serves "As We May Think" as a final technical example. After seven

chapters of describing technology and structuring reader's perceptions along lines of loss

and capabilities, along ideas of the necessity of forgetting and the power of mediation,

the article concludes by writing of a technology that does two remarkable things. First,

directly and with no user intervention interprets physical processes and relays that

information to the brain in a form that it can make use of. Second, it replaces a sense that

the user no longer possesses. Unlike glasses that improve sight but do not restore it,

cochlear implants *restore* hearing. Not perfectly, at least not yet. But to a degree

unimaginable in 1945. For that reason, when contemplating the potential of a device that

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[51]Marshall McLuhan described a similar situation in <u>Understanding Media: The extension of man</u> (New York: Signet Books, 1964). Yet the situation he describes differs from this piece of aural technology, and from the direction Vannevar sets with it for "As We May Think". McLuhan emphasizes that different media and their particular devices privilege the senses to differing degrees. A television addresses both eyes and ears, while a photograph only addresses ones eyes. McLuhan describes the situation of drawing an individual with the senses emphasized to correspond with media affect. What Vannevar touches on in his description of the ur-Cochlear implant differs from McLuhan's privileging of the senses. Sound does not overwhelm sight. Yet the media devices connected to sound – microphone, speaker, amplifier – have become part of the person. That becoming parallels McLuhan's extended human.

can use electricity to create thought, Vannevar relents with the following caveat: "It is a suggestive thought, but it hardly warrants prediction without losing touch with reality and immediateness" (108).

An important distinction: the cochlear implant does not work like glasses, or a microscope. It does not augment existing sensory perception, serving to magnify and extended a power a person already possesses. It destroys and supplants the near-dead remainder of a sense. Whatever residual hearing remained prior to the implantation is destroyed, and what replaces it is something similar, but very different. A technological analog of the sense takes the place of the old sense. It does not supplement, in the manner with which Vannevar describes the Memex supplementing the memory of a user. It erases the traces of an organic sense and replaces those traces with a technological analog occupying the structural position of that which was lost.

"In the outside world, all forms of intelligence, whether of sound or sight, have been reduced to the form of varying currents in an electric circuit in order that they may be transmitted" (ibid.). Rhetorically, this line transitions readers across three steps: from thinking about logical processes as something akin to math but representable mechanically, to thinking about sensory perception as a mechanical process that is representable electrically, to thinking about intelligence. Although "intelligence" in that line directly means information or stimuli, it still carries the secondary meaning of thought.

What reason can the text have for discussing internalized prosthetic technologies except to hint at an eventual reintegration of the device carrying "[man's] shady past,"

(ibid.) and "the summation of human experience" (102) with the mind upon which its mechanism is modeled? At that moment of reintegration, "As We May Think" seems to provide the solution to Vannevar's crisis of witnessing. A group of researchers thrown off their ability to consult and order their own memories has constructed a device designed to order experience, and has then implanted that device as a prosthetic within themselves. This device returns to investigators their ability to perform, but also their ability to forget, secure in the knowledge, "that he can find them again" (108). This foregrounding of loss and return alters the research process from one of learning, to one of trail marking. If one sufficiently notes where a piece of information resides, and has a device capable of instantly providing that information, then one no longer has an obligation to remember. Or so goes the logic of "As We May Think."

"[W]henever thought for a time runs along an accepted groove – there is an opportunity for the machine" (105). This new implant will allow for a haze to settle over the memory of the investigator, stride vigorously where he has fallen, remember where he cannot bear to, allow that shocked individual to forget, and by virtue of this amnesia, paradoxically, make "[h]is excursion ... more enjoyable" (108). That excursion Vannevar refers to is life, and the process of building a civilization. Forgetting enables forward progress, and what rests in the place of memory is a device offering the non-referential testimony of war-time science.

As We May Mediate

This final move – implanting the device that, as Chapter Six of "As We May Think" points out, "can presumably be operated from a distance," (107) – creates a situation where individuals no longer externalize their trails, their research, their lines of text and their webs of associations. "As We May Think," in this final move, aims towards erasing mediation. No longer will internal objects require substrates upon which to find their external form. In the place of that process, the Memex mates with the concept empowering the Cochlear implant, and people have direct mental access to other's web of trails. Through that access, one would have more than the product of research and more than the scaffolding of which Vannevar writes early in the article. Populations equipped with this device would have a connection directly to the way in which others think. And through that final associative link lay the hope of "As We May Think."

To a generation lost to itself, confronted with the horrors of its work, Vannevar offers the promise of a device capable of restoring empathy. By fully projecting ones web of thought into another, one achieves the necessary presence to fully comprehend the other. In that comprehension, this reading suggests, lay "As We May Think"'s promise of creating a technological avenue towards a utopia of non-violent resolution of difference.

What Vannevar seems to be offering the physicists of paragraph two is the promise of working on this device. Much like how psychologists during World War I sent shell-shocked soldiers to work houses, hoping non-violent labor would restore their

shattered nerves, "As We May Think" offers work as a curative.[52] Working towards a

utopia empowered by the same technology that created the hell of the Atomic Bomb and

the Final Solution promises to complete the restoration of the self begun through

observing ones reflected trails. Psychological peace is offered not through the

construction of a narrative that stitches together the shattered fragments of experience,

but through the construction of a device that stitches together the shattered fragments of a

discipline. The final promises of "As We May Think" are that the Memex' users will

"reacquire the privilege of forgetting," and through the resumption of work allowed by

that amnesia, elevate the spirit of humanity.

"As We May Think" calls out to engineers in a language they can understand: the

language of forces and laws, to work on a project aimed at the interests that first drew

them to science: the examination of those strange forces. Vannevar offers a thread to

lead these shocked, staggered workers from the maze of their own construction. And this

time, instead of organizing people for the march or erasing communities from a map, "As

We May Think" offers the hope that those same basic principles once turned to strange,

destructive gadgets, can now just as effectively be turned to strange, healing machines.

At the origin of every machine running the AND OR rules of Boole's logic, and

every machine providing the chance to write back into the darkness and see thought

amplified, glowing back through the molecular filaments of a billion thermionic tubes,

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[52]Ben Shepard discusses the history of military psychiatry in War of Nerves. In Chapter Six, "Home Fries," one can find descriptions of Dr. Arthur Hurst's methodology while running the British treatment facility at Seale Hayne in 1916. Hurst tried a variety of treatments on the shell-shocked soldiers: electrocution, hypnosis, talking, persuasion and field work, among others. He also filmed his patients to demonstrate the effectiveness of his methods. Shepard, War of Nerves, 78-80.

lay this little piece of writing's proposal for constructing the testimony of 6,000 war-time

engineers. "As We May Think" offers this proposal for a testimony referential of nothing

but a need, evocative of no event other than a willingness to be inscribed, yet capable of

altering human relationships as strongly and permanently as did the statistical tabulating

machine and printing press that preceded it.

CHAPTER THREE

Interpolated Figures of Near-Execution

Narratives of Survival

New media technologies of vision enable the recording of representations of inhuman, impossible and traumatic relationships to time. Often, the term new media simply designates some mixing of older technologies of representation and recording. New media can also mean the translation of those analog substrata into their binary or logical digital equivalents, a translation often done skillfully enough that one might never recognize the shift. In its most representationally powerful forms, work in new media combines both practices: the creation of a substrate that subsequently allows for the translation and manipulation of all prior mechanisms of representation in a digital state. This translation ignores differences produced by content. A documentary film of falling objects and a mathematical primer on gravity can now both occupy the same type of virtual space. By ignoring the specificity of content, this perspective on translation allows for an infinite mixing and recombination of source material and techniques as if everything were just oils that never dried, never faded.

In 1999, one technology successfully demonstrated the evocative power over a viewer's imagination that results from this mixing of various forms of visual media. Bullet-Time cinematography brought together the techniques and media of documentary photography, motion picture film, and virtual avatars built in digital environments. This

amalgam offered filmmakers a novel, creative tool with which to approach the difficult problem of how one narrates a moment of survival. In John Gaeta's development and application of this technology for the Wachowski brothers' The Matrix, this technology of vision inadvertently altered the history of survival. It did so not only for the characters it created in the film, but also for the entire genre of testimonial narrative production.

This technology was developed to represent the moment of near-execution. In The Matrix' version of that moment, viewers witness a young woman's survival, and later in the same film, a young man's transformation through survival. In the opening minutes of this film, when the screen's tonal value and shot selection suggest the dark realism of film noir, a young woman is seen during the commission of a crime. The police find her sitting hidden, lit by the green phosphor glow of a computer terminal in a room in a vacant, dilapidated hotel. Gun drawn, one officer approaches her from behind. The only narrative conclusions available to the audience at this moment are her capture or violent death. Instead, the young woman begins to fight, rising up, floating in mid-air – continuing to move – in a time now slower than her observer's. As time stops, the camera breaks free of its fixed perspective and time frame to rotate around her weightless form, providing a comprehensive visual study of the moment during which survival happens. And in the record of that moment, in Bullet-Time's highly mediated testimony, viewers witness a tightly controlled, choreographed encounter of survival and resistance.

In order to frame and unpack the implications of this and other new technologies of vision on the work and works of testimony, one must understand the theory and practice of testimonial narrative, the historical antecedents of a new technology of vision,

the theory and practice of narrative in this new medium, and most critically, how that

new medium resituates traditional testimonial work. The set of old and new media texts

around whose study this frame is constructed must rely on common metaphors and have

thematic, structural and representational ties. Without that shared focus of address, there

would be no possibility for the already difficult comparison of thought across media. The

closer the movements of one text parallel the movements of the other, the more

provocative will be the observations that arise from their comparison. One work that

shares these strong ties to the narrative of survival enabled and demonstrated by Bullet-

Time is Maurice Blanchot's 1994 autobiographical story, L'instant de ma mort.

