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This dissertation explores the relationships between literacy, technology, and bodies in the emerging media of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). In response to the recent, rapid emergence of new media forms, questions arise as to how and why we should prepare to compose in new digital media. To interrogate the *newness* accorded to new media composing, I historicize the literacy practices demanded by new media by examining digital texts, such as video games and software applications, alongside analogous “antiquated” media, such as dioramas and museum exhibits. Comparative textual analysis of analogous digital and non-digital VR, AR, and MR texts reveals new media and “antiquated” media utilize common characteristics of dimensionality, layering, and absence/presence, respectively. The establishment of shared traits demonstrates how media operate on a continuum of mutually held textual practices; despite their distinctive forms, new media texts do not represent either a hierarchical or linear progression of maturing development. Such an understanding aids composing in new VR, AR, and MR media by enabling composers to make fuller use of prior knowledge in a rapidly evolving new media environment, a finding significant both for educators and communicators. As these technologies mature, we will continue to compose both traditional and new forms of texts. As such, we need literacy theory that attends to both the traditional and the new and also is comprehensive enough to encompass future acts of composing in media yet to emerge.

FROM CORPOREALITY TO VIRTUAL REALITY: THEORIZING LITERACY,
BODIES, AND TECHNOLOGY IN THE EMERGING MEDIA
OF VIRTUAL, AUGMENTED, AND MIXED REALITIES

by

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CHAPTER I

INCORPORATION: SEEING, READING, AND COMPOSING AS LITERACY

Literacy in an Era of Rapid Textual Change

In 2015, the Oxford Dictionaries Word of the Year was not a single word, but the “Face with Tears of Joy” emoji (see Fig. 1), an ideogram designed for smartphones and instant messaging clients to express emotion or to convey facial expression. Although the Oxford Dictionaries Corpus had found a three-fold rise from 2014 to 2015 in usage of the word “emoji” (a term used in English since 1997), the Dictionaries chose only a single pictogram to signify “the ‘word’ that best reflected the ethos, mood, and preoccupations of 2015.” To select that particular electronic ideogram, Oxford University Press partnered with SwiftKey, a developer of auto-correct and predictive text smartphone app software, to identify the Tears of Joy emoji (see Figure 1) as the most used globally. In 2015, SwiftKey reported that particular emoji made up 20 percent of all emojis used in the UK and 17 percent of those in the US, and had risen from 4% and 9% respectively in 2014.¹ Not surprisingly, the decision faced criticism. *The New York Post* responded to the news with a video featuring emoticons, prior words, and interviews with everyday speakers under the headline “Word of the Year proves that we’re dumber than last year.”

¹ SwiftKey found culture-specific tendencies in the usage of Emoji, which reveal links between culture and visual meaning, something that merits future additional analysis.



Figure 1. Tears of Joy Emoji.

Note: This image may also be used using the Aurasma app to view additional data.

In a similar vein, although writing a few months before the Word of the Year news, *The Guardian* art writer Jonathan Jones argues that emojis as a communication tool are a sign that humans are “evolving backwards.” He compares emojis’ similarity to Egyptian hieroglyphics, which he argues enabled the Egyptians “to write spells but not to develop a more flexible, questioning literary culture: they left that to the Greeks.” Jones argues for the productive capabilities of letters and words over images, claiming the Greek alphabet was more “productive,” enabling Greece to “leap forward.” Indeed, he claims alphabetic language was “why Shakespeare was more articulate than the Aztecs”²: “That is why there is no ancient Egyptian *Iliad* or *Odyssey*. In other words, there are harsh limits on what you can say with pictures. The written word is infinitely more adaptable.”³ While I will return to comment on Jones’ perceptions on historical cultural literacy superiority, his comments evoke the contemporary conversation about changing communication practices.

² Jones’s comments resonate with an on-going perception of visual writing as inferior to alphabetic writing. Walter Mignolo links alphabetic writing with the exercise of power, social organization, and political control, specifically looking in the New World, noting that Europeans did not recognize the visual writing systems as literacy, nor their visual textual systems, which lacked letters, as recording, producing, and organizing knowledge.

³ Note: The *Iliad* and *Odyssey* are not italicized in the original, although this may be because of their hyperlinked status.

Indeed, the conversation about the relationship between words and images reaches beyond that of journalists engaged in cultural critique. A middle school teacher who took a graduate linguistics class with me posted recently on Facebook:

Early civilizations used pictographs. . . . Then, there was the Phoenician alphabet and the development of various scripts including the Latin script and the Greek alphabet. We could form words, and these words had sounds, and this was a sign society and humankind was advancing, particularly in the realm of written communication/record-keeping. Now, however, I scroll through FB and half of the “written” texts I see are emojis. So, let me get this straight. We spent thousands of years developing ways to write and communicate more clearly, and now we are, once again, communicating ideas with PICTURES?! *shakes head*

Just as with Jones, this teacher’s comments, along with comments I’ve heard from other teachers and professors, represent the sense that our language practices might be returning to earlier styles of communication, as well as the anxiety that this might represent a regression.⁴

These textual changes surrounding visuals have been made possibly by rapidly evolving composing technologies, supporting increased image usage in alphabetic texts or placing visuals as primary communication media through applications such as Instagram and Snapchat. Theorists such as Cynthia Selfe warned us in 1998 and 1999 to pay attention to the links between technology and literacy. Subsequently, she has detailed various forms of multimodal expression, aided and supported by recently developed

⁴ Jay Bolter posits that our “electronic writing shares qualities with both postliterate and preliterate picture writing. By combining alphabetic writing with images and diagrams, Web and CD-ROM or DVD designers are defining the computer as a writing space that vacillates between intuitive and abstract modes of representation” (61). Bolter might also remind those complaining about emoji of the association of icons with modern GUIs (62). And he would complicate the discussion with a reminder of Middle Ages manuscripts: “Like computer icons, medieval illuminated letters functioned simultaneously as text and picture. Medieval illumination threatened to turn letters back into images or abstract designs and sometimes made the letters all but impossible to read” (65).

technology, differentiating between their correspondent literacies and those of what she terms “alphabetic literacies” (“Taking Up”). Other literacy scholars, including the 1996 New London Group, Gunther Kress, Gregory Ulmer, and James Inman, have sought to develop theoretical approaches that account for the kinds of texts and textual practices that new technologies can create. I situate my discussion of literacy in this on-going conversation.

Just before Selfe issued her warning about paying attention to technology, the 1996 New London Group likewise similarly advocated new theory recognizing changes in society and text by developing their theory of “multiliteracy.” The theory addresses the multiplicity of literacy as it encompasses linguistic, visual, audio, gestural, spatial, and multimodal modes of communication (Cope and Kalantzis 7). The New London Group posits this term as an expanded approach to “‘mere literacy’ [which] remains centered on language only, and usually on a singular national form of language at that, which is conceived as a stable system based on rules such as mastering sound-letter correspondence.”⁵ Looking back in 2009, Cope and Kalantzis reflect that during the group’s original work in the mid-1990s email was new technology, the web was barely known, and technologies such as iPods, wikis, blogs and SMS messages were not even nameable (167). Despite the group’s inability to predict these specific technologies, Cope and Kalantzis find that their pedagogy of multiliteracies, one that posits the necessity of more than a singular alphabetic literacy, remains relevant over a decade and a half after their initial work.

⁵ The 1996 New London Group’s perception of “mere literacy” corresponds somewhat with Selfe’s “alphabetic literacy.”

Much as the New London Group's responds to new textual capabilities in changing global and technological contexts, Gregory Ulmer promotes understanding digital communication's rise and impact upon communication. In *Internet Invention: From Literacy to Electracy*, Ulmer theorizes a specialized literacy that he terms "electracy," which is "to digital media what literacy is to print." James Inman promotes *electracy* as a supra-theory in which text encompasses more than words on a page:

It is important to distinguish electracy from other terms, such as computer-based literacy, Internet literacy, digital literacy, electronic literacies, metamedia literacy, and even cyber-punk literacy. None of these other terms have the breadth electracy does as a concept, and none of them draw their ontology from electronic media exclusively. (52)

Inman points here toward two important ideas. First, multiple literacy terms have proliferated to address the impact of changing technology's impact upon textual production and consumption. Second, like Ulmer, Inman finds necessary distinguishing the literacy supported by digital technology from that engaged by composing and/or reading in non-digital technology.

As Selfe, the New London Group, Ulmer, and Inman advocate, I believe we should continue to examine the impacts of new technologies upon literacy. Doing so helps us understand technology's interactions with textual production and consumption, an important project given the rapidity with which new software and hardware arise and offer continually changing capabilities. Further, examining how new technology impacts literate practices helps us understand literacy outside those contexts.

I offer here a continuum-based theory further to resist implications, even if implicit, of any narrative of progress: engaging with literacy in digital environments is not somehow more advanced or superior to engagements with literacy in the non-electronic media, nor are digital expressions, such as emoji, a regression of literate human expression. I counter the trend that Jason Palmeri notes in which “advocates of the ‘multimodal turn’ in composition have been telling a very persuasive and influential narrative . . . about how and why we must move beyond our historic focus on alphabetic literacy” (1). I argue in my textual analyses of reality media texts that we can never move beyond alphabetic literacy as we pile up new literacies. I suggest that any theory that encompasses the future of composing must also cast a retrospective gaze at past literacy.

Like Ulmer and Inman, I see that literacy theory must address digital productions; however, my theory embraces all forms of production—digital and non-digital. Literacy theory should not distinguish literate knowledge, skills, practices, or attitudes based on location or medium of production or consumption. Digital-only (or digitally-focused) theories of literacy minimize or erase how texts created using non-digital literacy and media have also possessed similar complexities of expression and technology usage. Theories of literacy that elevate the digital risk not valuing the inclusion of traditional alphabetic literacy in the digital. Finally, if we create theories of literacy that focus on particular technologies, our theories risk becoming as obsolete as communications technologies continually change.

New media do not necessitate a separate understanding of reading and composing practices, as I will demonstrate in comparing a variety of new media and non-digital texts

that I refer to as “antiquated media texts.” I argue here that we should understand the processes of composing and reading texts in new media as operating within a continuity of existing literacy practices. Examining reading and composing through historic and emerging texts and practices reveals that new media texts do not necessitate a literacy radically disparate from that used for antiquated media texts. In examining texts through interactions of dimensions, layers, and simultaneous invocations of absence and presence, concepts that I will elaborate on in this larger project, my approach augments our understanding of reading and composing, both for new media and antiquated media texts.

Literacy Theory Framework

While rhetorical theory extends for multiple millennia, literacy is a fairly recent concept. The word fulfills a unique role in the English language. Although the word “literate” dates back to the sixteenth century and possibly the fifteenth century, the term “illiterate” develops in the sixteenth century, and “illiteracy” arises in the seventeenth century. According to the *OED Online*, the word “literacy” originated in the United States two centuries later.



Figure 2. The Rise of the Terms Literacy, Illiteracy, Literate, and Illiterate. This figure provides a comparative examination of the terms “literate,” “illiterate,” “illiteracy,” and the rise in the use of “literacy” over multiple centuries using Google Books data and the Google Ngram Viewer. (Michel, et al.)

Dating only from the late nineteenth century, “literacy” took on the inverse of illiteracy to mean the “quality, condition, or state of being literate; the ability to read and write” (“literacy, n.”).⁶ Since its inception, though, the word rapidly rose in usage (see Fig. 1). Literacy rapidly formed an association with schooling: “Literacy, in fact, was two of the ‘three R’s’: reading and writing (the third ‘R’ being ‘rithmetic’)” (Cope and Kalantzis, “Multiliteracies,” 168).

Having arisen in the U.S., the term literacy lacks exact parallels in other languages or histories. As Gunter Kress notes in “‘English’ at the Crossroads,” the word literacy does not occur in the romance languages or in German, as those languages have more alphabetic-specific terms (67-68). The English term:

collects together a vast and quite disparate range of skills, aptitudes, processes, dispositions and it presents them as though they were all of one kind. These range

⁶ By contrast, the term “illiteracy” dates back to 1660, according to the OED Online (“illiteracy, n.”).

from competence in handling letter-sound correspondence via the competence of producing grammatically and textually well-formed texts, to the competence of subtle understandings of complex text, to the production of “sensitive” responses to aesthetically valued texts. (68)

Recognizing that literacy definitions lead to it being reified as simply one thing—similar to the concern expressed by Ulmer and Inman—Kress then argues for disentangling and discussing separately all the uses and potentials of literacy to examine electronic technologies of communication. I believe, however, that what Kress points to in the term’s expansiveness is a signal toward a theoretical approach that encompasses new communicative possibilities because they arise from a history of past textual practices and thus share significant commonalities with historical textual production—including contemporary texts that are more recognizable as similar to historical forms, such as print books.

As discussed previously, many find problematic how the term literacy proliferated in the century after its development, particularly as an extended term. David Vincent warns that “literacy has become too promiscuous,” resulting in such concepts as “physical literacy” and “emotional literacy” (219). The OED cites the arrival of literacy in combination with a modifying word, such as “computer,” “cultural,” or “economic,” among many examples, as arising just before the middle of the twentieth century, with the changed meaning: “The ability to ‘read’ a specified subject or medium; competence or knowledge in a particular area” (“literacy, n.”). Vincent’s warning resonates with Inman’s list of “computer-based literacy, Internet literacy, digital literacy, electronic literacies, metamedia literacy, and even cyber-punk literacy” (qtd. in Ulmer, “The

Chora”). The pace at which such usages have arisen has only increased as the decades passed.

In this context of terminology proliferation, Anne Wysocki and Johndan Johnson-Eilola also offer caution about the term literacy in connection with understanding and fulfilling tasks: “Too hastily does ‘literacy’ slip off our tongues, we think, and get put next to other terms: visual literacy, computer literacy, video literacy, media literacy, multimedia literacy, television literacy, technological literacy. Too much is hidden by ‘literacy,’ we think, too much packed into those letters—too much that we are wrong to bring with us, implicitly or no” (349). I take seriously Vincent’s caution about overuse of the term. I also endeavor to take into account Wysocki and Johnson-Eilola’s warning about the way the term “literacy” can hide or obscure. As I will elaborate in this project, my holistic theoretical approach to understanding acts of reading and composing endeavors not merely to avoid the hiding or obscuring that Wysocki and Johnson-Eilola point to, but moreover to reveal the depth and range of reading and composing practices in examining them across multiple media.

Most Americans, if asked, would define literacy as “simply” reading or writing words, Erica Locklear suggests. However, most literacy theorists define literacy as plural, as James Paul Gee might say, or as JL Lemke says, as “legion.” Even print literacy, James Paul Gee observes,

is multiple. There are many different ways of reading and writing. We don’t read or write newspapers, legal tracts, essays, poetry, rap songs, and so on through a nearly endless list, in the same way. Each of these domains has its own rules and requirements. The legal literacy needed for reading law books is not the same as literacy needed for reading physics texts or superhero comic books. (*What*, 18)

Further complicating the issue, Gee points out, making an argument that resonates with Kress, is that “language is not the only important communicational system” (*What*, 17). Not only do we have such visual symbols as “[i]mages, symbols, graphics diagrams, artifacts, and many” others, but

words and images are very often juxtaposed and integrated. In newspaper and magazines, as well as in textbooks, images take up more and more space alongside words. In fact, in many modern textbooks images not only take up more space, they carry meanings that are independent of the words in the text. If you can’t read the images, you will not be able to recover their meanings from the words in the text alone—for example, a technical diagram covering cell division in a biology textbook will contain information not fully explicated in the words of the text itself. (*What*, 17)

What becomes clear is that literacy is much more than reading or writing words alone. Kress’s example makes clear that literacy surely involves understanding alphabetic text, as well as images, and the alphabetic and visual in combination, and that even our understanding of the visual must recognize that fullness of visuals as including so many types of images, including “[i]mages, symbols, graphics diagrams, artifacts, and many” others.

Textual Relationships with Technology

Literacy theorists depict literacy in ways that emphasize several broad perspectives. A number of theorists see literacy as culturally bound. Some emphasize its uniquely human quality, defining literacy as that which differentiates us from other life on the planet. For many, literacy itself is a technology. Such notable figures as Walter Ong and Dennis Baron occupy this latter camp. Indeed, Baron points out that literacy has been linked with technology for millennia, from the earliest period of what we understand

to be literacy. Observing that “the first writing technology was writing itself” (“Pencils”), Baron thus categorizes writing as a technology, just as Walter Ong does,⁷ as well as Eric Havelock, Jay Bolter, and Christina Haas. Seeing writing as a technology means that literacy is a transformation of natural resources into tools and that it likewise uses tools to be transformative of reality. As Bitzer says of rhetoric, this transformation takes place “not by the direct application of energy to objects, but by the creation of discourse which changes reality through the mediation of thought and action” (4). In other words, literacy functions as a device to implement functions and to produce change, much like a saw, shovel, lathe, or drill causes tangible real world effects.

While literacy functions as a technology, the relationship between the two possesses an added layer: literacy’s coopting of technology. Considering the impact of computers upon contemporary writing, Baron traces the history of literacy in relation to different technologies, from clay tablets to the printing press to the typewriter to the computer. Indeed, if something so humble as the pencil is a technology, as Baron asserts, it becomes impossible to picture literacy as inseparable from the technology to produce mass human expression. With the exponential rise of new communication technologies in everyday life, attention has returned to the relationship between literacy and technology. Most theorists who consider this link focus on recent technology, such as the computer and similar emerging technologies. Attention cast toward past technology often lands upon the printing press and the transition from manuscript to print culture, but Baron’s

⁷ Ong goes so far as to claim in the opening lecture in the 1985 Wolfson College Lectures at Oxford University that “Writing Is a Technology That Restructures Thought.”

article reminds us of the ranges of technology, including the simple pencil or the wax tablet. It is with such a broad understanding of technology that we should approach a comprehensive understanding of literacy.

These shifts of production technology have also coincided with renewed attention to and anxiety about literacy. In the *Phaedrus*, Plato frets about the nature of writing during a rise in written textual production. In his dialogue, he critiques writing's removed and static nature as inferior to dynamic speech and supposes it to have negative impacts beyond the production, such as by limiting the development of an individual's capacity to memorize and remember. Struggling to collate human knowledge in the 1600s after two centuries of printing press activity, Gottfried Leibniz fretted about "that horrible mass of books that keeps on growing," complaining that "[a] single observation or demonstration of consequence is enough to make one immortal and deserving of posterity" (qtd. in Jolley 61). In 1975, *Newsweek* in its infamous "Why Johnny Can't Write" blamed abundant television watching for Johnny's literacy crisis (Sheills). In 2015, Sherry Turkle blamed social media technology, from Facebook likes to snapchats to IMs for ruining individuals' ability to hold meaningful spoken conversations with one another.

Others see new opportunities in changing literacy technology. In the relatively recent pre-web era of rapidly evolving computer and Internet technologies, Ted Nelson theorized "hypertext" and a pre-WWW alternative to the web called "Project Xanadu." His oft-published *Literary Machines* contains the *subtitle* "The report on, and of, Project Xanadu concerning word processing, electronic publishing, hypertext, thinkertoys, tomorrow's intellectual revolution, and certain other topics including knowledge,

education and freedom,” indicating Nelson’s linking of technology and communication. In his 1990 MLA paper, Nelson claims one of the outcomes of his invention is “a return to literacy,” with the potential for “a new populitism [sic] that can make the deeper understandings of the few at last available to the many (“How Hypertext (Un)does the Canon” 6)” (qtd. in Moulthrop 695). Recognizing Nelson’s great claims for literacy, Stuart Moulthrop proclaims in the pre-Web era, “Gentle readers, welcome to Literacyland!” (695). Twenty years later, popular writer Clive Thompson contends young people are more literate than ever before, providing more opportunities for people to communicate than ever before. None of these technologists signal that this literacy is somehow radically different from that used in the pre-Web era.

Whether or not the proliferation of communication technology has led to our arrival in Literacyland, it has certainly raised questions about what communication counts as literate. For many, the definition of what counts as literacy—reading black text on white pages, such as in newspapers, novels, pamphlets, and so forth—seems frozen to the media available in the era in which the term “literacy” first arose. But as new forms of media proliferate, what else counts as literate expression? Text speak? The emoji? GIF files? Videos? I would contend that new media involve processes of reading and writing, much as those required for the texts such as newspapers, novels, pamphlets, and so forth, commonly accepted as involving literacy to produce and to consume.

New Literacy: The Rise of the Screen and the Return of the Body

A number of theorists have recently addressed understanding literacy in light of changing technology, albeit prior to the emergence of viable virtual reality, mixed reality,

and similar technologies. In an era popularly recognized as having a “visual turn” —one brought about by changing delivery technologies, many have focused on the development of the screen as an alternative or addition to the medium of print communication.

Elizabeth Yancey cites Elizabeth Daley, dean of the University of Southern California School of Television & Cinema, as proposing a literacy of the screen, one that parallels oral literacy and print literacy, becoming a third literacy, which will be required of all undergraduates. In a speech entitled “Speaking the Languages of Literacy,” Daley argues, “No longer can students be considered truly educated by mastering reading and writing alone. The ability to negotiate through life by combining words with pictures with audio and video to express thoughts will be the mark of the educated student” (qtd. in Yancey 305). Echoing Daley’s concern with the screen, Gunther Kress in *Literacy in the New Media Age* (2003) recognizes “the broad move from the now centuries-long dominance of writing to the new dominance of the image, on the other hand, the move from the dominance of the medium of the book to the dominance of the medium of the screen.” Kress argues these two changes “are producing a revolution in the uses and effects of literacy and of associated means for representing and communicating at every level and at every domain” (1).⁸ As these examples suggest, Daley and Kress here argue for literacy understood in terms of media, placing access upon the screen as mode of textual access. Kathleen Welch joins them in forwarding a case for screen-dominated writing

⁸ Kress writes in 1999 that “the ‘screen’ is the new space of representation. How it will be organized whether as a largely visual entity or as a largely linguistic entity will have far-reaching repercussions. It is too early to know, though my money is on the visual. In either case, the effects on representation through writing will be far reaching, though deeply different in each case” (“English” 82).

pedagogy, arguing that we need to “understand the ubiquitous screens of video and the less widespread screens of computers” (6).

While I find value in recognizing the rise in the screen as a new mode of text access, I would caution that such definitions of literacy are too medium-specific. Across the millennia of literacy, paper has given way only recently to screens, but already new technologies beyond the screen are coming. Indeed, emerging technologies have already and continue to evolve haptic (sensory) feedback, even if presently in the embryonic form of vibrating cellphones, smartwatches, and dual-shock game controllers. Because of the accelerating rate of technological change that is resistant to prediction, we should consider literacy as media-independent. In other words, the literacy required to read and to write words on paper or on screen are similar, although the technologies used to produce those words may be different. As an example, we do not consider the process of handwriting or typewriting individually to comprise literacy, although they contribute to the production of literate texts. Similarly, handwriting accomplished using pencil on paper is not substantially different from stylus on touch-sensitive screen. Comparative study can help identify similarities between media capabilities—as well as point out the long history of some of these capabilities.⁹ So, while I acknowledge that much of our literacy these days appears on screens, as Daley, Kress, Welch, and others assert, I suggest that placing too much emphasis on composing for the screen devalues the complex engagements we have had composing for other media, limits theoretical anticipation of rapidly evolving media, and inadequately addresses how media share

⁹ One implication for de-emphasizing media within literacy is considering how and which literate skills can be transferred from one medium to another.

textual features. Further, given the rapidity of technology development under Moore's Law, the screen may rapidly yield to new hardware for producing and consuming texts that we cannot adequately predict.

Thus, recent literacy theory has overemphasized the screen. In part, this theory elides the involvement of the body in interacting with texts, digital or not. Body-text connections have always existed, but such interactions have been so naturalized through long familiarity of working with non-digital texts, such as pencil on paper. Working with new media texts, which support sometimes unfamiliar bodily interactions with digital interfaces, provides opportunities for highlighting body-literacy. Such connections have, of course, always been present. Literacy clearly connects to our physical bodies, through requisite sensory input, whether eyes gazing upon written texts, fingers turning book pages, or hands moving pencils upon paper. The novelty of new media textual interactions accentuates body-literacy engagements, reminding us of connections between the body and textual production and consumption.

Such awareness occurs during textual production transitions. In describing the shifts from primary orality then to print-based and next to secondary orality societies, Ong reminds us of the bodily senses affecting the acquisition and production of texts. Ong observes that in primary orality, society is a hearing-based sensory world. With the arrival of print, society shifts to a visual-dominant sense world; with the emergence of telephone, radio and television and secondary orality, hearing reappears in the sensory world. Such sensory interaction becomes highlighted as new media texts arise that purposefully engage our senses. For example, as new media texts begin to integrate

tactile interaction and haptic feedback, we are aware of the body connection to texts while such interactions remain novel. Recognizing these connections in his new media literacy theory, Ulmer observes,

What literacy is to the analytical mind, electracy is to the affective body: a prosthesis that enhances and augments a natural or organic human potential. Alphabetic writing is an artificial memory that supports long complex chains of reasoning impossible to sustain within the organic mind. Digital imaging similarly supports extensive complexes of mood atmospheres beyond organic capacity. (“Electracy and Pedagogy”)

While I am resistant to focusing solely on new media or to distinguish alphabetic and digital composing that Ulmer’s electracy addresses, I believe that examining new media reminds us of affective bodily connections to literacy that have always been present.

My project particularly raises awareness of the link between body and literacy by investigating new media’s use of the body as interface. Because of the comparative novelty for adults newly encountering digital texts, new media offer multiple sites for investigating the body-literacy link that are more visible than the body-literacy connections of older media. While casting our gaze across text, turning pages, or listening to the radio are acts long naturalized for literate adults, the corresponding literacy acts required to access new media texts remain visible in their novelty, whether the swipe, tap, double-tap, or pull-down gestures of the touch screen mobile interface or the full body movements to play an Xbox Kinect game. Arguably the most influential individual on modern computing, Microsoft co-founder Bill Gates signals a link between body and literacy in describing the Natural User Interface in addressing how users can bodily interact with texts without needing to be able to read or write alphabetic text: “Even

more important, NUI means people who may not have even the most basic literacy skills will be able to take advantage of some of the benefits of digital technology and the information age for the first time.” Although he links body and literacy, Gates’ comment distinguishes between using the body as a textual interface as separate from “basic literacy.” As part of my project, I argue that using the body to access texts is a necessary part of literacy that is overlooked when accessing familiar texts and media that have become naturalized.

As one part of my project here, I aim to elevate in my project awareness of the body’s importance in digital media. While Kress acknowledges the body in “English at the Crossroads,” pointing out that “the body has been used in many cultures and in many periods as a medium of communication” (69), he focuses on traditional text media, such as textbooks and newspapers and new media without further elaborating the literacy link with the body. Here, I aim to explore the relationship between the body and all media, both new and antiquated.

Other theorists have noted the link between the screen and the body. Lisa Nakamura contends that the human body has been increasingly mediated by or represented on screens, provocatively noting that in recent decades representations of other humans in Western society often begin with ultrasound images. Nakamura’s argument points to how the body and screen are intertwined in the digital era. Rather than focusing on the screen, I argue for the importance of remembering the body, whether in digital or non-digital media, as a unifying link between literacy and any medium. Indeed, I contend that any theory of literacy should be medium-agnostic, recognizing the

commonalities between media as a means of understanding the richness of literate practices. Approaching literacy in such a fashion alleviates the risks of focusing too much on any one medium and ignoring the implications brought about by others. While Daley, Kress, and Kelly promote the awareness of screen literacy, we are at the time of this writing moving away from screens and toward media that may not depend at all on screens, such as holographic media. To remain relevant, approaches to literacy in this era must account for the rapid pace of technological development, particularly when specific technologies resist prediction of widespread adoption or obsolescence. Rhetorical theory provides just such a means for approaching literacy.

Rhetorical and Media Theory

Having considered the linkage between literacy and technology, I contend that because technology is ever changing—and, in fact, the pace of new technological developments are accelerating in hyperbolic fashion—literacy pedagogy should not be tied to teaching particular skills, but to theoretical approaches. Indeed, tying literacy pedagogy to teaching particular skills represents a particular folly given the rate of change at which not only do whole new communications technologies arise, but even individual communications technologies evolve. Consider, for example, the frequency with which an individual software application, such as Microsoft Word, changes. The capabilities that Microsoft Word offers have changed in the decades since it first became available; even individual functionalities within Word have evolved, whether by expanded capability or simply in the steps the user takes to activate the capability. It is

because of this that I contend that we should approach education about reading, writing, and interacting with texts from broad foundational theoretical standpoint.

Rhetoric offers one such theoretical approach to literacy education. Rhetorical approaches through the ages, from ancient to contemporary times, have addressed changing communication contexts and how rhetors should best adjust their message in consideration of different media. I define media as different textual output forms, such alphabetic and print-based, or image-based, moving film or text and static image combined on a webpage, or even the human voice, thus I trace how rhetoric has responded throughout the millennia to changing communication media. While it is true that Plato certainly didn't have computer technology, he considered in the *Phaedrus* what it means to be faced with new media—in his context, the rise of writing. Kathleen Welch contends that Sophistic classical rhetoric offers a model for understanding the secondary oralism resulting from today's changing media that supports new oral/aural opportunities, arguing that Isocrates' adoption of writing and rejection of spoken performance offer positive exemplars for changing communication.

Rhetorical theory has always been sensitive to changing communicative contexts. In the European medieval era, the changing media contexts resulted in new theoretical approaches. As governance shifted to monarchies and less democratic governance and justice systems, common people had limited opportunities to participate and to represent themselves. As such, individuals turned to letter-writing and rhetorical theory turned away from teaching individuals to orally represent themselves in court or at the agora and instead toward representing themselves from afar. *Ars dictaminis*, the art of letter writing,

arose as a unique subject of study, supported by such texts as *Dictaminum radii*, *Berviarium de dictamine*, and *The Principles of Letter Writing*.

During the eighteenth century, with a rising population in Europe, new opportunities for personal expression, and more representative governance, rhetorical theory turned attention toward elocution, which emphasizes the body in delivering a text. Focusing on more than pronunciation, diction, tone, volume, and pitch of oral performance, elocution attends to the body, including posture, gesture, and expression, among other aspects of physical delivery. Irish actor Thomas Sheridan published in 1759 “A Discourse Being Introductory to His Course of Lectures on Elocution and the English Language” and in 1762 *A Course of Lectures on Elocution*, a manifesto promoting the necessity of studying speaking. Complaining in his introductory discourse about “neglect” in “studying our own language, and the art of speaking it in public,” Sheridan critiques the English whom he saw as “possessed of all the advantages of literature,” although they hadn’t benefited from studying elocution. Sheridan links his call for elocution to the classical rhetorician Quintilian, who he claims promoted a revival of elocution during the decline of the Roman state.

Others followed Sheridan’s call for attention to elocution. John Walker, an English actor, developed *Elements of Elocution* (1781). Walker continues attending to classical rhetoric, emphasizing in his preface the importance of establishing the speaker’s good character in the exordium. While Sheridan’s work focuses on promoting the case for elocution, Walker’s *Elements* articulates elocution’s rules. In 1806, Gilbert Austin continues the development of rules in *Chironomia: or a Treatise on Rhetorical Delivery*,

which emphasizes the body's involvement in rhetorical delivery by addressing voice, as well as countenance, gesture, and positioning. In focusing on the physical aspects of oral communication, Austin places great emphasis on rhetoric's fifth canon, arguing "the advantages of good delivery are such, as to conceal in *some degree* the blemishes of the composition, or the matter delivered, and to add lustre to its beauties" (187). Resembling a modern-day semaphore manual, the oft-reproduced illustrations in *Chironomia* present a history of rhetorical delivery and then offers detailed diagrams for configuring the body—head, feet, hands, fingers. Each of these represented communicative symbols designed to be read in addition to the speaker's orally delivered material. As with Sheridan, Austin refers to prior rhetorical theory, specifically pointing to the contemporary "silence" about prior rhetoricians "whose works contain much valuable instruction on the subject of delivery" (v). While these theorists were male, American women likewise took up the elocution movement, producing dozens of elocutionary texts in the nineteenth century's last three decades. Jane Donawerth argues that "women were a major force in the late nineteenth-century elocution movement, taking and giving lessons, founding schools, organizing local performances, touring as elocutionists, and writing textbooks" (107).

As Philippa Spoel points out, rhetorical theory in the 18th—and 19th—century was about more than elocution; however, elocution does represent one of the major theoretical concerns of the period. While this particular era's elocutionary focus emphasizes how rhetorical theory has previously considered the body, it also provides an

example of how tensions arise in theory. For example, in Sheridan's "Discourse," he differentiates acts of reading the written word from speaking a text, claiming:

By the art of writing, sentiments can be communicated, either through the eye only, or through the eye and ear together, to individuals; or through the ear only to numbers; the first of these, by silent reading, the other two, by reading aloud. In the first instance, ideas of things are excited by written words, as the symbols of words spoken; and by association, the idea of the sounds also which accompany those words. Now at the best, supposing the ideas of the properest sounds, were always to be associated by the silent reader, the effect of any composition must be much weaker than if it were spoken, as far as ideas fall short of realities. But if, through ignorance in the art of speaking, or through vicious habits, he annexes the ideas of wrong sounds and tones to the words, it is impossible he can perceive the true force and beauty of the composition, so far at least as they depend upon sound and tone.

It's worth emphasizing that Sheridan makes a claim here about the inherent challenges of delivery in particular methods, suggesting that speaking a text is stronger than reading it. He also makes a claim that elocution also supports reading in enabling the reader to interpret the text in "properest" association. While Sheridan places great emphasis on the power of delivering a text through an embodied presence, I suggest that no one method of composing a text is inherently superior to another.

Elocution arose during an era in which the populace began interacting with one another in new ways corresponding to increasing populations and changing governance. Similarly, rhetorical theory developed in the late twentieth century to respond to the rise of computer-mediated communication. Not unlike the way Sheridan raises concerns about print versus oral delivery's impact upon the audience, the rise of digital rhetoric and computers and composition theory has likewise raised concerns about digital versus print delivery.

By recognizing commonalities, my approach seeks to dissolve artificial boundaries and hierarchies between different forms of texts, particularly by applying a historical perspective. Others have undertaken a similar approach in media studies and literary scholarship. Dennis Baron has historicized computers as technological composing tools by observing that technology has always been part of our composing processes, whether in clay tablets or pencils. Lisa Gitelman has undertaken similar work in media studies, challenging the definition of “new media” by pointing to the ways media rapidly changes. Her work focuses on theorizing current media histories by examining how old media were once theorized. Similarly, Henry Sussman in *Playful Intelligence: Digitizing Tradition* focuses on dissolving the gap between the digital and traditional by undertaking a comparative study of the past to understand how it anticipates and lays foundations for the digital era. Examining textual history in relationship to technology changes reveals that humanity’s entire communicative experience has routinely been affected by media change and should thus be accounted for in understanding literacy.

Other rhetorical theoretical concepts remain just as applicable today as when they were first theorized. Ekphrasis is one rhetorical term that yields a theoretical approach with renewed relevance. Plato describes ekphrasis in Book X of the *Republic*, making the point that the painter who depicts a bed in a painting is engaging in imitation (*mimesis*) and that poets engage in similar acts as painters. Any time that composers have attempted to represent other visuals, they have similarly engaged in ekphrasis. This concept applies to modern technologies now capable of representing objects through mimetic visual

technologies. None of these technologies are neutral, or exact reproductions,¹⁰ but instead mediate the objects through technologies that operate according to assumptions. As this example shows, ancient rhetorical concepts yield continued applicability for twenty-first century technologies, as I will show throughout this project.

Although our analysis of rhetorical theory has not always reflected this, rhetoricians has since ancient times considered the body's involvement in rhetorical delivery, although with shifting emphases. Debra Hawhee contends in *Bodily Arts: Rhetoric and Athletics in Ancient Greece* that rhetorical training in ancient Greece took place alongside bodily training. Hawhee argues that itinerant Sophists gathered at gymnasia where "citizen production" took place; at these sites took place "a syncretism," that is, "a crossover that contributed to the development of rhetoric as a bodily art: an art performed by and with the body as well as the mind" (111). Aristotle addressed the delivering of texts in *On Rhetoric*, discussing in Book III, volume, pitch, and rhythm and discussing delivery through actors' bodily performances. Ancient rhetoric offers multiple opportunities for examining contemporary rhetoric.