The young woman of Bullet-Time floats, much like the young man in L'instant de

ma mort, in "au moment où la fusillade n'était plus qu'en attente" ("the moment when

the shooting was no longer but to come") (Blanchot 6/7). That moment names the event

of a near-execution and is the focal event of Blanchot's brief, four-page story on the

strange temporality of his survival. That strange temporality will become for his text one

of two symptomatic marks of the traumatic experience.

Set in the closing days of World War II, Instant tells of the encounter between a

Nazi lieutenant, his firing squad of German soldiers, and a young nobleman. For reasons

the text is never fully able to articulate, the young man survives, escaping the certain

shooting to wander the forest and wonder how he failed to die. As strongly as Bullet-

Time enables and proscribes The Matrix' medium-dependant theory of survival for its

young woman, the structures of meaning that comprise Instant dictate the form of

survival for its young man. That survival will take place by virtue of an accident, an

accident enabled by a theory of symbolization reliant upon the impossibility of reference.

Accidents of any kind contradict Bullet-Time's obsession with certainty of reference, a

certainty portrayed and reliant upon visual and mathematical accuracy.

Rising Up

The young woman from <u>The Matrix</u> continues to hover, moving imperceptibly, at

a pace to which she is complicit in giving up control. Her complicity will be central to

the effects this technology of vision will later have upon her as actress, as character, and

as survivor. Surrender of control enables the coming into being of <u>The Matrix</u>' form of

the survivor. Through its manifestation, viewers are presented with a new depiction of

the relationship between survival and time. Without that technology of vision, viewers of

the film would have no explanation for how its female protagonist survived her first

encounter with death, or how its male protagonist survived his transformational

encounter with death. This technology of vision exists precisely to create that

explanation, and provide the central argument of the film around the issue of survival.

The vision machines that control the pace of her now potentialized, formerly

violent kinetic movement allow for the imperceptible physical details of survival to

surface. Those details surface because of Bullet-Time Cinematography visually depicts

the survival that trauma theory describes and that testimonies narrate. Those details

surface because Bullet-Time positions the body in space, time and narrative in ways that

simultaneously depict and force new understandings of the relationship between the

survivor's body, and the space and time of the event. These details become visible

against the backdrop of Bullet-Time's antecedent media and other media's

representational strategies for similar events.

This chapter's concern is the manner in which the narrative and meta-narrative

about survival made visible in those details by this technology of vision conflict with the

story written of survival via the symbolic representation of narrative and meta-narrative

in Instant. Put briefly, survival *happens* in the textual narrative of Blanchot's writing, it

is not experienced.[53] One can not narrate that moment of survival, only live it. No

explanation is sufficient to explain why one survived the certainty of an encounter "oú la

fusillade n`était plus qu`en attente" ("when the shooting was no longer but to come")

(6/7). From that utter insufficiency of explanation one can deduce that explanation is

impossible. Or rather, from this short text's oversaturatation of explanations, one can

deduce that the need for a narrative that can explain survival is of paramount importance.

Despite the superabundance of potential explanations, the text fails to settle on any one as

decisive, and so readers are left to conclude that survival only happens in the absence of

reason. In effect, one survives because one has been the victim of an accident.

In contrast, survival in the Bullet-Time Cinematography of The Matrix occurs

when one becomes an active participant in an explanation reliant upon an inhuman and

impossible relationship to time and space, a relationship best described as traumatic. In

fact, it is the subject's impossible relation to time that narratives on traumatic moments

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[53]This differentiation relies on D. W. Winnicott's "Fear of Breakdown," in which he describes patients who search for the cause of their anxiety in the future, not realizing that the event which is producing their dread already took place, but was never integrated into their memory. The event happened, but was never experienced. For more on this, see Winnicott's Psychoanalytic Explorations, edited by Clare Winnicott, published by Harvard University Press in 1989, pages 87-96.

attempt to document. By documenting that relationship in a visual, collaborative way, the technology and the subject create the experience of survival – a survival documented and explained once, visually, in a compelling manner that offers only the single viable truth of survival in new media: one survives because of a translation resulting in the digital figure of the survivor.

The moment of survival in <u>The Matrix</u> appears to show a young woman rising up, delivering a kick, and descending gracefully in what without time dilation would appear to be the blink of an eye. But this technology of vision is more complicated than film. Its explanation for survival required the production of an amalgam of filmed character, photographed actor and computer-generated simulation, all meticulously positioned in space and time to produce a simulacra who plays out survival. The spaces between the filmed and photographed conscious movements – the actual space of her movement – no longer belong to the actor. For this technology of vision to successfully create an explanation for survival, the actor must surrender control over her image and over her identity. Observers feed her fleeting moments into a computer, and the computer appropriates her body by interpolating her and her space of movement into the spaces between the frames of her existence. Her body is not replaced as if something were superimposed upon it; it is supplemented by a finite number of mathematical doppelgangers.

This processed woman hovers, unable to adjust in the variably brief time of observation, and her kick appears undelivered. That brief time of observation provides the metonymic moment sufficient to read the content, form and enabling technologies of

the film; a reading ultimately concerned with the narrative of survival offered by Bullet-Time cinematography's representations of bodies in time at the moment of their missed encounters with death. To reach that explanation, one must oscillate between theories of character and bodily formation in visual and symbolic media, and between the medium-specific explanations for survival depicted by these texts in their two key scenes of near-execution.

The Body in Time

L'instant de ma mort describes the odd temporal structure of what might have been an autobiographical moment of Maurice Blanchot's wartime life. Instant takes place around a moment in time named 1944 at a site named parenthetically, "le Château, disait-on" ("the Château, it was called") (2/3), in an unnamed territory somewhere in France, near to a forest named "Bois des bruyeres," (5) yet far enough away for the author to name it "éloigné" ("distant") (4/5). Naming, and the inability to properly affix a name will play a primary role in how survival is figured in Instant. The plot of this highly compressed story is straightforward. A young man in France, called out to die in front of a German firing squad, escapes being shot while the Nazi Lieutenant turns his back and the firing squad reveals itself to be Russian, naming themselves Vlassov Army, and thus, strangely conspiratorial.

The central problem of Instant is the building of a viable, logical explanation for this escape into survival. What results from Instant's attempt at logic is a temporally disjointed relating of the moment of near-execution intermixed with ambivalent

assertions on the reasons for this survival, reasons that all fail to adequately label and thus encapsulate survival. Because no explanation suffices, survival is a name within that text that persists with a remainder, and as such, without a valid answer. In that failure, composed of cast-off explanations ranging from the historical to the linguistic to the intellectual to the psychological, one finds the only explanation for survival this text is capable of offering: the accident.

The text's narration of the moment begins not with the pivotal encounter between the unnamed Nazi Lieutenant, his named firing squad, and an unnamed figure, presumably Blanchot as a young man. Instead, the text begins with an effect of that encounter – the representation of a fractured linear time. That representation is communicated to the reader not by directly describing a jumble of numbers named as dates – that comes later in the text – but by describing a body's impossible placement in time. "Je me souviens d'un jeune homme – un homme encore jeune – empêché de mourir par la mort même" ("I remember a man – a man still young – prevented from dying by death itself") (2/3). The age of the text's central figure is fractured by the narrative of that moment. The text names itself "I," and that "I" remembers from 1994 the autobiographical figure from 1944 as immobile in time, as still young. The text writes two key objects into its first line. One, the impossibility of a man who lives after having died in some significant, though not physically terminal way. The other, two signifiers under which to collect the descriptions to follow. But, because this text is autobiographical, those two signifiers, the "I" and the "young man," though they filter and collect signifieds independently, present alternating faces of the same faceted, or

fractured, subject. These two key objects gesture towards the effects, if not the cause, of survival within textual narratives.

By beginning the text with a linguistic description of a temporal and subjective paradox, Instant frames itself partly as mystery, one whose revelatory promise will be the explanation of what occurred to enable time and self to compose themselves around a split subjectivity.

To understand the significance of this split, and to begin unraveling the mystery of the event that produced this split, or dissociation,[54] we must understand how this text composes a its central character from multiple facets, and how those facets serve to narrate survival and the traumatic event. Oddly, for that understanding we must turn to the text that depicts a fictional version of the missed encounter with death. By using multiple visual technologies to compose its on-screen characters, The Matrix provides for a complex but telling allegory of character development that unpacks the faceted development of character in Instant. By visually compositing its characters in the moment of the missed encounter with death via Bullet-Time cinematography, The Matrix opens up Instant to a reading of its symbolic character composition during that same class of event. In order to achieve that reading, one must thoroughly understand the technology and implications of this new type of vision.

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[54] Dissociation disrupts the normal functioning of consciousness, identity, perception and memory. Marked by this disruption, dissociative disorders are often brought on as a defensive response to stimuli too traumatic to integrate with the self. For the clinical definition of Dissociate Disorder, see Codes 300.15 of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), (Washington, D.C.: American Psychiatric Association, 1994).

A Digital Zoopraxiscope

Bullet-Time Cinematography, the technology that visually captures the moment of the woman's kick, incorporates a large set of still cameras, a pair of movie cameras, and a computer to integrate the sequence of images produced through those lenses. Still cameras are placed in a round, focused on a common point of action. Movie cameras are placed at the beginning and end points of that round. At the critical moment of action, the film cameras run, the actor moves, and the still cameras capture in a sequence a predetermined moment or span of moments of that action. There is no rule predetermining the length of time that passes between the taking of exposures. This provides a series of stills from manifold angles covering an adjustably small span of motion. But this process is incomplete, flawed, as large gaps in movement exist between one frame and the next. If one watched the sequence as it exists at this stage, it would be like watching only every third frame of the film. The actor's movement would appear staccato, false. To eliminate this stutter, the filmed and still images are fed into a computer.

That falsity is anathema to the technology, given that the direction of computer rendered graphics has been towards increasing levels of photo-realism from the development of ANTIC[55] for the 1.8MHz Atari 400 in 1978 to 3D Studio Max R9 in 2007, used professionally on render farms running banks of 3GHz PCs,. Software interpolates frames between each still camera, excising that which would appear false. The resulting footage creates the impression that every action can persist interminably: an

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[55]The Alpha-Numeric Television Interface Circuit, an early graphics microprocessor.

impression reinforced by the freedom a spinning frame implies.

Interpolation here refers to a mathematical term, not a linguistic or philosophical one.[56] It refers to the difficult process by which one computes unknown points or values intermediary to known or tabulated values. Interpolation functions logically, assuming that the value of an unknown data point will lie on a path between the two endpoints that define a set. For computer graphics, this means that the simulated point will fall on the line described by the two measured, or real endpoints. Interpolated frames are complex mathematical visualizations simulating what might be seen between known, measured, "real" image frames. The more accurate the computation and measurement, the more interpolated frames one puts between photographs, the more seamless will be the final simulation product from one end of the set to the other.[57] In the case of Bullet-Time, the known frames are the photographic stills. Measured points are added as reference marks to the still images of the actor's movement, and the math is performed upon a wireframe model built within the computer, a model designed to mimic the actor, complete with

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[56]Interpellation is the Althusserian concept of how ideology subjectifies people through the accurate call of the authority figure. For more on this, see Lenin, and Philosophy, and Other Essays, New York: Monthly Review Press, 1971.

[57]As a reference, the Atari mentioned above could perform 0.33 Million Instructions Per Second (MIPS). An instruction is the basic logical operation of the machine, bringing two data elements together with one of four boolean operands: AND, OR, NAND or NOR. Those boolean operands form the computational basis for the logical mixing of source texts mentioned in the introduction. For more on boolean logic, see Frank Brown's Boolean Reasoning: the logic of Boolean equations, (Boston: Kluwer, 1990). The average PC in 2006 performs 4,000 MIPS. Though this difference does not directly translate into seamless interpolation, it does quantitatively mark a difference in possibility. Often, computers are compared to cars to underscore this massive increase in computational power. The 1908 Model T had a top speed of 45 mph. Its modern equivalent, if scaled similarly to the increase of a computer's computational power, would travel a half a million miles per hour.

parallel reference marks.[58]

In <u>The Matrix</u>, as the young woman rises to deliver her kick, all actors pause. The world continues at a finer pace as the camera *seems* to spin horizontally around her vertical axis, offering an infinite series of shifted still profiles of the violence about to come. Seems, because no cameras move during this technique. Were a camera to move, the illusion that this technology of vision exists to produce would fail. In actuality, upwards of 100 cameras present the appearance of a single, flexible viewpoint in a now unnatural time–scale.

Time, as a marker of the world's progression, veers relative to the compression and extension of delays between the individual camera perspectives. Each perspective results in an unique image, an image different from its neighbor by degrees. But that difference is important, and untranslatable. And because the differences from one perspective to the next, from one image to the next cannot be collapsed to form a single whole, a relation must be built from image to image. Film offers one logic for relating those still images. That relation of 100 stills yield 4 seconds of motion at the standard film rate of 24 frames per second (FPS). Were the process to stop at this point, with what is now a sequence of images from still cameras linked to film cameras to form one continuous scene, there would be little correspondence between the depiction of events here and the moment when the shooting was but to come in <u>Instant</u>. This technique has

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[58]For a more mathematical explanation of interpolation, see Abramowitz, M. and Stegun, I. A. (Eds.). "Interpolation." §25.2 in <u>Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables</u>, 9th printing, (New York: Dover, 1972) p. 878-882, and Iyanaga, S. and Kawada, Y. (Eds.). "Interpolation." Appendix A, Table 21 in <u>Encyclopedic Dictionary of Mathematics</u>. (Cambridge, MA: MIT Press, 1980) p. 1482-1483.

not yet produced its character.

At this point, Bullet-Time is simply a technological expansion upon Eadweard Muybridge's first experiments with moving stills, called The Horse in Motion. The mechanism he developed between 1872 and 1878 involved twelve cameras arranged along a straight track parallel to the path of a galloping horse. As it galloped by, the horse's hooves triggered the cameras by hitting a series of trip-wires. The cameras' focal plane described the path of motion of the horse – a straight line. Yet between each camera was a blank, and so the moving stills of his experiment resemble, but are not film.[59] The staccato, false movement of the represented object marks the visual product as unrealistic, and hence different.

Muybridge's technique also differs from Bullet-Time cinematography, that is likewise not film. The first difference would seem to be that Bullet-Time bends the line of cameras to describe a circle. However, Muybridge's 1887 work, Animal Locomotion, includes a similar structure. Both "Somersault, Man" and "Throwing Water from a Bucket" feature a single subject performing an action while surrounded by still cameras. In each case, six cameras are used to photograph the subject from six angles, all along the same plane. In both techniques, instead of the object traveling along a focal plane, the object rests at the determined center of a focal ring, its position describing a focal point. That point becomes the saturated center of a representational act. Unlike the false

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[59] "There were also experiments that attempted to use the photographic process to give motion to images of real figures; a series of still photographs taken by Eadweard Muybridge ... [were] projected on a screen in rapid succession to give the illusion of movement. But the final stages of the development of a practical motion picture camera and projection system had to wait until the perfection of a flexible foul that could replace glass photographic plates" (Sobchack 44).

facades of a stage's planar reality, where only the 2-dimensional face of a structure need look authentic, the full body of the focal object at the saturated center of these two techniques will be captured with obsessive detail.[60]

One difference between Bullet-Time and Muybridge's technique lay in how the two operations represent time. Muybridge triggers all six cameras simultaneously, and so the negatives depict the same instant from multiple perspectives. The sequences one composes from those negatives only appear to show figures in motion. That apparent motion creates the illusion of the passage of time, "the sensation of time unfolding as the eye slowly moves around the figure with each frame" (Delaney 4.1). Time, in Muybridge's sequence, is created not because the object has changed its posture, but for two reasons that emerge from the spectator. First, the camera has changed position. From frame to frame the spectator's position relative to the object shifts by 60 degrees, and the spectator incorrectly reads that shift in position as one requiring a commensurate shift in time. Second, the spectator identifies with the perspective of the camera, and in that identification unifies the various camera lenses into one photographic machine. Since the spectator is physically limited to viewing objects from one perspective in a moment, the spectator projects that limitation onto the photographic machine and imagines a lens circling a subject.

This misconception unifies the disparate machines photographing the subject, and

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[60]Muybridge clearly associates the source of his technique's visual obsession regarding its focal subjects with the scientific gaze. This association comes across in many obvious details such as the analytic scope of the 781 folio plates compiled in Animal Locomotion (1887), the grid lines backgrounding his subjects in The Human Figure in Motion (1901) and in the title he gives this technique in 1893, Descriptive Zoopraxography.

through that first unification, enables a unification of the focal subject. A spectator

assumes that the figure in the second frame, that now appears to have shifted posture

slightly since the first exposure, 60 degrees ago, is the same figure further along a given

arc of motion. But that unification is also a potentially false conclusion. Comparison of

Muybridge's cyanotype proofs held at the Smithsonian with the published sequences

from Animal Locomotion show that he manipulated the order of photographs in some

sequences, dropping some frames and shifting others earlier and later in the sequence.[61]

Bullet-Time uses Muybridge's perspectival movement, along with the focal object's

change in posture to create the experience of a unified perspective, a unified time-frame,

and ultimately a unified subject for its viewers.

The second difference is straightforward; Bullet-Time bridges the brief

technological gap between moving stills and film by incorporating the products of both in

one finished sequence.[62] Where this second difference becomes interesting is the that the

visual technology used to virtually construct that bridge was not developed until 100

years after either physical camera. The third, and most critical difference emerges from

this more recent development: the spatial and temporal gaps between each camera

perspective, the blanks where film and photograph do not exist, are revealed through

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[61]For more on this, see the discussion on frames 5 and 9 of "Ascending and Descending Stairs" from Animal Locomotion in Michelle Anne Delaney's curator's statement from the 2000 exhibition, Freeze Frame: Eadweard Muybridge's Photography of Motion.

[62]To put Muybridge's moving stills in historical context, one has to recognize that his footage was made before technology now commonplace. Forget the "thermionic tube," of "As We May Think," whose descendants power the computational component of bullet-time, and which form the enabling technology of Vannevar Bush's attempt to inscribe idiosyncratic patterns of thought. The vacuum tube was not developed into a light emitting device until the next year, and would not be used as an information containing device until 60 years after that. For more on the idea of lightbulbs as information technology, see Nicholas Negroponte's Being Digital.

Bullet-Time's application of graphical interpolation to be spaces that images, objects, and bodies can inhabit.

Those spaces, created and populated by this technology of vision, allow for a change in the witness' understanding of time. The event no longer takes place in a human time scale, in an instant; it takes place over a span long enough for every instance to be explained visually in a way that allows for aetiological observations. Because the provenance for this visual understanding is Muybridge's zoopraxography, a technology of vision as scientific as the microscope, then the resulting revelations might also be viewed as scientific, objective representations of events marking the passage of time.