Body Theory

Within this project, I have chosen to articulate my understanding of literacy as a continuum through an examination of texts that focus on depictions of the body. I have selected the body as a unifying textual object to emphasize the connection between literacy and the body. Further, I choose the body as it is a familiar object. As Turkle

¹⁰ Walter Benjamin would, of course, complicate the association of even an exact copy as being mimetic in "The Work of Art in the Age of Mechanical Reproduction (or Reproducibility)."

maintains, evocative textual objects aid theoretical development: “As theory defamiliarizes objects, objects familiarize theory. The abstract becomes concrete, closer to lived experience” (*Evocative* 307). These body-oriented texts aid exploration of real bodies interacting with literacy by providing a common referential point across these texts.

Bodies and language have a long history of being theorized in connection with each other. For Foucault, “the body is the inscribed surface of events” (83). His genealogy methodology focuses on analysis of the intersection of history and the body, particularly the way the body is both inscribed by and destroyed by history. Similar to the way that Foucault saw discourse as being culturally constituted and constitutive of how we perceive, bodies are also critical to Judith Butler’s theorizing because: “Discourses do actually live in bodies. They lodge in bodies; bodies in fact carry discourses as part of their own lifeblood” (Butler, cited in Meijer & Prins, 1998, p. 282). What Butler points to is the interrelationship between language and body, how language constructs how we perceive ourselves, how we carry language through our lived experience, how our past experiences affect how we understand and interpret our experiences and how we express those experiences through our language.

The connection between body and expression resonates throughout body-aware theories. In her essay “Coming to Writing,” Hélène Cixous continues the language-body connection by reading her body as a text:

I go where the “fundamental language” is spoken, the body language into which all the tongues of things, acts and beings, translate themselves, in my own breast, the whole of reality worked upon in my flesh, intercepted by my nerves, by my

sense, by the labor of all my cells, projected, analyzed, recomposed into a book.
(52)

Cixous describes the reciprocal relationship between language and bodies. However, what is of further significance here about Foucault, Butler, and Cixous's understandings of the body as constituted and interpreted by language and functioning as a text itself is that it offers a reminder that the body is not neutral, but culturally constructed through language. Indeed, in the same way that technology is not neutral, the body is also not neutral. Understanding the body's role in literacy necessitates understanding that the body is no more neutral an object than a piece of technological equipment; as such, it invites theoretical awareness that approaches it as culturally constructed. As emerging textual interaction increasingly involves the body in new ways—through interactive interface or through digital representation, literacy theory should explicitly account for the body and recognize that when it does not explicitly address the body, the absence of theory still has an impact by erasing the importance of the body.

Beyond the basics, such as the necessity of vision for traditional understandings of reading, the role of the body in literacy theory has received less attention than it should. One reason may be somatophobia, Elizabeth Spelman's term encapsulating Western hostility and disdain toward the body with "the body is seen as the source of all the undesirable traits a human could have" (Spelman 182). Somatophobia resonates with the Cartesian elevation of the mind over the body. Subsequent to the elocution era and theorizing the grotesque, Mikhail Bakhtin postulated the bodily canon, finding that the

feminine is associated with the grotesque.¹¹ In so theorizing, Bakhtin recognizes the somatophobic historical attitude toward the body, particularly specific types of bodies. Although literacy theory has addressed some aspects of the body in literacy theory, more attention could be paid. As an example, Deborah Brandt's influential *Literacy in American Lives* refers to the body only once.¹² The lack of attention paid to the body in literacy theory resonates with the traditional dualism that elevates mind over body, the intellectual over the physical. This body/mind Cartesian duality mirrors that of the traditional/contemporary binary in which the traditional is devalued in favor of the contemporary much as the mind is favored over the body. The traditional/contemporary binary relies on a pre-technology/technology divide. In literacy theory, this is a false dichotomy, as Dennis Baron points out, because technology has always been part of our literacy.

Similarly, the body has been part of our literate activity throughout history—even now. While the contemporary is often seen as the era of body-less digital rhetoric, the term “digital” offers an etymological clue that our earliest digital technology was our fingers. Other terms likewise point to the relationship between language and body. For

¹¹ Bakhtin's discussion of the bodily echoes Plato's concept of the ekphrastic forms. According to Bakhtin, "Wherever men laugh and curse, particularly in a familiar environment, their speech is filled with bodily images" (319).

Bakhtin also offers: "In the new bodily canon the leading role is attributed to the individually characteristic and expressive parts of the body: the head, face, eyes, lips, to the muscular system, and to the place of the body in the external world. The exact position and movements of the finished body in the finished outside world are brought out, so that the limits between them are not weakened" (321).

¹² Brandt's specific reference to the body is: "The holistic sensibilities of the African American church helped to hold intact a powerful, multiply performing sponsor that promoted integration over fragmentation, persistence over change, remembering over forgetting. As a by-product of helping members to keep body and soul together (often against the harshest conditions), the church also held together unique and enduring orientations to the written word that partook of this tradition" (*Literacy* 112).

example, the term sarcasm comes from the Greek meaning tearing of the flesh.¹³ Words have always been used to provoke the senses, even if we haven't always recognized this in our theories. Examining the relationships between body and technology, as well as body and language, reveals important reminders of these interrelationships throughout human history, even in this era of supposedly "disembodied communication."

One way in which technology was supposed to support the utopian or at least democratic interactions was the initial anonymity—or erasure of living bodies—provided through early Internet interactions. In the pre-Web and early Web days, before the technology evolved to rapidly depict complex graphics, interactions were dominated by alphabetic text: emails, chat interactions, and so forth. A famous *The New Yorker* cartoon captures this earlier anonymity with two dogs with one using a PC and says to the other: "On the Internet nobody knows you're a dog." The implication of the cartoon is that users could take up any identity they wanted. In *Life on the Screen*, Sherry Turkle claims that it is this anonymity that "gives people the chance to express multiple and often unexplored aspects of the self, to play with their identity and to try out new ones" (12). Writing about MUDs, alphabetic text-based role-playing games, Turkle writes that the anonymity—or supposed anonymity—of such environments "make[s] possible the creation of an identity so fluid and multiple that it strains the limits of the notion Identity, after all, refers to the sameness between two qualities, in this case between a person and his or her persona. But in MUDs, one can be many" (12). At that point, Turkle saw the possibilities of identity

¹³ I am indebted to Dr. Mark Elliot Brumley in a December 2015 conversation that identified sarcasm's etymology. For additional links between body and language, see also Dr. Brumley's dissertation *Declamation and Dismemberment: Rhetoric, The Body, And Disarticulation In Four Victorian Horror Novels*.

exploration in an era when embodiment occurred only during purposeful textual—rather than graphical—descriptions as a positive of the online environment. Since then, technology has only developed increased capabilities in terms of depicting embodied identities through increasingly visual software. As such, we as educators and composers need to understand not just rhetorical and technology theories, but also theories of the body.

Semiocy Theory in AR, VR, and MR

Additional theory may be relevant to theorizing composing in Augmented, Mixed, and Virtual Reality. In seeking to identify a new approach to language instruction, Nikolaj Elf proposes the use of semiocy, a concept originally promoted in 2003 by a workgroup including linguists, literary and educational researchers, and himself (then a graduate student). Elf offers an English translation from the workgroup's original Danish definition:

In knowledge society demands are increased constantly because the primary production in such a society involves, precisely, competencies in being able to interpret and use symbols, most commonly verbal signs, but also graphs, diagrams, instructional videos, programmes, statistics etc. Instead of offering literacy to the population, one now has to teach the population what one may term extended or semiotic literacy. In other words, we have moved from Lutheracy to alphabetic literacy, and now we have to move on to semiotic literacy (semiocy).
(Elf 4)

As Elf notes, this is a broad definition, but he positions it as a way of dealing with changes in society and one that we need to take up in educational settings, particularly in approaching language instruction. I agree with Elf about the importance of teaching using semiocy. Where I distinguish my argument from Elf's is that I propose is that we have

always engaged in semiocy, not just in the era in which technology enables us to rapidly produce graphics, diagrams, videos, and so forth. Further, understanding our current practices as engaging in semiocy can also help us see how we have always engaged in semiotic reading and composing. For example, the ancient and not-so-ancient practice of merchants hanging out emblems of their trade, such as boots or shoes for cobblers or a gun for gunsmiths, in lieu of lettered signage indicates that individuals have always interpreted and used of a variety of symbols.

Gee proposes the term “semiotic domain” as a way to recognize the multiplicity and situatedness of literacies. Semiotic domains are, for Gee, a term to talk about how “signs” take on meaning, signs “like images, sounds, gestures, movements, graphs, diagrams, equations, objects, and even humans like babies, midwives, and mothers (all of which have totally different meanings in different cultures and at different points in history)” (19). He offers further a translation of “an area or set of activities where people think, act, and value in certain ways,” and offers such examples as video gaming, birdwatching, physics, or anime (19). Gee argues that any new semiotic domain (a term recognizing the multiplicity of signs he finds better representative than literacy-in-context)—offers opportunities for active, critical learners to

1. Learn “to experience (see and act on) the world in a new way”
2. Gain “the potential to join and collaborate with a new affinity group”
3. Develop “resources for future learning and problem solving in the semiotic domains to which the game is related”

4. Learn “how to think about semiotic domains as design spaces that engage and manipulate people in certain ways and, in turn, help create certain relationships in society among people and groups of people” (*What* 38).

I likewise find educational value in learning in multiple semiotic areas and contend that investigating semiocy can help us understand expression in multiple areas, including traditional alphabetic print literacy.

Methodology

To explicate my theory, I explore a series of new media and antiquated media texts and offer three ways to conceptualize literacy that aid their comparison. I examine semiocy’s complex and multifaceted processes and functions through interactions of 1) dimensions, 2) layers, and 3) simultaneous and paradoxical invocations of absence and presence. These comparisons support my claim that what is required to read and to compose is, upon examination, substantially similar, whether in digital or pre-digital texts. This comparative analysis expands our understanding of reading and composing, enabling us to transfer familiarity from composing past VR, AR, and MR, into digital VR, AR, and MR. Lisa Dusenberry, Liz Hutter, and Joy Robinson argue that technical communicators should aim to be “adaptable communicators,” who can willingly “approach and manage unfamiliar communication modes, tasks, and technologies” (302). Dusenberry, Hutter, and Robinson contend that instructors can support the development of adaptable communicators through use of multimodal theory and multimodal classroom assignments. I argue that in an era of rising digital communication we can apply the notion of “adaptable communicators” to any composing subject and that working with

multiple media, in addition to multiple modes, offers composers the ability to respond flexibly to changing communication technologies. Such knowledge and skills provides composers the capability to access, develop, and share knowledge, a capability which has significant social, political, and material implications.

While I articulate this theory in greater depth in the next three chapters, I offer an illustration here to demonstrate my methodology and to begin laying a foundation for my discussion of semiocy. To articulate my definition of semiocy as an act that relies on transformation and the enabling of an individual to act upon the knowledge gained through literacy, I turn to the movie *The Matrix*, a 1999 dystopia by the Wachowskis. I include in my dissertation cinematic examples of science fiction thought experiments to establish a familiar means of envisioning the technologies and applications that I discuss.¹⁴ This technology-oriented movie enables me to deliberate upon semiocy in the use and absence of digital texts. In the movie, most humans perceive computer-mediated simulations as their reality, although they are not aware of this technological intervention that controls their perceptions of their experience. Through the assistance of a group of individuals who are conscious of the computer-controlled simulations, the character Neo physically breaks free of the computer mediation and perceives reality on his own, without computer filtration. Shortly after undergoing that disjuncture, he stands before computer screens interactively displaying the code of the computer-mediated simulation called “the Matrix.” One of the characters standing beside Neo says, “There’s way too

¹⁴ Multiple technology workers credit science fiction with helping them envision their innovations. For example, Michael Abrash, Oculus’s Chief Scientist states in his 2015 F8 address that the roots of his VR lay in science fiction, both in in his lifetime of reading science fiction “which showed me the path of thinking about VR as not only possible but as something I personally could help to make happen.”

much information to decode the Matrix. You get used to it, though. Your brain does the translating. I don't even see the code. All I see is blonde, brunette, redhead" (The Wachowskis, *The Matrix*). As that character points to different portions of the black screen, the movie presents Neo's perspective of a series of rapidly scrolling green letters and numbers representing the Matrix's code.

This moment represents Neo's first radical transformation in reading information in a new way. He no longer reads the world through the computer's interpretation of reality; he now sees the code controlling the computer's visual depiction of reality. But unlike the other free characters who have been outside computer mediation longer, Neo sees only the disjointed letters and numbers; he cannot yet read the code to perceive the blonde, brunette, or redhead females that the other free movie characters see. In the movie's denouement, Neo re-enters the computer simulation and sees not the visuals that the computer displays, but the Matrix's code; the letters and numbers form into bodily shapes, showing us Neo's new ability to see and to read that code, a second transformation. Neo can integrate multiple ways of interpreting and understanding the combinations of character and image texts holistically in order to read, act, and react to the situation he is in. This final semiocy transformation enables Neo not merely to be aware of information in a new way, but to act in an empowered way to defeat his antagonists, the computer agents. In these moments of reaction, he uses his newfound semiocy to compose and to respond to his situation to effect change. He has further made the transformation of seeing the agents as represented bodies. Neo provides an illustration of how semiocy involves first an awareness that information can be read, then the ability

to read that information, and subsequently the capacity to take action based on the ability. Thus, The Matrix not only provides an opportunity to explore the topic of screen literacy that arises in the digital era, but it also provides an opportunity for examining the involvement of bodies in the era of supposedly disembodied technology. Further, as Neo moves between media, his success in understanding and acting upon his perceptions supporting my understanding of literacy operating on a continuum.

Definitions of Key Terms

I am exploring and theorizing acts of reading, writing, and interacting with texts in technological contexts such as Virtual Reality, Augmented Reality, and Mixed Reality (see Table 1). Although these terms may be unfamiliar in fields and disciplines accustomed to working with more traditional media, I contend that these terms will be of increasing relevance to a variety of disciplines, even those that may not initially recognize their pertinence. That said, even in the technology fields developing the hardware and software for these different environments, the terms are neither uncontested nor static, as I will elaborate on. I offer here how I approach these terms, as well as what technologies and applications I associate with these designations.

Table 1

Definitions of Reality Media: Virtual Reality, Augmented Reality, and Mixed Reality.

Term	Definition	Associated Technologies
Virtual Reality (VR)	<p>VR is associated with the term “immersive,” meaning that the user is immersed in a different sense of reality. VR replaces the user’s view with a virtual scene or environment—often fictional or otherwise not representative of the user’s actuality scene. Constructed sound may overlay the user’s hearing of actual surrounding sound. Haptic feedback may be present.</p> <p>At present, consumer VR technology often entails putting on a boxy headset. Sound may be played through the device or attached headphones. Users may or may not see their own bodies represented in this environment.</p> <p>Once the user accesses the VR system, the VR may or may not require user input or interaction to proceed through the VR experience.</p>	<p>Oculus Rift, Sony PlayStation VR, Samsung Gear VR, HTC Vive, Google Cardboard</p> <p>CAVES (Cave Automatic Virtual Environments)</p> <p>Examples of virtual reality technological interfaces: Video games, technology-enhanced roller coaster/other amusement park “simulator” rides that focus on replacing the user’s perception that they are on a ride, immersive meetings</p>

Term	Definition	Associated Technologies
Augmented Reality (AR)	<p>A view, direct or indirect, of the physical world that surrounds the user with an overlay of additional data (whether alphabetic/numeric text, symbols, images, or other media, including video, audio, and haptic). Once the user activates the augmentation, the AR data may be responsive to the user's real-world location or request.</p> <p>In AR, the user's perception of the actual world is not replaced as it is in VR, but is added to.</p> <p>Users will perceive their own bodies.</p> <p>The user may directly perceive actuality, such as while flying a plane, as the augmentation is visible, such as by being projected onto a windshield, enabling the pilot-user to view both actuality as well as the technology-generated data/image. Alternately, the user may view a technology-mediated view of actuality as well as the technology-generated data/image.</p> <p>AR can be displayed using projection systems on other objects (such as windshields), on monitors that combine data (alphabetic, numeric, or symbolic) with an indirect view of the physical world, using headsets or glasses that combine perception of the physical world with data.</p>	<p>Google Glass, the Daqri Smart Helmet, Epson's Moverio</p> <p>AR may display directions for performing tasks, real-time information updates such as sports or stock information.</p> <p>Heads-up displays of status data on car windshields, runway directions on aircraft windshields or monitors, or via Google Glass</p> <p>Software apps: Crayola <i>Color Alive!</i> coloring, <i>Anatomy 4D</i>, etc.</p>

Term	Definition	Associated Technologies
Mixed Reality (MR)	<p>MR combines a view of the physical world with an additional overlay—one which might be a virtual world, might be recorded media, or might be another view the actual elsewhere. Microsoft differentiates Mixed Reality from Augmented Reality by asserting that in MR the display is fixed to a particular point in physical space, enabling the user to move around that point and observe it while shifting perspective (Microsoft, “General”).</p> <p>Depending on the level of mediation, the user may perceive their own body; for example, in a CAVE, the user may perceive their own body while walking around an otherwise virtual environment on the walls, floor, and ceiling.</p> <p>Paul Milgram and Fumio Kushino also described Mixed Reality as an umbrella term encompassing the area between the “Real Environment” and a “Virtual Environment” on their “virtuality continuum,” which offers a taxonomy that operates on dimensions of “Extent of World Knowledge (‘how much do we know about the world being displayed?’), Reproduction Fidelity (‘how “realistically” are we able to display it?’), and Extent of Presence Metaphor (‘what is the extent of the illusion that the observer is present within that world?’).”</p>	<p>Microsoft HoloLens Magic Leap (possibly)⁴¹</p> <p>CAVES</p> <p>Microsoft’s advertising for the HoloLens shows entertainment such as video-gaming and sports viewing, as well as directions for performing tasks such as repairing a sink.</p>

None of these are progressive technologies, evolving from one to another, but instead are different approaches to modifying the user’s perception of actuality using similar hardware. Thus, each of these techniques possesses similarities. For example, Mixed

⁴¹ Magic Leap has been highly secretive. Although the company has promoted its product, it has also not revealed much about its product or provided it for examination.

Reality and Augmented Reality each involve inserting digital content into the user's field of view—or, conversely, of allowing actuality to appear in a digital projection. Because of this overlap, the terminology distinctions can appear idiosyncratic. Indeed, some technology developers may avail themselves of new terms more as marketing differentiators than technology differentiators. For example, although I have listed Magic Leap as likely aligning with Mixed Reality, for a while the company used the term “cinematic reality,” which founder Rony Abovitz described as using “a ‘dynamic digital light field signal’ which apparently tricks your brain into thinking whatever digital object it’s seeing is actually embedded into — not pasted onto — the real world” (qtd. in Lomas). He has also described Mixed Reality technology as turning the world into “your new desktop” or “your new silver screen” (qtd. in Lomas). Abovitz’s description of Magic Leap offers a new paradigm that does not conform to the MR format as presently conceived; it will be interesting if the technology is released to the public as described. Further technology may evolve and our terminologies may likewise evolve to reflect the technology development.

Indeed, these technologies have all arisen as a result of a longer history of digital technology development. Prior to the contemporary era of virtual reality using smaller wearable technologies, users began interacting in the early 1990s with VR in CAVES. CAVES are interactive, theater-like rooms in which images were projected or displayed on the walls. Users might or might not wear glasses—such as shutter-blink glasses to convert the images into a 3D-appearance. While CAVES still exist, consumer VR technology has moved toward wearables more similar to glasses.

During this period of on-going change, terminology proliferates. Terminology occupying nearby ground in this realm reflect both different development and nomenclature paradigms. These terms include: Augmented Virtuality, Simulated Actuality, Mirror Reality, and Mediated Reality, among others. The term mediated reality—meaning the manipulation of a user’s perception via a wearable computer or device, such as a smartphone—can apply to many technologies as a blanket term that encompasses technology that affects a user’s perception of actuality. Similarly, “Simulated Actuality” describes the depiction of actuality via technology. Augmented Virtuality evokes the inverse of virtual reality with the virtual being augmented with actuality. I offer these additional terms to indicate that the rapid growth of names reflects the myriad possibilities for approaching the creation of texts using current and developing technology. In this project I focus only on the subject of Virtual Reality, Mixed Reality, and Augmented Reality.

Outline of the Chapters

This first chapter has synthesized scholarship in rhetoric, media, technology, and bodies to position my discussion in literacy scholarship while positing a need for a theory that addresses and encompasses new media and antiquated media reading and composing. In preparation for discussing new technologies, this chapter has offered definitions of the new media forms of virtual reality, augmented reality, and mixed reality and how I plan to approach these text forms as I examine reading and composing in those new media.

My next three chapters engage in analysis of new media and antiquated media texts to elaborate my theory of literacy and to support my claim that literacy operates

through continuity, specifically organized around dimensionality, layering, and a paradox of absence/presence. Each of these chapters finds common characteristics between both new media and antiquated media, highlighting how new media supervene prior media, enabling composers to draw upon prior knowledge and skills in creating texts in emerging media.

The second chapter, “Spatial Dimensions of Literacy: The Corpse in the Corpus” examines the dimensional acts of reading by understanding literacy in terms of spatial relationships between bodies and texts. Here I outline how literacy scholars such as Kress theorize literacy as movement as well as a dimensional process, but I also point toward contradictions in literacy theories, even in Kress’s work, that overemphasize the visual aspects of literacy. Building upon such spatial theorists as Nedra Reynolds, Michel de Certeau, Edward Soja, and others, I articulate how we should understand literacy as involving movement and dimensionality by understanding the body as an interface with literacy technologies. In continuing support of my overarching argument that literacy functions in continuation from past practices, I examine an antiquated medium, the Parsonage Parlor diorama from *The Nutshell Studies of Unexplained Death*, a series of 20 death scene dioramas from the 1940s to 1950s designed to train forensic investigators. I compare that text with a new medium, the Microsoft Xbox Kinect, a motion sensing device that enables users to input information with the computer game console originally released in 2010. I focus in particular on the 2011 game *The Gunstringer*, in which the game player stands before the Microsoft Xbox Kinect camera and physically moves

their¹⁵ body around the delineated sensor space on the floor. Such movement exemplifies the relationships between literacy, body, space, dimensionality and technology. While physical movement such as turning pages has become naturalized for proficient readers, game player directive actions draw attention to the relationship between body movement through space and progressing through a text. These texts demonstrate ways in which literacy itself is never automatic or innate, but is instead acquired.

The third chapter, “The Layers of Literacy: De-composition of Body Texts,” articulates how literacy functions through processes of layering. Examining how texts work with additive and subtractive layers of meaning, I use Roland Barthes positing in “The Rhetoric of the Image” the linguistic, the denoted, and the connoted message within an image, suggesting forms of interpretive layering. Reading a text involves more than one interpretative approach. Likewise addressing multiplicity, Deborah Brandt identifies the additive development of literacy in vertical and horizontal directions, positing that literacy “piles up” through formal schooling and prior materials and practices (652). To elaborate the layering process, I examine two texts of different media eras. The antiquated media I examine in this chapter is the *BODY WORLDS* exhibit, which employs the oldest medium of all: the body itself. Preserving about twenty different corpses through a plastination process, *BODY WORLDS* creates texts by removing the outermost layer of the body and subsequent layers to highlight different systems, including the skeletal, muscular, nervous, circulatory, digestive, respiratory, urinary, and reproductive systems. The *BODY WORLDS* exhibit invokes layering as a formative

¹⁵ As an intentional style choice, I use the epicene they (or its possessive form) to refer to individuals of indeterminate gender.

means of reading bodies for understanding by adding interpretive signage to the exhibits, demonstrating how we have long augmented texts, even prior to the new media era. The new media text I examine in this chapter is the Anatomy 4D augmented reality app which displays, in response to a target image, the human body on a smart phone or tablet screen. The app enables viewers to use a variety of controls to view different body systems within the body as different layers. This app layers literacy by combining both antiquated media (paper) and new media (smart phone/tablet app). Understanding literacy as a piling or accumulation of layers enables us to understand the manifold activities that are involved in literate practices. Such layers shape our ways of seeing and interpreting.

In Chapter Four, “Literacy’s Absence and Presence: Re-membering Bodies,” I examine how literacy necessarily engages with material absence and presence. Texts are physical, tangible objects representing intangible ideas and people, places, objects, and events. As such, literacy involves processes of conveying and understanding absences. Integrating such theorists as Jacques Derrida, Jean Baudrillard, Elaine Scarry, and Sherry Turkle, this chapter studies strategies for composing and reading absence within texts, while simultaneously understanding that absence necessarily invokes presence. The question of tangibility and intangibility becomes increasingly relevant with the rise of digital texts. For the antiquated media example in this chapter, I examine a building serving as both museum and memorial and examine how it incorporates presence and absence. The United States Holocaust Memorial Museum in Washington, D.C., faces the challenge of representing bodies made absent through the Holocaust. Several exhibits engage absence in textually significant ways, thus employing the trope of synecdoche to

communicate a powerful message. The new media I analyze in this chapter are from the Microsoft HoloLens, a Mixed Reality (MR) technology overlaying portions of the perceivable reality with digital images, which could be augmented or virtual. Analyzing HoloLens composing tools and texts reveals that digital Mixed Reality, like antiquated Mixed Reality, operates as a mixture of presence and absence.

The conclusion in the fifth chapter, “Fleshing Out Literacy: Ways of Seeing, Reading, and Composing” articulates the potential applications and implications of applying this literacy theory to pedagogy and for a variety of other literate purposes. Here, I examine how understanding literacy through spatial dimensions, layering, and absence/presence expands our understanding of past literacy practices, how such an understanding of literacy can aid the adoption of new literacy methodologies and what we should consider in the design of new literacy technologies and texts. I contend that understanding literacy as I have theorized has a number of pedagogical applications ranging from traditional school sites to museums and businesses. I consider how this understanding of literacy impacts the educational environment, whether in classes, as asynchronous training, in digital studios, and on the job as technical communication. I include too cautions and suggestions to consider regarding the social-cultural implications of developing literacy technologies. While many of my current new media samples focus on invisible, digital rhetoric—*i.e.*, texts that are not available without an electrically powered technology device—I look ahead toward the next development in new reality media texts representing bodies.

CHAPTER II

SPATIAL DIMENSIONS OF LITERACY: VIRTUAL REALITY AND THE CORPSE IN THE CORPUS

In the introduction, I claimed that we could expand our understanding of reading and composing by examining their dimensionality, by understanding the spatial relationships between bodies and texts, how texts function as spatial objects as well as work to evoke dimensions. This chapter explores that claim by looking at prior theory and exploring theoretical absences, contradictions, and applications. To trace how dimensionality functions in texts, I explore specific Virtual Reality (VR) texts in both new media and antiquated pre-new media forms. Analyzing texts' dimensionality—in actual, depicted, and imaginative aspects—reveals commonalities between new media and pre-new media texts. The dimensional functions of texts reveals how the spatial presence of and representations within texts are key elements of reading and authoring.

Situating my discussion in an on-going discussion of space in literacy, textuality, and, more generally, the humanities, I aim to extend the exploration of space to dimensionality in new media texts. In its definition of multiliteracy, the 1996 New London Group promotes spatiality as it theorizes literacy in an era of changing media. I further read multiliteracy's gestural mode as implying a dimensional process, one that

necessitates movement of the body through space.¹⁶ However, highlighting dimensionality demonstrates how existing literacy theory has overemphasized the visual aspects of texts. Building upon such spatial theorists as Nedra Reynolds, Michel de Certeau, and Edward Soja, among others, I articulate how we should understand literacy in terms of movement and dimensionality by understanding the body's interface and interaction with semiotic technologies. In continuing support of my overarching argument that literacy functions in continuation from past practices, I closely examine an antiquated medium, *The Nutshell Studies of Unexplained Death*, a series of eighteen surviving forensic death scene dioramas from the 1940s to 1950s, and a new medium, an Xbox game using a Kinect, a motion sensing device originally released in 2010. The analyses of the new media and pre-new media texts reveal that dimensionality has always shaped textual affordances and interpretations. The capabilities of emerging media, such as VR, will offer composers, audiences, educators, and scholars new inventive and pedagogical potentials.

Dimensionality and the Spatial Turn

I conceive dimensionality in conjunction with the spatial. Although others focus on spatiality, I choose the term dimensionality to emphasize multiple dimensions. Too often space conjures specific, cultural places—or the opposite, vast, nebulous reaches like “the frontier” or outer space. It is easy to think of a space as a two-dimensional spot, a

¹⁶ Indeed, literacy for Kress is thus about movement through multidimensional space. He sees texts as “complexes of signs from two perspectives, that of arrangements and that of movement. Arrangements are made by me--as a modal ensemble made for myself or for others--or else someone has made an arrangement as a modal ensemble for me. I, as a maker of meaning move in the world, literally, in different ways; and the world around me is in motion, in constant movement; and more often than not, I move in a world in motion” (159).

location on a map, a place. Dimensionality as a concept emphasizes more than the flat place of two-dimensional space, but the expansiveness of three dimensions; it stresses movement through space. In an era of motion-sensing gestural interfaces, emerging VR texts emphasize movement through space.¹⁷ The dimensional heightens our opportunities for examining the collective new media I term “reality media,” whether virtual, augmented, or mixed. Cameras and image display technologies have evolved to capture and to present 360-degree images. In theaters, action movies and documentaries are now routinely offered in both the usual two-dimensional format and a three-dimensional option. Televisions not only come in new resolutions but also offer 3D viewing for content both specifically designed for multi-dimensional viewing as well as traditional 2D content. Google’s Project Tango, which combines 3D motion tracking with depth sensing, provides mobile devices the ability to know where they are and how they move through space—without needing GPS or other schema.

Responding to these technological changes, language describing photography has evolved. The term “Photo Sphere” and the appendage of 360° have arisen to describe how photographs no longer necessarily mean rectilinear media, but can offer an image captured around a camera and sometimes presented around a viewer. As such, our texts have developed beyond the rectangular, two-dimensional displays of the screen literacy theorized by Gunther Kress, Kathleen Yancey, and Kathleen Welch, among others. That these writers developed their theories less than two decades ago points to the necessity for approaches and pedagogies that adapt to a rapidly changing technology environment.

¹⁷ Often, this movement is viewer-directed. The viewer has agency for choosing how to proceed through, to consume the text

Theory must respond to the dimensional capabilities of texts. It can perhaps build from theory that has increasingly addressed the spatial. I include here multiple understandings of space's importance in composition: (1) textual space, that is how space—actual, depicted, and imaginative—is represented, (2) space in textual media (how media use space to communicate), and (3) composing tools as spaces (what Jay Bolter terms “writing space”).¹⁸ As I previously mentioned, the 1996 New London Group articulated one aspect of multiliteracy as focusing on the spatial—the others being linguistic, visual, gestural, aural, and multimodal. The group contends, “Increasingly important are modes of meaning other than Linguistic, including Visual Meanings (images, page layouts, screen formats); Audio Meanings (music, sound effects); Gestural Meanings (body language, sensuality); Spatial Meanings (the meanings of environmental spaces, architectural spaces); and Multimodal Meanings” (19). On the meaning associated with environmental or architectural spaces, the Group offers these examples: “McDonalds [sic] has hard seats - to keep you moving. Casinos do not have windows or clocks - to remove tangible indicators of time passing. These are profoundly important spatial and architectonic meanings, crucial for reading Available Designs and for Designing social futures” (19). While the New London Group identifies the exigence of their work in changing communication forms and increasing channels, they identify in the McDonald's and casino examples “antiquated” (that is, pre-new media) texts. Such

¹⁸ Richard Lanham likewise sees the digital as creating a “writing space,” writing, “Electronic text creates not only a new writing space but a new educational space as well. Not only the humanities curriculum, but school and university structures, administrative and physical, are affected at every point, as of course is the whole cultural repository and information system we call a library” (xii).

texts can provide us ways of understanding the continuity of literacy as new media emerge.

Multiple academic disciplines well beyond geography—including anthropology, literature, history, psychology, and sociology—have recently turned attention to understanding the spatial in their studies. Spatial theorist Edward J. Soja, among others, has deemed the rise of this focus “the spatial turn”; others have called this “the landscape turn.” This changed focus recognizes theorists’ understanding of space as socially constructed and supports exploring what that means to the objects of their study. Henri Lefebvre points out that “[n]ot so many years ago, the word ‘space’ had a strictly geometrical meaning: the idea it evoked was simply that of an empty area” (1). But a notion of “social space,” that is, space as more than a neutral physical place, functioning instead as a social construction was exactly what Lefebvre was putting forth. Considering the rise of spatial analysis, de Certeau posits that “Just as signifying practices . . . were taken into consideration after linguistic systems had been investigated, today spatializing practices are attracting attention now that the codes and taxonomies of the spatial order have been examined” (116). In other words, ways of talking about and analyzing space begets spatial theory. Soja recognizes that the causes of the spatial turn may also arise from the context of “the increasing intervention of electronic media in our daily routines,” political activism around poverty, racism, sexual discrimination, and environmental degradation, or multiplying geopolitical conflicts around the globe as “we are becoming increasingly aware that we are, and always have been, intrinsically spatial beings, active participants in the social construction of our embracing spatialities” (1).

With the rise of academic theories as well as other cultural considerations, space is no longer just “an empty area.”

With resources like the Scholars’ Lab *Spatial Humanities* website, a broad community resource for those interested in geographic information systems (GIS) for humanities inquiry and in place-based digital scholarship, it might seem that the spatial turn arises as a consequence to technology. GIS first appeared in discussion in the late 1960s, and Global Positioning System satellites (GPS), theorized in the 1970s, were fully operational in 1995.¹⁹ Soon after rose such technologies as Google Earth and Google directions and maps on personal computers and phones, and such products as Garmins and other car-based services that enable drivers to navigate easily to unfamiliar locales. This combined technological capability and context of expectations has no doubt led scholars to explore and to present scholarship using cartography through such digital humanities scholarship, like the historically-focused work of *The Map of Early Modern London, Mapping Texts*,²⁰ and *Holocaust Geographies Collaborative*,²¹ predictive projects like *Silicon Valley’s Future Wasteland*,²² and historical-urban planning projects like Bristol UK’s *Know Your Place*, among others. While innovative, many of the aforementioned publish two-dimensional representations. The Digital Karnak project, for

¹⁹ I refer here to the first time GIS is referred to as a term—rather than as a concept in use (which might date back centuries earlier). Tomlinson first used the term “geographic information system” in a 1968 publication. Prior to that, Tomlinson had used the shorter term “geo-information system” in 1967.

²⁰ The Mapping Texts project attempts to identify patterns embedded within massive collections of historical newspapers by combining text-mining and visualization.

²¹ The *Holocaust Geographies Collaborative* argues that “the key geographic concepts of location, scale, resolution, territoriality and the space/place dichotomy are fundamental to an expanded understanding of the genocide.” This project emphasizes dynamic mapping to understand change over time, as well as individual movement in particular spaces.

²² In the *Silicon Valley’s Future Wasteland* project, lead researcher Nicholas Bauch examines the economic impact of loss of venture capital-funded businesses in the Valley.

example, provides 3D and VR models of the ancient Egyptian temple. Regardless of their form, digital mapping software has enabled scholars to participate in and to communicate their spatial research and to theorize space in new ways.

However, just as map-making was possible long before these latest technologies, this spatial turn extends beyond technological inquiries. Soja, for example, saw space as not merely neutral, but a way of studying and understanding justice and injustice. Not unlike the New London Group positing multiliteracy as necessary for our culturally and linguistically diverse context in increasingly globalized societies, Soja sought a way to interrogate the impacts of space on society (and vice-versa). Claiming that spatial thinking has changed in relation to economic, political, and cultural transformations in the contemporary world (5)²³ as well as the rise of the Internet, Barney Warf and Santa Arias see the spatial turn in the way that “Space, place, mapping, and geographical imaginations have become commonplace topics in a variety of analytical fields” (i). The authors contend this focus is important: “Geography matters . . . because where things happen is critical to knowing *how* and *why* they happen” (1). Working from a similar stance on how and why, Franco Moretti approaches literary studies through spatial analysis and argues for looking at literature broadly through spatial thinking.²⁴ Although Moretti in particular adopts technological tools, spatial approaches do not necessarily

²³ Warf and Arias concede that “globalization” is a vague term, but note that the changing networks related to new economies, immigration, tourism, media, pollution, and more are examples of global change (5).