Those spaces force a reframing of the question of what takes place during survival. At first, that framing only deals with the physical details of survival, with forensic details: how might a given body have twisted and contorted so that a threat missed? But for those spaces to exist, for a visual narrative to be created that will populate this void, the flow of time must veer. And as time fractures, one begins to see that the event of near-execution happens in a variety of registers. One develops a visual relationship to the physical, psychological and social registers of survival. Survival in Bullet-Time becomes a process akin to Althusser's theory of and Butler's expansion of interpellation, constituting a subject that did not exist prior to the traumatic event, a subject aetiologically necessary for survival to take place.

And time does veer, like a parameter, relative to the needs set by the software's desire for photo-realism. Were the software to require the inserting of one interpolated frame between each photograph, the sequence would have 198 frames, yielding a

moment now 6 seconds long, composed half of the photographic "real," half of the mathematically imagined other.

To write of the desire of a piece of software is strange, to write of the mathematically imagined other even stranger, but The Matrix demands this psychoanalytic reading regarding the implications of its technology of production. The film demands that reading in two complex ways, ways that coincide with the mechanisms used by Bullet-Time Cinematography to build unified characters from fragmented images. The first demand emerges from the anthropomorphic forms given to many of the movie's visualizations. The second demand is staged by Bullet-Time Cinematography as it constructs visual narratives of survival, and hence deals with the central problematic of that branch of psychoanalysis known as trauma theory: how one might relieve the symptomology characteristic of survival by integrating through narrative the missed encounter with death.

The anthropomorphic forms that sheathe the primary fictional machines of The Matrix' narrative, and that constitute the first demand, are either identical to humans, or analogous of animals. I write primary to differentiate between the devices that embody themes of the film, such as Agents and Sentinels, and the devices that, although they are provocative, are clearly secondary. For instance, alarm clocks. Graphic designers and computer animators provide bodies for these primary machines. "The Sentinels: killing machines that are at once terrifying and beautiful. They have an organic architecture like a microbiotic organism" (Wachowski 49). These objects are designed to look and move like viruses and end up resembling squid or octopuses, calling to mind the myths

surrounding these monsters of the deep, creating linkages between this film and prior

films that influenced its visual language,[63] and most importantly, bridging the gap

between the viewer's pre-existing internal objects and the film's presentation of the

machinic other.

To facilitate those links, the film provides organic bodies for these machinic

characters. Viewers are expected to trust the visible content and infer a mind's presence

behind technological facades. The film even sets up the machine's human-form

technology as the pinnacle of the machines' development: "As soon as we start thinking

for you, it really becomes our civilization" (Wachowski 100). In that scene, one sees the

odd encounter of a human-form machine speaking to a captive audience, an audience

represented inside the filmic universe by a politically conscious man tied to a chair, as the

machine repeats the primary psychoanalytic demand: the audience must acknowledge its

mind.

The film allows for an argument common to the genre of science fiction. The

prodigal machine that one cast off long ago has returned home, and now resembles its

creators. It looks in the eyes of the descendants of its creators, beings effectively its

siblings, and demands recognition.[64] This film, a film focused around the event of

survival, stages this demand in character, narrative and production technology. That

demand aims at something other than a Cartesian recognition that machines can think.

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[63]Examples of this style of conscious homage abound in <u>The Matrix</u>, from the way trash floats like tumbleweed from a Spaghetti Western between two figures about to fight, to the ways aforementioned monsters from the deep attack the hero's submarine.

[64]One example of this is a classic of the genre, Frank Herbert's <u>Dune</u> series. In all of its incarnations over 40 years as novel, film and mini-series, the individual plots that take place in its universe are contingent upon this problem of the violence associated with the prodigal return.

That primary demand contains three parts: read these machines as one would any human character; consequently, give them appropriate, sensitive psychoanalytic readings; and most critically, recognize that because of the machine's analogous nature to humanity, the depiction of survival enabled by this new technology of vision argues for a new theory of survival. A prerequisite to the audience's capitulation to that demand is an acceptance of the illusion of the body presented by this film because that theory emerges from a desire to map the visual field of the event of survival.

Reading internal, psychological attributes from external, bodily characteristics resembles a reader's assumptions regarding a narrativized character's reality. Characters hold human attributes, and texts need remainders to be read in. The remainder describes everything that cannot be encapsulated by the technology of representation enframing a figure. The remainder enables readers to shift the limited sketch of a character's psychology into the viable psychology of a mind. The remainder shifts the figure of the survivor in testimonial work from character to human being. Essentially, this process describes an kind of anthropomorphism. Instead of inscribing human attributes onto inanimate objects to make those objects seem more familiar and understandable, one reads human attributes from those same inanimate objects. The inanimate objects of central concern here: the symbols and icons that compose the identities of distinct characters, and the technologies that inscribe those representations. Technologies of representation rely on metaphor to represent objects that appear human, and that fleeting, improvised appearance encourages readers to assume a figure that possesses human or animal internal qualities. Without that assumption, the demand articulated by the film

that Bullet-Time visualizations be read as reflective of psychical processes would fail to be acknowledged. Without that acknowledgment, Bullet-Time's explanations for survival would fail to be recognized.

That assumption ignores the boundaries of human or machine, of the born and the made. The film actively collapses this distinction, positing fictional places named "growing fields" (Wachowski 50) where human birth no longer occurs; where machines make humans. In this conflation of the born and the made, the machine gains the human's psychological reality, and the born gains the made's interchangeability. That the film's primary narrative thrust revolves around this swap of attributes while taking place in two visually distinct "realities" subtly reminds all spectators that the mechanisms depicting and depicted by this film are themselves embodiments of and engines of anthropomorphic desire, and that all people represented by this technology are actually integrations of technological and biological processes.

Bullet-Time Cinematography recreates with exacting visual details the type of moment Blanchot describes as "when the shooting was no longer but to come." The intricacy of the technique underscores the importance placed upon this moment by the film, and constitutes the beginning of the second demand that one read its technology psychoanalytically. Bullet-Time, as obvious from the description above, is a time consuming technique that exists in this film solely to represent a narrative that explains moments of unexpected survival.

Bullet-Time takes an explanatory relationship to its subject. One can read Bullet-Time as an explanatory technology because of its antecedent: Muybridge's camera in the

round. Muybridge photographed and composed sequences of those photographs so as to further the scientific understanding of motion.[65] One can see his desire towards scientific rigor in the depth and precision of coverage of his subject matter: with roughly 20,000 images comprising the 781 plates in Animal Locomotion, many differ in subject matter only by small increments. Plates 74-94 are all of a figure "Ascending Incline," plates 113-150, "Descending Incline," plates 152-170 depict various types of jumps. Through meticulous studies of particular motions he sought to enhance and alter our perception of time, and through that altering, to allow kinesthetic details to reveal themselves. Bullet-Time functions with a similar rigor in the way it atomizes the time of movement so as to allow for more nuanced understanding of an event. But instead of focusing that scientific gaze upon everyday actions, it takes survival as its subject.

Ultimately, that gaze results in a visual narrative of the moment of survival. When confronted by the authorities, the woman from the vacant hotel, Trinity, leaps. She does so not only because that physical gesture is the character's only avenue to survival. She leaps not only because that provides the most compelling aesthetic, or the greatest insight into her character. She leaps, and in that rising up conveys the eradication of constraints of time, gravity and body that this technology exists to portray. Instant names the feeling of that annihilation of constraint: "un sentiment de légèreté extraordinaire, une

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[65]One might call this desire to quantize movement a meme of the age, as it manifests itself contemporaneously to Muybridge in multiple disciplines. For instance, one finds movement studies in the scientific management principles of Fredrick Taylor (Principles of Scientific Management, 1911), Henry Gantt (Organizing for Work, 1919),and Frank and Lillian Gilbreth (Field Study, 1908). Each developed scientific theories of work through quantitative measurements of time, motion and the body. Each atomized those three categories of analysis to develop better, more efficient methodologies for the performance of specific tasks, such as brick-laying. Muybridge shared that particular interest, reassuring readers of the Animal Locomotion prospectus that the movements his cameras captured were authoritative examples of their type; "the mechanics are experts in their particular trades" (Muybridge 12).

sorts de béatitude (rien d'heureux cependant), – allégresse souveraine? La rencontre de

la more et de la mort?" ("a feeling of extraordinary lightness, a sort of beatitude (nothing

happy, however) – sovereign elation? The encounter of death with death?") (Blanchot

4/5). Trinity leaps in a moment that describes survival, because that leap performs

survival. Her leap is the visual analog of Blanchot's textual representation of the

moment when the shooting was but to come, at the moment of what was for him the

accident of survival. Bullet-Time presents, in this leap, a visual narrative of the traumatic

event.

The interdisciplinary body of research named trauma theory takes the narration

of the traumatic moment as its central problematic. The discipline's mode of address

draws from the psychoanalytic theory of Freud and Lacan, the psychiatric work of Laub

and van der Kolk, and the literary theory of Caruth and Hartman. It does so because that

problematic crystallizes both the nature of the event described by theory and resisted by

practice, and the symptomology that necessitates work on trauma. To analogize, if

physical trauma receives attention because a victim might bleed to death, then

psychological trauma receives attention because one's mind is bleeding. Whether it be

named shell-shock, PTSD, or war neurosis, clinical descriptions of the traumatic event

share similarities. Traumatic memory is defined by its constitutive gap in experience.

One essentially constructs a complex void in memory, in the narrative of an event, so as

to carry oneself through that impossible moment.

Whether the aetiology of that gap is best described by Freud's theory of an

"excess of unbound cathexis [bedeutung]," or by van der Kolk et.al.'s work on

endogenous opiod withdrawl,[66] both studies share a concern with the production of

narrative memory relative to the peculiarities of the traumatic event.