²⁴ Franco Moretti particularly emphasizes approaching literary studies through spatial analysis *Graphs, Maps, Trees* (2007) and *Atlas of the European Novel, 1800-1900* (1998).

mean using new technologies, but are responding to broader shifts in society and applying spatial analyses to understand the past in new ways.

In rhetoric, considering the role of space represents less of a turn and more of a spatial *return*. Rhetoric has a long history of using place as a means of exploring and generating ideas.²⁵ In *Timaeus*, Plato theorized the *khôra* (also transcribed as *chōra* or *chora*),²⁶ a state of being and nonbeing linked to interstitiality, or in-betweenness of place.²⁷ Literally, the Greek term *khôra* referred specifically to the area surrounding the Ancient Greek city proper, but Plato uses the term to refer to an open receptacle for generating meaning, presenting a space that is between places serving as a productive site. Plato also uses a similar landscape in *Phaedrus* as Socrates and Phaedrus walk outside the city walls to discuss the latter's sophistic rhetorical training. Here, Socrates makes use of space for pedagogical purposes (Wycherly).

Aristotle continues the discussion of space by spending much of *Rhetoric* presenting the *topoi* (Greek, literally meaning “places”) to enable rhetors to understand relationships upon which rhetors can find material to write or speak about. Cicero and Quintilian both recount a legend about a poet who developed a device known as “the method of *loci*” (from the Latin for “places”), with memories affixed to particular spatial locations. In the legend, the poet Simonides is called upon to identify bodies in a

²⁵ Thomas Rickert calls for additional work on the relationship between humans and space, arguing, “Rhetorical theory is only beginning to consider how these transformations of human being in its relation to place affect rhetoric” and calling for “work that furthers ontological insights into the dissolution of the subject/object dichotomy and the vital role of the material environment in rhetorical practices” (42).

²⁶ Note: Because the translation from the ancient Greece has inevitably introduced variation, I have attempted to adopt the spelling that the particular author used.

²⁷ Rickert points out that the concept of *chora* as presented in *Timaeus* is “murky” and “given to mystery and mysticism” (46).

collapsed building based on where he recalled they were located during his performance. (I will return in chapter IV to the legend of Simonides and the technique popularly known as the *memory theatre* or *memory palace*.) Even the concept of “discourse,” etymologically, means “running to and fro,” that is, from place to place or topic to topic (Oxford Dictionaries). Place and space thus functioned in early rhetorical theory to generate and to communicate.

Although space has been discussed since the beginning of rhetoric, it has not received focused attention throughout rhetorical history. Recently, a number of recent theorists, such as Julia Kristeva, Judith Butler, and Jacques Derrida, have taken up chora. It should not be surprising that feminist theorists like Kristeva, Luce Irigaray, and Butler use chora, given its feminine or maternal associations. Kristeva uses chora to indicate a stage or state in multiple ways, both as a place a mother occupies (“Revolution in Poetic Language”) and as semiotic influence on subjectivity (“Linguistics, Semiotics, Textuality”). Kristeva acknowledges Plato’s *Timaeus* as providing the term that she uses “to denote an essentially mobile and extremely provisional articulation constituted by movements and their ephemeral stases” (93). For Kristeva, then, the chora is not a stable site, but a conceptual space both critical for identity formation and also open to movement. Judith Butler similarly views *chora* in *Bodies that Matter* as “that site where materiality and femininity appear to merge to form a materiality prior to and formative of any notion of the empirical” (17). For Butler, *chora* represents a concept that is uncomfortably associated with one gender. I, however, see that if the choric represents

Plato's "third-kind," it would not be associated with one of the two common genders, but instead would be a non-binary conception.

Derrida writes about *chora* extensively. In an essay entitled "Khōra," he asserts that Socrates performs a choric function by initiating a conversation by asking questions and then receding from attention. In other words, Socrates performs an inventive act. Following Plato's conceptualization, for Derrida the *chora* here functions as a third kind where Socrates is neither fully a speaker, nor fully silent, but from the conversation he helps instantiate springs forth the *chora* itself. Derrida's khōra is inventive.

More recent media theorists, like Gregory Ulmer and Jeff Rice, theorize *chora* in relation to Internet and new media technologies. In considering the contemporary era and the rise of new media, Gregory Ulmer conceives of digital writing as "chorography." Ulmer defines chorography as a tool of invention, a "means of pattern making, pattern recognition, pattern generation. It is not that memory is no longer thought of as 'place,' but that the notion itself of spatiality has changed" (*Heuretics* 36). Ulmer sees chorography as associational learning in cyberspace, an environment where much data is stored but the use of data collections is not inherently apparent (45-47). Ulmer sees *chora* as related to both memory and invention.

Like Ulmer, Rice views *chora* as critical to new media as he accounts for the impact of technology, cultural studies, and visual writing in his revisioning of the 1963 revival of composition studies. Rice takes up *chora* as an associative term resonant with 1963 that also conjures Marshall McLuhan's notion of cool media. *Chora* is one of the six rhetorical principles Rice theorizes as conducive to cool, a narrative that he finds overlaps

with composition's.²⁸ For Rice, chora's logic "is not based on the fixity we currently associate with print culture" (35). Building on Edward Casey's understanding of chora's potential for connectivity, Rice contends that he enacts chora in his revisioning because it enables him "to bring together disparate events and texts from 1963. It teaches me how to make connections" (35). Rice cites the example of the hyperlink as one of the best, but not only, ways to conceive of the choral: The hypertextual link "allows writers the capability of developing threads around single words or ideas, and that requires readers to navigate these threads in various ways. The link is indicative of a new media push to reorganize space in terms of meaning construction" (35). The chora is inventive, indeed central to digital rhetoric (40).

In *Ambient Rhetoric*, Thomas Rickert builds on Plato's *chōra* in his conceptualization of the ambient, which derives from the Latin *ambientem*, "the present participle of the verb *ambire*, meaning 'to go about' (*amb*-, 'on both sides,' 'around,' 'about' + *ire*, 'to go') (5). Rickert's ambient functions then as, among other things, reference to the surrounding, encompassing characteristics of an environment, as well as a nod to the French *ambiance* "arrangement of accessories to support the primary effect of a work" (6). In an era in which the digital intersects with the "everyday environment," Rickert notes that technology is "permeating the carpentry of the world . . . in networks and technology infrastructures, houses and buildings" (1) which are now populated with "smart" computation objects "an inescapable part of the furniture of everyday life" (72). This change calls into question our surroundings: "We are entering an age of ambience,

²⁸ The six rhetorical principles Rice finds conducive to cool are chora, appropriation, juxtaposition, commutation, nonlinearity, imagery.

one in which boundaries between subject and object, human and nonhuman, and information and matter dissolve” (1). Rickert’s age of ambience arises in an era of increasing technology, and, as such, “a choric rhetorician will attend to memory, networks, technologies, intuitions, and environments (places), because these things all touch on place as something generated, not statically present and hence perceived” (67). Technology’s change is on-going; we will not arrive at a “‘new’ place on which fresh (ambiently derived) conceptions of place could rest” (73). We are continually engaged in choric invention.

Dimensions of Writing Spaces

While chora has been theorized in digital rhetoric as one means to address spatial concerns, the spatial merits even further consideration. Theorists have addressed spatiality both in the digital and non-digital. Kress, for example, shows in “‘English’ at the Crossroads” that it is possible to analyze a text to understand meaning as arising in part through spatial arrangement. Examining textbooks and print newspapers, Kress points to the relationship between words and image in examining a textbook page from 1936 targeted to 14 year olds that combines both word and image:

In terms of space on the page, the image here takes a little more than one third of the page; most of the pages in this book are more usually given over wholly to print, or use smaller illustrations. Writing is the vehicle for providing all the information which is judged to be relevant. Language (in the written form) is considered as a full medium of representation and communication: everything that needs to be said is said in language; conversely, the implicit assumption is that everything that can be said can only be said in language. (71)

By contrast, in a 1988 textbook presenting corresponding science information:

writing is not dominant. In terms of the amount of space taken up by language and image on the page the proportions are now reversed—about one third is writing, two thirds is given over to image—though that alone is not the major indicator of the changed relation. Rather it is the fact that now writing is not the vehicle for conveying all the information which is judged to be relevant. Here language is implicitly seen as a medium which is only in part able to express and represent what needs to be represented. Everything that needs to be communicated is now not judged to be communicable in the written mode alone; the assumption is that some things are best done by using writing, and others are best done by using images. The two modes have become specialized to particular tasks. (74)

Each of the textbooks points to different spatial allocations for their communicative purposes. Discussing how communication is multi-semiotic, Kress writes that “[e]ven the densely printed page of novels, or of older textbooks, as of governmental reports, had layout, used typefaces of a certain kind, had paragraphing, all of them visual elements” (70). While he focuses on the visual in this discussion, even those visual elements relate to the spatial: the size of typefaces, the paragraphing, and layouts. Kress talks about the promotion and the subordination of conceptual importance through ordering that he terms a “syntactic hierarchy.” Ultimately, Kress argues, “Writing is thus doubly spatial: once metaphorical, through the order of syntactic hierarchy, and once actual, through the visual display on a surface” (81). This means that writing is spatial in both visual and representational arrangement within a sentence.

Anne Wysocki offers a similar contention in arguing that the space of a text helps us make immediate judgments about its purpose (123). She argues, “*All page- and screen-based texts are (therefore) visual and their visual elements and arrangements can*

be analyzed” (ed: italics hers; 123). We make assumptions about the type of a text based on its spatiality; for example, when we see an 8.5” x 11” document with double-spaced type, we make an assumption about a school assignment (124). Wysocki offers reminders that textual spatial arrangements perform arguments and that the expectations for such arrangements change over time (witness the difference between illuminated medieval manuscripts versus software manuals). Wysocki offers the valuable contribution that expectations for how text is arranged given a space changes over time and in different genres and for different media. As we enter the era of VR, AR, and MR texts, we can anticipate that we will develop new expectations for spatial arrangement in these new media.

Considering the importance of the spatial in composing acts, Jay Bolter begins his articulation in *Writing Space* with an excerpt from Victor Hugo’s 1842 *Notre-Dame de Paris*. Bolter then cites Frances A. Yates’s *The Art of Memory*, which claims that the medieval cathedral packed with statues and stained glass “was a library to be read by the religious, who walked through its aisles looking up at the scenes of the Bible, the images of saints, allegorical figures of virtue and vice, and visions of heaven and hell” (2). Bolter here emphasizes that de Certeau presents the text as a space and space as a text (or the interrelationship between space and text). Rather than a space being simply a geometric area, de Certeau conceives of space in terms of its use and users: “Thus the street geometrically defined by urban planning is transformed into a space by walkers. In the same way, an act of reading is the space produced by the practice of a particular place: a

written text, *i.e.*, a place constituted by a system of signs” (117). In other words, space is instantiated by its reading. Thus, texts are spaces and spaces are texts.

Bolter returns to the idea of the medieval cathedral to emphasize the sanctity of visuals because of their unusuality during the Middle Ages (54): “The images must have had a different status for them than the endless barrage that confronts the contemporary television viewer or Web user” (55). I would suggest that it is not only the visuals that had a different status upon the medieval and today’s audience, but the experience of space itself. Televisions, and so many screens, have provided different experiences with space. A 55” television can deliver the world to my living room couch, but watching TV feels different from standing or sitting in the soaring Cathedral-Basilica of Saint Louis with a nave soaring high above surrounded by a dozen statues personifying Faith, Hope, and Charity, and St. Joan of Arc. Like me, medieval era people would not have had frequent experience with such spaces.

Like Ulmer and Rice, Nedra Reynolds argues for a changed relationship between space as a result of new technology. In *Geographies of Writing*, Reynolds posits, “Just as concepts of space and place change in response to changes in transportation, architecture, or urban planning, there is abundant evidence that new technologies are also shifting our understandings of space and are ushering in new forms of writing or talking—forms that many users are still adjusting to” (20). As with Bolter and de Certeau, Reynolds likewise sees a person’s activity in regards to the text as functioning in terms of location; she distinguishes the ways texts are inhabited based on whether the individual interacting with them is writer or reader: “Readers (as visitors or transients) and writers (as dwellers

or owners) are never going to experience a text in the same way” (166). This relationship isn’t stable, however,

as De Certeau implies, a finished text, one that the writer will not change again or has published, is one where the writer has moved out and left his text for readers to inhabit. It becomes a different dwelling, then, and the writer’s familiarity grows dimmer and more distant. Readers may become inhabitants, then, just as close friends or extended family members may become dwellers in our homes, if they come often enough and learn what cupboard the coffee cups are kept in. Readers inhabit a text when they cease to be outsiders and move through it with some familiarity, confidence, or fully engaged memories of what goes where or what a certain “turn” leads. (166)

Reynolds thus suggests that although a writer may construct one space, the space is not stable; indeed, the reader may well occupy another space than the one the writer created, particularly the more the reader engages with the text. Reynolds’ metaphor suggests that the reader comes to occupy a virtual space, an idea that is less metaphorical as texts begin to surround us in the era of 360° texts, VR, AR, and MR games, and immersive images such as Google Photo Spheres.

Akin to Reynolds’s assertion that new technologies are shifting our understandings of space, Bolter likewise contend that technology is altering our understanding of how we communicate. Written and revised again at the end of the 20th century, Bolter’s *Writing Space* focuses largely on the way that the computer and electronic writing in the form of hypertext are challenging the book in the “late age of print.” Discussing how Gutenberg’s 42-line Bible with thick letter forms, scribal abbreviations, and page layouts imitated manuscripts produced by scribes, Bolter points out, “It took a few generations for printers to realize that they could create a new writing

space with thinner letters, fewer abbreviations, and less ink” (8). He reminds us that early books were so large that people read and wrote standing up (9). By contrast, today’s predominant writing space, the word processor, uses the scroll as its visual metaphor, with pages scrolling one after another. With the rise of reality media, we now face a paradigm shift as significant as the computer and hypertext that Bolter writes about.

Constructing Writing Spaces

Once again, we must consider the writing space, which Bolter defines as “a material and visual field, whose properties are determined by a writing technology and the uses to which that technology is put by a culture of readers and writers” (12). As “the interaction of material properties and cultural choices and practices,” a space’s meaning derives from prior spaces (12). Not only is the writing space a place for writing, it is also a place for reading. As both an individual and cultural location, “the writing space is a potent metaphor”; it is here that the “writer enters into a reflective and reflexive relationship with the written page, a relationship in which thoughts are bodied forth” (13). The writer’s own mind becomes a writing space (13). The rise of electronic writing has caused redefinition of both “the visual and conceptual space of writing,” inciting the rise of the spatial metaphor for writing and reading witnessed in terms such as “cyberspace” (12). Bolter brings to the discussion the notion that the writing space is indeed complicated by new technologies, but he also reminds us of how the contemporary connects to the past in discussing Gutenberg’s first printing, incunabula, 25-foot long papyrus scroll volumes, among other texts, and how they too connect to the electronic text.

For Bolter, writing space is multiple. When reading online websites, “We think of the pages themselves as floating in a virtual space, which we vaguely associate with the various physical locations of computers on the Internet” (29). Thus, the writing space is both virtual and physical. Collecting books “within one conceptual and physical structure,” the library “is the physical realization of a culture’s writing space of books. What the reader does metaphorically in the encyclopedia, he or she can do literally in the library—move into and through a textual space” (91). Our awareness of changing space during the electronic age can help us understand our experiences with physical texts as being more than occupying a physical space. That space is important for both writer and reader. Resonating with Reynolds’ comments and de Certeau’s sense that a person’s ability to “inhabit” a text changes with their role as reader or writer, Bolter claims, “The organization of writing, the style of writing, the expectations of the reader – all these are affected by the physical space the text occupies” (77). I extend this idea by suggesting that it is not only the physical space that the text occupies, but the reader’s expectations of the space the text occupies. While one might glance at an 8.5” x 11” sheet of paper and make presumptions, it is harder to estimate what experiences one might have in a Virtual Reality game when we are unable to estimate the game’s shape, size, and space when we lack a corresponding material object containing that text. It is into that unknown space that we proceed in VR.

Spaces do not merely exist, as de Certeau argues, in an alignment with Lefebvre; space is constructed. Indeed, space is “actuated by the ensemble of movements deployed within it. Space occurs as the effect produced by the operations that orient it, situate it,

temporalize it, and make it function in a polyvalent unity of conflictual programs or contractual proximities” (117). Or as de Certeau later offers, “In short, *space is a practiced place*” (117). As cited earlier, de Certeau sees space as a place where users’ uses are determinative: “the street geometrically defined by urban planning is transformed into a space by walkers . . . an act of reading is the space produced by the practice of a particular place: a written text, i.e., a place constructed by a system of signs” (117). Barring physical restriction, use makes the space.

How individuals use and interact with space depends on strategies and tactics (xix).²⁹ Institutions and structures of “will and power,” such as businesses, cities, governments, and scientific institutions, are “producers” of strategies (xix). Strategies are “proper” (xix). Individuals act as “consumers” when they are subjected to and shaped by these strategies; however, these individuals use “tactics,” which are the “art of the weak” (37) and which he associates with cleverness, with *mētis*. de Certeau elaborates the tactic: “A tactic insinuates itself into the other’s place, fragmentarily, without taking it over in its entirety, without being able to keep it at a distance. It has at its disposal no base where it can capitalize on its advantages, prepares its expansions, and secure independence with respect to circumstances” (xix). Thus, de Certeau sees everyday practices, such as reading, talking, shopping, moving about, and so forth, in terms of tactics. Elaborating on the practice of reading, de Certeau extends the tactic to the spatial:

He insinuates into another person’s text the ruses of pleasure and appropriation: he poaches on it, is transported into it, pluralizes himself in it like the internal

²⁹ For information about strategies and tactics, see especially de Certeau’s “Walking in the City” in *The Practice of Everyday Life*.

rumblings of one's body. Ruse, metaphor, arrangement, this production is also an 'invention' of the memory. Words become the outlet or product of silent histories. The readable transforms itself into the memorable: Barthes reads Proust in Stendhal's text; the viewer reads the landscape of his childhood in the evening news. The thin film of writing becomes a movement of strata, a play of spaces. A different world (the reader's) slips into the author's place. (xxi)³⁰

De Certeau here offers the idea of writing and reader as spatial, but as possibilities for memory and invention, much like the choric others theorize. The PlayStation game *Journey* (2012) focuses not on defeating boss-level opponents, but instead on players exploring a fantasy world, without verbal or textual direction. Players learn to walk, leap, and fly between spaces. However, some users, having completed the game multiple times, determined that they could escape normal gameplay space and slip into areas partially-coded and not fully-developed that provided new places to explore or an alternate, ghostly view of the normal game world. While it was certainly not the intent of Thatgamecompany for users to explore these areas or for them to be part of gameplay, players nonetheless found these extra-dimensional spaces and made them part of their *Journey* experience. I would suggest that such behavior represents a digital tactic and it is just as likely that VR users will engage in similar tactics.

Elsewhere, de Certeau blurs the relationship between space and story. Discussing how Greek mass transit options, such as busses or trains, are called *metaphorai*—metaphors, de Certeau argues, "Stories could also take this noble name: every day, they

³⁰ De Certeau explores in multiple ways the relationship between communication and space. De Certeau links space with discourse: "consumers move about, their trajectories form unforeseeable sentences, partly unreadable paths across a space. Although they are composed with the vocabularies of established languages (those of television, newspapers, supermarkets, or museum sequences) and although they remain subordinated to the prescribed syntactical forms (temporal modes of schedules, paradigmatic orders of spaces, etc.), the trajectories trace out the ruses of other interests and desires that are neither determined nor captured by the systems in which they develop" (xviii).

traverse and organize places; they select and link them together; they make sentences and itineraries out of them. They are spatial trajectories” (115). Indeed, he argues, “narrative structures have the status of spatial syntaxes” (115). For him, ultimately, “Every story is a travel story—a spatial practice” (115). De Certeau’s proposal resonates with the etymological history behind discourse as “running to and fro.” Although de Certeau particularly refers with his idea of travel stories to literary analysis, this analysis can aid in understanding Virtual Reality (and AR and MR) texts. Every story in VR, AR, and MR will be a spatial story, particularly as the reader will “move into” these textual spaces and identify with their spaces after subsequent experience.

Focusing on actual uses of space, Edward Soja offers three ways for thinking about space. Developing his concepts of Firstspace, Secondspace, and Thirdspace, he builds on Lefebvre’s theorized spaces: “the *perceived* space of materialized Spatial Practice; the *conceived* space he defined as Representations of Space; and the *lived* Spaces of Representation (translated into English as “Representational Spaces”)” (10). Correlating with Lefebvre’s “real” space, Firstspace perspective and epistemology “is fixed mainly on the concrete materiality of spatial forms, on things that can be empirically mapped” (10). Aligning with Lefebvre’s “imagined” space, Secondspace is “conceived in ideas about space, in thoughtful re-presentations of human spatiality in mental or cognitive forms” (10). Soja claims most who do their thinking about space have done so in either Firstspace or Secondspace. Soja’s Thirdspace echoes Plato’s *khôra*, as a place where

everything comes together... subjectivity and objectivity, the abstract and the concrete, the real and the imagined, the knowable and the unimaginable, the repetitive and the differential, structure and agency, mind and body, consciousness and the unconscious, the disciplined and the transdisciplinary, everyday life and unending history. (57)

This “thirthing” of the spatial imagination provides “another mode of thinking about space that draws upon the material and mental spaces of the traditional dualism but,”

Thirdspace is “[s]imultaneously real and imagined and more (both and also . . .), the exploration of Thirdspace can be described and inscribed in journeys to ‘real-and-imagined’ (or perhaps ‘realandimagined’?) places” (11). Soja provides an example of bell hooks’ adoption of the margin as a political and geographical act, a discursive choice as a means to move beyond the usual binaries involved in race, class, and gender because the choice of “marginality reconceptualizes the problematic of subjection by deconstructing and disordering both margin and center. In those restructured and recentered margins, new space of opportunity and action are created, the new spaces that difference makes” (98). Soja sees in Thirdspace theory the potential not just for thinking about space and life in new ways, but for enacting real life change.

Others have suggested that we apply our understandings of the spatial to scholarship, even when such methodologies might represent a non-traditional approach. To understand literature, Moretti argues that literary scholars should apply the spatial to their studies, specifically by pursuing computational and quantitative analysis to graph and map literary works. Such work, Moretti argues, would help illuminate how geographic place shapes literature. Moretti addresses this work himself in *Atlas of the*

European Novel, 1800-1900 by exploring a series of 100 maps to articulate the links between literature and space. In other words, to discuss the interrelationships between fiction and place, Moretti chose to support his argument with multiple representations of locations in the form of maps. Such systematic work with mapping, he argues, can serve as analytical tools “that dissect the text in an unusual way, bringing to light relations that would otherwise remain hidden: it raises doubts, ideas. It poses new questions, and forces you to look for new answers” (3-4). With the rise of VR, AR, and MR media, one might imagine other possibilities for pursuing this sort of research. Imagine, for example, standing on the stage of the Globe, courtesy of VR, to see Renaissance actors perform Shakespeare’s works. Or standing on the floor or in a balcony of the Globe to watch a performance. Any of these could be possible through new reality technologies.

Exploring Virtual Reality

Just as GPS and GIS contributed to the spatial turn, new Virtual Reality technologies provide affordances for presenting space as texts and thinking about textual space. As reality media become more broadly accepted, the spaces for engaging with spatial theory will likewise expand. These media will not offer wholly new spaces, however; close examination reveals that VR spaces link to prior models. Understanding the way VR uses space reveals that much of our ability to understand texts relies upon our interpretations of their dimensionality. Before exploring how VR uses space, it is important to articulate what VR is. I contend that VR should be approached both as a theoretical concept and as a technological implementation.

Alex Reid similarly argues for understanding Virtual Reality as a duality, noting “neither of which is reality in the way we have traditionally understood it” (1). First, he contends, is the form of Virtual Reality most of us think of when hearing the term: A computerized representation brought about by modern technology. Second is a philosophical view courtesy of pre-Socratic philosophers, continuing through the millennia to be found now in deconstruction, rhizomes, and simulation. This virtual offers “an alternate theory of cosmos, of matter, time, and space” that informs the first understanding of VR (1). Reid contends that both of these are important for understanding the future of composition and education, particularly as it moves online. To support his claim, Reid examines how nineteenth-century “new media” technologies such as the typewriter arose at the same time as literary studies. Reid’s claim offers us the importance of understanding VR in relation to technology, but also as a challenge to a singular notion of reality. As we move into a world communicating through reality media, Reid’s recognition of multiple realities bears increasing relevance.

The Virtual Reality I refer to is a simulation through the use of technology. Reid treats the technological sense of the virtual more broadly, pointing out how the word “virtual” has been applied often to various computer-based experiences, for example, with online learning having been referred to as “virtual education” (4). I do not consider the process of taking courses by retrieving and uploading documents through a Learning Management System, or interacting with the instructor and other classmates through online video calls and conferences, a “virtual” experience. To me, VR should be restricted to that which simulates an environment in which the user is immersed.

Jaron Lanier, an early VR innovator, first applied the term “Virtual Reality” to describe his emerging technology in 1989.³¹ Comparing talk about VR in the early 1990s to the discussions around prior technological developments in radio, cinema, and photograph, Lanier described the aspirational rhetoric around all these media as “technology as a route to community, an experience of infinity, as a route to a sort of social communion, and an ability to be free of physical constraints on the sources of experience” (Lanier and Biocca 156). Although noting that VR came close to fulfilling those goals, he also cautioned, “It’s very important to understand that the technology by itself doesn’t necessarily have any cultural or spiritual quality. It has cultural or spiritual potential, but that can only be realized by cultural development that springs up alongside it” (156). Lanier saw the importance of being involved in the earliest stages of development in order to shape that usage.³² Lanier’s discussion here focuses less on the technological descriptors and ultimately on what that technology might do for us socially, culturally, and spiritually.

One of Lanier’s prototypes provides an example of how Lanier saw VR as transcending the physical actualities that we live in. Biocca’s description of one of Lanier’s early VR demos featured him asking for crowd input “to show us how easily our imaginations could create a virtual world” (151). Scientists requested a desert scene, mountains, sky, and a camel. Lanier tired of the conventional suggestions, proposing: “A

³¹ Lanier was working in VR development for his company VPL Research.

³² In his interview with Biocca, Jaron Lanier went on with his understanding of how Virtual Reality usage could be shaped, “So, if virtual reality is used in a way where people using it improvise the content of worlds, collaboratively, then virtual reality would seem to come closest to providing the kind of shared dream space that makes the technology more coherent with all the marketers have promised Westerners” (156).

pizza, a flying pizza, was needed in this desert world. The audience decided on a topping. A flight path was created for it, and—voilà—the pizza flew, inside the camel and out into the sky” (152). It is clear that what Lanier envisioned here was not a recreation of the world around us, but a space where the constraints of the actual world, whether in the form of physics or expectation, need not apply. Decades later, Lanier argues that VR will give us new capacities to see ourselves, not digital photographic representations of ourselves, but modified versions of selves in which we might have tentacles rather than arms. Lanier maintains a view of VR as offering potentials in addition to those in the actual world. What he foresees as virtuality’s capabilities involves something entirely different than taking an online course.

Not long after Lanier’s creation of the term “Virtual Reality,” applications of the term proliferated. Seeking greater specificity and accuracy in terminology usage, Paul Milgram and Fumio Kishino theorize a “reality-virtuality continuum” with virtual environments and real environments on opposite ends of the spectrum (see Figure 3). Between the two poles are Augmented Reality (AR) and Augmented Virtuality (AV). Milgram and Kishino promote the concept of Mixed Reality (MR) as that combining real world and virtual world objects within a single display (3). Milgram and Kishino offer VR’s conventional definition as one in which “the participant-observer is totally immersed in, and able to interact with, a completely synthetic world.” VR is flexible; it “may mimic the properties of some real-world environments, either existing or fictional; however, it can also exceed the bounds of physical reality by creating a world in which the physical laws ordinarily governing space, time, mechanics, material properties, etc.

no longer hold.” The researchers contend that many discussions of VR might instead better use terms that exist elsewhere on the virtuality continuum, falling into, for example, Augmented Reality (AR) or Augmented Virtuality (AV). I follow the distinctions these authors made in carefully applying and consistently following the term VR to recognize immersive environments, AR to focus on augmentations of actuality, and MR to recognize the flexibility of technologies that support perception of actuality with an overlay of either AR or VR.

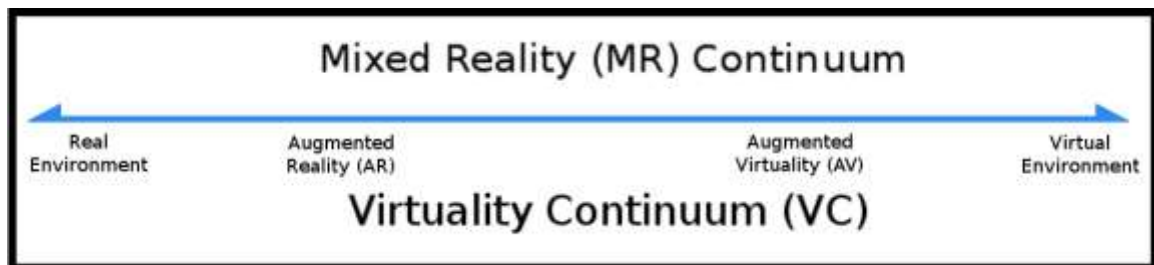


Figure 3. Simplified Representation of Milgram and Kishino’s “Virtuality Continuum.”

In 1992, Jonathan Steuer similarly responds to concern about VR by summarizing in his oft-cited article how Virtual Reality has been defined as a medium, not unlike the telephone or television, or through the hardware, such as by identifying the computers, head-mounted displays, speakers, and motion-sensing gloves, required to access VR texts. Steuer argued, however, that

from the standpoint of communication researchers, policymakers, software developers, and media consumers, a device-driven definition of Virtual Reality is unacceptable: It fails to provide any insight into the processes or effects of using these systems, fails to provide a conceptual framework from which to make regulatory decisions, and fails to provide a method for consumers to rely on their

previous experiences with other media in understanding the nature of Virtual Reality. (73)

Rather than attempt to identify VR systems based on particular hardware—for which no minimum set of requirements exist and for which no way exists to distinguish between VR and no-VR systems, Steuer proposes a VR definition focused on human experience of *presence*. As a distinction from technological hardware-based definitions of VR, presence refers to “the experience of one’s physical environment; it refers not to one’s surroundings as they exist in the physical world, but to the perception of those surroundings as mediated by both automatic and controlled mental processes (Gibson, 1979): *Presence is defined as the sense of being in an environment*” (75). Telepresence involves that same environmental sensation achieved through mediation by any technology, including past, present, and future media—whether reading a letter, talking on the phone, playing video games, using message boards, and so forth (78-79). Steuer identifies that while individual perception of presence might vary, the technological variables influencing telepresence are the breadth and depth of vividness and speed, range, and mapping of interactivity.³³ None of this, he maintains, is limited to a particular form of technology hardware.

While I agree with Steuer that Virtual Reality need not be limited to the mediation of particular technologies—indeed, I rely on a similar position in my discussion of dimensions in antiquated media—I define for the purposes of discussing new media VR

³³ Sensory breadth, for example, communicates information across the five perceptual senses that J.J. Gibson (1966) identifies: the body’s orienting (or equilibrium), the auditory, the haptic, the taste-smell, and the visual (81).

the importance of intentionality in the design, whether hardware and software. Certainly, CAVES (Cave Automatic Virtual Environments), rooms with specialized display equipment (a la *Star Trek*'s holodeck), support users perceiving themselves to be in an immersive environments, thus meeting Steuer's definition of Virtual Reality. However, I focus here on the consumer VR technology specifically intended to deliver VR experiences now becoming readily available.³⁴ Such hardware delivers and markets itself to provide VR experiences, such as the Samsung Gear VR ("powered by Oculus"), the HTC Vive, Facebook's Oculus Rift, and Sony's PlayStation VR. While the Samsung Gear VR is supported by a more generic cell phone, it is a device specifically designed for delivering VR experiences.

At present these devices necessitate putting on a headset that controls the entirety of the user's viewing experience. Sound is played through the device (or cell phone). These two sensory inputs provide the "immersive" experience meaning that the user is immersed in a different sense of their environment. Users may or may not perceive their own bodies in this environment; their bodies may instead be replaced by those of characters they assume in the virtual environment, or may be absent altogether. Virtual Reality is distinguished from Augmented Reality and Mixed Reality in that it replaces the user's view with a constructed scene. Constructed sound may overlay or replace the user's perception of actual surrounding sound. Once the user accesses the VR system, the VR may or may not require user input to proceed through the VR experience, depending on whether the content is a video or a game; in general, though, the user will be able to

³⁴ In April 2016, Samsung Gear VR had been used over one million times (Metz).

turn their views to achieve the sense that they are surrounded by a different environment than their actual one.

Understanding dimensionality is key for developing successful Virtual Reality texts. I've previously defined Virtual Reality as a textual environment in which VR replaces the viewer's visual and possibly auditory perception with a virtual scene. Sensory replacement leads to the term *immersive* as a descriptor for the VR user experience as perceiving themselves as "immersed" in a different reality than that of their surrounding actuality. What today's VR strives for with its headsets is the user having a sense of being in a different environment, as in *The Matrix*, *Tron*, *Lawnmower Man*, and *Hackers*, where no other environment is particularly perceptible. (Unlike these movies which showed characters having complete virtual bodily experiences with little perception of actuality, however, consumers experiencing VR today will put on a headset and headphones/earbuds—with possibly some haptic feedback—to interact with virtual experiences.)

Successful VR thus depends on emulating multiple dimensions in space. One of the first apps I tried on my Oculus-powered Samsung Gear VR was a Netflix app that not only allowed me to stream Netflix content to my VR device, but also showed that content on a simulated television in my choice of several different virtual living rooms. So, I sat on my living room couch and had a first-person view of sitting on a virtual couch. Thus, my first Oculus VR experience replicated the experience of an existing space, albeit reconceiving it as a much nicer space than my apartment living room.

Although VR is commonly associated with computer technologies, I, and others, suggest that virtual experiences can be gained outside digital environments. For example, entertainment parks like Disneyland, haunted houses, and room-sized recreations of classic paintings all provide virtual experiences using primarily non-digital media. Henry Sussman sees the virtual as existing outside the increasingly mainstream technological versions. He writes, “At one end of the age or time-span of virtuality is the long tradition of mimesis itself, with its emblematic scenes of writing and representation (the underworld, oracles, magical armor) and sequestered precincts (temples, theaters), in which the distortion-effects of over-determined simulation are afforded full exposure” (316). While Steuer focuses his telepresence definition of VR on sensory breadth and depth of vividness and the speed, range, and mapping of interactivity, Sussman presents a different, but not entirely dissimilar set of criteria for achieving virtuality: a) verisimilitude; b) participant attentiveness; c) absorptiveness (entrancedness); d) immediacy; e) interactivity - which “may or may not result in learning, heightened self- or critical awareness, greater ‘power’ in articulation, discernment, dealings with the environment (19-20). As with Steuer’s resistance to define VR in terms of particular technologies, Sussman notes that VR is not technologically-bound: “Virtual interaction and transaction transpire as much in theaters, cinemas, and museums as in relation to computers” (20). Indeed, our awareness of VR may be highly personal:

Because we are so fully acclimated to the conditions of virtuality prevailing between our minds and a computer screen, it may now be easier for us to acknowledge the virtual dimensions always embedded in a host of interactions seemingly far afield from technology. Extrapolating backward from the time we

spend online, there are moments when our conversation, our sexual interchange, our physical exertion, our active or passive participation in musical or dramatic performance, our reading, our meditative or other structured religious activities, collective or individual, and our ingestion of food, acquires an all-absorbing quality that can only be characterized as virtual. (20-21)

VR may thus be particularly individual, and idiosyncratic to the particular experience.

Sussman also associates with the virtual a quality of addictiveness. He wagers that the number of individuals addicted to video games and email outnumbers—and has for a while—alcoholics and drug addicts (21). But not every addiction should be avoided or treated; he argues, “Virtual addiction, or the addiction to the virtual states of everyday life, is the very platform for aesthetic, creative, intensively intellectual, religious, and, I would argue in this study, therapeutic experience” (21). It is though this “rhetoric of virtuality” that Sussman posits an opportunity for retrospection. Not only can we look back on our own lives for these virtual moments, this language inspired by technological advancement provides us a way of looking at prior eras. Through his understanding of virtuality, Sussman argues that Walter Benjamin and the Romantics all engaged in virtual addiction for productive aims. Retrospection reveals that long before digital machines came along, virtuality appeared in Bach’s music, Escher’s graphics, and Godel’s strings of numbers. Like Sussman, I see value in looking back to see what our present media have in common with prior media⁸⁴.

⁸⁴ Adopting a similar tactic of looking back, Tom Standage argues in *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century’s On-Line Pioneers* that our current technology parallels past technological revolutions. Standage argues that looking at the history of the telegraph in consideration of the Internet reveals that the promises of a new technology do not automatically enact their utopic ideals. Using similar historical comparisons, Standage argues in *Writing on the Wall: Social Media - The First 2,000 Years* that social media is nothing new, that ancient graffiti bear remarkable similarity to Internet comments.

In studying the effects of electronic devices on writing, Bolter likewise casts a retrospective gaze and sees commonality in linking writing with the virtual. He argues, “Electronic writing may also be virtual, yet all previous writing technologies were virtual as well, in the sense that they invited writers and readers to participate in an abstract space of signs. This virtual or conceptual writing space forms a continuum with the material space of writing” (Bolter 18). Bolter’s definition of virtual focuses here primarily on the interpretation of abstract signs to invoke another environment or experience. But understanding the historical relationship with the contemporary does not merely mean understanding how the present links to past. It provides opportunities also for understanding disjunctures. Bolter argues that “the computer’s virtuality refashions the writing space of the printed book and the manuscript” (18). Bolter’s point here is that the materiality of our composing space has changed from that in existence for centuries.

Writing during the rise of hypertext, Stuart Moulthrop understands the literacy required for writing online as complex. He defines hypertext literacy as encompassing two domains:

the ordinary grammatical, rhetorical, and tropological space that we now know as ‘literature,’ and also a second province, stricter in its formalisms but much greater in its power to shape interactive discourse. This second domain has been called ‘writing space’ (Bolter, 4); a case might be made (with apologies to those who insist that Virtual Reality is strictly a non-print phenomenon) that it also represents the true meaning of cyberspace. (699)

To achieve literacy in this secondary domain, users must recognize the ways in which

Literacy under hypertext must extend not only to the ‘content’ of a composition but to its hypotextual “form” as well—e.g., the way nodes are divided to accommodate data structures and display strategies, or the types of linkage available and the ways they are apparent to the reader. Practically speaking, this means that users of a hypertext system can be expected to understand print not only as the medium of traditional literary discourse, but also as a meta-tool, the key to power at the level of the system itself. (700)

In other words, users must achieve a sort of “secondary literacy” in which they achieve a “self-consciousness about the technological mediation of those acts, a sensitivity to the way texts-below-the-text constitute another order behind the visible” (700). What Moulthrop points to is an idea that I’ll return to in Chapter III, that literacy is layered in multiple ways. Now, VR is on the verging of changing the decades-long electronic writing space that Bolter theorized and the hypertext that Moulthrop considered. Where will we go next, and how will that broaden our views on the past? Examining existing VR media provide us with direction.

Pre-New Media Dimensional Semiocy: *The Nutshell Studies of Unexplained Death*

In an effort to improve forensic investigation and training in the early twentieth century, Frances Glessner Lee decided to create a series of pedagogical texts that I contend are Virtual Reality spaces.³⁵ These literacy tools trained police detectives in forensic investigation to read, to analyze, and to make supported claims about what had

³⁵ Initially influenced by a family friend who was a doctor, George Burgess Magrath, Lee developed a commitment to legal medicine and medical training and, to support her efforts in furthering forensic medicine and investigator education, established in 1936 and endowed the Harvard George Burgess Magrath Endowment of Legal Medicine (Magrath died two years later) (Christian). Lee believed every state should require the coroners who assigned causes and manners of death to be medical examiners who possessed medical training, something only a few states required in the 1930s (Botz 26).

occurred at alleged crime sites.³⁶ Although she had in 1936 established and endowed Harvard's George Burgess Magrath Endowment of Legal Medicine, Lee saw a need for more hands-on training for students, something that was impossible because of time constraints, the timing of crimes during scheduled training, and laws restricting important details of unsolved crimes (27).³⁷ Rather than write up case files or detailed descriptions for investigators to read and to learn from, Lee chose to create physical models of crime scenes. Having created representative, dollhouse-like miniatures before, Lee developed throughout the 1940s and 1950s the diorama-style scientific models that she called *The Nutshell Studies of Unexplained Death*, a name inspired by the police saying, "Convict the guilty, clear the innocent and find the truth in a nutshell" (27). As instructional aids, the *Studies* do not identify the cause of death; the viewer is left to determine whether the death was natural, accidental, or intentional, as the result of homicide or suicide.

Collectively, the *Studies* are a collection of eighteen remaining "dollhouse"-style dioramas of not immediately explainable death scenes constructed as an educational emulation of the physical spaces detectives might enter when called to investigate an unexpected death.³⁸ The *Studies* feature various death scenes: a corpse in a bathtub under a water faucet, an apparent hanging from an attic rafter, a man slumped in his car in a garage, a woman who appears to be sleeping in a bed, another lying in a closet.

³⁶ Modern-day experts agree about the need for Lee's work: "Investigators used to do dumb things," Bruce Goldfarb, a spokesman for the Maryland medical examiner's office, claims. "They would walk through blood, move bodies, and put their fingers through bullet holes in clothing" (qtd. in Nuwer).

³⁷ Lee's models also made an argument that professional medical examiners in lieu of non-specialized, elected coroners needed to be involved in the crime scene investigation process.

³⁸ Lee's use of miniatures for educational use is not isolated. Mrs. James Thorne also created a series of almost 100 miniatures to represent rooms from past historical eras (Botz 35).

Extremely detailed and exacting, the models evoke the sense that they are three-dimensional stage plans, with elaborate set designs and props represented within the dioramas. The models represent the physical space, various objects inside the spaces, including furniture, flooring, and various other interior elements, ranging from sinks, clotheslines, milk pails, magazines, lamps, calendars, and more, as appropriate to convincingly emulate a particular site. The most important object is a doll-like version of the corpse corresponding to that mysterious death victim.

However, the models do not exactly re-present actual violent death sites in miniature. Instead, the dioramas are modified versions of actual scenes in which Lee adjusted details for anonymizing, instructional, and symbolic purposes. As such, models often conglomerate multiple actual mysterious death scenes as they present learning opportunities for investigators. After going on-site with investigators, watching autopsies, and doing other research such as reading case files and reviewing photographs and measurements, Lee designed models that did not correspond to the exact interiors of those crime scenes; for example, she hung a miniature painting of her house in *Living Room* (Botz 36). Lee also spent a good deal of time thinking through the symbolism of the various elements of the model “to reflect the victim’s lifestyle and create the appropriate atmosphere in the rooms,” spending hours looking through sample wallpaper books before selecting evocative choices, such as red roses, underwater patterns, and using bare cement in *Unpapered Bedroom* to suggest a second-rate hotel room (33). Lee sought to evoke the sorts of crime scenes investigators might enter in the future.

As such, Lee was purposeful in choosing scenes and details for her studies. To prepare investigators for their work, she “selected the most enigmatic cases to baffle the detectives-in-training and teach them that nothing should be taken at face value: murders can be staged as accidents or suicides, suicides can masquerade as accidents, and accidents can be misconstrued as murder” (Botz 27). In other words, Lee presented complex interpretive situations for investigators to practice observing, analyzing, and to put forward arguments supported by the evidence. Of note, however: “The models present cases that are impossible to solve with visual evidence alone” (Botz 27). While investigators can put forward hypotheses based on the provided brief statements, their reports would be incomplete without additional forensic evidence—something they would obtain in actual casework.

Lee’s eighteen different models were all titled based on the sites represented. The spaces include a variety of singular rooms and complex spaces, including: *Three-Room Dwelling*, *Log Cabin*, *Blue Bedroom*, *Dark Bathroom*, *Burned Cabin*, *Unpapered Bedroom*, *Attic*, *Woodman’s Shack*, *Barn*, *Saloon and Jail*, among others. While most of the scenes are three-sided, roofed representations with the fourth side open to viewing, the *Barn*, *Log Cabin*, *Burned Cabin*, *Garage*, *Three-Room Dwelling*, and *Two-Story Porch* are freestanding exhibits. Lee consistently maintained a 1:12 (one inch to one foot) scale in each of the models.³⁹ With such a small size, Lee used tweezers to assemble detailed scenes, including a preponderance of material objects that any site possesses, in order to prepare investigators for future work at crime scenes.

³⁹ Once she developed a design, she handed off her requirements to her carpenter who created the detailed blueprint (Botz 32).

In examining the literacy processes of the collection *The Nutshell Studies of Unexplained Death*, I focus in particular on the Parsonage Parlor diorama, which depicts the death scene of Dorothy Dennison, a high school student who had been missing for four days, upon Officer Sullivan's discovery of her body. As is typical for the models, trainees viewing the scene also receive additional data: a statement from the victim's mother and the police report. The mother's statement reads:

On Monday, August 19th, Dorothy walked to town to buy some hamburger steak for dinner. She didn't have much money in her purse. When she failed to return in time for dinner I telephoned a neighbor who told me she saw Dorothy walking toward the market, but had not seen her since. I also telephoned the market and the owner said he sold Dorothy a pound of hamburger sometime before noon but didn't notice which way she turned when she left his shop. By late afternoon, thoroughly alarmed, I notified the police. (199)

The police report reads:

Lieutenant's Peal's investigation report stated that Monday afternoon, August 19, 1946, at 5:25 P.M., he received a telephone call from Mrs. Dennison at police headquarters, and at once took charge of the matter personally. The customary inquiries began by Wednesday. A systematic search of all closed or unoccupied buildings in the vicinity was undertaken. It was not until Friday, August 23, at 4:15, he and Officer Patrick Sullivan entered the Parsonage Parlor and found the premises as represented in the model.

Temperatures during the week ranged from between 86 and 92° F with high humidity. (199)

The viewer interprets the case as a combination of these print texts and the model itself.

The model contains an entryway with a mirrored side table and an arched opening into a parlor with a piano with its lid pulled over the keys, piano stool, covered furniture,

including armchairs, a side table with a radio, and even a painting of Madonna and Child and a calendar with a Journey of the Magi. The level of detail is extreme. For example, the radio even has a little electrical wire running along the wall under the window. A twine-wrapped packet—presumably the meat—and a small clasp purse sit on the seat of wooden accent chair. In many ways, this would present a domestic scene suited for a dollhouse, except for the corpse lying prone on the rug, the blood puddled around her head across the flooring, and the hammer, its face reddened, next to the nearby accent chair. Here, Lee includes such details as muscles stiffened with rigor mortis, the purple red discoloration indicating gravity's pull on blood, bite marks on the victim's skin, a blood puddle surrounding the victim's head, and a knife protruding from the victim's stomach just above her red belt. The victim wears a red bow in her hair and matching ballet slippers, and a white dress that has been opened to expose her chest. Just as important to observe is what is NOT present in this scene: No furniture is overturned, none of the protective furniture covering is askew, no blood is visible on the walls or furniture, no windows are broken, no doors are damaged. Nothing is broken. Even the meat-wrapped package and purse remain lying neatly on the chair, as if placed rather than dropped, flung, or wrenched from the victim.

While the Parsonage Parlor scene is based on an actual murder and the diorama provides significant details pointing toward a cause of death, the exhibit intentionally does not identify the murderer in order to allow investigators to interpret the scene on their own. Indeed, rather than being texts with a singular answer, Lee describes the intent for the viewer experience: "The Nutshell Studies are not presented as crimes to be solved.

Rather, they are designed as exercises in observing and evaluating indirect evidence, especially that which may have medical importance” (qtd. in Botz and Lee 47). In other words, Lee’s pedagogical design does not aim for a singular answer, but focuses instead on process and critical thinking.

Investigators examine the Parsonage Parlor model and its alphabetic texts, then put forward their suppositions with evidence they viewed at the scene and in combination with the provided statements. As one example, Michael McGrath, forensic psychiatry and criminal profiling consultant offers this reading of the scene based on the evidence he perceives in the model:

It is likely that she willingly went to this place as the meat and purse are placed on the chair, not thrown about or left somewhere else (*i.e.*, where she might have initially been accosted). She probably knew the killer as she either went there with him or let him in (assuming no sign of forced entry) and there are no signs of a struggle at the crime scene. The killer was able to get close enough to stab her or hit her (with the hammer) without her apparently fighting or trying to escape (knocking things over, etc.). We would need to know what the autopsy said regarding the cause of death (hammer to head? stab to abdomen?) and whether or not a sexual assault took place, and if so, whether it was pre- or postmortem. (Botz 206)

By focusing on the placement of the meat and purse, the lack of signs of struggle, and the presence of the hammer in addition to the knife protruding from the victim’s stomach, McGrath’s analysis indicates that his hypothesis and supporting narrative build from the visual and spatial details within the model.

McGrath’s analysis may or may not be the one around which Lee designed the model; as noted previously, Lee’s intent with the *Studies* is not to have trainees focus on

finding a single or “right” answer (although each of the scenes possess a solution), but on the observation and argumentation process. During one training seminar, detectives put forward a claim based on the reports and their visual inspection of the space that the butcher had taken Dorothy to the parsonage, where he killed her (Rosberg). The seminar leader, however, pointed toward textual information the investigators had been provided that the temperature had fluctuated between 86 and 92 degrees during the week that Dorothy was missing, and that humidity had remained extremely high. He also pointed toward the visual data: the relatively well-preserved condition of the corpse in contrast to the package of hamburger that Dorothy had purchased the prior Monday was covered with maggots. Trainees need to take note of the details offered in the textual offerings and in the visual and dimensional compositions of the model, then use those in their analyses and in their claims.

The success of the *Studies* can be seen in their continued use as part of the Harvard Associates in Police Science (HAPS) and their display at Maryland’s Office of the Chief Medical Examiner. Initially instituted in the 1940s and 1950s, the *Studies* have been used since their creation. When Harvard closed its forensics program, it placed the *Studies* in storage, but Harvard professor Russell Fisher took the models to Baltimore when he accepted the position of Maryland’s chief medical examiner. In 1968, he began using them in teaching seminars (Nuwer). Inspired by Lee’s *Nutshell Studies*, Thomas P. Mauriello, a University of Maryland criminology professor, similarly created six dioramas to teach his students the process of investigating crime scenes and published a

book with photographs of those models.⁹² Individuals still study Lee's models as investigatory learning opportunities today.

New Media Dimensional Semiocy: *The Gunstringer*

For this chapter's new media text example, I focus in particular on the 2011 Microsoft Xbox Kinect game *The Gunstringer*. I examine closely a video game because the first Virtual Reality new media heavily emphasize gaming. Following such scholars as James Paul Gee, Ian Bogost, Jane McGonigal, Bonnie A. Nardi, I take seriously the video game as a medium and as a site for engaging with semiotic expression.⁹³ Further, of the different types of VR apps now available, I choose gaming because of the amount of interactivity in the user experience. Unlike videos, which may involve limited interactions of turning one's head, game players make numerous active choices that are determinative to the narrative. Depending on the game, game players make numerous decisions about movement, about whether to act and what action to take, where to move, when to hide, and so forth. These sorts of decisions involve the user "reading" the game to make choices. If a user sees an overwhelming number of opponents who could cause the avatar to "die," they may read the situation as being one in which it is advantageous to hide. As they move into (following Reynolds and de Certeau's metaphor) games,

⁹² Abigail Goldman, a former crime reporter, public defender researcher, and criminal justice coordinator has created a set of "dieoramas" similar to Lee's (Silver).

⁹³ Gee and his research team have found from their interviews "a number of young people who have used the domain of video games as a fruitful precursor domain for mastering other semiotic domains tied to computers and related technologies," including some of whom who later majored in computer science or related areas (*What* 40).

Bogost contends that "videogames are already becoming a pervasive medium, one as interwoven with culture as writing and images. Videogames are not a subcultural form for adolescents but just another medium woven into everyday life" (*How to* 7).

players blur the lines between writer and reader, becoming something like George Landow's "wreader."

The Xbox Kinect gaming system that supports *The Gunstringer* operates by having the "Kinect" camera and sensor connected to an Xbox game console, which outputs video to a television. For *The Gunstringer*, the game player stands before the Kinect camera and physically moves their body around the delineated sensor floor space. Unlike some Xbox interfaces, such as the *Your Shape 2012: Fitness Evolved*, *The Gunstringer* user is not depicted on screen. Instead the user sees the Gunstringer avatar move and act on screen in response to the player's direction. Generally a single player game (although it also supports two-person play), the game player uses one hand to control the movements of the POV character, a marionette of a skeleton sheriff, and another hand to direct the avatar to take particular actions, such as aiming and shooting. The player proceeds through the game narrative through movement that does not require physically touching the text or technology medium. Instead of a game controller, the user's movement through the physical world interactively becomes part of the text's movement displayed on-screen.

The Gunstringer's Western narrative focuses on a wronged, pistol-wielding sheriff seeking revenge against his old posse, each member of which provides the setting and conflict for one of the game's levels. During each of the levels, the Gunstringer has to evade multiple obstacles and fight numerous enemies; each level's final confrontation, or "boss encounter," involves fighting one of the posse members in a showdown-style fight. Throughout the level, the user directs the Gunstringer to move side to side or to

jump with the left hand, which is displayed on-screen as leaping over and around boulders, cacti, and other dangers; walking across bridges or running along trains; dodging wagons, flaming barrels, rolling logs, and more. With the right hand, the user directs the Gunstringer's offensive and defensive actions by mimicking such actions as shooting a gun, punching, slicing with a sword, wailing, and pummeling the opponent with a deus ex machina fist from above. Alphabetic text messages pop up on screen directing the user to avoid obstacles by moving the left hand or, say, to punch with either hand to take out the snakes the Gunstringer hates. Throughout the game, the on-screen avatar shoots vultures, crocodiles, and other antagonists and engages in jumping and horse chases, all complete with cartoon-styled sound effects. The narrator grows a narrative about vengeance and sometimes offers commentary, such as "the Gunstringer felt nothing but air" when the user directs the avatar not to jump to safety but instead falls into a chasm. The narrator also offers user directive advice that often sounds like narrative. When telling the user to shoot instead of hiding, the narrator offers, "Try as he might, he could not fire upon his enemy from his present vantage point," "He would have to lean around this cover to bushwhack his enemies properly," or "The Gunstringer couldn't shoot until he peeked out of cover." To signal that the Sheriff can only shoot a maximum of six bullets at once, the narrator describes how the Sheriff "had six targets in his sight, not one would escape."

Although each level has its own unique setting (the dessert, the East Asian mountains, New Orleans and the surrounding bayou, and the underworld), the Gunstringer performs in each the same basic actions: maneuvering through the game's

forward-momentum, dodging hazards, and performing offensive acts. However, in each level, the Gunstringer takes on an additional weapon—such as a sword or flamethrower—that involves slightly modified actions. A live action audience of actual human beings appears on-screen from time to time, sometimes in a split screen as if they are looking upon the game’s cartoon-stage, and other times they’re shown during the interstitial “rest” segments. After the final boss confrontation, the closing sequences features the cartoon Gunstringer appearing on stage and facing the live-action audience. In proof that this game was developed before the 2012 Aurora theater shooting, the Gunstringer turns his guns on the audience as they flee his weapons’ fire. Eventually, the still cartoon-animated Gunstringer leaps from the stage, severs his marionette strings from the suspension bars and runs from the theater, mounts a Chihuahua, and causes a dramatic car crash. After that, the game credits roll.

Nutshell Studies’ Virtual Reality Semiotic Learning

Lee’s foreword to the investigator indicates that she is very much involved in her choice of media and its relation with a larger media ecology when she describes how “each model is a tableau depicting the scene at the most effective moment, very much as if a motion picture were stopped at such a point” (qtd. in Botz 47). That said, I believe her work was even more innovative than stop-motion cinema. Specifically, I contend that the *Studies* are an example of pre-new media use of VR for pedagogical purposes, one that engages with multiple modes of communication as well as a number of literacy skills and activities with the intent of investigators physically interacting with texts, learning to read scenes, and being able to apply that knowledge to their professional lives. As noted

in Chapter I and as I will elaborate more here, many have found new media in prior decades and centuries. What I strive to do in identifying the manner in which the *Nutshell Studies* function as a Virtual Reality text is to identify the way semiocy functions, particularly but not exclusively via dimensionality, in ways that we might be too habituated to notice in a more familiar or expected form.

I have offered such attributes of VR as immersion and replacing the user's view with a virtual scene. As primarily a visual experience at present, VR may or may not include sound and haptics. Although users will be generally able to direct their gaze, they may or may not offer directive input to proceed through the VR experience. Lee's *Nutshell Studies* offer a pedagogical experience that present a way to understand Virtual Reality semiocy. Examining the *Studies* provides an opportunity to see that successful VR engages in verisimilitude through believable details and illusions—while avoiding blunders that disrupt belief, offering a stance for the audience to access the VR, and using multiple modes in this semiotic communication. It necessarily engages in presenting texts via multiple dimensions.

The primary characteristic I associate with VR is that it is “immersive,” meaning that the user is immersed in a different sense of reality. In this environment, users may or may not perceive their own bodies. Lee's foreword comments to the Investigator about how the Nutshell audience should view a study for best success point to the same sorts of illusions that adds the reality to the virtual. Lee suggests, “[t]he inspector may best examine them by imagining himself a trifle less than six inches tall. With that firmly in mind, a few moments of observation will then make him able to step into the scene and

there find many tiny details that will then make him able to step into the scene” (qtd. in Botz 47). Here, Lee asks the investigator to imagine themselves as being in the scene, to picture themselves miniaturized and present in the model itself, explicitly directing the viewer “to step into the scene,” albeit in mental form. This stepping into the scene is the act of immersion that successful VR enacts. Sussman’s sense of virtuality helps us to understand that work can contain the virtual: There can be little doubt that investigators engage in virtuality as they go about imagining and playing out different scenarios as they perform their work.

Lee herself recognized the media of her texts and the way that they might engage in remediation. Lee told the investigator viewing her *Studies* that “each model is a tableau depicting the scene at the most effective moment, very much as if a motion picture were stopped at such a point” (qtd. in Botz 47). Others likewise see the function of Lee’s media work as functioning like a more recent innovation: “It’s like a 1930s version of 1990s computer animation. It’s fascinating,” said Lt. Edward Hopkins, president of the Harvard Associates in Police Science (HAPS)” (qtd. in Respers). If Lee were working today to seek change, I imagine she would choose not a material model, but that she would avail herself of current technology and create a Virtual Reality simulation for each of the scenes.

All of Lee’s models are simulations for which she strives for verisimilitude, something key for VR immersion. Her work in each of the *Studies* indicates a compulsive focus on details. For example, in one model, Lee hand rolled the cigarettes that are part of the scene, then she lit them and stubbed them out. The *Burned Cabin* was built and then

blowtorched by Lee to ensure the scorching and charring looked realistic. In study, even the cans have appropriate labels with the condensed milk clearly reading PET to indicate their manufacture; the *Woodman's Shack* features recognizable Kellogg's Corn Flakes and Campbell's Soup labels, adding a touch of familiarity. Lee carefully considered the bodies, making them "of cloth, stuffed with soft cotton and a core of BB shot - so they'll be flexible but not so light they'll sprawl awkwardly and uncorpse-like" (Dempewolf 240). Choosing such an unusual interior material for the corpse dolls demonstrates Lee's care in conveying a form that sustains believability while instructive. Overall, her composition demonstrates the importance of dimensional composing—and its complexity. Dimensional composing is not just attending to spatial configuration, but considering the arrangement of interior objects and thought toward the audience, such as signaled in Lee's foreword to the investigator.

Lee dedicated such attention to the details because inaccuracies related to the crime scene would of course inhibit learning, but further, any inaccuracies would disrupt the sense of reality in the virtual scene. To ensure believability and to sustain suspension of disbelief, Lee made sure that for example, the prop whistle that one model's five-inch-tall state trooper wore on his neck would actually blow; the pencil in his hand made from a toothpick actually had lead (Dempewolf).⁹⁶ In other Studies, a miniature coffeepot comes complete with a strainer containing grinds, a tiny stereoscope contains photographs reduced from the originals, and "everything works," including the window

⁹⁶ *Of Dolls and Murder* documentary-maker Susan Marks notes that this model documented in *Popular Mechanics* was destroyed in transport to the Office of Maryland Medical Examiner in the 1960s.

shades (Botz 33). Lee ensured believability because every material object worked in actuality, albeit in miniature.

Details are important for lending verisimilitude to VR. In the *Nutshell Studies*, Lee put great thought into the materiality and designs of the objects she placed in her models, not merely for the believability, but also for the pedagogical intent behind Lee's project. She designed each study to educate investigators on specific forensic medicine principles⁹⁷. Not only is learning to read the space important to the *Studies*, but reading the material objects in terms of their particulars, from colors to textures to specific designs that Lee thought significant for helping individuals learn the forensic medicine for investigative purposes. Contemporary reviewers noted the level of detail in the models, "Each corpse is cunningly colored. One may carry the cherry red brought on by carbon-monoxide death; another an ordinary post-mortem purplish caste. The delicate miniature discoloration in bruises on the 1/4-inch neck of a throttled victim are so accurate that a trained examiner can diagnose it immediately" (Dempewolf 240). As this review notes, Lee's work was so detailed that experts in the field would find her work credible and therefore trainees would learn the particularities that would aid their search for the legal medicine clues to support their future investigative work. The solution to one study relies on "the principle that blood will always settle in the area of the corpse which is closest to the ground at the time of death. Thus, if a person dies while lying on his back, gravity will draw the blood to that area and lividity (an easily observable, red

⁹⁷ Lee's other purposes was to enact an argument to replace the coroner system with medical examiners. On this point, Lee has not been successful. As of 2011, only 16 states had chief medical examiners; otherwise, states possessed decentralized systems with a coroner in every county; and hybrid mixtures of both.

discoloration) will set in” (Rosberg). Because the model in question presents an apparent suicide, lying face down, yet with obvious lividity in the lower back, it demonstrated that someone turned it over after death occurred (Rosberg). This dimensional model provided investigators with preparation for recognizing those details, wherever they might occur, in their actual investigations.

Individuals working in forensic medicine indeed found the detail contributing to both education and believability. Jerry Dziecichowicz, a Baltimore medical examiner’s office administrator, says of the models, “Frances Lee captured the moment when everything is at a crime scene—there’s so much evidence available, if you know how to look for it.” In fact, that preponderance of evidence is overwhelming as others in the *Of Dolls and Murder* documentary note. Baltimore police detective Robert Ross analyzes a *Nutshell* model with fellow detective Sean Jones, looking at tracing blood pools, splatter, and drag marks in an apparent triple murder. He comments, “It really is like a puzzle. And that’s what makes it real. Because in a real investigation it’s like that. You walk into a house, and you don’t know what’s evidence and what’s not. So you have to look at everything.” Ross’s observation points to the way that viewers walk around and read the model’s space—not merely the space of the room, but the space between textual objects, the placement of textual objects, and the size—that is, how much space an object takes up, how the object is configured in space, and how relevant that is to actual investigation.

Lee’s efforts to ensure not just credibility but also believability echo those of Michael Abrash, Oculus’s Chief Scientist, who describes how the brain perceives and interprets reality, virtual or actual. Successful VR depends on the same sorts of illusions

that individuals may perceive in their surrounding actuality. Abrash explains, “Virtual reality done right truly is reality,” as he shows a series of optical illusions that exist in actuality and claims that VR operates using similar illusions to convince viewers of the believability of the virtual environment. Quoting Morpheus from *The Matrix*—the science fiction movie that made him believe in VR, Abrash recites in his F8 address, “What is ‘real’? How do you define ‘real’? If you are talking about what you can feel, what you can smell, what you can taste and see, then ‘real’ is simply electrical signals interpreted by your brain.” Abrash then explains, “That’s really all you need to know to understand why VR is not just cool or world-changing and why you are going to care a lot about VR sooner or later.” Having identified the exigence of his discussion, Abrash presents how the conscious mind never interacts with the real world, but instead processes signals from the body’s perceptual sensors in our eyes, ears, skin, tongue, nose, and balance organs: “We only know what those sensors detect, interpret, and signal to the brain,” which deliver only a “small subset of the real world.” Abrash points out how, for example, our vision is limited: We can’t see infrared or ultraviolet, we only have 2-degree circle in high resolution, each eye has a blind spot, and we only see a fraction of the 360-degrees around us, problems with night vision, and more. As such, “Our visual data is astonishingly spare.” That’s the visual model of the world, however, that we trust and rely upon; to prove his point, Abrash asks us to consider if we’re experiencing the real world right now why don’t we notice that we have a blind spot in each eye, that we can’t perceive blue in the center of our eyes, or that we perceive in high definition an area only the size of our thumbs. We rely on inference, not objective observation, that there’s

a real world exterior to us; that reality is only the mind's interpretation of nerve impulses based on its model of reality is critical to understanding VR, Abrash contends. Abrash presents optical illusions, such as the The Dress (which in 2015 social media users argued over whether its colors were white and gold or blue and black), the Ames Window/Ames Trapezoid (in which a straw, pen, or other linear object appears to rotate *through* an open window), color illusions, and so forth, to demonstrate that how we visually perceive the world is an interpretation susceptible to our sensory organ limitations.

As a consciously constructed text, a VR does not function solely to be a faithful reproduction of actuality. VR embraces the affordances of its media to achieve its objectives as a media separate from actuality. One such affordance is that VR is different from actuality. Difference can serve as a tool to help individuals attend to the surroundings and experiences that otherwise have become so naturalized and expected that individuals have trouble perceiving them without a perspective change. For example, the *Nutshell Studies* function in part by varying the presentation of a space, and shrinking it so individuals can practice seeing both the entirety but also to help individuals practice attending to their surroundings. In her Foreword to trainees, Lee directs users to practice observing the miniature scene: "Comparison with certain familiar objects will also be helpful, as for instance, a table of standard height (30) inches becomes 2 1/2 inches—an ordinary side chair with seat 18 inches high is now only 1 1/2 inches high—a revolver of about 11 1/4 inches overall length here but a scant inch, et cetera" (qtd. in Botz 47). Learning how to interpret actuality into VR helps viewers reciprocally pay attention to the details of their everyday lives in new ways ("how high is a stair riser?").

The difference between VR and their everyday experiences helps viewers attend to details in space that might be overlooked because of familiarity. Attention to detail by the viewer is extremely important: “In one diorama, a vital clue can only be found by looking in a miniature mirror. In another, there are 31 major blunders and a lot of minor ones committed by a bumbling policeman before the arrival of a medical examiner” (Dempewolff 240). The *Studies* provide a lesson about paying attention to material objects, both by noting their individual characteristics and their locations, as a skill relevant in examining crime scenes. Doing so enables the audience then to “find many tiny details that might otherwise escape notice” (qtd. in Botz 47). Lee’s aim is to enable viewers to transfer this skill to their working lives.

Neither the *Nutshell Studies* nor VR exist outside particular semiotic domains. Semiocy is always socially and contextually situated. James Paul Gee offers a way to understanding how users must always judge the fittingness of discourse and identities in social contexts by offering a hypothetical example of him going into a neighborhood “biker bar,” and saying, “to my leather-jacketed and tattooed drinking buddy, as I sit down: ‘May I have a match for my cigarette, please?’” (*Social*, 2). But semiocy is much more complex than merely using the right words in the right context, as Gee goes on to illustrate: “But now imagine I say the ‘right’ thing (‘Gotta match?’ or ‘Give me a light, wouldya?’), but while saying it, I carefully wipe off the bar stool with a napkin to avoid getting my newly pressed designer jeans dirty. . . . I have said the right thing, but my “saying–doing” combination is nonetheless all wrong” (*Social* 3). What Gee alludes to but does not elaborate on here is the multiple communication modalities involved: the

visualness of clothing, the auralty of spoken dialogue, the gestures and body language. All of those aspects align to enable an individual to fit into a particular social interchange in a particular place.

That is, as I aim to show, what Lee was aiming for in her innovative teaching aids. Lee offers not just education to read spaces and material objects through the specialized semiotic domain of forensic medicine, but also opportunities to talk about this technique with others. In actuality, investigators must read through their knowledge of forensic medicine, the physical space, the victim's body location and position, and so many other clues. Forensic investigators in training walk around the diorama and read the space and the body in relationship to that place for clues about the action that occurred there. The text has no clear starting point, nor ending point, but the viewer determines when to stop reading the text. Lee, however, offers a systematic reading system for approaching the space: "It will simplify the examiner's work if he will first choose the point at which he enters the scene and, beginning at his left at the place, describe the premises in a clockwise direction back to the starting point, thence to the center of the scene and ending with the body and its immediately surroundings" (qtd. in Botz 47). Here, Lee's system also offers a tool for subsequently communicating about the resulting observations.

Lee's models leverage multiple modes in addition to the dimensional to provide a learning environment that reflects the future situation in which they will apply their knowledge. Trainees view the visuals of the models and the alphabetic printed text associated with the statements and police reports. They also practice their new semiocy

work by talking to fellow investigators when working in small groups to evaluate the diorama's scenes. Botz argues that "the fact that vital clues must be derived from autopsies and from the results of the lab tests highlights the importance of the need for communication among the medical examiner, law enforcement officers, and forensic investigators at the scene of the crime" (27). After trainees leave the models, they return to work as investigators to apply their new semiotic knowledge.

Lee's foreword to the investigator indicates one of the other particular successful tactics for Virtual Reality involving learner stance. Lee's foreword to the trainee indicates: "The observer should approach his assignment as if he were the special officer detailed to investigate the case" (qtd. in Botz 47). The student receives the sort of information that a law enforcement investigator would normally have when sent to investigate, "together with the first statements obtained from one or more of the most immediate accessible witnesses. It must not be overlooked that these statements may be true, mistaken, or intentionally false, or a combination of any two or all three of these" (qtd. in Botz 47). What Lee points to is the adoption of a role for the individual viewing the models that aids their immersion. This same sort of identification with a stance aligns with that of an individual entering a VR and finding the experience so believable that the viewer feels immersion. In advising the adoption of the role, Lee offers the user additional clarification regarding the audience's mindset, stating that "The observer must therefore view each case with an entirely open mind" (qtd. in Botz 47). While that suggestion may be specific to the process of doing forensic investigation, Lee's advice may also pertain to individuals entering VR environments to experience immersion.

Nutshell Studies trainees adopt a role and proceed with an objective in mind: to learn about legal medicine. The combination of role and purpose enhance the believability of the virtual environment.

The VR Semiocy of *The Gunstringer*

I contend that *The Gunstringer* is a VR system that provides an opportunity for not visual but bodily immersion. At the time of this writing, we lack fully immersive environments available to consumers. By that, I mean we have either visually immersive environments, like the Gear VR, or bodily immersive environments, like the Kinect. In the former, users wear headsets to provide a visually immersive experience, where they turn their heads and perceive the constructed images. In the latter, users interact with a system in which their movements—or gestures—align with the experience depicted on screen. For example, when the user makes a lifting motion, the Gunstringer marionette appears to move in response to that gesture, much as would happen if the user were actually holding and directing a puppet. This bodily connection provides a sense of immersion. Body motion-sensing gaming systems, such as the Xbox Kinect, the Nintendo Wii with Balance Board, and the Sony PlayStation Move, began release during the early 2000s and represent a particular stage in the evolution of game play. Nintendo Wii users hold or place a remote into their pockets, or stand on a Balance Board, and interact with the video game not through traditional gaming interactions, like inputting game and controller-specific commands (such as by clicking the Wii's A or B buttons, the up and down scroll and left and right buttons, or the zoom in or out; the Xbox's left or right triggers or bumpers, the left or right sticks, or the directional pads; the PlayStation's the

triangle, circle, square, and X, or R1, R2, L1, and L2, etc.) but by moving. The gaming system senses the user's movement as an input. With the Microsoft Xbox Kinect, once the user turns on the gaming system, the user no longer touches the interface. Such interfaces are called Natural User Interface—so-called because the machine portion of the human-computer interface is de-emphasized. Bill Gates hails this sort of NUI as “completely natural,” a claim that I will contest after an examination of a Kinect game, and link to conceptions about literacy. However, the Xbox Kinect offers a means for exploring body connections with VR.