Winnicott describes this peculiar relationship between the survivor's memory and

the event in "Fear of Breakdown" as the difference between what happened and what has

been experienced. Most events happen and are integrated into experience through

narrative, then to be forgotten. Traumatic events short circuit that process, bringing

amnesia with them upon every attempted transition from happening to experience. One

must recognize that "happening" takes place in the present tense, as the time of a

traumatic memory is always in the present. Perhaps trauma always takes place in the

present because the neurobiology of attempted or coerced remembering of the traumatic

event parallels the event, collapsing difference between the two until event and

remembrance both trigger the same intense outpouring and consequent depletion of

catecholamine,[67] or perhaps because trauma triggers and is triggered by a "sudden erasure

of the [internal] other" (Laub 2002). That erasure occurs because the event shuts down

an individual's ability to "maintain dialogue with themselves as to what they felt, saw,

experienced, and remembered" (ibid). Until that dialogue can be restored through

therapeutic work, reflection upon the event is impossible, and the event remains firmly

in the category of the happening: a perennially violent present.

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[66]See van der Kolk, Bessel and M. Greenberg, H. Boyd, J. Krystal. "Inescapable shock, neurotransmitters, and addiction to trauma: toward a psychobiology of post traumatic stress," in Biol Psychiatry. 20.3 (March 1985): 314-25.

[67]A set of compounds that can serve as neurotransmitters in the sympathetic nervous system. One, dopamine, is directly linked to the symptoms of Parkinson's disease. For more, see Wichmann, T. & DeLong, M.R. "Pathophysiology of Parkinsonian Motor Abnormalities," Advances in Neurology, 60 (1993): 53-61.

That violence subverts the possibility for narrative. Yet paradoxically, narrative, to many who work on the subject of trauma, provides the mechanism to reestablish the dialogue with the internal other. Enabling that dialogue returns the person to themselves cognitively, reduces the symptomology of survivors and allows for the disillusion of the various screen (mis)perceptions and memories that of necessity accompany and enable survival.   These illusory screens and symptoms of the traumatic event are what enable the constitution of the subject as survivor; they enable survival, though at impossible cost.

That cost is the loss of the survivor's ability to differentiate and integrate experience. Beyond the Pleasure Principle, using different language, argues that this loss of differentiation, or the ability to recognize and separate internal and external stimuli, takes place because the traumatic shock has imparted too much energy into the nervous system, and that energy remains unbound, and hence disruptive. As Nijenhuis, van der Hart and Steele argue in "Trauma-Related Structural Dissociation of the Personality," these liminal events disrupt the healthy "creation of meaningful combinations of sensations, affects, motor behaviors, and perceptions of the environment within a given moment and across time [which are] essential to engaging in adaptive behavior" (Nijenhuis, et al). The value of this definition of the psychological cost of survival comes in the possibility for recovery it makes possible.

> Individuals who were confronted with a threatening event have been able to succeed in synthesizing the experience when they have created a coherent mental structure that involves and organizes representations of the salient external and internal events. (ibid.)

> Technically, in terms of the physical direction necessary to position the

photographed bodies, computationally, in terms of the math necessary to compose the interpolated bodies, and artistically, in terms of the aesthetic play of shapes, Bullet-Time visually communicates the external event of a body suspended in time. These registers allow for viewers to study the incremental passage of time. Trinity, the film's young woman, remains suspended in mid-air, unable to kick until the technology allows for time to resume a speed sufficient for her to act. In that suspension we witness the way a body acts without time, and with a time drastically slowed. In that witnessing, in the spectacle of Trinity's floating body, we begin to see the joining together of the two demands placed by the film upon its readers, the implications of that joining for the development of character, and eventually, the possible utility of that character for therapeutic work.

The embodied character that enables viewers to perceive time in this new manner is composed of fragments from three distinct sources. The first of those fragments is recorded on 24 frames per second of film and features Trinity, a post-apocalyptic leather clad computer hacker played by Carrie-Anne Moss. The second of those fragments comes from the 24 frames per second sequence built from the product of a Muybridge-like ring of still cameras to capture a 360° visual document[68] of Carrie-Anne Moss leaping into the air in front of a man with a gun. The third set of fragments comes from computer simulations of what bodies might exist in between the measured moments of

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[68]The difference between document, a piece of raw footage that exists with a minimum of directorial influence and a minimum of narrative ordering, and documentary, film which has been unified through ideology, aesthetic and technique is developed in An Introduction to Film by Vivian and Thomas Sobchack. I refer to this second compositional element as a document, because although it requires a great deal of technical direction to set the shot, once the process has begun it must take place without influence. The event captured by this technique is of such short duration that it does not allow for interference. One can retake the shot with direction, but the event, the motions being photographed are, in the initial sequence produced by this technology of vision, unadulterated.

the filmic performance and the photographed scientific study and features the

interpolated body, the mathematical imaginings of Trinity, the survivor. In effect, these

three distinct media capture three different aspects of being and from those three aspects

build a composite form that the viewer recognizes as the character Trinity.

That composite form provides viewers with an explanation of how this individual

survived, an explanation offering a coherent structure of the salient external events that

took place during the immanent threat to life. But, for a survivor to accept a sequence

such as Trinity's as reality, one would have to ignore the fact that this visual offering is

illusory.

Illusion, the play of wishes upon perception[69] takes place in a middle realm, "a

third area," (Turner 1073) that is not of the person, not the "inner-fantasy" described by

Winnicott and not *not* of the person, not "outer reality" (ibid). Illusion offers the

opportunity to share internal objects with others, to play, while still exerting partial magic

control over those objects. Illusion empowers the transitional object, that bridge between

self and other. Illusion's linking of wish-fulfillment and perception guides the creation of

screen perceptions and memories so important to the initial survival of an event, but that

later prevent any potential for narrative. These screens become points of attachment for

the survivor, presenting "an obstacle that they cannot go beyond" (Janet 660). What was

an illusory screen that allowed for the development of objects in a transitional space

between self and other has shifted into the space of delusion. Delusion exists when one

can compare an objective real with the subjective perceptions of that real, and recognize

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[69]See Freud's The Future of an Illusion, (Garden City: Anchor Books, 1961), p. 31.

differentiations between those two phenomena (Turner 1063-4, and Winnicott 15-18).

What is unclear is whether the bodies offered by Bullet-Time to explain survival function

as illusion or delusion, as screen or reality, and how their ambiguous status impacts our

understanding of survival.

Composed of three distinct performances using three distinct media, the form

presented by Bullet-Time exists as a unique being. Despite its existence as a body built

from fragments, it offers a character without seams, without a facade. Or rather, a

character that is only facade. The product of this visual technology, the product of

adding Trinity as performance to Moss as visual study to Trinity as interpolation yields a

finished body that this process demands replace the three source bodies. Bullet-Time

offers a new body, the body of Trinity as survivor. That body creates a new media

palimpsest, not quite erasing the source material, but disguising its origins. Instead of

annihilating the prior text and reusing the substrate, Bullet-Time inhabits the spaces

afforded by the source media between the source materials, rewriting all three donors as

new text.

For one to believe in the narrative of survival inscribed by this new text, one must

allow for the erasure of difference between the three source media. Each body must be

read as identical, as images of the same being, in order for the narrative of survival

offered by this technology to be valid. Otherwise, the sequence disintegrates.

Viewers desire the sequence be whole, that the bodies depicted be the same body.

"Our perception is so bound to our belief in the sequential structure that we can overlook

the black borders marking off each individual frame and fill in parts that are missing, the

inexplicable gaps between the separate phases of the movement" (Delaney 4.1). Viewers
of Muybridge's sequences overlook the inexplicable, and create from highly fragmented
still images a coherent narrative. Muybridge's editing, his reordering of stills out of
sequence so as to enable greater narrative flow, creates a sense that this type of
visualization fears disintegration and encourages synthetic viewing. Muybridge's
cameras in the round and Bullet-Time both exist to offer sequences of images with which
viewers can synthesize the moments of an event in a narrative. To read the Trinity-
Survivor as a body distinct from the source bodies would dismantle the sequence, and
erase the narrative of survival offered by this technology. That type of reading would
demand each medium stream remain a separate performance, would pronounce the
technology a failure, and would be agonistic to the demands made by the film and the
film's enabling technology.

Synthetic viewing results in a spectator accepting the technological illusion of the
composite body as a unified character. Bound by mathematical interpolates, by
quantitative analysis that fixed the middle points between two measured instants and then
embodies those middle points, the character of the survivor takes shape. Without the
software to create these middle terms, the spectator's eye would engage in a tmetical
reading that skips over the inexplicable gaps in Trinity's movements.[70] Because the
technology that creates these simulated Trinities is so robust, the eye has little chance to

[70]I refer here to Epsen Aarseth's use of Barthes' understanding of *tmesis*, or the readerly tendency
to avoid words and passages by an uncontrolled, often unconscious skipping. Tmesis is unavoidable, and
further fragment texts. However, tmesis can be managed – texts considered more writerly are examples of
this management of the reader's attention. For more on tmesis, see: Roland Barthes, The Pleasure of the
Text, (translated by Richard Miller, New York: Noonday, 1975) p. 10-11, and Epsen Aarseth, Cybertext:
Perspectives on Ergodic Literature (Baltimore: Johns Hopkins, 1997) p. 78-79.

skip across the black borders between each frame. The black borders no longer exist.

Gaps no longer exist, at first only in a visual register. "Cinema ... links everything on a

hypertechnical, hypereddicient, hypervisible level. No blanks, no ellipses, no silence"

(Baudrillard 2005, 112). What a spectator witnesses is the ordered explanation of how

one moment links to the next; what enables that ordering is the eradication of difference

upon which the illusion of film relies. Bullet-Time provides explanations for the

inexplicable gaps between frames, and in its ability to explain the inexplicable lies the

power of this technology.