In much the same way that video games have transitioned from massive plywood arcade boxes with built-in monitors, joysticks, and buttons to home console and personal game controllers, the Xbox Kinect, the Wii, and the Move represent the transition to bodily immersive environments. Today's affordable VR systems, such as Samsung Gear VR and Google Cardboard, are general purpose visually immersive experiences, offering media consumption, social networking, and more, and are not game-specific technologies. Sony's PlayStation VR will be primarily games-focused, but may also offer other experiences, like the Gear VR and Rift, much as the current PlayStation offers media streaming and other uses beyond gaming. Ultimately, VR will need to merge both the motion-sensing user directive and the visually immersive capabilities to provide a more *Matrix* like experience. Motion-sensing and haptic feedback technologies are in development and will soon integrate with visual technologies to implement a fuller VR.

The semiocy in *The Gunstringer* is multiple for the player, ranging across the oral, written, visual, and bodily for the interpretative and to bodily movement for user

input. VR literacy necessarily engages multimodal semiocy. The user encounters and must respond to multiple modes of perception and interpretation. Much of the game relies on visual imagery, but the game also contains alphabetic text. Some cues are verbal with the narrator explicitly directing the user to act, although he generally provides narrative structure. The usually unseen audience gasps and oohs in response to the user's successes and failures. Other actions, such as the user's successful shooting of the gun result in auditory confirmation of user actions. Some VR systems offer haptic feedback via controllers; more are sure to be developed. The rise of haptics represent a new turn into multimodality, a turn which moves us toward an encompassing semiocy. VR designers will need to account for not only the alphabetic print, images, and sounds of a VR text, but they will also need to design for haptic feedback (although *The Gunstringer* encounters bodily feedback via aching shoulders and slowing muscles). The VR audience will increasingly encounter tactile and responsive feedback that they will need to interpret and respond to.

The Gunstringer emphasizes dimensionality as one of its key semiocy content areas. The Gunstringer avatar must negotiate movement in multiple dimensions for running, dodging, jumping, and hiding in order to progress through the game. The game player must interpret the avatar's game location, then coordinate their movements through space and anticipate how those will be translated into expression via the avatar's game actions. *The Gunstringer* reminds the user of dimensionality by breaking the fourth wall—something rare in filmmaking and rarer in game play—interleaving snippets of full-motion live action footage the game-maker shot in The Paramount Theater in Austin,

Texas. At critical points in the game, the screen angle skews so that the user no longer sees from the point of view of the cartoonish marionette sheriff, but also sees the live action video of an actual human audience, complicating the representation of dimensional space. At those points in the game play, the screen's cartoon scenery that had once depicted open desert or other Western scenes now confines the view to a smaller space that evokes a stage set. This stage is still a cartoonish animation, even as the live action human audience looks. The audience looms large, as if in close up or as if looking into a miniature dollhouse scene (indeed, at the end of the game, the marionette is revealed to be small—shorter than an audience member's boot). When the live audience appears, the game offers a reminder of how it textually occupies multiple spaces: the game's action space where the Gunstringer faces challenges, the theater audience, and the user's playing space before the Kinect sensor. This changed relationship with dimensionality is key to VR texts.

By contrast, Bogost criticizes exergaming and other forms of motion-controlled gaming, arguing that “most families do not enjoy neat and tidy offices with space for physical activity, and furthermore most don't have a computer monitor as large as their television to facilitate proper visual feedback from a safe distance” (*Persuasive* 315). Of course what's changed since Bogost wrote that critique is that far fewer games are played on computer monitors; more are played either on phones (with games appropriately sized to those smaller screens) or on the television screens that have grown increasingly larger. That said, Bogost also identifies how virtual space and real space interact, noting many negative reviews complain about “the enormous amount of living room space Kinect

requires, far more than most people will have in a sizable home let alone a modest apartment” (“Diskinect”). Bogost makes a point about space being limited in living rooms. Yet the games represent large spaces, like football fields and soccer pitches, so game players are interacting in highly compressed virtual versions of sporting fields, much like the *Nutshell Studies* offer compressed versions of crime scenes. So, indeed, such games still engage with spatial expressions by providing users with a simulated football field in their homes.

At the points when *The Gunstringer* displays a watching human audience, the player is reminded that they are playing a part in a narrative, suggesting a relationship between dimensions and narrative roles. The game player may feel in control and, indeed, necessarily must control the marionette sheriff in order to move forward through the narrative by moving through the space. If the player does not take actions and respond, the sheriff will not move, will be killed by the game’s adversaries, and the narrative will end. In this way, the player may feel in control and may feel a sense of agency. However, these scenes that show the audience looking onto the marionette on stage are a *Matrix*-style red-pill-blue-pill confrontation, as they provide a reminder that any agency the user feels is a virtual agency because they’re functioning inside someone else’s narrative. Indeed, just as the audience gasps in horror when the marionette looks at them during the game’s final sequence, the Gunstringer is likewise horrified as an image of the game player taken earlier by the Kinect camera is suddenly inserted into the game, again breaking the fourth (or fifth?) wall and blurring the actual and the virtual. While it is true that VR users may or may not see their own bodies as part of the immersion experience,

the display of the game player's photograph breaks the suspension of disbelief by disassociating the gamer from the on-screen avatar, purposefully breaking the sense of immersion that is so important for VR as the game comes to an end.

One of the aspects of semiocy—one key to VR—that becomes apparent in interacting with *The Gunstringer* is the physicality of communication. For example, after my second day of playing *The Gunstringer*, I found my arm muscles were sore from holding them up for game play and for the gestures used to proceed through game play. While my on-screen avatar was injured and mortally wounded multiple times in my effort to reach the end of the game, the sensations of tired muscles and aching shoulders in my real life body, as well as the injury of a household member whose repetitive stress injury prevented further *The Gunstringer* play, offers a reminder that “reality” is a part of “Virtual Reality.” Pause too long at one of the interstitial screens between “acts” where the user is given options to restart the level, return to the Main Menu, or to continue, and the Xbox itself prompts, “Feeling tired or sore? Consider taking a break.” Of course, any act of communication involves the body, even silently reading to oneself. However, the physical impacts of book-reading are often limited to the short-term injuries of drowsy readers letting a book fall on their faces or bibliophiles carrying too many books, or to readers developing long term injuries to necks from staring down at books or impacts to eyesight. It is only when we are in pain or discomfort, whether from carpal tunnel syndrome, dry eyes, sore throat, “Nintendo thumb,” or learning new communication acts that our awareness heightens to the relationship between the body and communication. Bill Brown, citing Leo Stein, identifies the imposition of material reality into the virtual:

you cut your finger on a sheet of paper, you trip over some toy, you get bopped on the head by a falling nut. These are occasions outside the scene of phenomenological attention that nonetheless teach you that you're 'caught up in things' and that the 'body is a thing among things.'" (3-4)

Even though our imaginations may attain states of virtuality, we still have "occasions of contingency—the chance interruption—that disclose a physicality of things" (4).

Such active game play also draws attention to the presumptions about bodies that texts make. For example, *The Gunstringer* assumes that an individual has two hands with which to play the system. While the game offers a setting for individuals who "suffer" from left-handedness to allow them to control the marionette with their right hands and to use the left for targeting, the game requires a certain ambidexterity with one hand moving the avatar and the other hand defending from attacks. While playing the game, I was reminded of learning to play the piano where my left and right hands performed separate, complex acts, doing two different things at the same time. Because it will be an immersive—both visually and bodily—textual space, VR has the potential to be increasingly gestural.

VR interfaces have a characteristic stress on physical agency. One of the original advertising campaigns for the Xbox Kinect system emphasized the user interaction of the motion-control system by featuring a slogan stating, "You are the controller." Again, while the Xbox is not a visually immersive but a bodily immersive VR experience, I contend it serves as a model for future interfaces. The idea that the individual is the controller—or user input device—seeks to erase the space between the text and the audience. Eliding the fact that the user does engage with the Kinect camera, which inputs

into the Xbox console and outputs to the screen, renders invisible the technological mediation involved in game play to favor a suggestion that human “controllers” have control—particularly in ways that gamers do not using other game controllers.

The Gunstringer leverages increasingly complex patterns within its game as a way of training game players in its semiocy. Players first recognize repeating situations, then apply similar actions that succeeded previously. For example, when the Gunstringer takes over driving a steamboat and the only on-screen avatar is the steamboat rather than the Gunstringer himself or his first-person perspective, the game provides no suggestion to avoid the waterway’s obstacles, ranging from mines to other boats. This absence is in contrast to other places the game display a visual box on-screen with text reminding the user of cues, such at the beginning of each scene when the user is prompted to pick the marionette up with the user’s left hand. Or, upon first introducing a new movement, the game displays a message, such as, to punch opponents with the right hand—and potentially the left too. Lacking such a cue when my on-screen character switched to a riverboat, I decided to use the same gestures I’d used to help the Gunstringer maneuver around and to jump over previous obstacles—such as rivers, boulders, and chasms. To make this decision, I relied on such visual cues as the riverboat flashing in the same way that the marionette avatar flashed when he “hit” obstacles. This confirmed that I needed to steer the riverboat to successfully reach the end of the section. Once I made the decision to direct the riverboat, the game also provided visual confirmation of movement in coordination with my left hand efforts to steer. Just as importantly, I also received visual confirmation in the lack of damage flashes to the riverboat as I successfully moved

downstream between obstacles. Similarly, when the Samurai cowboys on flying rockets come toward the Gunstringer, the player knows that these are opponents because they fly in the same patterns as the injurious ducks and geese of previous levels. All these acts of reading the game and acting in response to the game indicate that I transferred prior in-game knowledge to a later portion of the game. This transfer of game semiocy—in knowledge, in reading, in acting—helped me successfully navigate the river course and proceed in the game. This provides one set of examples in which game players can transfer skills within the game (and potentially to other games operating using similar logic). How transferable that semiotic knowledge is, however, depends on interface designs intersecting with future opportunities. At the conclusion of that section, *The Gunstringer* game displayed to me a message during the interstitial scene change of, “Very good job. [User Name] has a bright future ahead in waving arms around at things that aren’t there.”¹⁰⁷ The game seems to recognize the situatedness of game semiocy—potentially to particular scenarios, such as media using motion-sensing technologies watching for user interactions.

The arm-waving movement in *The Gunstringer* exemplifies the relationships between semiocy, space, and dimensionality. While physical movement such as turning pages has become naturalized for proficient readers, the game’s user directive actions draw attention to the relationship between body movement through dimensions and progressing through a text. This text illuminates how the Kinect’s Natural User Interface requires semiotic training of the user, directing the game player to perform actions in

¹⁰⁷ The quote is attributed to Lloyd Kaufman of Troma Films.

certain ways, a reminder of the ways in which semiocy itself is never automatic or innate. While this understanding clearly has important ramifications for user interface designers, it also provides a reminder that individuals learning new semiotic areas first need training.

As such, VR texts will necessitate learning strategies. *The Gunstringer* illustrates it is a new semiotic domain, as Gee might say, because it illustrates the need for learning a new semiocy. At the very beginning of the game, *The Gunstringer* features an initial training segment, showing the user how to use the left hand to move the avatar and the right hand to perform important game play skills, such as moving and defending against opponents. The game provides a special pre-scoring area for practice interacting with the game, giving users time to practice how to maneuver, how to aim and to shoot before the user experiences gameplay consequences, such as points to game-deaths. As the user proceeds, the game displays additional prompts for new skills—such as punching—with right, left, and both fists, wailing, punching, pummeling, and slamming one’s fist “into the ground” to call forth a “Hand of God” boss-level defeat. As the game progresses, it presents the user with not just repetition of prior actions but increasing levels of difficulty performing those actions until the finale-level challenge.

Users can find initial training in other environments, too. Much as *The Gunstringer* begins with instructions on how to perform basic tasks in the game, VR systems necessitate initial training and setup. For example, the Oculus-powered Samsung Gear VR displays upon startup an initial training segment in which the user learns how to interact with the menus and VR texts through head movement, gaze interaction, and

using the controls on the side of the headset. These controls enable users to move between screens, open selected apps or “experiences” (textual media, such as video), and moving back a “screen.” Individual texts within the Gear VR likewise provide individual instruction on how to proceed, providing users with clues about how to play games or how to open additional content. In this way, VR texts may differentiate themselves from other forms of texts, such as newspapers or novels, that operate with relative consistency between media. Much as Microsoft Windows initially included games for acclimating users to the interface (Levin), VR environments will need to provide learning opportunities, particularly if they add additional input devices, such as game controllers, which some VR games use and others do not. Once learned, some standard actions will transfer between VR apps and experiences, but lack of consistency, which may be exacerbated by use of additional controllers, will impact takeup of interaction.

All in all, *The Gunstringer*’s emphasis on body control foretells the coming emphasis on body movement in VR. This emphasis on the body’s involvement in expression and interaction is, of course, nothing new, as discussed in Chapter I. Of course every literate interaction necessitates bodily movement. Many adults are, however, habituated to that bodily engagement because of familiarity with communicative interactions; however, VR will introduce new awareness to the body in composing and communicating. Google’s *Tilt Brush* is a VR prototyping tool currently available only on the HTC Vive that supports users composing in VR for VR (and likely other outputs). This “painting” tool creates three-dimension virtual images from the user’s painting choices. The palette enables users to choose different brush shapes, colors, and standard,

star, light, and fire stroke patterns. While Google identifies the software as having an “intuitive” interface, it is intuitive only for individuals who have previously worked with VR and with software painting tools such as Microsoft Paint, GIMP, and the like. Individuals with prior artistic experience—painting, drawing, and/or sculpting—would also be able to take up this work in ways that might feel somewhat familiar. However, Google promises this enables users to “[e]xperience painting as you have never before.” This assertion encompasses the way that Google appeals to the familiar act of painting—or digital painting—as VR evokes the unfamiliar in this new digital composing site. The VR spaces offers creators the capability to “[w]alk around” their art, showing that VR composers will need environments, or, as Bolter might say “writing spaces,” in which to examine their multi-dimensional compositions as they prepare “room-scale VR masterpieces or bite-sized animation GIFs.” As texts increasingly engage dimensions, users will need composing and editing tools, both in software and thinking, to support dimensional composing.

Much as *Tilt Brush*’s painting gestures mimic painting in actuality, the gestures in *The Gunstringer* in some ways mirror those that would be used in actually carrying out some of the activities. The movement of the avatar mirrors, in simplified form, what a puppeteer would do to direct the marionette. Albeit performed with less force, the punch, wail, pummel, and swing gestures simulate those an individual would use in actuality perform those acts. This suggests a useful way to design VR environments to build on prior knowledge. That said, other gestures are indeed game-specific gestures rather than exact correlations with actual acts. For example, the shooting gesture is a simplified

version of weapons use. Because the Kinect camera system cannot detect a trigger-pulling gesture, the command to shoot involves the user lifting their hand to mimic the kickback. Likewise, the game environment does not equip the player with an actual sword-like object to swing—indeed, does not likely allow sufficient game-play time to grab an actual sword before its use is needed, so the sword-swinging gesture is again a symbolic gesture. These translations of actual bodily movements into VR offer a reminder that VR is not actuality and communicative input and output involves a combination of transfer of semiocy and also learning of new semiotic interpretation and response.

Just as *The Gunstringer*'s reliance on two hands makes assumptions about audience bodies, VR's dimensionality will lead designers to make assumptions about bodies. The Xbox Kinect's "You are the controller" advertisement promotes normative bodies. While every communicative interaction makes assumptions about the receptive and delivery capabilities of the audience, the rise of VR provides new scenarios for engaging with these assumptions. For example, while *The Gunstringer* provides accommodations for individuals to sit (the game even suggests if individuals get tired, they can do so), the game still relies on the physical capabilities of a two-armed person. Other Kinect games make similar assumptions—although some also call for individuals to move their legs and some take voice input as well. Ultimately, these devices' assumptions about what constitutes a "normal" human body isn't very different from those inherent in other textual expressions. The book that has been popular for centuries relies on sighted individuals. To account for individuals without or with poor sight, books

otherwise make accommodations by using Braille or audio versions. VR will make assumptions about bodies; we should consider how those impact audiences.

Given the demonstration of expectations around bodies fitting particular norms, future VR textual interaction may involve expectations of full-body involvement to “immerse” in the VR. Interfaces need to account for individuals who have wheelchairs, need canes to walk, or may not have the use of both arms, and so forth. Further, designers may want to recognize that the “realities” they compose for consumption may be entirely different experiences of a “reality” than individuals with disabilities experience on a day-to-day basis, which may affect, how “realistic” the VR appears to such an individual, as well as how “immersed” the user feel in that experience. Alternately, designers may wish to communicate to others the realities of individuals with disabilities. Such interfaces could provide opportunities for empathizing with their experiences. While any individual might prove a suitable audience for VR realities communicating about the experience of disabilities, such texts could prove especially illustrative for doctors, designers, and other individuals working with individuals with disabilities. As we move forward with textual design and expectations of semiocy, it’s worth remembering that, with the exception of those who die young or who age well, we are all “temporarily able bodies” (Brueggemann, White, Dunn Heifferon, and Chou 369).

As previously mentioned, Bill Gates has stated that Natural User Interfaces (NUI), such as that represented by the Kinect offer new ways of interacting with digital texts. Gates argues, “Even more important, NUI means people who may not have even the most basic literacy skills will be able to take advantage of some of the benefits of

digital technology and the information age for the first time.” What Gates misses is that of course all individuals have literacy skills, although perhaps not to a particular print literacy (whether in a native spoken or other language). Further, Gates elides the literacy that games or other Natural User Interfaces entail. As someone who has played such Kinect games as *Kinect Sports*, *Child of Eden*, *The Gunstringer*, *Kinectimals*, and others, I would contend that no user interaction is particularly self-evident in the Xbox Kinect experience. While some movements might be more intuitive than others, the games instruct the user how to perform various actions within the game interface. That instruction is not substantially different from the direction we receive in learning to read, to write, to use software, or to interact with particular social groups.

That said, VR may have additional educational opportunities. Nonetheless, educational psychologists have tested vocabulary and traditional literacy acquisition by comparing children who i) jointly read a story with an adult who used an expressive reading, explanation and demonstration of vocabulary, and provided instruction on how to read all capital words or intonate based on explanation points, ii) had the story read by a character in a Kinect game and told to stand in front of the Kinect cameras and to perform activities described as part of the story, a process described as “playing a reading game,” or iii) had the story read by a character in a Kinect game and directed to perform in-game activities related to the story. The first and third groups experienced significant gains for High Frequency Words, Active Decoding, and Total Reading Score, but only the third group had significant gains for Sight words. This study provides one example of the ways in which interactive VR may provide opportunities for increasing not just users’

Virtual Reality semiotic expertise, but also other communicative skills and knowledge, in this case, that are associated with traditional print literacy.

Virtual Reality Semiocy: Comparative Analysis

Comparing both *The Gunstringer* and the *Nutshell Murders* reveals commonalities between the two that further elaborate VR's semiocy. The central characteristic I have explored here is dimensionality of texts and physical interactions with those texts. My examination has also identified the importance to VR of immersiveness, both visual and bodily, in achieving verisimilitude—both in details and in movement, and by having a role to adopt or objective to fulfill. VR supports semiotic learning transfer based on patterns and accuracy in details.

Central to Virtual Reality, dimensionality is an important concept now that we have 360-degree/"VR" cameras, 3D game devices such as the Nintendo 3DS, 3D televisions, and apps that allow us to take 360-degree photos with our regular phones. This technology and data infrastructure provides resources for Virtual Reality. From an initial perspective, it could seem that the virtual, which uses very little actual space except for the physical equipment necessary to create and display the virtual, might involve little in the way of space. Yet both *The Gunstringer* and the *Nutshell Murders* evoke dimensionality in representing space. Large spaces, whether entire rooms or entire planets are condensed to feet-wide models or representation on small screens. These texts also engage with dimensionality in requiring the audience to move as part of interacting with those texts. In the *Nutshell Murders*, detectives must move around to gain the

optimum view—and in the one case use the appropriate angle on a mirror to spot a vital clue. Movement is a key consequence of dimensionality.

VR's immersion depends on how believable VR invokes multidimensional movement. While the New London Group identify the importance of spatial understanding in their definition of multiliteracy, they touch on it only briefly by identifying how McDonald's has hard seats to keep customers moving and how casinos do not have windows or clocks to keep customers stationery. These are cues that users should or should not engage in movement. Similarly, games, such as *The Gunstringer*, succeed in evoking dimensionality based on how successfully the user reads and responds to such movement cues. Kinetic expression enables users to "feel" in ways that they might not when pressing the Xbox's left trigger, the right bumper, steering the right stick, or scratching a circle on the left directional pad. Just as *The Gunstringer* user engages in bodily movement as if they were the marionette's puppeteer (or sometimes the marionette himself), the detectives walk around the *Nutshell* rather than stand in one place. Their shifts in perspective enable them to find vital clues and to practice moving around a space, much as they would at a crime scene. Individuals become conscious of their interactions with material objects in spatial arrangements because the model is not the usual dimensional interaction to which they have become habituated. Indeed, habituation renders invisible the interactions between humans and any textual experience because all literate interaction involves movement. Eyes scan pages, eardrums vibrate, mouths move, and fingers move the pencil or the stylus across the paper or screen. We always interact

with texts through multiple dimensions, including the imaginative, the text's space, and our own interaction or relationship with the text.

Bodily engagement in education is not new. Deborah Hawhee argues that ancient pedagogy was closely tied to bodily training: “the ‘three Rs’ of ancient pedagogy: rhythm, repetition, and response. It is these modes of learning, I will suggest, that comprise the sophisticated method of rhetorical training. The three Rs thus loop training back to *kairos* and *mētis* thereby securing the body's critical role in learning and performing” (141). *The Gunstringer* relies on those techniques that Hawhee identified as important to ancient instruction. Users engage with physical rhythm, repetition, and response at the right time to learn the gestures that provide gameplay interaction. While generally few books seek to instruct their readers on how to proceed through the text, video games teach users how to interact with the text, almost always in ways idiosyncratic to particular games, but successful games build on establishing patterns that grow increasingly more complex as the game builds. Similarly, the *Nutshell Studies* engage with a focus on attending to details that Lee hoped trainees could transfer to their future careers.

Although multiliteracy includes the gestural—the body's movement through space—as one of its modes, Bogost critiques the gaming's current gestural technologies, which have not been widely adopted, “Designers and players tend to understand gestural control as *actions*” (*How* 90). In terms of gestural design, “Physical realism is the goal, a reduction of the gap between player action and in-game effect commensurate with advances in graphical realism” (*How* 90). Bogost contrasts this with everyday gestures, which “not only perform actions but also convey meaning” (*How* 90). He points toward

body language, noting that much of it is nonverbal and “intransitive,” because the gestures do not perform actions that alter the physical environment “in the same way a racquet does when striking a ball / or a hand does when crazing a pool” (*How* 90-91). Yet gestures “can also alter our own thoughts or feelings about the world or ourselves. These sensations can be complex, and they can evolve. Flipping someone off may impress delight, then guilt, then shame” (91).⁴⁰ Bogost here identifies a possible social disjunction to VR’s immersiveness.

As noted earlier, VR’s immersiveness and benefits of that immersion depend on the audience’s ability to deeply identify with a role undertaken, something that . In considering the relationship between literacy and gaming, James Paul Gee points to the importance of learning being sufficiently compelling to keep the learner engaged. Video games can be compelling, although he notes that what counts as compelling is idiosyncratic to the game player and at different times, as “what made a game compelling to me when I started to play is not what makes a game compelling to me now” (59). Of chief importance is the game player’s ability to adopt an identity that supports engagement; as Gee explains, “[I]f the virtual world and virtual identity at stake in learning are not compelling to the learner, at some level, then little deep learning is liable to occur, in part because the learner is going to be unwilling to put in the effort and practice demanded for mastering the domain” (59). As noted in the analysis of *Nutshell*

⁴⁰ Bogost also cites the example of Nintendo Wii *Manhunt 2*, a game nearly banned in multiple countries because it “asked players to act out heinous acts of torture through physical actions. Yet the game’s coupling of gestures to violent acts makes them more, not less, repugnant by implicating the player in their commitment” (91).

Studies, the adoption of an appropriate role or stance, with a particular objective in mind, aids immersion over resistance, which is key to learning.

Taking on a role means adopting a mindset that may or may not match one's usual identity. For novice forensic investigators working with the *Nutshell Studies*, it is about taking on a new identity. For gamers, it might be only taking on a temporary identity as a marionette to succeed at a game. VR's flexibility enables its audience to take on real and non-real identities. The word "experience" arises frequently as a way of describing VR media; VR is experiential, but is a user actually becoming a marionette puppeteer? Bogost recognizes games' interstitial quality by focusing on their experiential potential:

In this way, games are different from other media. Sure, a movie or a book or a painting can depict squalor, can attune us to the agony of misfortune. . . . We don't watch or read games like we do cinema and novels and paintings, nor do we perform them like we might dance or football or Frisbee. Rather, we do something in-between with games. Yes, we "play" games like we do sports, and yes, games bear "meaning" as do the fine and plastic arts. But something else is at work in games. Games are devices we operate. (*How to Talk*, 1)

In other words, games are a technology that offers opportunities to feel what experiences are like. Elsewhere, Bogost argues, "We may often play games because they affect us, because they allow us to be someone fantastic and unassailable. . . . we want to feel what it's like to play them" ("The Squalid"). We may take on unreal identities, as the fantastic and unassailable, but as I noted, we can experience real-life pain, and as Gee notes, we may gain enough expertise that we pick up related semiotic domains, such as computer science. A virtual experience in a solitary confinement cell is not the same as

an actual solitary confinement, but we can “feel what it’s like,” much as gamers feel “like” their gameplay experiences. Similarly, the *Nutshell Studies* are a virtual experience that simulates what real life criminal investigation procedures are. The models’ virtual experience does, according to forensic experts, prepare individuals for their future work. In these ways, VR blurs from effects in “Virtual Reality” to “reality.”

While VR functions in multiple realities, it also engages multiple semiotic modes, in ways that can revise existing notions of multimodality. As seen in both the *Nutshell Studies* and *The Gunstringer*, VR texts contain visual, dimensional, auditory, and alphabetic text. VR has and will continue to offer multimodality, demonstrating, as Shipka, Prior, and Palmeri have contended, that multimodality can be found in texts regardless of whether they are digital or non-digital. Developing VR technology has the potential to expand our notion of multimodality to embrace the haptic or tactile, although this too, as I will touch on in Chapter III, has always been part of our communicative experiences. While multiliteracy embraces the spatial as a literacy, analyzing VR reveals how space is not a neutral construct, but something that we must learn to read and to read in particular ways, culturally inscribed and perceived by particular social groups. How Lee directs the forensic investigator to read a space is very different from the way an architect, designer, parent of a small child, or accessibility expert might read the space. The way a forensic investigator reads a space is not the same way a gamer reads a space. Even when mimicking real life gestures, games direct users to attend to particular movements expressed in gameplay space, but in ways that are specific to those games.

I have claimed that Frances Glessner Lee's *Nutshell Studies of Unexpected Death* are an example of Virtual Reality developed decades before computer technology could remotely support VR. Others have similarly found VR and other forms of new media in prior decades and centuries. Erin C. Blake explains that the device now termed a zograscope, a device for adding the illusion of depth to two-dimensional pictures, appeared in the 1740s-1750s as a modification of the camera obscura.⁴¹ Zograscope prints appeared regularly in English magazine and newspaper advertisements and in separate hand-tinted engravings available for purchase. Of special significance: "Curiously, almost every one of the known engravings from that period has the same subject. Zograscope prints depict the manmade environment, particularly urban topography" (1). Blake interrogates why the early incarnation of three-dimensional viewing focused on cities, buildings, and gardens, "rather than in natural scenery, or the wide range of subjects tapped by painting and other graphic genres?" Blake contends, "The zograscope enabled its users to think of themselves as individuals participating together in the larger sphere of polite society" (1-2). The zograscope offered a nonverbal "space for viewing that was both domestic and public" and supported "a new relationship between privacy and the public sphere. Zograscopes provided a model for seeing public space as generic, neutral 'polite' space" (2). While I contend that space is not neutral, what Blake here argues is that zograscope users were seeking to take control of their urban spaces, flattening the bodily experiences of "sights, sounds, smells, and jostling in

⁴¹ Blake offers this more technical description: has "a convex lens at least three inches in diameter, with a focal distance of about an arm's length. The lens refracts the light rays coming from each point on the print being viewed so that rather than seeming to originate on the surface of the paper, they arrive at the eyes almost parallel to each other, as if originating from a much greater distance" (2).

the streets” that were “too earthy and all-inclusive for a self-conception as a polite society” (5). The zograscope told a story of “public space as available, accessible, dynamic, and vibrant, but controllable, clean, and polite” where “streets, squares, parks, and church interiors were spaces for unhindered physical movement and expansive vision, not static, deep, particular experience,” a vision of “modern geography, made visible by the zograscope in its presentation of generalized open space as something three-dimensionally real” (5).

Of course, it was not only the zograscope that could be seen as a form of new media or use of Virtual Reality. Both Laura Burd Schiavo and Kristie Fleckenstein have written about the stereoscope, that device that holds for each eye lenses over two copies of the same photograph to render the photograph’s image three-dimensional to the user. Writing about the stereoscope’s use between 1838 and the 1920s, Fleckenstein argues that “the stereoscope’s thingness—its construction and everyday use—promoted a way of seeing that paradoxically relied on the user’s embodiment—his or her use of the stereoscope—to erase that embodiment; in short, it counseled the user to dismiss all senses except sight” (127). Fleckenstein’s argument echoes Blake’s point that zograscope users sought media that took them away from the bodily experiences of other urbanites. Their points about antiquated media should invite us to consider whether the urge to Virtual Reality, whether digital or non-digital, is a fleeing from particular forms of experience.

Understanding media and technology history enables us to understand VR as not arising strictly from a vacuum or as an inevitable development of computer technology.

In fact, it becomes apparent that past technologies have a mediating influence upon newer tech, while developing technologies can remediate older technologies. For example, the View-Master, a film reel-based stereoscopic device first released in 1939, representing a continuation from the stereoscopes of the prior century, no doubt laid expectations for VR viewing devices. Now that VR viewing devices have become available, the View-Master was remediated in 2015 and released in partnership with Google as a VR headset. As children work with such technologies from an early age, they will form expectations for future VR use.

Composing Dimensionality in VR

I began this chapter with an assertion that dimensionality is a key literacy for Virtual Reality. While VR possesses multiple semiotic potentials, its standout quality is dimensionality. Through VR, our textual world will be able to explore not just in two dimensions, but we will compose in and think in multiple dimensions. Using VR, scientists and students will be able to pull up models of organic molecules and rotate them to understand them in new ways. Performers can share their first-person experiences from the stage. Engineers and planners will be able to walk through design plans in multiple dimensions and show clients what redesigned home, office, public, and other spaces might look like. Sociologists can record and study spaces long after they have physical access to those places. Drawing from Soja, activists can likewise record and study human interactions with spaces and publish their work to argue for societal change. And, as with so many prior media—from the zograscope to the View-Master to television—humans can explore the entire planet and beyond.

We will be able to use VR to think about the ways we see, interpret, and act upon the space around us. This capacity includes not just composing in space, but also thinking about space. How will VR affirm and challenge Soja's theory of Thirdspace? Can VR serve as a manifestation of Soja's Thirdspace, that "[s]imultaneously real and imagined and more (both and also . . .) . . . (11) 'real-and-imagined' (or perhaps 'realandimagined'?) places"? Or is Thirdspace an opportunity or to understand VR? Or is it a space for further exploring Thirdspace? Perhaps the answer is all of those.

As such, VR offers a new *choric* space. It is, to borrow Plato's phrase, a "third-kind." And like Ulmer and Rice, I see that VR offers us inventional possibilities. What sort of associations might individuals be able to make when they can view and work in multiple dimensions? Rice notes that chora's logic "is not based on the fixity we currently associate with print culture" (35). With our composing spaces subject to a new revision in transitioning from computer to virtual work spaces, VR offers new choric possibilities. In an era of gestural interfaces and Virtual Reality, space is not static and may indeed be thought of and encountered in multiple and paradoxical ways. As Rickert has noted, we are not so much arriving at a new point in technological change, at a place for ambience to rest in a singular state, so much as we will see VR continue to evolve and to offer new choric potentials.

As Bolter, Reynolds, and so many others have said, technology offers us new writing spaces. As *Tilt Brush* offers a preview, VR has the potential to offer brand new composing spaces—and thinking spaces. One common early VR app function displays media the user already has created. For example, I can pull up the digital photos I've

taken and display them in a wrap-around photo gallery, much like an art gallery display, except for the fact that some photos may be displayed above or behind me on a sphere. One could easily imagine a composing space in which the user's entire visual space is occupied by their writing. The primary document the user is writing is displayed to the front and note cards appear adjacent to the primary text. The periphery contains reference materials and media. Perhaps the primary text is displayed at multiple segments that the user can view simultaneously. Imagine what sort of texts might emerge from an immersive composing environment. Not only will technology grow, but users will, to use de Certeau's terminology, develop tactics that resist the strategies that technologies and designers implement.

We need to take seriously the capabilities and constraints of communicating in VR as educators and communicators. Technologists, such as Kevin Kelly, argue that "within 15 years, the bulk of our work and play time will touch the virtual to some degree." As such, scholars should, as Cindy Selfe would say, pay attention to VR. VR offers the potential for English studies to explore scholarship in new text forms. Much as Moretti makes the argument for using maps and other tools (such as graphs and visualization trees) for performing literary analysis, Janet H. Murray argues that "some kinds of knowledge can be better represented in digital formats than they have been in print" (6), listing such examples as language learners hearing multiple native speakers uttering the same material or multiple performers reciting Hamlet's soliloquies. Murray argues, "The more we cultivate [the computer] as a tool for serious inquiry, the more it

will offer itself as both an analytical and a synthetic medium” (7). Reality media thus present the computer as a tool for inquiry.

Reality media, including Virtual Reality, represent a revisioning of the writing space on par with the introduction of the personal computer in the 1980s that Selfe, Hawisher, Bolter, and others have written about. Ultimately, as VR technologies mature, we might compose some fairly traditional texts in VR. Or we might compose entirely new forms of texts. It’s hard to predict the fullness of how VR texts will develop. That’s why it’s important to pay attention—and to contribute to ways in which VR texts are made and studied.

CHAPTER III

THE LAYERS OF LITERACY: AUGMENTED REALITY AND THE DE-COMPOSITION OF BODY TEXTS

In the prior chapter, I explored how Virtual Reality's distinctive textual trait is dimensionality. Examining both digital and non-digital texts reveals that more than contemporary VR digital texts possess virtual characteristics. VR's primary trait of dimensionality provides a site for exemplifying the importance of the dimensionality in textual inscription and interpretation and a commonality across textual eras. In this chapter, I examine how Augmented Reality functions through a primary logic of layering. AR's exploitation of the layer illustrates how semiocy operates through multiple processes of meaning-making. The metaphor of the layer offers a means of understanding the acts of reading and composing as more complicated than processing words on a singular level and reveals that much more is at work than a singular interpretation of ideas, words, and images in isolation to an individual text alone.

To consider how layers function within texts, I explore Augmented Reality (AR) in both new media software and in an antiquated pre-new media form by exploring displays using the body itself. AR uses readily apparent, material layers, heightening the visibility of semiocy's functioning through processes of layering. However, this deployment of the layer is not isolated to digital media. Indeed, the metaphor of the layer emphasizes particularly how, even when engaging with printed words, readers and

authors work with so much more than alphabetic text. Others (Gitelman; Anderson and Sayers) have likewise found layers in literacy, specifically identifying and examining the material layers manifest in texts and textual processes. Such material layers are also present in Augmented Reality, as I will note; however, I aim also to extend the awareness of layers to considering immaterial layers, much as Gee and Barthes theorize (even if they do not explicitly use the layer metaphor). These intangible—or less readily apparent—layers influence our reading and composing processes. Augmented Reality highlights these layers by combining actuality and the digital, demonstrating a layering logic part of new and antiquated media.

I continue to extend my larger argument that semiocy functions as part of a continuum that builds on past texts and textual practices. To do so, I examine an antiquated medium in the *BODY WORLDS* exhibition. I also explore the Anatomy 4D app which displays images of the body and its systems using Augmented Reality digital technology. The comparative analysis of the digital and pre-digital media reveals that both operate using the layering that Augmented Reality foregrounds. Layers have always shaped textual capabilities and processes. The expansion of digital AR media provides opportunities for exploration of a textual function that has been rendered invisible through naturalization. Attending to the layer provides ways to understand the depth and complexity affecting textual interpretation.

To elaborate the semiocy-layering relationship, I identify how texts work with additive and subtractive layers, a textual characteristic highlighted by Augmented Reality texts. Articulating this layering characteristic helps understand how the processes of

semiocy simultaneously reveal and conceal and necessitate attending to and ignoring layers. I position my articulation of semiotic layering in existing literacy theory.

Although some theorists explicitly use the metaphor of the layer in discussing processes of composing and reading, others do not; however, the metaphor unifies theory through a new interpretive perspective. Recognizing and understanding the impact of these layers, in particular nonmaterial invisible ones, provides opportunities for offering education in semiocy and textual interpretation and invention.

As with the previous chapter, I examine texts involving the body to emphasize the one connection between historical, new, and future media: the body. The body is the ultimate commonality on this historical continuum. Bodies have been represented in multiple media for both medical professionals and lay individuals for centuries. As with the examples I cite here, such texts make an argument that we can understand how human bodies work by viewing visual representations of bodies. As I will demonstrate, whether antiquated or new media, such texts operate through a multiplicity of layers that intersect with histories, both personal and societal, to make meaning.

Theorizing Layers of Semiocy

Through the readily apparent combination of material and digital objects to form a text, Augmented Reality technologies provide a site for examining how semiocy functions through both tangible and intangible layering processes. Others have explored how literacy functions through both material and immaterial layers to explore how we read texts not only for what they say, but how they appear. Our surrounding societal contexts affect how we read, compose, and respond to interlocutors, much as our

surrounding physical contexts likewise function as layers that affect our compositions. Through its reliance on a physical interpretive medium in displaying a text layer upon a representation of actuality, digital Augmented Reality highlights multiple layers. In what follows, a comparative examination of texts using antiquated and new media, as well as a literature review, reveals that layering has always been present in textual production, even if it is expressed or interpreted in ways unique to individual texts.

In his famous “The Rhetoric of the Image,” Roland Barthes presents how layers function in something as simple as a one page advertisement. Barthes challenges the limited view of “language” as limited to the written word by exploring the multiple ways in which a one-page advertisement can be read. Barthes points out that beyond the linguistic message, or written language, literal and symbolic messages also exist. The advertisement thus communicates using linguistic messages, including one that is “denoted,” such as the caption⁴² and the product labels, and another that is “connoted,” the creation of “Panzani” to convey to the French audience a certain “Italianicity.” The *symbolic message* is the non-linguistic part of the text, the connoted image. One example of symbolic connotation is the way that the half-open bag signifies shopping for oneself. Additionally, the tomato, the pepper and the red, yellow, and green hues signifying the aforementioned Italianicity that would not be legible to an Italian in the way it is to a French audience. The *literal message*, or denoted image, is the photographic image of the tomato, which corresponds to a real object—a tomato, much as the image of the pepper

⁴² The caption reads, “PATES - SAUCE - PARMESAN” and “A L’ITALIENNE DE LUXE.”

represents a pepper; in other words, the relationship between the image signifier and signified object is the same.

Barthes points here to the ways in which we read not through alphabetic language alone. Instead, we read through the alphabetic text using denotation and connotation. We simultaneously perceive the perceptual message and the cultural message, perceiving and recognizing the actual objects at the same time as we understand their symbolism. By pointing to the way in which the French would read the ad based on their familiarity with certain tourist stereotypes (34), Barthes notes repeatedly how the signs and our interpretations of them are drawn from cultural codes.

Although demonstrating that we do not read words alone, Barthes still emphasizes the importance of the linguistic message, particularly its relationship with the image. In doing so, he precedes Gunther Kress in contending that modern readers frequently encounter images, but Barthes differs from Kress in positing that the image has not ascended the alphabetic. Instead, the image frequently appears in *combination* with words:

Today, at the level of mass communications, it appears that the linguistic message is indeed present in every image: as title, caption, accompanying press article, film dialogue, comic strip balloon. Which shows that it is not very accurate to talk of a civilization of the image— we are still, and more than ever, a civilization of writing, writing and speech continuing to be the full terms of the informational structure. (38)

Barthes points not only to the frequency of words in combination with images, but he also identifies how the relationship between words and images can perform two possible

functions: 1) *Anchorage*: the most frequent function focuses or directs the audience to a possible meaning from the range of interpretations that images provoke, and 2) *Relay*: the less common function where text, such as dialogue, and image stand in a complementary relationship, such as in cartoons and comic strips (40-41). Barthes' concepts of Anchorage and Relay show that words and images can function in directive, reinforcing ways and in paralleling ways.

Barthes emphasizes in his reading the importance of intentionality in advertising. While the actual products being sold appear in the ad, Barthes points to numerous communicative decisions, both on the product packaging and in the advertisement. The ad designers chose to display materials, such as the red tomatoes, yellow onions, red peppers, and pale mushrooms, that make up or supplement the pasta product as well as reinforce the theme of "Italicianicity." While the photography depicts actual objects as they are, overall the image is a multiply constructed text. Barthes notes that the linguistic, the denoted, and the connoted message exist within the single image, pointing to multiple levels of interpretive layering. Reading the text involves more than one approach to the multiple signs embedded within it. But were all the signs removed, "I continue to 'read' the image, to 'understand' that it assembles in a common space a number of identifiable (nameable) objects, not merely shapes and colours" (35). In other words, Barthes emphasizes the intention of this image is to communicate in particular ways.

One other point in his analysis of the advertisement bears attention: the recognizability of the page as an advertisement. The audience—whether the intended French audience or the contemporary American one—identifies the word-image

combination—whether present in the magazine Barthes saw or reproduced on the contemporary web—as belonging to a genre focused on persuading the recipients of the products’ commercial value and their need to purchase the featured products. As Barthes is focused on rhetoric in this essay, it is not surprising that he does not use the term “genre,” particularly as Carolyn Miller argues in 1984 that rhetorical theory “has not provided firm guidance on what constitutes a genre” (151). Miller argues that “a rhetorically sound definition of genre must be centered not on the substance or the form of discourse but on the action it is used to accomplish” (151).¹¹⁹ I operate from Miller’s understanding of genre as focused on the intended action the form should accomplish: in this case, the persuasion of an audience to buy Panzani pasta products.⁴³ So while Barthes does not elaborate the relationship between rhetoric and genre, his analysis points to another interpretive layer: genre.

Ultimately, what Barthes articulates in “The Rhetoric of the Image” are the multiple communication processes involved in deciphering a single page text. While he refers specifically to the linguistic message (both connoted and denoted), the coded

¹¹⁹ Miller further refines her definition to focus on “typified rhetorical actions based on recurrent situations” (159).

⁴³ What I appreciate about Miller’s definition of genre is that it does not focus on medium, something of particular importance during an era of rapidly evolving media.

Carolyn Miller and Dawn Shepherd take up the question of medium and genre in “Questions for Genre Theory from the Blogosphere.” In this 2009 article, the authors return to the topic of their 2004 article, which forwarded the claim that blogs were an emerging genre. In 2009, Miller and Shepherd revise their claim to consider the blog now a medium rather than a genre. What the researchers found in a few short years was that the blog, which had initially been a personal document, specifically a diary/log of personal writing, that had burgeoned into political blogs, corporate blogs, cooking blogs, and so many other innumerable forms that the “blog” was no longer united by a focus on a single form of social action or understanding. Both RGS and digital rhetoric/new media need to understand genre and medium as distinct, shaped by understanding the intended actions the expressions seek.

iconic message, the non-coded iconic message, and the literal, he reveals that the multiple interpretive acts being called upon. The reader processes alphabetic, iconographic, cultural, literal, and generic layers, among others. Textual interpretation involves examining a text through multiple layers, often near-instantaneously so that the audience member is rarely consciously engaging these different approaches in reaching an understanding of the text.

While Barthes theorizes the multiple layers in textual meaning-making, Deborah Brandt addresses how literacy functions through multiplicity. Brandt addresses the additive development of literacy in vertical and horizontal directions. She posits that literacy “piles up” through formal schooling that accumulates in families, as well as “in a residual sense, as materials and practices from earlier times often linger” (652). She argues then that literacy is not a singular task, knowledge, or ability. As Barthes articulates layers in a single text to illustrate the multiple ways to make meaning, Brandt points to broader historical patterns of interpretation and composition. In this accumulative piling process, Brandt claims that literacy in the U.S. has involved a series of “transformations that gradually co-opt and eclipse earlier versions” (652), a point that I find supports my claim that literacy operates as a continuity of practices, although I interpret the term “eclipse” not as erasure of literacy practices, but as habits that remain obscured through naturalization. Instead, I propose that new semiocytic practices supervene older semiocies, that is, they rely on prior acts of reading and writing. Thus, it is important to understand both emerging and historical ways of composing and interpreting

and how they share layering as a common property; indeed, new media can be seen as an overlay of multiple past practices.

The Layers of Multimodality

Understanding literacy as a piling up or accumulating of layers enables us to understand the manifold activities that are involved in semiotic practices. Such layers shape our ways of seeing and interpreting. In “‘English’ at the Crossroads,” Gunther Kress stresses that communication has always been multi-semiotic (70). When we read, Kress, among others (Shipka; Ball and Charlton; Prior⁴⁴), contends we do not interpret texts through a single mode. Viewing texts as possessing more than a single layer or mode to interpret demonstrates the complexity of literacy as more than reading or writing the alphabetic. As Kress demonstrates through semiotics and Barthes establishes through multiple levels of messages, texts operate through multiple layers, not only the alphabetic.

For Joddy Murray, the layer is essential to multimodality. He argues that while discursive (word-based) rhetoric operates through linear relationships of textual elements, non-discursive (image-based) rhetoric relies on the layer: “Layers are key to multimodal authoring because these texts are non-discursive. Whereas discursive texts rely on sequence, one utterance elaborating on the previous utterance, non-discursive texts rely on no specific ordering” (178). Indeed, he argues,

⁴⁴ Prior writes, “Multimodality has always and everywhere been present as representations are propagated across multiple media and as any situated event is indexically fed by all modes present whether they are focalized or backgrounded” (27).

[I]mage, as non-discursive text, is the most important underlying compositional element in creating multimodal text precisely because of its ability to access something *other* than discursive meaning. In fact, it is through image that meaning (discursive or not) is assembled and made available through our senses: our world is experienced in multimodal ways, and as such, as humans, our texts must both acknowledge and grow out of this messy yet generative collection of multisensual images that surround our everyday experience. (57)

Murray's layers exist when images or sound are located beside text or as a comparison of different textual sections. These layers "provide depth, texture, complexity, nuance, even contradiction: all of which is important in creating multimedia products that move beyond simple representation/illustration" (178-179). Understanding how to "compose with image (and, consequently, affect)" enables rhetors to reach audiences (111).

Gee emphasizes understanding literacy as more than reading and writing, but also as social and cultural multimodal practices, suggesting that the social and cultural can be seen as layers impacting multiple modes of interpretation. In Chapter II, I cited Gee offering the hypothetical example of him going into a neighborhood "biker bar." He points to the inappropriateness of speaking to one of the leather-jacketed, tattooed patrons by asking, "May I have a match for my cigarette, please?" when "'Gotta match?' or 'Give me a light, wouldya?'" would be better suited to the occasion (*Social 2*). Further, Gee notes that one's behavior must also match one's words; even speaking the more appropriate words while cleaning off the bar stool with a napkin to keep his ironed designer jeans clean would be a mismatch (*Social 3*). This example of Gee's points to the way that an interlocutor needs to understand language not only as we traditionally understand it—words written or spoken—but also as specific to a given social context.

This means that individuals must understand that they speak in social and cultural settings using multiple and appropriate semiotic layers (oral linguistic, gestural, language, clothing), but, as Gee shows, they must also read the situational layers: the physical context made up of audience and body language and clothing.

Social Layers

Much as Gee emphasizes the multiple social and cultural layers, many other literacy theorists have written about how societies and cultures influence how texts are composed and interpreted. Understanding the social as a layer points to how layers can function in ways that direct the interpretation. As in Gee's bar scene, the social affects not just linguistic text, but other modes as well. Further supporting the social interpretive impact, Gee offers a case study that illustrates how social experiences affect function as an interpretive layer. He presents the study of how different social groups interpreted a story of 24 words: "Heartsick and dejected, Abigail turned to Slug with her tale of woe. Slug, feeling compassion for Abigail, sought out Gregory and beat him brutally" (*Social* 43). Gee found that the study's African-American readers claimed that the two sentences "'say' that Abigail told Slug to beat up Gregory" (*Social* 44). Readers who were not African-Americans "claimed that these sentences 'say' no such thing" and that "the African-Americans have misread the sentences." (*Social* 44). Gee's point is that "whatever literacy has to do with reading, reading must be spelled out, at the very least, as multiple abilities to 'read' texts of certain types in certain ways or to certain levels. There are obviously many abilities here, each of them a type of literacy, one of a set of literacies" (44). The takeaway is: "One has to be socialized into a practice to learn to read

texts of type X in way Y” (45). Gee thus demonstrates how different social experiences affect and are even prerequisite for audience meaning-making.

As in Gee’s example, the social can impact how we interpret in ways that drive us toward some meanings and away from others. Burke’s notion of terministic screens offers a way of understanding how the social affects our interpretation. Terministic screens point to one way that layers can inhibit some understanding in favor of others:

We must use terministic screens, since we can’t say anything without the use of terms; whatever terms we use, they necessarily constitute a corresponding kind of screen; and any such screen necessarily directs the attention to one field rather than another. Within that field there can be different screens, each with its own ways of directing the attention and shaping the range of observations implicit in the given terminology. (50)

Such layers invite association or dissociation, action or inaction, belief or disbelief. In other words, social layers work in complex ways, not merely as addition or as concealment, but in directive ways.

As I have previously cited, De Certeau offers a layering metaphor in exploring how readers occupy an author’s text. He offers an image of geological epochs, a metaphor linked to a historical exposure, specifically to the social: “Barthes reads Proust in Stendahl’s text; the viewer reads the landscape of his childhood in the evening news. The thin film of writing becomes a movement of strata, a play of spaces. A different world (the reader’s) slips into the author’s place” (xxi). Here, De Certeau identifies a relationship between memory and textual interpretation. Overlaid over every audience member’s viewing of a text is the memory—really, memories—that influence their

reading. Every audience member interprets a text through the layers of the individual's remembrance, their unique past social experiences, reminding us that the acts of reading and writing are never neutral, but always socially imbued.⁴⁵

Material Layers

Other scholars have offered the “palimpsest” as a metaphor for exploring how layered a text may be in its composition, layers that remain legible in the final product. Kathleen Blake Yancey explores in writing about e-portfolios how common college assignments demonstrate layers of texts: “Like a print portfolio, the digital includes traces of earlier thinking: palimtext and palimpsest both” (752). Noting that Ben Barton and Marthalee Barton offer the palimpsest as a means of achieving fuller representation through multiple layers, Yancey also builds on Michael Davidson's notion of the palimtext, although his concept focuses on the material. Davidson explains how the term serves “to emphasize the intertextual—and inter-discursive—quality of postmodern writing as well as its materiality” (78). Davidson's concept focuses less on static object and more on dynamic process: “The palimtext is neither a genre nor an object, but a writing-in-process that may make use of any number of textual sources. As its name implies, the palimtext retains vestiges of prior writings out of which it emerges. Or more accurately, it is the still-visible record of its responses to those earlier writings” (78).

While Yancey, Barton and Barton, and Davidson refer to layers that make evident the

⁴⁵ What determines how one reads is the individual's “experiences with other people who are members of various sorts of social and cultural groups, whether these are biblical scholars, radical lawyers, peace activists, family members, fellow ethnic group or church members, or whatever. These groups work through their various social practices, to encourage people to read and think in certain ways, and not others, about certain sorts of texts and things” (Gee 6).

writer's process drafting and development—and in Davidson's case, intertextual references, the reader uses those strata for interpretation. While Davidson specifically refers to material documents, Yancey refers to the e-portfolio as providing similar traces and residues of the writing process that leads to this particular record of a student's writing history.

In exploring material layers in her examination of historical media, Lisa Gitelman emphasizes how the material affects readings of text. Inherent in Yancey, Barton and Barton, and Davidson viewing layers as process-revealing is a temporality that Gitelman's understanding of material layers evokes:

Because they [inscriptions] are at some level material, one important quality that all inscriptions share is a relationship with the past. Whether scribbled down just a second ago or chiseled into stone during the sixth millennium BCE, whether captured in the blink of a shutter or accumulated over months and years of bookkeeping, inscriptions attest to the moments of their own inscription in the past. In this sense, they instantiate the history that produced them, and thus help to direct any retrospective sense of what history in general is. (Gitelman 20)

Gitelman illustrates her argument with the specific example of the Salem witch trials, a historical event now “known largely because people at the time wrote about them” (20). The documents they left contain accounts of the events recorded in traditional alphabetic writing, but “also plenty of other data by virtue of their materiality—their material existence and material or forensic properties” (20). The presence of this other data results in reading being a complex process involving more than decoding the words written on those records, as Gitelman explains:

Historians today read the Salem documents, of course, yet they also “read the background”; they analyze the written words, but they also assess the look, feel, and smell of the paper, sometimes without even realizing they’re doing so. A shared sense of writing, of what can be written down and what cannot, also helps make them comprehensible in a lot of subtle ways (20).

Historians’ analysis of the look, feel, and smell of paper—without necessarily realizing they’re even performing such analysis—exemplifies a process of reading using multiple layers.

While Gitelman *largely* refers to a process of reading the material layers of the text, I extend the layer to other information embedded while composing the text and perceived during the reading process. For example, understanding “what can be written down and what cannot” represents a social layer that impacts semiocy composing processes. Walter Benjamin’s notion of the “aura” represents another layer that is intangible, but represents how texts are understood. In discussing the impact of mechanical reproduction, Benjamin claims that the “sphere of authenticity is outside the technical,” meaning that process of reproducing art incurs a loss as the original artwork possesses an “aura,” something that copies lack because of the changed context. A layer of the auratic surrounds the original, while “[i]n even the most perfect reproduction of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be” (21). For him, a layer of authenticity is legible as missing in copies. Benjamin’s aura becomes ever more relevant in an era of digital copies of texts.

The Layers of Digital Media

The “piling up” metaphor signals, as Brandt notes, how twentieth and early twenty-first century literacy has rapidly proliferated and diversified. The rapidity of these changes means that “the ideological texture of literacy has become more complex as more layers of earlier forms of literacy exist simultaneously within the society and within the experiences of individuals” (75). As Brandt observes, literacy is both individual and social in acquisition and performance. The relentless process of on-going change “has forced literate ability to include a capacity to amalgamate new reading and writing practices in response to rapid social change” (75).⁴⁶ With new communications technologies appearing every day, this aggregation of literacy skills will necessarily continue.

A tension exists in whether new communication technologies offer additive layers or are prone to rapid obsolescence. Some have seen the rise of new media composing as heralding new literacy opportunities. Stuart Moulthrop contends that hypertext might achieve more than just the “return to literacy” that Ted Nelson foresaw in his Project Xanadu (the alternative and precursor vision to Tim Berners-Lee’s World Wide Web). Moulthrop saw that hypertext users must also achieve a sort of “secondary literacy,” a move that echoes Ong’s and McLuhan’s secondary orality. For Moulthrop, secondary literacy occurs when readers achieve a “self-consciousness about the technological mediation of those acts, a sensitivity to the way texts-below-the-text constitute another

⁴⁶ Of course, while additive, the accumulating nature of literacy is not without its deleterious impact as Brandt notes: “On another front, many American workers are piling up obsolete knowledge and skills related to obsolete communication technologies and computer software” (215).

order behind the visible. This secondary literacy involves both rhetoric and technics: to read at the hypotextual level is to confront (paragnostically) the design of the system; to write at this level is to reprogram . . .” rendering for readers “a cyberspace in the truest sense of the word, meaning a place of command and control where the written word has the power to remake appearances” (700). What Moulthrop identifies here is the way in which an individual not only reads by understanding the relationship between a given text and its source text, but also by understanding how the text is delivered—in this case, the design of electronic cyberspace. In looking at Nelson’s Project Xanadu, Moulthrop saw the potential for individuals other than the “programming elite” to gain access to a new literacy: communicating online by understanding the communication system itself. Of course, what Moulthrop points to with secondary literacy is not new; it is, however, attending to how the medium interacts with the message. In this case, Moulthrop forecasted a necessity for individuals to become more familiar with the technologies underlying Internet communication as part of achieving primary literacy.

Although it might seem counter to the nature of digital composing, Daniel Anderson and Jentery Sayers offer the metaphor and materiality of layers as a way to illustrate the shifting relationships between composing, the humanities, and digital culture. The scholars offer layers as a provocation for understanding reading and writing as something other than the usual linear, sequential representations brought about by the progressive ordering of pages as linear text on numbered pages. In adding “verticality to our sense of composing,” the layers metaphor resists the notion of a text as a singular artifact: “Each reading performs and even generates new versions of a text over time, but

accumulated representations of those readings can be gathered, simultaneous, viewed through one another. And writing is layered, too, revision over revision stratified over time” (80). Rather than focusing on the text at a single moment, the layers metaphor places the emphasis on process as taking place over time.

In addition to supporting understanding of the composition *process*, the layer also functions on a *product* level. Anderson and Sayers focus on digital composing tools support compositing, that is, building a text from multiple elements. They contend that “as inscriptions, layers mark history” (90), suggesting an archaeological metaphor. Despite perceptions and ideologies that suggest electronic permanence, Anderson and Sayers articulate how digital composition functions in material ways: “The digital *rots*. It *decays*. It *degrades*” (89). Content does disappear; URLs cease to function; these losses affect how the referring site coheres given the referral absence. If such occurs, readers must work through the layers that remain to make meaning. As with Yancey, Anderson and Sayers point to ways that *material* layering pertains to the *digital*.

The Layers of Augmented Reality

As I and others have theorized, layers function in multiple ways. Layering helps us understand texts diachronically (with regard to their historical development) and synchronically (without regard to history), as processes and products—both in the author’s composition and in the audience’s interpretation. Layers work in combination, they add, they conceal, they focus, they offer productive tensions for interpretation. Layers evoke multiplicity. Layers suggest history in a present moment. They may be material or digital; clearly perceptible or intangible. By combining actuality and the

textual, digital Augmented Reality highlights the layering that is part of textual composition or interpretation.

To articulate the layering process, I examine two texts of different media eras. The antiquated media I examine in this chapter is a *BODY WORLDS* museum exhibit, which employs the oldest medium of all: the body itself. Preserving about 25 different corpses through a plastination process, *BODY WORLDS* creates texts by removing the outermost layer of the body and subsequent layers to highlight different systems, including the skeletal, muscular, nervous, circulatory, digestive, respiratory, urinary, and reproductive systems. The bodies are further modified for display through preservatives, dyes, and multiple other modifications. The *BODY WORLDS* exhibits invoke layering as a formative means of reading bodies for understanding. The exhibition makes an argument that to read the human body we must remove the exterior layers and then progressively build up understanding by accreting additional layers.

The new media text I examine in this chapter is the Anatomy 4D augmented reality app which involves printing images from the app's Library and then pointing a smart phone or tablet's camera at the Library image. Once activated, the app displays on the device screen a multi-dimensional image corresponding to that Library printout. The image responds to the tilting of the device by correspondingly tilting the body on screen; users can pinch or expand to change the display of the body. The app enables viewers to use a variety of controls to change the view of the body from male to female, to change transparency of the skin, and to display different body systems within the body. This app layers literacy activities by layering the media that readers need to engage with both

antiquated media and new media. This augmented reality app demonstrates the need for understanding semiocy as a continuum of past practices and current practices as app users must engage in acts of reading paper media as well as new media.

Augmented Reality Explored

In the previous chapter, I wrote extensively about Virtual Reality, a medium distinct from Augmented Reality. As previously noted, VR is the immersive experience of the actuality-blocking goggles of the Oculus Rift, the Samsung Gear VR, or Google Cardboard, and the science fictional *Star Trek* holodeck, *The Matrix* computer environment, or “the Grid” of *Tron*. By contrast, Augmented Reality displays additional data to users while also enabling them to perceive their actual surroundings instead of blocking them. Augmented Reality is, as I have described before, a view—direct or indirect—of the physical world that surrounds the user with an overlay of additional data (whether alphabetic/numeric text, symbols, images, or other media, including video, audio, and haptic). In short, Augmented Reality is a combination of the actual world plus a layer of data.

In contrast to VR, which often displays a fictional or an immersive environment otherwise not representative of the user’s actuality, AR’s layered display represents information about the actual world. Before this additional layer is displayed, Augmented Reality first involves a process in which a trigger (an image, a situation, or user action) causes technology (screen, glasses, or device) to deliver additional data (visual, auditory, haptic, and/or olfactory) to the user. Depending on the software/hardware configuration, AR triggers might include such examples as the user pointing a device at a particular

image while running a particular app, being in a particular location, or even turning an app on. Once the trigger activates the augmentation, the AR data may be additionally responsive to the user's real-world location or request, continually updating the data displayed on-screen; alternately, the data may display only a pre-determined image or video.

In 1997, in the first survey on Augmented Reality, Ronald Azuma presented a classification-based definition of AR technologies. For him, AR

- combines real and virtual,
- is interactive in real time, and
- is registered in 3D. (356)

For Azuma, these virtual and real objects coexist in the same space, much as shown in the films *Who Framed Roger Rabbit?* and *Jurassic Park*. In these movies, the objects combine in three dimensions so that the virtual object covers the actual object (356).

Layering real and virtual objects in three dimensions offers advantages because Augmented Reality “enhances a user’s perception of and interaction with the real world. The virtual objects display information that the user cannot directly detect with his own senses” (356). For Azuma, AR is an enhancement that improves the user’s perception of the actual. One of the first applications Azuma suggests for AR is medical: “Doctors could use augmented reality as a visualization and training aid for surgery” (356).⁴⁷ It is this application that I focus on with my new media and antiquated media AR texts.

⁴⁷ Additionally, Azuma explores uses for AR in maintenance and repair, annotation, robot path planning, entertainment, and military aircraft navigation and targeting.

AR is accessed as either marker-based or markerless technology. Situational AR is an example of “markerless” AR. Marker-based AR is triggered through visual cues called “markers.” The Aurasma software enables users to create and to view additional media (videos or images) by choosing a “trigger” image. For example, Aurasma users have been able to point their cameras at static images, such as posters, or physical objects, such as beer cans or hotel lobby stands. The Aurasma app then displays media specified by the content creator. Because the AR software depends on the user pointing their phone at the trigger image, Aurasma is a marker-based AR.

As I will discuss in this chapter’s new media example, the Daqri *4D Anatomy* software is a marker-based AR that involves the user installing and running the *Anatomy 4D* software on a supported device, such as a tablet or phone, tablet, and then pointing the device’s camera at a trigger image Daqri provides. In response, the software displays on the user’s screen the image of a body or a heart corresponding to the trigger image. Users can then rotate, zoom in, or view different information about the body or heart. In this example, the user chooses the trigger image, which determines what information is displayed; while they can control how they view that image, it will always display the same image and will not update the information based on the user’s surroundings.

By contrast, information displayed in other applications may be responsive in multiple modes to the user’s surrounding actuality. Heads-up displays (HUD), also known as “synthetic vision systems,” were used in American space shuttles in aircraft cockpits. The displays showed information about the flight path, the surrounding air traffic, ground features, air speed, or other situational information that changes as the

aircraft moves through space. As an example of a responsive location-based AR interface, Yelp has an AR feature called Monocle. When a user is in a particular area, they can point their phone's camera and use it as an AR viewfinder. The phone then displays a list of establishment names over the actual surroundings with Yelp's usual listing of star ratings and numbers of reviews, as well as information about the establishment's proximity. Similarly geographically-responsive, AR may also be haptic and auditory. When a user wearing a smart watch requests directions, the watch's linked phone/speaker can provide auditory directions, while the watch also vibrates when it is time to make a traffic move. Location-sensitive AR technologies communicate via multiple modes.

Augmented Reality in Fiction

Just as we've seen science fiction depict VR, SF cinema has also provided examples of Augmented Reality that provide helpful touchstones for understanding AR as providing the AR viewer an "enhanced" version of reality that simultaneously allows the viewer to experience both their surrounding actuality and also an overlay of data. One of the earlier AR examples is *The Terminator 2* (1991). This film's namesake humanistic robot travels from the future to the contemporary era on a murderous mission. The futuristic robot has AR visual capabilities. The audience sees from his perspective what augmented reality might look like. As the robot looks around a bar, the film shows data written in his visual field: vital statistics, threat assessments, clothing and body shapes outlined for clothing size match. Later, the robot identifies brand names and models. The

movie shows from the robot's perspective how a fully integrated AR vision might function.⁴⁸

Two decades later, *Iron Man* (2008) provides moviegoers both exterior and first-person views of AR. In the movie, the main character Tony Stark becomes the titular superhero when he wears a robotic-style suit that provides him with armor, a jet pack, and an interactive Artificial Intelligence named Jarvis. The suit also features a helmet with a clear faceplate to augment his vision. While the clear faceplate enables the character to see his actual surroundings, it also displays translucent information enabling the user to perceive data without obscuring his view. For example, Stark sees risk identification and tactical data that will help him both evade threats and defend himself; he sees his very technologically-enhanced suit's status, much like a gamer sees player health status, location information, flight trajectories, and so forth. The AR view is also flexible as it responds to particular triggers—whether by Stark's request, by the AI's direction, or by another trigger, such as perception of an immediate threat. Unlike the Terminator's Augmented Reality that is visible only to the robot, Stark's AR display appears on his faceplate and so is visible to him and is also apparent to others, thus providing a contrast between the Terminator's private data and Stark's more public display. Current AR technologies are similar to Stark's AR in that the device responsible for mediating is apparent. How soon AR contact lenses will be available is an open question.

⁴⁸ Further, the robot's AR visual perceptions distinguish him from his "mere" human opponents who have unmodified vision.

A Brief History of Augmented Reality

Although I explore Virtual Reality in Chapter II, discuss Augmented Reality in Chapter III, and Chapter IV addresses Mixed Reality, I do not mean to suggest through this chapter order or through any other discussion a hierarchy in any sense. No reality media are “more mature” than any other. Much like Milgram and Kishino represent the Reality-Virtuality Continuum as a means of describing particular technological approaches, I likewise see different reality media and their corresponding semiocy as existing on a spectrum rather than functioning on a hierarchy or as a progression. Again, none of these reality media is “better,” “superior,” or “more advanced” than another. Each medium offers its own affordances and constraints. A particular medium should be suited to its particular purpose.

The history of the different reality media and technologies reveals adaptations to different purposes. Despite recent attention suggesting otherwise, Augmented Reality is not new, although its technologies have matured considerably since their first release five decades back. The popular press frequently dates Augmented Reality to 1990, the time when Boeing researcher Tom Caudell applied the term “augmented reality” to describe a digital display used by aircraft electricians that blended virtual (e.g., computer-generated) graphics onto a physical reality. However, long before Caudell used the term augmented reality to his project, developers had been developing Augmented Reality hardware and software. Indeed, Clemens Arth et al have identified five decades worth of augmented reality implementations, beginning in 1968 with Ivan Sutherland’s optical see-through head-mounted display that was, depending on its configuration, also a virtual reality

system. Arth et al note the necessary confluence of multiple technologies, such as mobile computing, geographical information systems, the global positioning system, and cameras, involved in Augmented Reality development. Reviewing the history of AR makes clear AR's hardware movement from early cumbersome head-mounted display (HMD) to more agile HMDs, like Google Glass, and the development of AR smartphone and tablet apps.

Regardless of its hardware implementation, Augmented Reality software at present is distinguished between built-in content and responsive interactions. Applications with built-in augmented reality content include games and illustration of coloring pages. While built-in AR software responds to the user's input, it does not change substantially based on the user's situation. For example, in an AR coloring app, the app renders a multi-dimensional version of the colored-in object based on the colors the user chose, but it cannot suddenly transform the colored dragon into a rose—or even add or display a multi-dimensional rose if the artist modified the target image. By contrast, responsive AR applications include more flexible display. For example, aircraft AR display information corresponding both to the user's location and the user's situation; the displayed information is dynamically determined based on the user's situation.

As of this writing, Augmented Reality remains in flux as it possesses no definitive market leaders or standard platforms. This means that users install different AR software packages to experience different versions of AR implementations. While some developers have focused on developing focused applications, Layar developed the Layar Reality Browser, an “Augmented Reality Browser.” Using Layar, users point their phone

cameras at their surroundings. The browser uses the phone's GPS to identify the user's location and Web access to retrieve information about their surroundings. Layar displays on-screen their surroundings with alphabetic labels about nearby sites of interest, such as ATMs, restaurants, historical locations, and so forth, depending on the user's expressed preferences in the "Geo Layers" settings. The no-longer-updated Google Goggles functions similarly to search for and to display associated information about objects the device camera photographs.

Despite the multiple decades of and growing recent development, Augmented Reality does not have a standard interface or interaction. AR will not be widely adopted until it is more deeply integrated into device operating systems, becoming a standard phone interaction, rather than an add-on in which users have to install individual applications like Layar and Aurasma, and upgraded versions of individual applications, like Yelp. China's Baidu appears to be performing this deeper integration. Google's Tango, which functions more as a platform delivering a range of tools, such as a gaming environment displaying the user's actual background within the games, providing a visualization tool for measuring and planning changes to the user's surrounding environment, and serving as a navigation tool to display directions and information about the user's locale.⁴⁹ Such broader uses of AR may yield the standardization that will lead to greater adoption of AR by other developers and users.

⁴⁹ Google makes grand promises in describing its product: "Tango lets you see more of your world. Just hold up your phone, and watch as virtual objects and information appear on top of your surroundings. So no matter where you are, there's always a richer, deeper experience to engage with, explore and enjoy" (*Project Tango*).

Augmented Reality Nomenclature

During the initial period of intense development of VR, AR, and related technologies in the late 1980s and early 1990s, the same terms were often applied to different technologies. In response, Milgram and Kishino in 1994 offered their Reality-Virtuality Continuum to address how terminology could distinguish between different technologies with greater specificity and accuracy. Although Milgram and Kishino offered the continuum and term definitions to distinguish between the technological and medial capabilities, some researchers objected that *any* reality depending on computer-generated images was a *virtual* reality. However, like Milgram and Kishino found useful differentiating the reality-simulating and -modifying hardware, I find it useful to distinguish between different reality media, particularly as reality technologies are again undergoing a growth spurt similar to the one in the late 1980s and early 1990s.

Several recent products demonstrate the current proliferation of reality media, as well as the challenges of terminology during periods of growth. The Nintendo 3DS, first commercially available in 2011, the Crayola *Color Alive!* coloring books, released in early 2015, and summer 2016's hit app Pokémon GO all advertise their products as using Augmented Reality. A closer look, however, complicates their claims to Augmented Reality. Crayola's *Color Alive!* coloring books use standard printed paper in combination with the Daqri Crayola *Color Alive!* app. Using the supplied crayons, or their own markers or pencils, users fill in the outlines of the book's images (dragons, superheroes, or Barbie dolls). Then, the user points the camera of a smart phone or tablet running the *Color Alive!* app at the sheet of paper and the screen displays three-dimensional

animations of the colored-in image. The dragon, for example, can breathe fire or flap its wings. The user can rotate the image to see the dragon from multiple angles. Users can also take photos of themselves with their creations. The background of all these animations and videos is the user's actual surroundings. Both Crayola and the app stores describe the coloring book interface as Augmented Reality, implying that they see AR as a modification of the reality visible through the app device's camera.

Multiple Nintendo products similarly claim the AR label. Nintendo's 3DS AR games function like *Color Alive!* in that they take input from the device's camera to determine the games' on-screen background. To activate Nintendo's AR software, the user first must point the 3DS at a special game card. Next, the 3DS camera records the user's surroundings. Then, the screen displays the game in a mixed environment combining a virtual object with a direct view of the user's actuality. For example, in *Archery*, the user shoots on-screen virtual targets with the setting being the user's actual surroundings, courtesy of the 3DS's camera. *Archery*'s boss-level opponent is a virtual dragon. In *Graffiti*, users draw their own Character Card avatar using the device's input pad and then view it displayed on-screen with the user's actual surroundings. When the user moves the camera in these games, the background shifts accordingly. Niantic's Pokémon GO! app, which enables the user to "collect" the "pocket monsters" in a scavenger hunt-style game, has an AR button that determines whether the Pokémon are displayed on a virtual background or the user's actuality as input by the camera.