In those now explained moments, Trinity as survivor is built. An effect of its

construction is the wiping away of traces that would allow for separate readings of her

constituent parts. In that effacing of alternatives, a single proposition emerges as the only

explanation for survival. That explanation is delivered in the form of the survivor's body

and one either accepts the illusory body, or one dismisses the proffered explanation for

survival. Without the interpolatory math of Bullet-Time, the explanatory body could not

have been brought into such realistic being, and hence the figure of the survivor could not

exist as clearly, as visibly. Characters survive in <u>The Matrix</u> because of directed action,

because of the visual accuracy with which the character of the survivor is presented. The

survivor as a character relies on interpolation as the mechanism that gives it existence,

and characters in turn survive only because interpolation is possible within this medium.

Le Château, disait-on

Survival in <u>Instant</u> is a more ambiguous proposition. Or rather, creating and

communicating the moment of survival in <u>Instant</u> depends upon an ambiguity inherent to symbolic representation. That ambiguity is performed by the text in multiple registers. The narrator suggests reasons for survival as part of <u>Instant</u>'s internal gloss. The character suggests reasons for survival as part of the story of a set of events. The structural parallelism of the narrative suggests reasons for survival as part of the framing. Ultimately, the logical conflict presented by the need for so many competing explanations creates only one certainty: no explanation is sufficient, and so survival must occur without reason. Survival must have been an accident. In the recognition that survival takes place by accident, one must read the medium itself as the source of this suggestion.

Written into the analogy of the execution squad taking aim at the young man and the devices used by the text to compose its primary character, one sees a theory of language and medium dictating a theory of survival. "Le nazi mit en rang ses hommes pour atteindre, selon les règles, la cible humaine" ("The Nazi placed his men in a row in order to his, according to the rules, the human target") (Blanchot 4/5). That squad, lined up according to the rules of executions and symbolic representation, yet fragmented beyond coordination, mirrors the symbolic mechanisms by which this text produces its meaning. <u>Instant</u> composes characters in its brief four pages with tools that take aim upon meaning but never fire for fear of the certain miss, with tools that act according to rules and structures that lack a normalizing central authority, and with the recognition that the nature of its tools will ultimately dictate the form in which it inscribes survival.

Take for granted the first explanation for survival inscribed in <u>Instant</u> by the title

of the volume, <u>Demeure</u>, that included Elizabeth Rottenberg's English translation of

Blanchot's story. As Rei Terada points out in his 2001 review, the word *demeure* was

drawn from multiple moments in <u>Instant</u>, and translates to "residence," "abode,"

"permanently" and more tellingly, "remains" (Terada 132). <u>Demeure</u> frames <u>Instant</u> and

the survival it narrates as a text about the sites where people once lived. Superficially,

that site is conveyed within <u>Instant</u> by the figure of the chateau as it reappears throughout

the text to different purposes.

The chateau first appears as a refuge, "à des hôtes qui sans doute demandaient

secours" ("to guests who were presumably asking for help") (Blanchot 2/3). But that

facade quickly changes in the next line with the arrival of a howling Nazi. That speed of

revision, in which the expected status of a defined object in <u>Instant</u> unexpectedly changes

state from safe to dangerous, from refuge to a place of threat, from threat to an

explanation for survival, is indicative of the way this text produces meaning. Sudden

state changes also indicate the text's dependancy on a theory of symbolic representation,

and gesture towards the eventual medium-specific reason for survival.

Demeure also references remains, both directly towards the remainder of a

process that can never be fully resolved, and tangentially towards the corpses and

unbound emotions that litter <u>Instant</u>. "Demeurait cependent," ("there remained") (6/7),

the text informs its readers, "le entiment de légèreté que je ne saurais traduire" ("the

feeling of lightness that I would not know how to translate") (6-8/7-9). Translate from

what language, and into what language? Remained after what was taken away from what

original? The text leaves these questions unasked, in part because the remainder persists

as that uncomfortable object that refuses to fit in an otherwise orderly narrative.

Instead, the text represents survival as a process that creates a remainder, a thing which is left behind, which cannot be bound to a narrative, and which cannot be erased. That remainder is screened by survival, much like the text's multiple explanations screen the text's theory of language. Survival becomes the story constructed to disguise and bury the remainder, in this case the unnameable feeling of lightness. Yet that lightness will dictate the form of survival constructed by this text as strongly as the text's theory of language dictates Instant's eventual explanation of survival as accident. And so, the remainder abides as a palimpsest upon which the author attempts to write the narrative of his survival. But this palimpsest refuses the adhesion of writing, of memory. The unknowability of this palimpsest of the remainder is directly named as beyond the capability of the text to understand, or even name: "ce sentiment inanalysable," ("this unanalyzable feeling") (8/9). In this figuration, survival becomes the process of an erasure, and Instant, Blanchot's textual narrative of philosophy and history whose goal is to in some respect bring that hidden surface back into relief so as to allow the needed composition of a narrative of survival.

The text offers another superficial explanation for survival in the floating nationalities of the firing squad. When governed by the Nazi lieutenant while first taking aim upon the young man, they are "ses hommes" ("his men") (4/5). They are "Les Allemands ... prets a demeurer ainsi dans une immobilite qui arretait le temps" ("The Germans ... prepared to remain thus in an immobility that arrested time") (ibid.). Note here the return of the remainder in the form of *demeurer*, bestowing upon the soldiers, in

this line at least, an invulnerability to the passage of time and the connotation of faithfulness. That invulnerability figures these soldiers as *his* instrument of death, bonded by faith to both their lieutenant and their victim. Their atemporality, invulnerability, and faithfulness to the victim transcend the immediacy of national origin to rewrite them as the first encounter with a death that Blanchot will ultimately place outside of his young man. "Comme si la mort hors de lui ne pouvait désormais que se heurter à la more en lui" ("as if the death outside of him could only henceforth collide with the death in him") (8/9). Yet that collision is one destined to be missed as certainly as the execution cannot take place. The text must always fail to completely encapsulate its objects through description, thus demanding that these two immortal deaths orbit each other in the ambiguity of the text.

That invulnerability works in a myriad of strange ways, but is suspended almost as quickly as it is assigned. The text's inability to compose an explanation for the why of survival provokes its inability to accurately and permanently fix the floating signifiers it relies upon to compose the narrative. The text's necessary naming and renaming of objects extends beyond the Chateau to the figures of the Nazi lieutenant, as his language escalates from "timidement" ("timidly") (2/3) to "hurlement" ("a howl") (ibid.) in the space of three lines. No figure in this text allows itself to be fixed, to remain in place, except for the final pre-determined encounter of the death inside with the death outside.

Aux yeux des Russes

When the German soldiers are released from their lieutenant as he leaves the text

to explore a nearby explosion, their nationality shifts, and presumably so does their stance as being[71] outside of time. "'Nous, pas allemands, russes'" ("'We're not Germans, Russians.'") (4/5). This change of nationalities is significant for two reasons. Firstly, this change reinforces the disconnect from the Nazi lieutenant that began when he left the scene. That disconnect denies a reading of the soldiers as merely an extension of the officer's will, seamlessly performing his ordered actions. This separation between the soldiers and the lieutenant will later return as the device that enables for the construction of meaning, narrative and character within Instant, as well as the primary source of the medium-dependant explanation for survival. His role in the soldiers' construction of the young man as the human target parallels the role occupied by the machines that aggregate the three source images in Bullet-Time cinematography. With him absent, there is no device capable of fixing the significance of the rules and words relative to the young man.

Secondly, changing their nationality reincorporates them into the flow of time. The narrative ceased at the point when the Germans arrested time, and began again on the next line with a simple, interruptive, "[m]ais voici" ("[t]hen") (4/5). This interruption prevents the reader from permanently recognizing in the soldiers "la mort hors de lui" ("the death outside of him") (8/9) because that death is a remainder of an encounter that persists interminably, recurring as a wound in time and being that refuses to heal. If time

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[71]Not beings, as the soldiers are a monolith, presenting one face, performing one action so long as they are German, so long as they are the lieutenant's men. Even separate from the lieutenant the soldiers still act as a single being. But as soon as they speak and rename themselves, they fragment. "[Q]ue l'un d'eux s'approcha," ("[O]ne of them approached") (Blanchot 5/6) the survivor testifies, "nous," ("we're") (ibid) the one emphasizes.

were to stop, "then" would never take place. One would exist forever in a shorted circuit of "now." Much like in the floating pause of Trinity's rise during the first Bullet-Time sequence in <u>The Matrix</u>, "then" must await until time's resumption, until the moment of integration. The text arrests time, then quickly, one word later, resumes it. Both the arrest and the renewal in <u>Instant</u> are enabled by the figure of the soldier as they take aim, interminably, and then step forward, breaking their collective immortality.

Yet that simple *mais voici* also translates to "but here." This alternate translation, one used by Rottenberg in an unpublished draft of <u>Instant</u> that was later discarded, creates an even more direct refutation of the soldiers blind subordinance to the execution machine run by the Nazi. They exist outside of time, immobile, "but." In that word the contrary position is established. Contrary in this instance connotes independence: the unified firing squad fragmented into unique soldiers as "one of them" breaks rank and approaches. Framing the soldiers as capable of independent action directly contradicts their earlier group tendency to accept orders and take aim. Except, that more accurate translation presents an even more complicated moment.

Translating *mais voici* to "but here" emphasizes the next utterance as something coming from an outside, as a statement exterior to whatever was taking place prior to that word. The text takes advantage of that meaning to problematize the soldiers' ambiguous status: both individual, discrete, merciful, and temporary; and systemic, collective, threatening, and immortal figures outside of time. As the soldiers in this reading analogize the manner in which this text uses symbolic representation, <u>Instant</u> uses this ambivalence to problematize reference and preview a textual trajectory of survival.