Crayola's, Nintendo's, and Niantic's products are marketed as Augmented Reality, presumably because the images are a computer-mediated addition to the actuality

displayed by the camera input. However, they better represent what Chapter IV refers to as Mixed Reality, the combination of mediated actuality with the potential to display either virtual images and animations or data about actuality. As such, despite Milgram and Kishino's efforts to establish a system of nomenclature that distinguishes between mediated environments, actual application of that media has varied from their guidelines. As reality media multiply, the terminology used to describe them will continue to resist conforming to strict frameworks, whether for marketing purposes or because evolving capabilities blur the boundaries of the theoretical schema.⁵⁰

By contrast with the Crayola, Nintendo, and Niantic "Augmented Reality" products, *The Night Sky* app offers a model of what conforms to the definition of Augmented Reality that I work with. *The Night Sky* is an application for smart phones or tablets that uses their GPS and compass or gyroscope to display information about objects in the evening sky. After installing and activating the app on a supported device, the user points the device toward the sky and the screen displays a star map with labels for stars, planets, galaxies, constellations, and satellites currently visible in that time and location. While the app displays a rendered star chart or other information and media about celestial objects, it acts largely as any other location-sensitive text. The app also possesses an "AR button" that, when activated, overlays on the screen the camera view with the app's map and labels. This combination of real-time image with data about pertinent objects demonstrates what I refer to as Augmented Reality.

⁵⁰ In its patent filings, Magic Leap recognizes that "The waveguide display system can, thus, comprise an optically see-through mixed reality (or "augmented reality") display system, in which artificial or remote image data can be superimposed, overlaid, or juxtaposed with real scenes" ("Patent").

Digital applications such as *The Night Sky*, Crayola and Daqri's *Color Alive!*, the Nintendo 3DS AR games, and Niantic's Pokémon GO app have laid the foundation for future media, whether or not fully conforming to the scholarly conceptualization of AR. Given the popularity of the Nintendo and Niantic's millions of users, the academic distinction of Augmented Reality and Mixed Reality likely represent that AR is a term that has blurred with MR. However, because *Color Alive!*, the 3DS AR games, the Pokémon GO app, and other toys incorporating reality media are marketed primarily to children and youths, young media users are growing up in a world where they have had access to digital AR and MR.⁵¹ When these users graduate from coloring books using these technologies, they will likely expect learning and work tools and entertainment that continue to engage with these media. As such, AR is a textual form that will become increasingly important and prevalent, whether present in its purest isolated form or in the MR that represent its combination with VR.

Antiquated Media Layered Semiocy: *BODY WORLDS*

The antiquated, non-digital medium I examine in this chapter is the *BODY WORLDS & The Cycle of Life* exhibit. Presenting about twenty different “whole body” adult and embryonic corpses and a number of other body segments preserved through a “plastination” process, *BODY WORLDS & The Cycle of Life* presents texts by removing the outermost layer of the body—the skin—and subsequent layers to highlight different systems, including the skeletal, muscular, nervous, circulatory, digestive, respiratory,

⁵¹ Other toys include Crayola's Easy Animation Studio, Activision's Skylanders, Disney Infinity 2.0, Nintendo's Amiibo, and Anki Overdrive. Each of these uses a physical object (such as a model figure) that users scan with a supported device and then interact with in a digital space.

urinary, and reproductive systems (see Figures 4 and 5). I focus here particularly on the version of the *BODY WORLDS* exhibit that I visited in Charlotte, North Carolina, while it was on display between November 2015 and May 2016. *BODY WORLDS & The Cycle of Life* depicts the entire human life cycle, from fetal development to old age, touching on illness and injuries that compromise health.

The *BODY WORLDS* exhibitions possess augmentation through non-digital multimodal layers. As Jody Shipka, Paul Prior, and Jason Palmeri note, multimodal texts are not limited to the digital. *The Cycle of Life* exhibits includes not just plastinated bodies, but plastic slices, labels attached to bodies and beside them, signage, photographs, and so forth to help communicate its overarching message. The bodies are sliced, posed, dissected, splayed, and otherwise configured as gesturing sculptures. Tissues are dyed and bleached to adjust their coloration. Additionally, users can add to the price of their admission the purchase of hand-held devices for audio tours and listen to an oral guide for particular exhibit stops. All these additions are layers—linguistic, visual, gestural, audio—that exist as part of the larger body text exhibit. Each textual encounter points toward a “piling up” a la Brandt for interpreting multiple texts, from visual to textual labels, in multiple ways.



Figure 4. Adult Skeleton Greeting *BODY WORLDS* Visitors.
This skeleton is one of the first adult bodies to greet visitors at the *BODY WORLDS & The Cycle of Life* exhibit in Charlotte, NC. This image may also be used using the Aurasma app to view additional data.

As a form of Augmented Reality, the *BODY WORLDS & The Cycle of Life* exhibit invokes layering as a formative means of reading bodies for understanding. The flayed tissues represent one of the most immediately apparent aspects of layer, specifically that of removal. However, each of the displayed bodies possesses interpretive signage that augments or enhances the reading of each of these texts. These signs possess multimodal combinations of alphabetic text and images, so the audience reads the combination of body, words, and images together to engage in a complex act of literacy.

While the signs offer an additive layer, the flesh removal offers emphasis—on particular systems. As such, layers direct attention toward and away from individual characteristics. None of the plastinates are recognizable as individual people, but instead show only common anatomical features, muscles, skeletons, ligaments, and so forth. The plastinates are posed and labeled as “The Baseball Player,” “Nerve Leonardo,” “The Runner,” and so forth, depending on the posture the plastinate holds or information the plastinate is demonstrating. The individual identity here is removed, and replaced with another, more generic one, determined both by signage and configuration of the body as a text within the museum exhibit. (Nothing indicates a correlation between the body on display and its assumed identity.) By contrast, the pre-augmentation bodies at the plastination factory in China are “disconcertingly recognizable as real people, with visible signs of the identity that flaying and dissection will soon erase” (Belling 21). By removing such identifying features as skin, hair, eyebrows, and clothing, the viewer does not know the race, age, or any hint of life stories that made these people individuals. To an extent, every medical professional in training must study from generalized bodies.

However, each individual has a unique personal history and shared social experience that should be accounted for. As one example, the impact of poverty has a tremendous impact on health,¹⁴⁴ yet the exhibit elides any indicator or discussion of that impact on these bodies. Plastination also incurs the loss of additional signifiers: clothing, hair color, makeup (or the lack thereof), tattoos, and so forth. In general, while one body or some body parts and slides on display may have arthritis, most bodies are depicted as athletes and performers. By removing the layer of individuality, the exhibit makes an argument that all (healthy) bodies are similar underneath. However, people are individuals and their health statuses are always subject to their unique histories, choices, and genetic inheritance.

¹⁴⁴ Among other sources, see Aber and Belle.

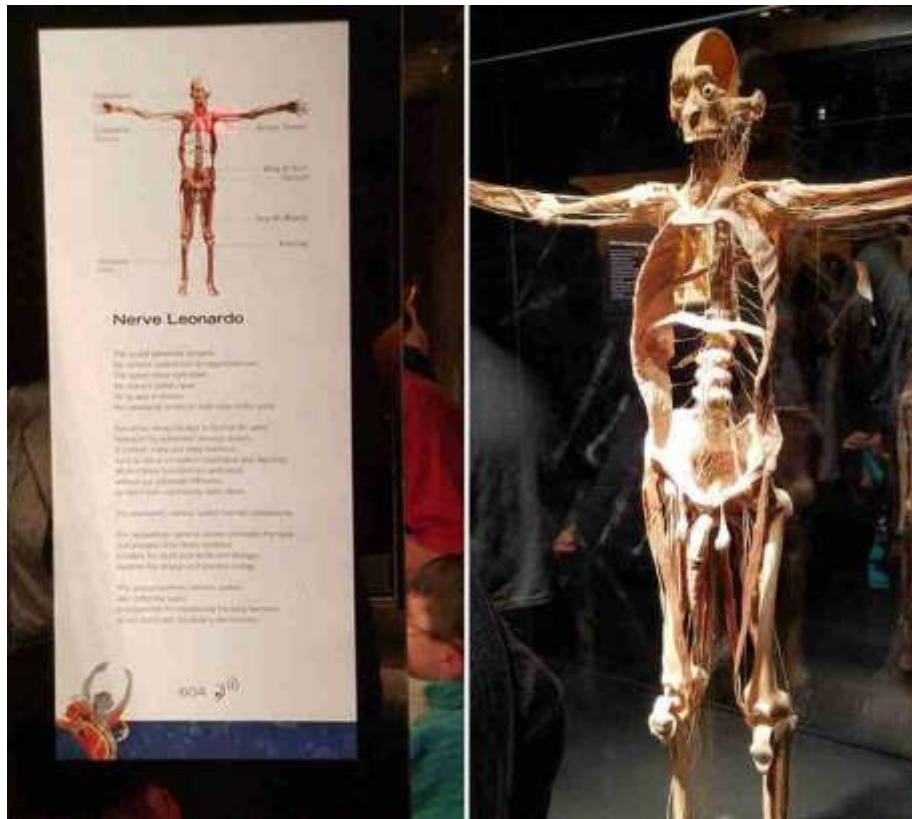


Figure 5. “Nerve Leonardo.”

This played corpse is one plastinate on exhibit at the *BODY WORLDS & The Cycle of Life* exhibit in Charlotte, NC. This image may also be used using the Aurasma app to view additional data.

The *BODY WORLDS* Augmented Reality exhibits demonstrate the layered approach to presenting a message. The layers include the cultural, individual, material, and multimodal, as I have noted here. The layers are both additive and directive; they are simultaneously reductive and eliding. The layers are multiple and complex.

New Media Layered Semiocy: *Anatomy 4D*

The *Anatomy 4D* app, created by Daqri and available on Android and iOS devices, is a free augmented reality app that displays images of the human body or the

human heart.⁵² *Anatomy 4D* is a marker-dependent augmented reality app, displaying the on the device screen a multi-dimensional image of the structure of the heart or the systems of a human body (the app enables the user to change the view between a male or a female body) depending on the underlying printout or on-screen version of the app.

To view these body systems, the *Anatomy 4D* app must first be opened on the device, and then the device camera must be pointed at the app's "Library" image, either a printout or an on-screen image of sufficient resolution and brightness. If the user tilts the device, the app responds by correspondingly changing the orientation and perspective of the on-screen image; this enables the user to view the body or heart as three-dimensional objects from multiple angles. Additionally, users can pinch or zoom to enlarge or to shrink the image view. The app enables viewers to use a variety of controls to change the view by adding or removing layers, or otherwise configuring aspects of the image. For example, on the app's body image, users can choose male or female, change the skin transparency, and display different body systems, such as the gastrointestinal, the skeletal, or nervous structures.

Daqri describes *Anatomy 4D* as being a human anatomy learning tool for a wide-ranging audience. Claiming the app provides *modern* educational benefits on both the Apple iTunes store and the Google Play, they emphasize the app's Augmented Reality:

Through this free app and a simple printed image, *Anatomy 4D* transports students, teachers, medical professionals, and anyone who wants to learn about the body into an interactive 4D experience of human anatomy. Visually stunning

⁵² *Anatomy 4D* is an app that should not be confused with the website *4D Anatomy*, which displays much more detailed imagery and provides learning and testing modules for students.

and completely interactive, *Anatomy 4D* uses augmented reality and other cutting edge technologies to create the perfect vehicle for 21st century education.
(*Anatomy 4D*)

In this description, the app maker emphasizes Augmented Reality as a “cutting edge” technology that enables “anyone” to learn. While Daqri accentuates the AR technology, the company, by contrast, depicts the trigger layer that the app depends upon as a “simple printed image.” Not described as “technology,” the trigger image is merely “simple.”

In displaying the AR image/animation, the app relies on multiple on-screen content layers to communicate human anatomy, whether for the entire body or the heart in detail. Users can activate or deactivate different image layers to learn about the body through looking at individual body systems or its systemic interactions in layered form. For example, in viewing the heart, the user can turn off or on 10 different layers: superior vena cava, valves, ventricle, veins/arteries, cardiac cycle, blood flow, left atrium, pulmonary trunk, right atrium, and aorta. This enables the app to display 3,628,800 different permutations for viewing the heart. The body with its eleven different configuration options (Gastro intestinal (sic), Integumentary, Lymphatic, Nervous, Muscular, Respiratory, Reproductive, Skeletal, Urinary, Sexual, Circulatory) possesses 39,916,800 different permutations of layer display. These layers are labeled with alphabetic text; all told, within the AR interface, *Anatomy 4D* uses 12 alphabetic words on the “The Human Body” AR image through the layer labels and “The Heart” AR uses 18 words. No additional labeling or narration is available within the app.

The trigger image printouts provide alphabetic information about the body. In addition to displaying the trigger image itself, the printouts contain infographic-style images, headings, and alphabetic textual information about anatomy. In these, the printout offers additional details about the heart, brain, lungs, intestines, and blood vessels, which, although the image does not specifically identify their connections, link to the circulatory, nervous, respiratory, gastrointestinal, and integumentary systems displayed in the AR. For example, the image also has a callout regarding “Wet Feet” with the explanation that “Feet have 500,000 sweat glands and can produce more than a pint of sweat a day” and displays 28 water drops in two rows. Other labels offer similar facts about different body systems.

The trigger image printout does not discuss every system presented in the AR, and the anatomical topics addressed on the printouts do not always correspond directly to the systems in the AR app. For example, “The Human Body” image displays a heading for “Right Vs. Left” with a callout with a line drawn to the body’s encircled right hand. The text then explains that right-handed people live “on average, *nine years longer* than left-handed people do” (emphasis original). The remaining sentence offers that most machines and tools used on a daily basis are designed for the right hand, “resulting in thousands of accidents and deaths each year.” The AR image of the human body does not include any information about handedness or other body norm differentiations.

While *Anatomy 4D*’s target images contain both visual and alphabetic information, “The Human Body” AR displays visual information in response to the selected menu options, “The Heart” AR also contains auditory sensation. When the

“Cardiac Cycle” layer is activated, the AR animates the heart to beat and the device speaker plays the familiar “lub-dub, lub-dub” of a beating heart. Otherwise, the app’s UI contains an initial startup sound and beeps to confirm the turning on or off of different body layers. The app thus communicates using sound as a layer, in addition to the visual and alphabetic.

New Media Virtual Reality Semiotic Learning: *Anatomy 4D*

The *Anatomy 4D* app demonstrates the importance of layering in semiocy by necessitating that readers engage with antiquated and new media, in combination. This augmented reality app exemplifies how new media supervenes historical media; app users must engage with their existing familiarity with print media, digital interfaces, and the semiotic significance of visuals, sound, and alphabetic text. As such, this AR app demonstrates the importance of understanding semiocy as encompassing a continuum of past and current practices as app users engage in acts of reading paper media as well as digital media.

In general, the technology of Augmented Reality necessitates physical layers. In Daqri’s case, marker-based *Anatomy 4D* app requires the use of a visual trigger, which might be on a sheet of paper or another screen, and a smartphone or tablet. By contrast, markerless AR requires only the use of the smartphone or other device for displaying the virtual layering of data in combination with the on-screen depiction of actuality; nonetheless, that smart device serves as a physical layer for mediating actuality. As I will discuss in further detail, users must understand not only how to interpret that on-screen data, but they must understand how to use the mediating technology.

Prior to and concurrent with the digital era, print media have availed themselves of material layering. Print encyclopedias and specialty texts have featured representations of bodies with different bodily systems, such as the skeletal, circulatory, or nervous, printed on transparent overlay sheets to represent multiple systems that compose the human body. With these representations so printed, the reader could peel away layers of display, insert a blank sheet to focus on a particular layer, or view multiple pages together to gain some sense of the system interactions. A distinction between the encyclopedia versions of layers and the AR version is the configurability. Digital augmented reality texts enable users to be more selective of the combinations of layers they choose to view and readily change configurations. For example, short of tearing pages from the spine, an encyclopedia user can only view layers that are in close proximity to each other because the intervening pages will block the view of layers printed on widely disparate pages.

The unique affordance of Augmented Reality, ultimately, is digital layering. As the *Anatomy 4D* app shows, these layers can be extraordinarily configurable. Only eleven simple options to turn off and on different body systems ultimately yield 39,916,800 different permutations of layer display. AR users gain the ability to manipulate the textual display further by choosing to zoom in or out and to rotate the body to view it in three dimensions and to adjust the different transparency levels. Further, in the case of “The Heart,” AR users can activate animation and thus view the pulsing of that organ. Thus, digital AR texts support not just rapid layering configuration, but add-on movement, reminding the audience that the body that they view represents that of a living system. Although digital AR offers additional affordances, nonetheless, both the ripped-out

encyclopedia transparencies and the configurable AR demonstrate the active decision-making involvement of reader choice.

Anatomy 4D demonstrates that AR continues to use prior forms of communication. For example, *Anatomy 4D*'s AR interface uses alphabetic words in combination with images. As if proving Roland Barthes' point about the proliferation of linguistic messages in mass communication, alphabetic literacy appears throughout *Anatomy 4D* as well as the *BODY WORLDS* exhibits. Just as alphabetic literacy is not monomodal, the image often appears in conjunction with the letter. As previously noted, within the AR interface, *Anatomy 4D* uses 12 alphabetic words through the layer labels on the "The Human Body" AR and "The Heart" AR uses 18 words. "The Human Body" trigger image contains 252 words and the "The Heart" trigger uses 221 words.

Additionally, the text on the target image remains visible, although it is not legible without concentrated reading effort. Despite its relative newness in the scale of human mediated communication, digital Augmented Reality continues to incorporate old recording media: the alphabetic text that Barthes observes remains abundant among the visual images humans have used since making petroglyphs and cave paintings.

AR is a highly visual-intensive medium. Not only does the technology-mediated device display actuality as an on-screen visual, it also displays additional data. For example, *Anatomy 4D* displays an image of the body or the heart, one of the 39,916,800 or 3,628,800 different permutations of the body or heart images, respectively, depending on which layer configurations the user chooses. "The Human Body" trigger page contains seven images (including the primary trigger image) and the "The Heart" trigger likewise

includes seven images (including the trigger). Additionally, the target image remains partially visible in actuality, although the user largely attends to the AR image in lieu of the background. These images may be stationary or they may move, either through animation (such as the heartbeat) or through the user's directive movement, such as moving the phone to rotate or to access different views of the three-dimensional body.

While AR concentrates on the visual sense, it also includes sound and haptic layers. As mentioned previously, Anatomy 4D plays the sound of a beating heart. This may be one reason the AR app provides a sense of realism. In a 5 of 5 star review, iTunes App Store reviewer CL34567 effused about the simplicity and the sensation the app provided: "Tops! #1 App Best. Heart sound I could feel in my Hand. . . . with my iPad in my hand, held over the Picture of the Heart. The Sound and Graphics are like you are holding in the Palm of your Hand an actual Heart." The reviewer emphasizes in this write-up the tactile sensation of holding a small device, comparing the sensation with holding a single organ in the hand, something that an iPad provides in a way that a print encyclopedia listing for the heart does not. Although the flat tablet cannot approximate the weight, heat, or movement of a pulsing heart, the sound provides an additional sense that print media can describe but not emulate.

Digital Augmented Reality Technology Layering

The app interface provides a two-fold semiotic layer for the user to navigate in its menu system: alphabetic and technological. The software offers About, Target Library, and Instructions menu options that the user can access. To access these options, the user must know how to open the menu through the standard Android or iOS operating system

access points. The menu options function as supplemental portions of the app because users may not open them as they are not necessary for the app's primary function of displaying anatomy information. The menu options display information that operates through traditional text, meaning they combine on-screen images and alphabetic writing, and do not use any augmented reality. The About page uses 87 words and no images to describe the software. The Target Library includes two pages, one for each target image and with only two words "Save" and "Share." The Instructions use three pages with a mix of three page-specific images and alphabetic literacy (33 words). This means that the app relies on users being able to interpret words and images in combination to understand the Augmented Reality.

Anatomy 4D makes evident the semiocy links between emerging media and traditional media through its layered use of augmented and traditional print media. As a marker-based AR, the app depends on both emerging and long-standing media by necessitating the pointing of a smart, camera-equipped device at a printout. With this configuration, the app user is always able to see the trigger image behind the AR rendering, as well as the printout lying underneath the device. Not only does the app use the physical layering of holding the device above a sheet of paper, *Anatomy 4D* relies upon layering media inside the app where the user can see an amalgamation of the target image with the AR image/animation. The user's interpretive skill relies upon their ability to interpret and to process these layers. In essence, this combination means users need the ability to read and to compose in hybrid.

Augmented Reality necessitates further user knowledge of technology hardware and software interfaces. For example, *Anatomy 4D* relies on user knowledge of standard iOS and Android gestures to manipulate the AR images. The user must understand how to pinch-in or pinch-out to magnify or to expand the view of the body systems. The user must know that moving the device around the target coordinates with the on-screen display changing, granting them access to body views from different angles. Not only must users have an understanding of these interfaces, they must keep current on them. While books have generally retained many of the same features in the centuries since their initial development, smartphone and tablet technologies and interfaces routinely implement new ways of interacting with those devices. This means that users routinely must learn new ways of interacting with texts displayed on devices.

Because of its reliance on not just a physical layer through the hardware of smartphones, tablets, and whatever mobile visual medium emerges next but also its use of AR software, Digital Augmented Reality is potentially an invisible digital layer for individuals who do not recognize and do not have the tools to engage with augmented texts. This invisibility means that users may not know or have access to Augmented Reality text forms because either they lack the technology, the knowledge to use such technology, or even recognition that an AR text is there to be recognized. For example, users might walk past Zenda's AR art installations on the streets of Portland and not access the AR portion of the text because they do not have the Aurasma software installed or they do not even recognize that the ceramics also have an Aurasma-associated text. In this way, AR may remain an invisible layer to individuals who do not

recognize or have the tools for accessing those texts. Charles Moran argues that in our twenty-first century pedagogies we need to pay attention to issues of access and to use affordable technology and to be cautious about adopting high-end technologies too quickly for the classroom. Teaching AR can provide students with access to and knowledge of invisible digital texts. While individual implementations of technologies change, teaching students these communication forms and their place in the historical continuum will prepare them with critical awareness of multiple communication media.

The issue of access arises in conjunction with another cultural context: age. The *Anatomy 4D* includes depictions of the reproductive systems in the AR images, although the trigger image does not display any of these. As a result, the Apple iTunes App Store requires individuals to be older to download the app, stating, “You must be at least 17 years old to download this app” and offering this reason for the age limit, “Frequent/Intense Sexual Content or Nudity.” By contrast, the Google Play Store does not have any such limit. Interestingly, the Apple store displays on the app store a representation of the AR body with the female option, meaning that the body displays breast tissue, with the skin opaqueness largely blocking view of the internal reproductive organs. Each store thus operates under a different layer or interpretation of the human body.

Digital Augmented Reality’s Absent Layer

Despite its numerous layers—material and immaterial, *Anatomy 4D*’s app is missing a layer that other experiences provide. Although the AR provides a multidimensional view of the human body and reviews cite how the app invokes a sense

of holding a human organ, AR is not equivalent to those acts. Despite AR's heavy use of visuals and Murray's identification of the power of images (as "the very basis for language and meaning"), which suggests that AR's visual layering is a powerful teacher, not just of knowledge, but also of emotion (83-136), digital AR does not provide the same affective impacts as encountering the human body. Guggenheim Fellowship winner Dr. Christine Montross contends that while

many medical schools are beginning to argue that imaging technology has improved to the point where it should be used in place of the dissection of human cadavers as the central tool of instruction for young doctors-to-be. This is a mistake. No matter how detailed and versatile they become, computer images can never provide the indelible lessons that novice doctors learn from real bodies.

While Montross compellingly argues for physician education, which affects not just the doctor but every individual seeking health care, the issue extends beyond physician education when *Anatomy 4D* identifies their target audience as "students, teachers, medical professionals, and anyone who wants to learn about the body." Indeed, Lisa Nakamura points out that screens mediate many human interactions these days and thus we should consider screen-communication impacts. She notes that our first interactions with new humans in Western society often begin with screens in the forms of ultrasound images (157). As such, I believe the textual representations of bodies in augmented media have the potential to impact how many audiences read and interact with the living bodies around them.

Montross offers an explanation of the differences between interacting with technology-mediated bodies and actual human bodies in terms of emotional response.

Montross writes extensively about her experiences as a first-year medical student required to dissect a cadaver in anatomy lab. That experience frames not just her first-year studies, but extends into her practice as a physician: “During my first semester of medical school, I cannot know how the emotional difficulty of the actions we perform on our cadavers will help us prepare for the agonizing moments we will observe in the lives of the living” (Montross 245). Montross has argued repeatedly for the importance of medical student dissection of corpses for learning various ways human anatomy expresses in individual bodies, but also because “cadaveric dissection is a measure of one’s capacity to handle the emotional demands of being a physician” (152). Such demands include being able to deliver terminal diagnoses, to perform medical procedures that induce pain, and to remain calm when working with patients who have shocking conditions and injuries. Because doctors have first confronted their emotional responses in performing procedures on a corpse, they have begun their emotional preparation for working with living patients. Montross doubts that digital environments can provide that sort of preparation.

One reason that certain implementations of the digital do not yet provide that preparation is because technological depictions of human bodies present a singular or ideal model. While *Anatomy 4D* supports viewing 39,916,800 different body permutations, it expresses each of the systems as it conforms to a singular norm of a male or female body. By contrast, Montross discovers in the first-year medical school anatomy lab that the “colors of the spinal cords vary from cadaver to cadaver, as they do with all tissues in all structures” (248). So while millions of different permutations are helpful,

medical students would benefit from trillions or quadrillions of potentially different digital permutations to prepare for the extensive variation of the human body. In gross anatomy labs, students have opportunities for encountering individuals with bodily variations. For example, students might examine bodies with tumors, missing organs, or even, in Montross's own lab experience, a missing umbilicus. Still, technology has the capacity to provide more options than the limited number of bodies that students can access in the anatomy lab, although further improvements could be made to showing these variations.¹⁴⁹

Anatomical study enables medical students to learn to read the body, both inside lab conditions and when working with patients. In describing dissection, Montross uses similes that suggest the process of reading: "The skin of the chest pulls back easily after we have made the incisions, and the body opens like a book. Thumbs inserted at the midline of the chest above the sternum, or breastbone, pull back both sides, like the covers of a text, revealing the ribs and the muscles that connect them" (25). Later, she describes how, after working in hospice for months, she has learned to read signs of impending death:

I know what dying people look like. Once they have been sick long enough, as most who are in hospice / have, they grow thin. They are pale. When they sleep,

¹⁴⁹ Montross describes her anatomical lab at Brown University School of Medicine as having 72 students in the wide, white room, which meant that one cadaver was shared by four students and called it a "luxury": Even at that size, ours is one of the smallest medical-school classes in the country. It is not uncommon for anatomy classes at American universities to take up several rooms, in order to accommodate two hundred or more students, and for faculty instructions to be shown on video monitors mounted in each room. At international schools, where class sizes can number several hundred and cadavers may be in short supply, students may cycle through the lab in rounds. In these arrangements, with sixteen or more students assigned to a single body, the students are essentially only observers of dissections that have been completed largely by staff members. (*Body* 70-71).

which can be all the time, their mouths are open wide. This has its own terminology outside hospice, which was explained to me by a surgery resident. “That’s the O sign, considered a poor prognostic factor, but not as bad as the Q sign,” he said, grinning, referring to the open mouth with the tongue lolling out of whichever corner is most susceptible to gravity. (238-239)

Their study results in a new ability to read the body unique to the medically educated.

Montross writes, “We cannot imagine not knowing that it is the pulse of the descending aorta that visibly beats in the thin woman’s belly, the bony zygomatic arch that forms the cheekbone’s rise” (252). Reading the living body becomes an intuitive process.

Despite critiques, digital representations of the body have a place in anatomical study, although they should not be a replacement. Doctors need to read the human bodies of their patients; they also need to read bodies on screens and indeed as layered systems. So, in addition to the cadavers and demonstrations, anatomy lab students also work with dissection slices. These Plexiglas squares preserving actual cross-sectional slices of actual body lie “scattered on lab benches all around the periphery of the room” and are intended to provide another view of the body, one that will prepare students to understand views that technology will render (188).⁵³ Students need to understand cross-sectional views because they will use as physicians CT scans showing “slices” of the brain to determine “whether the ventricles are enlarged or whether there is blood beneath some of the brain’s protective layers” or whether the cross-sectional imaging shows inflammation or tumor in abdominal anatomy a patient needs surgery (187-188). Dissection “alone does not allow us to envision the relative position of one vessel to

⁵³ Such squares are not unlike the plastinated slices found in the *BODY WORLDS* exhibits.

another—even one organ to another—in cross section” (Montross 188). In other words, multiple methods are necessary for teaching students how to read bodies and how to read the images of bodies that technology presents.

Among these other teaching methods, digital technology has a place in anatomical pedagogy. Montross argues, “Computers can show things that still and lifeless cadavers cannot — blood pumping in real time through the heart’s chambers, for instance. And it is far easier to visualize nerves and vessels when they’re color-coded on a computer than it is to pick through the indistinguishable gray-green tangles inside a formalin-embalmed cadaver.” Montross points out that an advantage of mobile technology is its portability where students could continue their studies in contexts other than the anatomy lab, such as their homes.

While digital technology has the potential to help students, it cannot be the sole replacement because it does not yet provide the physical sensation that material objects provide. Susan Wells writes in her studies of nineteenth-century medical study that “the dissecting room was the place where students confronted the material practices of their future profession” (60). That remains true of twenty-first century medical study; Montross discusses discovering in the anatomy lab how the flesh of the palm dulls the scalpel so much faster than other flesh; while one or two blades normally sufficed for the seven hours of lab, she used five for the palm alone (94). Such realities are material layers not present in the digital environment. Thus, while *Anatomy 4D* offers us the physical layering of a detection and display device pointed toward a marker printout, it

conversely does not possess the material layer that teaches the physical sensations of dissection or otherwise physically interacting with the body.

Anatomy 4D's many layers demonstrate the layering function of digital Augmented Reality. AR chiefly invokes material layers through its use of a mediating device pointed at a real-world target; however, it conversely lacks the ability to fully convey the material sensations of interacting with actual objects. AR texts communicate through multimodal layers, including sound and haptic sensation, although not necessarily the same senses of actual materiality. While Murray argues that the visual powerfully links to the affective, Montross's experiences offer a reminder that AR lacks an authenticity of interacting with individuals and thus learning about emotional responses to human encounters. The AR device necessitates particular layers of knowledge and interaction, including the use of the device and its standard operating procedures. Digital AR possesses the ability to display layers in a wide range of configuration and display options, enabling the text to possess multiple different versions, such as in this ability to turn on and off different body system layers in *Anatomy 4D*. Even though AR is a digital medium, it integrates traditional alphabetic literacy, through the use of words on-screen and, in *Anatomy 4D*, in target images. Each of these layers has affordances and constraints, as do all texts, AR or non-AR.

Comparative Analysis: The Layers of Virtual Reality Semiocy

The layering logic of AR is neither inherently revealing nor concealing, but dependent on textual usage. Both *BODY WORLDS* and *Anatomy 4D* possess a purpose of teaching the body by removing layers from visual display, whether the skin, fat, or organs

that might interfere with the viewing of a particular system in a *BODY WORLDS* corpse, or one of the different representations of bodily systems in the *Anatomy 4D* app. In analyzing the single-page print magazine advertisement, Barthes demonstrates that the ways meaning is layered is not limited to complex texts. Nor is it limited to print media, as these AR textual examples show.

Layers in multiplicity invoke depth. Depth conveys a sense of fullness, an essence that adds complexity. Such depth conveys the believability, in the case of *Anatomy 4D*, or authenticity, in the *BODY WORLDS* exhibits, that is particularly helpful for the intangible digital Augmented Reality text, such as when viewing a depiction of a non-living body in *Anatomy 4D*. While adding layers offers depth, at the same time, the texts examined here operate using a logic of removing layers, material or digital, to make visible additional meaning. Such removals mirror those of gross anatomy labs where students perform semester-long dissections that resemble slow autopsies. Elizabeth Klaver offers the complex etymology behind the word “autopsy.” While describing the instance of the contemporary autopsy as having “unveiled the body,” she notes that the “doing” of an autopsy is “cutting into the body and seeing for oneself” (2). She elaborates:

The Greek roots of the word “autopsy” (*auto+opsis*) contain the dead metaphor of vision together with the empirical thrust of Western epistemology since the Renaissance—to *see with one’s own eyes*. Interestingly, “autopsy” as a particular way of seeing was not coined in French (*autopsie*) until the sixteenth century and not until the seventeenth in English, when it became necessary to find a name for the new scientific episteme based on observation that was coming ever more forcefully of age. (2-3)⁵⁴

⁵⁴ Klaver goes on to note, “‘autopsy’ operates as a concept that can navigate various disciplines with ease, traversing a number of seemingly disparate fields from medical science to the arts and humanities, for at its most fundamental denotation it simply points to the privilege of vision in Western culture” (3).

But what does it mean to see with one's own eyes? Through the use of layers, every text functions by directing attention to and away from particulars. This means that the layering process simultaneously reveals and elides, makes certain meaning visible, and other meaning invisible. Even for the anatomy classes in which students are intended to see bodies with their own eyes, as they strip away layers of flesh and other tissues, the labs use mediated bodies. These bodies have undergone up to months of preservation and other preparations, including shaving hair and injecting contrast dyes, at great expense (despite not paying donors).⁵⁵ Such preparation complicates the notion of medical students seeing with their own eyes in their first year anatomy labs.

What can be legible as a text represents one layer of semiocy. As noted previously, Gitelman observes that historians learn about past societies by considering what they thought could be written down and what could not. The *BODY WORLDS* exhibits have been controversial enough to require ethics boards to meet before their display and for John Lantos to entitle his collection about the exhibitions as *Controversial Bodies*. Whether bodies can be viewed as texts or as corpses may explain part of the controversy. Wells explains that in the nineteenth century the “the act of dissection was also understood to require privacy—almost secrecy: the body of the book

⁵⁵ United States law prevents human remains from being bought and sold. As a result, “Some schools are hit hard by the lack of cadavers, while others are unaffected. In 2008, Colorado and Wyoming were 20 bodies short of the 158 cadavers requested by the states’ medical schools. Half of Canadian medical schools have cut back on using cadavers, relying instead on new technology to make teaching basic anatomy more efficient. In the Middle East and Caribbean, medical schools routinely ship in cadavers from all over the world” (McCall). Montross notes that body preparation may cost \$2,000 (“Dead”).

would be opened only in an enclosed space” (Wells 61).⁵⁶ Bodies can be read as texts in certain contexts.

Another way to understand the controversy surrounding *BODY WORLDS* or the reason *iTunes* might require *Anatomy 4D* users to be at least 17 years of age are the cultural and social layers overlaying the texts. What might not be objectionable in one location is problematic in another social environment and for particular audience members. For example, if the *BODY WORLDS* exhibits of “anatomical art” were displayed not at science museums, but as art museum installations, they would be read through a different contextual layer. As art, the exhibits are no less, but are instead differently, controversial. Linda Schulte-Sasse critiques how *BODY WORLDS* idealizes bodily perfection: “A preponderance of the plastinates are athletes, and sequencing tends to be important as we progress from the Smoker, whose charred lungs show us the perils of bad habits, to the glory of the Blocking Goalkeeper, the Archer, the Balance-Beam Gymnast, the Hurdler, and the Figure Skating Pair—idealistic models of what we’d like to be but probably never will” (86). Schulte-Sasse noted that Nazi art fetishized athletic body forms, “which privileged sculpture above other art forms” (87). In Europe, the *BODY WORLDS* exhibitions have appeared in Berlin’s Postbahnhof, Munich’s Olympic Park Arena, and Vienna’s fairgrounds, sites more commonly “commerce-oriented exhibitions and rock concerts” (Schulte-Sasse 81). The 2003 Hamburg exhibit appeared in an erotic art museum in the city’s red light district, while in Brussels, the organizers

⁵⁶ Wells goes on to emphasize the textual qualities of these bodies: “Dissection was so much a practice of reading that, as in this instance, it could also serve as a practice of writing” (68).

installed the exhibit in the cellar of a slaughterhouse. Each of these exhibit sites represents a different version of the contextual layers through which to view the texts.