Shifting the soldiers' nationality begins a second process to explain and narrate survival. First, the shift labels the soldiers in a way which allows for the character, the narrator, and the reader to accept the possibility of the mercy that follows. To imagine Blanchot placing the source of mercy and therefore survival at the howling mouth of the Nazi lieutenant is unthinkable. That character functions in this text like a logical machine, calculating the significance of signs and applying rules and labels to order the objects of the text. This model of a logical, rational reading of texts provides one the capability to accord the proper historic and philosophical significance to signs like 1807, the date inscribed on the chateau.[72] That moment of logical reading is used by the text to explain how the building survived. No such interpretive reading exists as a rationale for the survival of the young man.

To imagine a schism between the signifiers portrayed as "his men," who act only according to rules is equally unthinkable. But "his men," his words, no longer belong to him. Texts that begin character descriptions by drawing attention to the use of "français honteusement normal" ("shamefully normal French") (2/3), create gaps based on linguistic difference. Between soldier and officer the national, and hence linguistic barrier effectively conveys the unbridgeable, formerly invisible gap between order and obeyance, between command and action, between aim and execution, and between naming and being. This explanation for survival continues, further refining the

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[72]For a text as short as Instant to accord one-half of a page to discussing Hegel, Jena and Napoleon, and the respect these figures deserved in the eyes of the lieutenant is significant. It demonstrates that there is a synchronicity of thought between the young man and the lieutenant around the cultural heritage named by the date, 1807. Both are capable of logical, contemplative readings even in traumatic times.

description of the Russians, naming them part of the Vlassov Army.[73] Resignifying

reinforces the reader ability to believe in the text's next two moves, both of which are

key to developing Instant's linguistically based narrative of survival.

The first of those strange moves is entirely linguistic, and relies on the one

Russian soldier performing a symbolic act that is the performative inverse but equivalent

in power to Goethe's Faust conjuring the *erdgeist* by drawing a symbol. In Faust's

summoning of the earth spirit, one has the act and figure in which to read the mechanism

by which the immaterial becomes manifest. This one Russian soldier will reverse that

act, and use the same mechanism to perform an erasure.

"[E]t, dans une sorte de rire: 'armée Vlassov,' il lui fit signe de disparaître./ Je

crois qu'il s`eloigna" ("[A]nd, with a sort of laugh, 'Vlassov army,' made a sign for him

to disappear./ I think he moved away") (4/5). The Russian's gesture and self-renaming

affect the young man so powerfully they obliterate his sense of the real ("le sens du réel")

(4) and the narrator's ability to descriptively follow the young man.   Reducing the

narrator's ability to describe to the mere guess of "I think" conveys that the Russian's

renaming obliterated the potential for any comprehensive narrative of that moment, even

50 years after the event. Obliterated is the only word that conveys the force of a sign that

can sufficiently preserve its power over that gap between event and narration to still deny

naming.

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[73]Composed of Ukrainian, Cossack, and Russian POWs captured by the Germans, and commanded by General Andreij Vlassov, himself captured in 1942, the 20,000 soldier ROA (Russkaya Osvoboditelnaya Armiya) collaborated with the Germans on both fronts. Late in the war, many soldiers in the ROA fled west, hoping to surrender to American, British, or French forces, rather than to Stalin and the Russian communists their General was fighting against.

In that gap between the instant when the shooting was but to come and the moment when the text recovers its sense of the real, a sign was made that neither the young man nor his elder self as narrator can describe. It functions prepositionally to the character, forcing him from the page into a space of absence. Survival is given in that moment, given by the soldier to the young man, given by the text to us in the figure of an unreadable, unwritable sign. Survival occurs in that moment because of a symbolic gesture by one soldier who broke the line and performed as symbolic representations always perform. That sign created a gap in narrative and the young man's real into which he fell, a fall from which he later reemerged changed, immortal, unable to die because he had internalized death in that missed encounter with signification. In this moment, the young man's narrative of survival falls into the medium.

The text binds another explanation for survival to the executioners' status as Russians. Instant unambiguously links survival to nobility through the middle term of the Russian's eyes. "N'était vivant que parce que, même aux yeux des Russes, il appartenaità une classe noble" ("He was only living because, even in the eyes of the Russians, he belonged to a noble class") (6/7). Superficially, this explanation begins with the Russians political status as members of the Vlassov Army. Presumably, if they were anti-Communist, they were czarist, and capable of appreciating nobility. This explanation also reinforces the text's historical and philosophical explanations for survival. Every character around the survivor appears to recognize his and his Château's historical and philosophical significance. The text connects those two figures to Napoleon, Hegel, nobility, Jena and the difficult work of literary production and

Blanchot through the final figure of the lost manuscript. In those Russian eyes this connection is built, and the young man is read relative to his various significations. Nobility serves as one label used by the young man in his interpretation of what took place in that moment. Nobility names the force that allowed for Russian eyes to witness survival. That name is as superficial as any other offered by Instant.

Survival connects aetiologically to a mechanism far more significant than the screen of nobility created by the logic of a traumatic narrative and the character of a traumatized young man. What we read here is the analogical structure written 50 years after the primary trauma, a structure dependant upon deconstructive theories of representation and language. Survival at the end of the Russians' eyes connects not to nobility, mercy or an accident of history, but to the sign of the text, the sign of the medium, and the sign of Blanchot's language. Much like Bullet-Time uses the camera eye to inscribe a theory of new media history and representation into the traumatic moment, Instant uses the Russians' eyes to convey its theory of old media representation into the same class of moment.

"[A]ux yeux des Russes," ("[T]he eyes of the Russians,") (6/7) the text tells us. Given multiple Russians, multiple eyes only makes sense. This multiplicity of eyes indicates something other than a historical fact of many men, each staring at the young man with their two eyes. Instant is filled with moments of visual recognition. The young man witnesses bloated horses and burning farms, the Nazi lieutenant spares the house because he sees a manuscript and because he sees the date 1807, he shows the reader bullets and casings, the traces of war. This moment of survival is packaged as one more

visual recognition; a recognition of nobility linked to survival through the interpretive eyes of the Russians.

But that line cannot take place until after their disaggregation from "his men" to the plural Russians. Prior to that, the singularity of their vision is unified under the command of the Nazi lieutenant. To reverse this formula would yield the "Russians' eyes," and thus begin to aggregate the Russians back to the monolithic immobility they possessed as the lieutenant's men. Then, one may read "the eye of the Russian," or "the Russian's eye," a reading that emphasizes the tropological nature of the "eye" over its numerical reality as "eyes." That singular "eye" emphasizes the unified perspective implicit in the young man's assessment of the other's perspective. The text unifies the Russians into a singular visual mechanism when it aggregates them as "his men," and then when the young man ascribes to their eyes a common viewpoint, a common understanding. The eye gets read in this moment as a mechanism of analysis and as a device that enables the performative gesture of the Russian's sign. That gesture culminates the process of interpretation that transforms the object of the Russians' gaze. That interpretative sequence of Russians, survival, eyes, nobility is itself a culmination of the narrative and the theory of representation of the text embodied by the relationship among the Nazi lieutenant, the young man and the firing squad qua Russian revolutionaries.

"Le nazi mit en rang ses hommes pour ateindre, selon les règles, la cible humaine" ("The Nazi placed his men in a row in order to hit, according to the rules, the human target") (4/5). The rules of an execution function like a grammar in this text,

ordering objects so that each might perform a given function of description. Rules occupy the performative middle position between subject and object, organizing the textual bodies so that each can occupy its proper position. These rules, inscribed by the Nazi into his men echo the manner in which symbolic representation constructs characters.

Each soldier stands like a word taking aim upon an object. Each soldier, each eye, reconfigures that object with each gaze. As soon as the rules are engaged and the soldiers form into a row, the young man transforms into the human target. As each word gets sorted through a reader's eyes to the container that bears the label of a given object, that object takes shape.

The rules that organize the Russians are familiar to readers, because they describe the process of reading and the structure of symbolic representation. Each stands in a row, like a word, taking aim upon its designated target. Some aim towards the Nazi lieutenant. Some aim at the split figure of the young man and the narrator's "I." Some aim at survival. This process of constructing ideas and figures through selective aggregation parallels the process of interpellation, in which appellations are recognized by a target as applicable to the self. Recognition of a term's applicability creates for the self a subject position relative to the one calling out. In that recognition, the subject is enabled and constituted. Interpellation was developed to describe subjectification in political contexts, thus it focuses on the mechanisms by which the state communicates viable modes of being for law-abiding citizens.[74] In both processes there is an inherent

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[74]For the political discussion of interpellation, see Louis Althusser's "Ideology and Ideological State Apparatuses" in Lenin and Philosophy and Other Essays.

ambiguity as to what constitutes "proper" naming.

The young man of <u>Instant</u> exemplifies this dual process, accepting without challenge his interpellation as "the human target," a subject position built for him by the rules dictated by the Nazi, the author, and language. The young man takes his position gracefully, going so far as to offer the obligatory last request at the moment when the shooting was but to take place: "Faites au moins rentrer ma famille," ("at least have my family go inside") (4/5). That request, his final request, symbolizes the completion of the executory interpellation and the young man's acceptance of the ordering that enabled it. Blanchot's orderly assignation of the process of rules, young man, human target, final request and the reader's acceptance of this description as factual auto-biography reinforce the power of this dual naming, a naming subverted by survival.

So long as the lieutenant stands there shepherding the process, characters are built, "according to the rules." This rules of this process are the textual analog to the composition of character in Bullet-Time. Each system of meaning produces discrete units aimed at a common focal point. That point is the creation of character and narrative at the moment of a near-execution. And in that shared moment, each throws representations. From Bullet-Time, readers are provided three distinct media, each of which provided individual image frames. Those media have been normalized, translated into their digital equivalents so that they might be combined in novel ways and so that the differences between them can be erased. Normalizing the media stream allows for the machine to aggregate the otherwise unrelatable frames into a unified vision of the character as survivor, into a unified, single media stream. Yet in <u>Instant</u>, no software

works to create the virtual interpolates that plug the gaps between the limited perspectives of still and film visuals. Instant relies upon readers to bind the discrete units of the text into a figure of the survivor. To ease the difficulty of navigating this process, and to complete the textual analogy of this theory, Instant places a figure within the text upon whom the reader must model the interpolative action that links word to word and meaning to object.

Within the text, both the reader's and Blanchot's impossible positions of interpolation, interpellation, interpretation and authorship are occupied by the Nazi lieutenant. Etymologically, and as a rank, lieutenant designates the "one who takes the place of another; usually, an officer or military who acts for a superior; a representative, substitute, viceregent" (OED).[75]   The Nazi functions in lieu of another figure, force or process. Superficially, he stands in for the machinery of the state that has effectively assigned him the label and ideology of fascism. Yet this character figures the work of both reader and author, constructing meaning from names, directing the action of the soldier-words, finding texts and focusing attention. As repository of rules, and interpreter of meaning for "his men," the superior most directly represented by this figure is the set of rules that govern symbolic representation, and thus, survival in Instant. He fulfils this role principally while governing the synthetic eye of *ses hommes*.

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[75]During World War II, a Nazi lieutenant would either have been an *Oberleutnant* or *Obersturmführer*, depending on whether he was military, or para-military, such as *Schutzstaffel* (SS) or *Strumabteilung* (SA). Given the emphasis the text places on his political status over his national status, one can conclude the latter more accurate, and that his Vlassov unit numbered the typical amount for a lieutenant's command: 50-100 men.

The Synthetic Eye

Synthetic viewing makes possible the soldiers' unifying transformation of the young man to the human target. It makes possible, in the narrative, the proper assignation of meaning to each figure in the text relative to the young man's survival, and enables the reader's correct interpretation of the status and meaning of each of those figures. Synthetic viewing draws together the disparate elements that constitute each character, and from those elements creates unified wholes. This concept is one we are familiar with, as it functioned similarly for Bullet-Time cinematography in The Matrix.

Each contributory media stream was synchronized to a digital substrate, then aesthetically normalized for tone, hue, framing and other visual elements. Those media streams were combined, and an illusion was created for the viewer that these three distinct subjects depicted in these different media were in fact the same subject.[76] What emerges from that composition is a subject unique in the world of survival. Their subjectivity, which had been fragmented by the traumatic moment into the strange temporality evinced by the young man of Instant, has been unified. What enables that composition is the machine that synchronizes and aggregates the stills, frames and fields from the contributory media streams of Bullet-Time. That machine governs the subject viewers eventually see, ensuring that they only see the figure in its composite, illusory

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[76]"Subject" functions similarly to the psychoanalytic concept of "self," as defined by Edith Jacobson in The Self and the Object World. "[T]he whole person of an individual, including his body and body parts as well as his psychic organization and its parts. ... an auxiliary descriptive term, which points to the person as a subject in distinction from the surrounding world of objects" (6). What matters from this definition is the way it situates subject and object, contextualizing elements of the subject, or self, against the backdrop of the world. This definition also includes both the representations of these contributory elements to the subject, such as body and mind, and some concept of a real self to which those representations refer.

form. That machine functions as the computational double of the Nazi lieutenant as each tries to govern the reading of their audience.

So long as the lieutenant stays in place, governing the reading of his men, then they read subjects and objects the way his force demands. Under his governorship, traditional rules of signification apply, referents always hit their mark, and the young man remains permanently the human target. Each soldier's eye, each word of the text works in unison to define and present singular, unified subjects, archetypes of the scene of an execution. However, the lieutenant's position is impossible, and so the text forces him from the page to heed the call of distant symbolic warfare. Even upon his return to the text, his position is marked as impossible. He tries to return order to the scene, to understand and narrate the young man's survival. But by then synthetic reading is impossible, and all the lieutenant can do is force incorrect readings of subjectivity on the text and on the soldiers. His misreading is so fundamental as to continue shifting the name of the young man from "human target" to "young chatelaine" ("jeune châtelain") (Blanchot 7/6). This misreading suggests "a female castellan" (OED), a reading not supported by the French, but present in its translation. Chatelaine is a title gendered female, and in that appellation, the Nazi lieutenant interpellates the subject, transforming young man to young woman. In that subtle flaw, one begins to see the complete breakdown of the machine that governs subjectivity and reading, a breakdown precipitated by departure.

In that departure, in the shutting off of the machine that governs our reading, the soldiers disaggregate, the young man spins out of control, the media streams that

contribute to Trinity's survival separate, and the delicate process of character composition falls apart. Each Russian eye as word begins to see a different young man, a different reason for survival. And in the now unbridgable distance between those eyes a processing delay begins to take shape. The Russian eyes now capture unique, unassimilable aspects of the young man's death and survival.

Writing, symbolic representation must fail to capture each of those aspects in the brief four pages of Instant. Arguably, even had Blanchot written 122 pages, one for each of the Russian eyes, the technology of writing does not have the power to assimilate each of those distinct perspectives. It can present them, possibly, but not unify them into a single subject. "The shooting" embeds itself in the text, as does the beginning and end terms of the executory process: the rules arranging the men and the target, the last request, the fall into survival. But the delay now placed between those perspectives resists description, except as a delay between the occurrence of an event and the experience of the event. That delay corresponds to the delay written into Winnicott's earlier definitions of "happening" and "experience," and to the temporal structure of the traumatic event as one which takes place, but remains unexperienced by its resistance to narrative description. That delay gets written into the subject of the survivor.

Delay from image to image, a feature prominent in Muybridge's zoopraxiscope and visible in the harsh boundaries and staccato movements between frames is written into Instant, but effaced from Bullet-Time. Effacing the delays between images also effaces the gaps between images, and thus the gaps and delays between subject positions. That effacure unifies the subject of the survivor in Bullet-Time, but it is beyond the

subject's ability to control. As the kick and her survival manifest, she loses control of the

moment. Control of the kick passes from subject to camera, and from camera to

computer as it interpolates the middle terms between the visible moments of her action.

As it erases delays and gaps, the computer's vision of survival overwhelms the scene, the

woman and the viewer with its capacity to process the information and present a unified

conclusion. "Only human" (Wachowski 109), says Agent Jones, the exemplary pinnacle

of the human-form technology of The Matrix. "Only human" implies that the space

between times, the space of "l'infini qui s'ouvre" ("the infinite opening up") (Blanchot

8/7) into which the literary survivor accidentally falls, is a space that belongs to that

which is not human: to the Nazi lieutenant as he stands in for the force of a language

complete with transcendental signifiers and to the interpolatory machine as it unifies the

split subjectivity of the survivor. That space of infinite accidents and infinite synthetic

potential belongs to Agent Jones, to The Matrix's version of the Nazi lieutenant.

Machines alone enjoy, in this argument, the comprehension necessary for a full

exploitation of times between images: an argument contaminating the film from

screenplay to enabling technology.

But as that saturated focal point opens up to an increasingly complex set of visual

Both texts recognize their position on the border between "only human," and only

machine. Each position contaminates the other until neither exists and the spaces

between times open up either to the inexplicable accident of survival, or to the one who

can exploit those spaces to survive through force of will.

But as that saturated focal point opens up to an increasingly complex set of visual

technologies one becomes increasingly aware of the paranoia regarding youth, death,

time and age at the core of these representational strategies. As the 122 Russian eyes

transform into the six still cameras of Muybridge and the 122 still cameras used to

capture Trinity's opening kick, and as those 122 cameras are seeded with virtual,

interpolated camera perspectives, one begins to see an infinite ring of cameras

surrounding every event. While this ring originates in Muybridge's human desire to

understand motion and Gaeta's desire to atomize and represent a complete temporal and

spatial event, Bullet-Time primarily testifies to the technology's desire to fix the full

content and form of the near-execution. The woman, Trinity, kills a man with this kick.

Her kick pauses, because the technology has made that pause possible, and because it

demonstrates "a specific fear of death" (Winnicott 92) in its obsession with the moment

prior to impact: the moment where the kick, like Blanchot's shooting "was no longer but

to come."

But recording the event in this unique, comprehensive manner fails to capture the

event. Interpolating a woman who never existed between the images of a woman who

did not only fails to explain survival, but succeeds in executing the woman as surely as

mechanization eliminated the factory worker. She disappears in a moment similar to the

disappearance of the young chatelaine, a disappearance into a space where she loses her

sense of the real. And what returns is a simulation of what the interpolating machine

imagines survival might have been, had anyone survived.

Ultimately, both texts write of a fragmentation and erasure of the subject at the

moment of survival. In Instant, that erasure can only be bracketed, gestured towards, in

the accidental nature of survival dependant upon symbolic representation. The subject

which survives in <u>Instant</u> is therefore fragmented, confused and separated from his own

temporality, permanently young, old, dead, alive and completely bereft of answers.

Bullet-Time films a spectacle of survival, erasing the survivor beneath the weight of a

simulation that testifies less to the nature of the survival it depicts, and more to a denial

of ambiguity. Bullet-Time, like other digital technologies, fears and resists ambiguity in

every level of its being from logical computation to positional visualization. The subjects

constituted by it are as marked by the technology of their production as the young man

was marked by the text. And so viewers witness Trinity as she falls into the air, floating

in the oversaturated focal point at the center of her filmic apparatus, falling into a

survival marked by an obsessional fear of the unknown, and an overwhelming need to

both deny and answer the question, why didn't I die?

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