Both *BODY WORLDS* and the *Anatomy 4D* app are mobile texts and in some senses are subject to varying contexts. The bodies in *BODY WORLDS* take on a contextual layer of the museum or exhibit hall where the exhibition is installed; *Anatomy 4D* presents the user's actual environment as part of the body's context. By contrast, the Renaissance anatomist Andreas Vesalius in his *De humani corporis fabrica* presented contexts for the bodies he illustrated, ones belonging to the bodies rather than the viewers.¹⁵⁹

Although not unique to Augmented Reality, texts possess an affective layer. Individuals have strong emotional responses to the plastinates at the *BODY WORLDS* exhibits; in Charlotte, I heard people ask, "Are those real bodies?" and upon receiving confirmation, exclaim, "Ew." Joddy Murray argues that the image layer of texts carries "not only perceptual information but also emotional information" (84). That affective potential is critical to meaning-making: "Without a slight emotional shade to the image of an object, we cannot ultimately connect the image with its value, or meaning, or level of familiarity we have with it" (100). Murray reminds us that our everyday lives are multimodal with numerous encounters with the visual and other senses. Textual images particularly carry this emotional valence. As Montross points out, the emotional knowledge gained from anatomy labs is an essential part of doctor preparation. Even in nineteenth century medical education, Susan Wells finds that both male and female

¹⁵⁹ I am indebted to Susan Sample from the University of Utah for her observation about Vesalius's use of environmental contexts following my Rhetoric Society of America presentation May 27, 2016.

students “are frightened or repulsed at first but then grow fascinated by what they learn: sometimes they make jokes about the body they are dissecting, or imagine it as reanimated” (60).⁵⁷ The question, however, is whether individuals learn to deal with the emotional responses from viewing and manipulating virtual models that they do from dead bodies.

Because of the technology necessary to use digital Augmented Reality and the necessity to physically obtain or view any text, access corresponds to one layer affecting semiocy. The ability to acquire texts has always been an impact upon rates of literacy, even the simple ability to acquire paper and presses for printing books. Lacking opportunities to work with texts impacts audience acquisition or reinforcement of the skills associated with working with those texts, as well as the knowledge presented in those texts. For the Daqri *Anatomy 4D* app, an audience must first have access to the hardware—a smart phone or tablet—to display the text. Not only does that require the means (financial or social), it also requires having knowledge of such hardware and application capabilities. Then the user must have sufficient knowledge to access the appropriate site for downloading the app, as well as for installing and activating the app. None of these are particularly specific to AR. Users may transfer many of those abilities from prior experiences with digital technology. What these material needs and knowledge represent is an underlying layer requisite for semiocy.

⁵⁷ Wells goes on to add, “Unlike male students, however, women students do not seem to have been prone to either practical jokes or sexual humor in the dissecting room” (60).

Visual Emphases in Augmented Reality Applications

AR presents so many visuals, still or moving, because of the visual display capabilities of today's smartphones and tablets. With this visual emphasis, a number of Augmented Reality texts focus on art. The artist Zenka, otherwise known as Jenny Carden, sees herself as a futurist who creates "Art for the Galactic Age." Exhibiting outdoor art in places such as Portland, Oregon, Zenka combined ceramic street art on the sides of buildings with AR texts using the free Aurasma software. Users viewing the art through Aurasma could see, over a ceramic beetle an on-screen animation of beetles fighting and over a physical pie chart-style "place setting" mounted to a wall, a video of world population and energy consumption. In Mexico, artist and professor Josue Abraham combines in his "Virtualidades" exhibition physical three-dimensional sculptures with Augmented Reality using AR software (Mufson). Abraham has, for example, a pedestal-mounted sculpture that resembles the legs of an artist's model figure. Other body parts lie next to the figure's feet. When holding a smart device running the AR software up to the image, the device displays a video combining the actual model sculpture with an animation of the figure moving from the waist-up.

The New Yorker's May 2016 magazine cover featured a dual Augmented Reality version. Using the Uncovr software, the magazine's AR cover is sponsored by Qualcomm, which also has placed AR ads inside the magazine. The AR cover zooms in on the O in the magazine's title and then features a city that grows and expands and features people moving through it in the print copy's color scheme. These additions extend the magazine beyond the print visuals with additional animated images.

Two AR apps focus on providing bodily understanding through visual distortion. Claiming to use “the power of augmented reality to bring true empathy to migraine sufferers,” Excedrin Migraine’s AR app shows the various visual distortions, including aura and light sensitivity, migraine sufferers experience in an effort to convey the migraine experience to non-migraineurs. Excedrin’s website features videos of individuals wearing gear that provides a simulation of a friend or family member’s particular migraine experience. The non-migraineurs in the videos are seen saying, “I have to take this off,” referring to the AR gear, and “I’m so sorry you go through this,” and “I’ll never doubt you again.” Individuals can download a version of the app from the Google Play and Apple iTunes App Store to build and share a “personal migraine, including aura, symptoms and more.”⁵⁸

Another app that seeks to use technology to evoke an embodied experience is the BeerBox Google CardBoard app. This software distorts the user’s visual experience to simulate the bodily effects of alcohol consumption. Instead of passing through the visual images of Google Cardboard without intervention, the phone software purposefully modifies the visual display of the user’s surrounding actuality. As with many other vision-simulating devices, the app has actual effects on the user’s body; this time, however, the device intentionally endeavors to induce physical unsteadiness and discomfort. The app enables users to choose different levels of “inebriation simulation. As the level increases, your vision will have increased delay, blurriness, trouble focusing, and doubling.” The app developer dares the user, “See if you can make it to level 10

⁵⁸ Sarah Emerson has critiqued the empathy that the app offers: “If I could choose between safer treatment options and someone feeling sorry for me when I said I had a migraine, I would pick the former.”

while keeping composure.” The app developer offers a variety of health and safety warnings about using the app and acknowledges that, while intoxication is a highly personal state, the app’s “goal is to capture certain common elements” of the experience. Other uses might be to convey to young people the dangers of drinking and driving.

The heavy use of the image layer as part of Augmented Reality provides embodied experiences. While Virtual Reality is well known for causing the embodied experience of motion sickness despite the viewer’s not moving, AR can likewise provide physical sensations through visual texts. With tweaks to Augmented Reality such as those found in the BeerBox and Excedrin Migraine app, viewers can have similarly embodied textual experiences. As Joddy Murray argues, visuals are particularly supportive of affective experiences, which provide particularly effective instruction.

Augmented Reality Classroom Application

Of the various reality media currently available, the medium most ready for classroom use is Augmented Reality. While VR and MR currently involve using specialized hardware, AR can use devices that many students and colleges already own, and some AR creation software is freely available, making it a good choice for implementation by cash-strapped students. In my 2016 Writing for the Workplace and Public Audiences class, I assigned my students an Augmented Reality project in celebration of the University’s 125th anniversary. The project used the free Aurasma software for associating a trigger image and linking it to and delivering the associated AR media. To complete the assignment, students first had to conduct research in the University archives. They then needed to identify a building on campus for which they

wanted to create their AR project. They conducted additional research and then developed videos using software of their choice—such as Microsoft PowerPoint or recorded video and free video editing software such as Windows Movie Maker or Apple iMovie. The students then identified a trigger image, often a building sign, and created that image file, such as by taking a photo of the building sign. The students completed the assignment by uploading the video and the image file to Aurasma. At that point, any individual using the Aurasma software who held their phone up to the trigger image could view an AR video of the building.

The students' projects operated using the physical layer of the device and the AR software, but they also discovered historical layers that would affect how different individuals would “read” different buildings. To uncover these historical layers, this project relied on archival research, specifically digitized archives, and the re-presentation of those resources through digital means. This archival research revealed how when the university was ordered to admit students of color, those students were sent to live in one building: Shaw dormitory. Another campus site students investigated was the Auditorium formerly named for Charles B. Aycock, an early twentieth century governor who supported universal education, but whose politics aligned with white supremacy and segregation. While, of course, any research project would enable students to uncover these histories, the AR project enabled students to show to an audience standing outside the buildings the history associated with these sites using the AR layer. AR can make visible layers of history (or class, race, gender, etc.) that have often been made invisible, either through the passage of time or intentional editing of local narratives. Because this

AR project uses site-based markers, the audience has a different embodied response than if individuals were consuming text while not standing in those locations. AR offers the potential to be, although is not automatically or inherently, a tool for making visible erasures of different kinds. AR's potential function as a means of communicating literal removals, such as old buildings or signs, as well as absences through historical inattention or purposeful silencing or reconfiguring, is an idea I will return to in Chapter V.

Toward the Future

As an emerging form of technology, it is hard to predict how the technology of Augmented Reality will evolve. While some might argue that we should wait for developing composition technologies to stabilize, as Cynthia Selfe warned, it is important to pay attention to technology. In an era of rapidly evolving technologies, we should engage in conversations about and teach our students to critically work with rapidly changing technology. Further, we should not ignore the fact all texts rely on technology: from the humble pencil to language itself. Understanding how emerging media link to past communication technologies supports acquisition of future media. One link between digital Augmented Reality and past media is the layering process, which recognizes the multiplicity of impacts upon processes of reading and composing, including display, composition, physical, and historical/cultural. Any text is made up of this multiplicity.

Understanding the textual layering process enables us to recognize the links between antiquated and new media and helps approach teaching critical analysis and composition of texts. Layers enable us, as Yancey and Davidson point out, to see

meaning through compositional processes. The concept of layering provides a means of acknowledging cultural and historical significance to texts and to composing processes, even when those layers may not seem apparent. For example, when Pokémon GO released mid-2016 to wide notoriety, video gameplay shifted from the living room to the world at large—at least, in any countries where Niantic had made the game available on a rolling release schedule. Two of the earliest countries where Pokémon GO became available were the United States and Poland. That gameplay could take place anywhere (or anywhere with a sufficiently large population of other Pokémon GO players) meant that any park, sidewalk, business, or other location could be a site where individuals found and attempted to “collect” pocket monsters. As a result, places like the United States Holocaust Memorial Museum, Arlington National Cemetery, Auschwitz Memorial and Museum (Akhtar), and even the sites of killings, including those of Tamir Rice (Bayne; Herron) and the 2003 Rhode Island night club fire (Smith), could be sites of gameplay.¹⁷¹ Site officials pleaded with players and the software maker to halt Pokémon GO on their respective grounds (Akhtar). Pokémon GO players were failing to read the cultural and historical layers of these locations and instead saw the digital layer; these sites were not a layer of digital and geographical latitude and longitude coordinates, but places representing significant human suffering and loss of life. What this signifies is that the audience must read both the device layer, as well as their physical location, to understand the palimpsest experience of Augmented Reality. Much as Gee discussed in

¹⁷¹ Niantic Labs removed the United States Holocaust Memorial Museum and the Hiroshima Peace Memorial (the site of the World War II atomic bombing) as a Poke stop as well as having creatures spawn there (AP News; Makuch).

asking for a light in a biker bar, interlocutors must read on multiple levels, carefully adjusting to the appropriate local context.

Some find the physical layer of the Pokémon GO AR site an affordance. Worship sites are often sites of the lucrative “poke stops” that dispense the balls necessary for capturing the “pocket monsters” (Bali). Some churches find the mixing of mobile gaming and their sites an uncomfortable merger (White); other churches have decided to use the game as a strategy for bringing individuals to their churches (Cokesbury Commons). An individual named Jamie (no other name given), the author of the Tamir Rice Poké stop text, memorialized the boy by linking a Poké stop where Rice was killed.⁵⁹ This text adds an additional virtual layer to the community’s physical memorial, viewable to local Pokémon GO players.⁶⁰ Although no authorized memorial exists, the Poké stop memorial provides a local perspective on the shooting, one at variance with the Cleveland grand jury’s December 2015 finding that the shooting was justifiable. This additional textual layer reveals complexity to the ways sites can be interpreted.

These examples provide ways to understand how the layering process of text functions simultaneously to add complexity and concealment. Recognizing semiocyc’s layering enables composers and audience members to attend to the multiple, different textual layers, whether material, process, product, cultural, social, mode, or other. Such layering offers a way of viewing the continuity between past and emerging media; rather than focusing on specific skills or knowledge at particular times, understanding texts as

⁵⁹ The Poke stop text reads, “Community memorial for Tamir Rice, shot and killed by CPD officers who shot him in under 2s after breaking department policy regarding escalation of force” (Rubin).

⁶⁰ The community memorial has no official plaque (Rubin).

working through layers provides a more general way of understanding texts from the past, now, and into hard-to-predict future communications media.

CHAPTER IV
TEXTUAL ABSENCE AND PRESENCE: MIXED REALITY AND
RE-MEMBERING BODIES

Both Cicero and Quintilian recount a legend beginning with the Thassalian Scopas commissioning the poet Simonides to perform an ode celebrating a boxer's victory. Having accepted the work, the poet delivers his ode at a well-attended feast in Scopas's palace. Unfortunately, Simonides alludes in his poem to the mythical twins Castor and Pollux as many times as he refers to the victorious boxer, so Scopas refuses to pay the poet his full wage, offering only half the commission and arguing that the twins owe the poet the other half. Simonides is then summoned outside the feast hall by a visitor. As the poet exits the palace, the building collapses to rubble. Although unpaid, Simonides has survived. Rescuers discover the destruction is so severe that the bodies have been crushed beyond recognition. Frantic relatives arrive, desperate to identify their relatives for their mourning rites. The searchers call upon the surviving Simonides to recall from his performance where individuals were located about the banquet so families can determine whose remains are whose. As he recollects the seating arrangement, Simonides invents the technique known as "the method of loci" (*loci* being Latin for "places"), in which memories are affixed to particular spatial locations. Whether or not Simonides actually created the technique, this legend popularized the notion of the *memory theatre* or *memory palace* as a way of storing and recalling memories

Nedra Reynolds similarly contends that Plato may have chosen to set “the scene in *Phaedrus* so deliberately because he wanted to help readers to *remember* it: in a memorable setting, his ideas about love, the soul, and philosophical rhetoric are more likely to take hold, not just in the pliable mind of Phaedrus but also in readers of this carefully crafted dialogue” (1). Rhetoric then has strong early associations with making a textual presence for the physically absent. It is this paradoxical relationship that I wish to examine in this chapter.

I examined in Chapter II how Virtual Reality employs dimensionality as a primary textual feature. In Chapter III, I explored how Augmented Reality engages with layering, noting that both digital and non-digital texts engage in both process and product-oriented layers. In this Chapter, I explore the concept of Mixed Reality, a hybrid form of reality media combining the actual world with the virtual. Through an exploration of Mixed Reality, I examine how textual production and interpretation processes necessarily engage with the paradox of absence and presence in communication. As entities simulating reality, non-spoken texts have traditionally been physical, tangible objects representing intangible ideas and people, places, objects, and events. As such, literacy involves processes of conveying and understanding absences. Integrating such theorists as Jacques Derrida, Jean Baudrillard, Elaine Scarry, and Sherry Turkle, this chapter studies strategies for composing and reading absence within texts, while simultaneously understanding that absence necessarily invokes presence.

The question of absence and presence through tangibility and intangibility becomes increasingly relevant with the rise of digital texts. Antiquated media use

physical materials, while digital new media produce intangible texts, visible only through technology mediation; Mixed Reality combines the material and the immaterial. I explore in this chapter that both antiquated and new media texts engage absence and presence. Specifically, both antiquated and new media engage their audiences' bodily interactions, proving literacy has always been an embodied process of presence, despite and when employing absence. The paradox of textual absences and presences in simultaneity provides a link between antiquated and new media, furthering my exploration of how newer media supervene their predecessors. While critiques often depict new media as disembodied, analysis of new media supervening antiquated media demonstrates that textual representations have long considered the impact of textual practices on human bodies. Just as antiquated media have engaged absence-presence, new media composers can intentionally employ paradoxes of absence-presence for powerful rhetoric purposes. While new media must recognize physical absences for which the virtual offers continual reminders, absence can be a present affordance.

For the antiquated media example in this chapter, I examine a building serving as both museum and memorial and examine how it employs presence and absence within its textual presentation to emphasize loss of life. The United States Holocaust Memorial Museum in Washington, D.C., faces the challenge of representing the history of a genocide, a term created specifically in response to the crimes of World War II.⁶¹ Hosting both physical exhibits in the permanent D.C. site and traveling exhibitions, as well as

⁶¹ To be fair, the term genocide could be applied to prior ethnic murders, such as the Turkish genocide of Armenians that Hitler cites in his Obersalzberg Speech of August 22, 1939 as providing a model for the action he was planning.

online exhibits, the memorial museum represents through Mixed Reality people whose lives and cultures were targeted for total destruction by genocide.

To examine the relationship between absence and presence in a new media framework, I study the Microsoft HoloLens. The HoloLens is a visor-like device worn around the head to display digital content on transparent screens that also support perception of the wearer's surroundings to create Mixed Reality texts. As the HoloLens is in early use, this chapter speculates more broadly on future applications. I explore ways that the HoloLens bridges the physical and the digital, the absent and the present.

Understanding how new media technologies, such as the HoloLens, supervene antiquated media, while leaving prior media and literacy forms still in use, establishes the importance of understanding how texts negotiate the paradoxical relationship of textual representations of that which is physically absent from the text and audience. Mixed Reality texts provide an opportunity for analyzing how texts both absent and depict bodies, and how the tools of production and consumption make assumptions about the bodies that are the subjects and makers of those texts. Although Mixed Reality's combination of realities engages multiple binaries, such as real/virtual, abled/disabled, and creator/consumer, and offers combinations that resist simple either-or views, I focus here on the absent/present.

Theorizing the Textual Paradox of Absence and Presence

In Chapter II, I presented a discussion of the *chora*, starting with Plato's conception of the receptacle or state of being and nonbeing linked to interstitiality, or in-

betweenness of place.⁶² As I noted previously, the Greek term *khôra* referred specifically to the area surrounding the Ancient Greek city proper, while Plato adapted the term to designate the receptacle for generating and producing meaning. I return again to this concept because Plato also thought of the *chora* in terms of materiality and immateriality. The *chora* was for Plato and continues to serve for others as a site of invention, where the immaterial could take shape in material form. This immateriality-materiality function carries forward in textual representation, as, while texts do not exactly make material their representations, their representations are also not precisely immaterial, either. As noted previously, the *chora* has returned to attention during the digital era, as the digital offers new ways of conceiving space. However, the digital also provides a new way of considering creation: Are digital objects material objects? Or, as objects without immediate matter, are they inherently immaterial? The *chora* as a place of “third kind,” neither being nor nonbeing, a place for holding the forms, offers a way of understanding the digital realm as outside the material-immaterial binary.

Anxiety about the immaterial and the absent have been theorized since writing’s earliest days. Plato’s great fear in *Phaedrus* is that a written text has no speaker physically present. Worse yet, the text appears to be living, although it is static; Plato has Socrates saying that “writing is unfortunately like painting; for the creations of the painter have the attitude of life, and yet if you ask them a question they preserve a solemn silence.” Socrates further articulates the problems with written texts:

⁶² Rickert points out that the concept of *chora* as presented in *Timaeus* is “murky” and “given to mystery and mysticism” (46).

You would imagine that they had intelligence, but if you want to know anything and put a question to one of them, the speaker always gives one unvarying answer. And when they have been once written down they are tumbled about anywhere among those who may or may not understand them, and know not to whom they should reply, to whom not: and, if they are maltreated or abused, they have no parent to protect them; and they cannot protect or defend themselves.

Plato's concern then is with the physically absent rhetor compared with the materially-present text. The irony, as many have noted, is that the absent Plato is making this argument in his written text, although perhaps Plato has proven his point that his written text is silent and fixed and, despite the appearance of a dialogue, cannot speak back, defend his argument, or even answer questions about whether he was aware of the irony.

More recently, theorists in linguistics and poststructuralism have taken up the concern with the presence/absence (or material-immaterial) binary. Jacques Derrida explores in *Of Grammatology* the relationship between signs and signifiers, the links between language and truth. Derrida theorizes deconstruction through the notion of the trace as the “mark of the absence of a presence, an always-already absent present” (Spivak xxxvi). Deconstruction finds no definitive meaning or truth, only absence of presence, that “always-already absent present.” Rather than language revealing or creating some material truth, Derrida posits, “And what we call production is necessarily a text, the system of a writing and of a reading which we know—a priori, but only now and with a knowledge that is not one at all—are ordered around their own blind spot” (178). Derrida suggests that we are trying to supplement (the) text, but that effort does not lead us to see any better—it does not bring the absent to the present, but instead leads us into a chain of supplements that “produce the sense of the very thing they defer: the

mirage of the thing itself, of immediate presence, of originary perception. Immediacy is derived” (171). Derrida explains that reading is the interpretation of a chain of significations, a production that is a reproduction, a double commentary. However, “if reading must not be content with doubling the text, it cannot legitimately transgress the text toward something other than it, toward a referent, . . . a reality . . . a signified outside the text . . . outside language” because “[t]here is nothing outside the text” (172; his emphasis). His illustration suggests that the absent or present binary is not simply an either-or, but a both-and in “mark of the absence of a presence, an always-already absent present.” The text itself is present and producing an absence that in turn is a presence.

This absence-presence paradox presents considerations for both textual reading and production. While Plato frets about the absence of the text’s creator in *Phaedrus*, Derrida explores the ever-present absence of the audience. In “Signature Event Context,” he contends that “[a] written sign is proffered in the absence of the receiver” (7). Indeed, “To be what it is, all writing must, therefore, be capable of functioning in the radical absence of every empirically determined receiver in general” (8). In talking about both written language and writers of it, Derrida explores the absence in the presence of the signature (whether in using a language move or in signing one’s name)—and the present absence of the signer:

For a writing to be a writing it must continue to ‘act’ and to be readable even when what is called the author of the writing no longer answers for what he has written, for what he seems to have signed, be it because of temporary absence, because he is dead, or, more generally, because he has not employed his absolutely actual and present intention or attention, in order to sustain what seems to be written “in his name.” (8)

For Derrida, written language functions in terms of the negative: specifically, the absence called forth by a presence, whether in terms of the writer, the recipient, or the relationship between signs and signifiers.

Continuing in the poststructuralist tradition and building on the signs, signifiers, and symbolic representations in linguistics and semiotics, Jean Baudrillard's work, especially in *Simulation and Simulacra*, complicates the relationship between signs and signifiers and posits that the differences between representations and reality have become increasingly blurred. Baudrillard enacts that position by beginning his text with an alleged epigraph from Ecclesiastes: "The simulacrum is never that which conceals the truth—it is the truth which conceals that there is none. The simulacrum is true" (1). Of course, those words are not a quote from Ecclesiastes and thus counter the way in which epigraphs are expected to be accurate representations of other works, but Baudrillard's own creation, which provokes the reader to question what might be truth, courtesy of this epigraphic simulacrum's work.

Baudrillard offers the key terms dissimulation and simulation, which pertain to an absence or presence in relation to reality. Dissimulation involves pretending to not have something, an implied absence, while simulation feigns a presence (3). Baudrillard writes that "simulating is not pretending" as "pretending, or dissimulating, leaves the reality intact: the difference is always clear, it is simply masked, whereas simulation threatens the difference between 'true' and 'false,' between 'real' and 'imaginary'" (5). A simulacrum is that which bears "no relation to any reality whatever"; as such, it is a pure

simulacrum (6). In other words, simulations claim a kind of presence that threatens our understanding of “reality” as it relates to truthfulness.

Articulating historical stages of representations of reality, Baudrillard identifies a “precession of simulacra” in which the reality no longer precedes its representation; instead the map precedes, even “engenders” it (1). As a result, “It is the real, and not the map, whose vestiges subsist here and there, in the deserts which are no longer those of the Empire, but our own. The desert of the real itself” (1). In this state of being, Baudrillard postulates “hyperreality,” that is, the inability to distinguish reality from a simulation of reality, rather, “the generation by models of a real without origin or reality: a hyperreal.” In other words, “It is no longer a question of imitation, nor duplication, nor even parody. It is a question of substituting the signs of the real for the real” (2). Only the representation of reality remains.

While Baudrillard clearly was concerned with media, his theories predate digital reality media. He theorizes the successive stages of the image of reality:

1. The image is the reflection of a basic reality, a good appearance, “the representation of the order of sacrament”;
2. The image masks and perverts a basic reality; as such, “it is an evil appearance: of the order of malefice”;
3. The image masks the absence of a basic reality; “it is of the order of sorcery”;
4. The image “bears no relation to any reality whatever: it is its own pure simulacrum”; it “is no longer in the order of appearance at all, but of simulation” (6).

Although theorizing before the practical release of digital reality media, Baudrillard's concern with representations of realities bears increasing importance in the age of digital reality media. In his theories, Baudrillard addresses an antiquated reality medium, the amusement park of Disneyland. He positions Disneyland as an "imaginary [that] is neither true nor false: it is a deterrence machine set up in order to rejuvenate in reverse the fiction of the real" (13). Its function is "to hide that it is the 'real' country, all of 'real' America" (12). In other words, the representation conceals that what is taken as reality is, in fact, not real. The city of Los Angeles belongs "to the hyperreal order and the order of simulation" (12). As the Disneyland discussion demonstrates, Baudrillard's discussion of images, then, applies to a variety of media, including the city of Los Angeles. As digital media increasingly gain new capacities for creating new forms of representation, Baudrillard's theories related to reality and image become increasingly important.⁶³

Literacy's Absent-Present

Literacy theorists have likewise taken up the simultaneous paradox of textuality's absence-presence paradox through discussions of materiality. I share with Christina Haas a conviction that "texts written or read are at once material and immaterial, and writers and readers engage one another in realms that are both physical and mental" (4). Even when readers interact with electronic texts, they must possess some hardware for obtaining and displaying that text. Haas defines the material as that "having mass or matter and occupying physical space" (4). She lists such implements as pens, pencils, and

⁶³ *The Matrix*, the movie about immersive virtual reality I refer to in Chapter I, refers to Baudrillard several times, including having Neo store data in a hollowed out copy of Simulation and Simulacra and having the character Morpheus welcome Neo to "the desert of the real."

written products; she also notes that “[e]ven pixelated screen images, although they may not seem material in the same way as do marks chiseled on a clay tablet, depend upon several kinds of material apparatus both for creation and for perception and use,” including such items as keyboards, monitors, and chips (4). Haas explores the tactile relationship with writing to consider multiple ways materiality might shape the process of creating texts: “How is it that material tools can shape mental processes? And what is the relationship of material tools to the culture in which they are embedded?” (224). Haas’s questions raise important concerns that can be extended to digital reality media.

Materiality is a complex process not just for composers, but also for readers. Although the recipients of texts understand that the text is not going to answer them in the same way as a present interlocutor, readers also engage in reading not just for presence, but absence. I previously cited Lisa Gitelman, who writes about how historians read for absence and thus detect a presence: “A shared sense of writing, of what can be written down and what cannot, also helps make them comprehensible in a lot of subtle ways” (Gitelman, *Always* 20). Historians thus make interpretations based both on what is written and what is particularly absent from written texts. But, even for readers who are not scholarly experts, reading involves understanding what is and is not part of a text. Book readers, for example, learn to not read the header text running across the top of the page each time they turn the page. For critical interpretation, however, seeing what is not addressed is sometimes as important as seeing what is.

Recent decades have seen theorists speaking about the links between literacy and the materiality. In part, this discussion has arisen in response to the point Lester Faigley

argues “that literacy has always been a material, multimedia construct but we only now are becoming aware of this multidimensionality and materiality because computer technologies have made it possible for many people to produce and publish multimedia presentations” (175-76). Faigley goes on to note that even though digital technology presents as “cyberspace and a virtual world, the materiality of the Internet as a medium is unavoidable” (194). Users need to work with physical hardware that needs to be turned on and with adequate memory and applications, connected to the resources of the Internet, which likewise have correspondingly appropriate hardware and software. The material-immaterial texts have potentially real-world ramifications, as Faigley notes in his analysis.

Many others have continued Haas’s work. Stacey Pigg has examined materiality in the digital age. She argues that too often “the materiality of academic writing easily slips under the radar” and that “how students access and incorporate places and technologies in composing habits outside classrooms may be one of the most important determinants of their success” (271). In her studies, Pigg has linked the body’s responses with technology usage, particularly in the way most individuals need to remove Internet access “temporarily in order to accomplish some of learning’s cognitive labor, [that] doing so represents an unintuitive bodily response to mobile device screens as well as an act of resistance toward discourses that suggest individuals should remain always on and available” (268). Pigg provides examples of the way students navigate the overlap between virtual and physical space, such as using both phones and computers while writing or using computers in particular ways, which she contends are material writing

practices. Such usages create “an embodied memory for and through writing, which influences their academic identities” (268). The material then affects the writer’s body and identity.

Literacy in the new media age necessitates understanding materiality. Gunther Kress argues for attending to resources, “the material stuff that we use for making meaning” (32). Although focused particularly on the multimodality of new media literacy, he offers an example of a sculptor needing to understand the potentials of sculpting materials, without which a composer is at a “disadvantage” (32). Such understanding means learning about “the traditions of sculpture, in their own or in other cultures—not only what can be done with fibreglass but also what has been done with that material” because a composition derives, at least partly, “meaning from its contrast with what has been made before” (32). Kress makes clear that when he talks about modes being material, he means materiality beyond the physical, such as in considering the materiality of sound in time (32). For Kress, multiple modes of expression are material: “for instance the material of sound in speech or in music, of graphic matter and light in image, or of the motion of parts of the body in gesture” (45). Materiality is more than marks on two-dimensional sheets of paper or the shaping of three-dimensional objects.

Recent rhetorical theory too has taken up materiality, considering how physical objects work in immaterial ways. Scot Barnett and Casey Boyle offer the concept of rhetorical ontology, a relational framework engaging both past and present theories of materiality in rhetoric in anticipation of new rhetorical materiality approaches; building on the philosophical understanding of ontology as “the study of being, or ‘what is,’

rhetorical ontology “highlights how various material elements— human and nonhuman alike—interact suasively and agentially in rhetorical situations and ecologies” (2). In other words, rhetorical ontology recognizes the persuasive elements of not only traditionally understood texts and rhetors, but that of material objects, as well. Scholars such as Kristie Fleckenstein apply this understanding to technological objects, such as nineteenth-century stereoscopes, considering them as rhetorical agents that shape hyperattention and foster disembodiment. Barbara Dickson offers a view of material rhetoric as “a mode of interpretation that takes as its object of study the significations of material things and corporal entities—objects that signify not through language but through their spatial organization, mobility, mass, utility, orality, and tactility” (297). Others have advanced theories of object-oriented rhetoric and new materialist rhetoric to consider more how things function suasively.

Objects have a bearing on reality. Although focused on the relationships between things and humans and how things never fully reveal themselves to other things or humans, Graham Harman comments on the relationship between objects and representation: “Every object is a private reality that withdraws from any attempt to perceive, touch, or use it. An object cannot be fully translated or paraphrased: it simply is what it is, and no other object can replace or adequately mirror it” (222). Thus, material objects resist re-presentation. The idea that the reality of objects cannot fully be understood through lack of revelation challenges how they can be re-presented in other realities: mixed, virtual, or augmented. Instead, Harman’s idea points away from replication and toward the representation instantiating another thing.

Representations can lead to new realities, although the question is whether these are complete, accurate, or capable of effecting change. Simonides' tale led to a reality in which searchers successfully recovered and identified accident victims. While classical rhetoric theorized memory as a tool for remembering speeches, the legend of Simonides points to the importance of remembering for existential purposes. His memory palace technique was one focused on spatially-fixed memories. De Certeau sees memory of the spatial as rife with absences: "Fragments of it come out in legends. . . ." He describes the remembrances tied to local areas as one as much populated by absence as presence: "‘Here, there used to be a bakery.’ ‘That’s where old lady Dupuis used to live.’ It is striking here that the places people live in are like the presences of diverse absences. What can be seen designates what is no longer there: ‘you see, here there used to be . . . ,’ but it can longer be seen" (108; ellipsis his). As Gitelman notes in historians' reading practices, describing the local space is a practice as much in noting absence as presence.

The Absent-Present Body and Texts

Through its paradox of absence and presence, Mixed Reality offers important ramifications for the body: as subject, of creator, and of audience. During the earliest stages of the Internet, only alphabetic text communications could be easily exchanged or posted. Users were not required to use their actual names, although they could; however, many could adopt or by dint of institutionally-assigned identification strings ended up using pseudonyms or unspecific identifiers. As noted in Chapter I, early rhetoric surrounding the Internet offered utopic promises of a prejudice- and bias-free environment because users could not see other users' physical appearances. Peter Steiner

created a now-famous cartoon published by *The New Yorker* on July 5, 1993, that captured the spirit of the time. In the image, a dog sits on a desk chair before a computer and turns to another dog sitting on the floor, “On the Internet, nobody knows you’re a dog.” In this early time, users interacted as disembodied producers of text, subject allegedly to neither prejudice nor to assumptions, except those based on their assumed identities. The early Internet abounded with expectations of privacy or facades that might not align with the purported identities. Disembodied rhetoric offered promise.

Since that time, however, Internet usage, with or without names, and body representations have been revealed to function much less utopically. Despite their physical bodies being removed, women have faced intense discrimination on the Internet (Duggan). Digital disembodiment has offered peril for others too. Adam Banks argues that racism has been “programmed” into technologies (39-40) and that while composition studies and technical writing studies have paid some attention to writing technologies, greater attention should be given to the “Digital Divide,” which is all too often described in terms of a material access to connectivity and ownership (32). He suggests that we broaden the discussion of access to four dimensions: material, functional, experiential, and critical. For Banks, the material relates to economic conditions affecting the use or nonuse of technology.⁶⁴ Banks writes that of course one needs to own or be near “computers, software, Internet connections, and other tools in order to have access to

⁶⁴ For Banks, functional access relates to the ability to productively use technology. Experiential access pertains to whether use of technology is an important and relevant part in people’s lives. Critical access

denotes the ability to analyze and comprehend the benefits and drawbacks of employing technology for a given purpose (40-46).

those technologies” (138). However, material access is only one of the elements necessary to address digital access. Users must also have the functional access to know how to use those tools effectively, must be connected with those tools via experiential access, and must have critical access through understanding the benefits and problems of those technologies to critique and to use them (138). As all four are necessary “to be intelligent users, producers, and even transformers of technologies” (138), simply having material access is not sufficient for digital composition.

Trauma theorist Elaine Scarry addresses the material relationship between writing and bodily injury, arguing in her canonical text *The Body in Pain* that bodily pain is inexpressible through language. She divides *The Body in Pain* between two sections: “unmaking” and “making.” This arrangement emphasizes antithetical processes related to physical suffering. She writes, “Whatever pain achieves, it achieves in part, through its unsharability, and it ensures this unsharability through its resistance to language” (4). Having analyzed Amnesty International torture reports as texts central to her argument, Scarry notes that Amnesty’s “ability to bring about the cessation of torture depends centrally on its ability to communicate the reality of physical pain to those who are not themselves in pain” (9). For Scarry, torture is an evil not so much because of its infliction of pain, but because torture is not a productive act, but instead is an absolute negating of the torture victim’s subjectivity and agency: “The goal of the torturer is to make the one, the body, emphatically and crushingly *present* by destroying it, and to make the other, the voice, *absent* by destroying it” (49). Scarry demonstrates that deliberately inflicted pain, such as that from torture and warfare, is an “unmaking,” a process of denial, of

destruction, of absenting the sufferer. But, for Scarry, art and cultural creation can work against that pain in a “making” process, an assertion of presence.

Digital researchers have taken up consideration of how bodies are affected by technological communication, creating and receiving it. Sherry Turkle signals the sort of paradox I deal with here in the title of her text: *Alone Together*. Present, but absent. In her transition from enthusiastic promotion of the Internet’s communication capabilities in *Life on the Screen* to cynicism about the impact of technology on human communication and relationships found in *Alone Together*. Turkle attributes this change in part to the relationship between communication technology and the users’ human bodies:

The technology has become like a phantom limb, it is so much a part of them. These young people are among the first to grow up with an expectation of continuous connection: always on, and always on them. And they are among the first to grow up not necessarily thinking of simulation as second best. All of this makes them fluent with technology but brings a set of new insecurities. They nurture friendships on social-networking sites and then wonder if they have communicated. (17)

Turkle identifies this as “the experience of living full time on the Net, newly free in some ways, newly yoked in others. We are all cyborgs now” (*Alone* 152). Turkle points out that the effects are not limited to either the digital or to the actual world: “Laboratory research suggests that how we look and act in the virtual affect our behavior in the real” (*Alone* 223). It is this cyberworld that Turkle writes of that I am concerned about in my exploration of digital Mixed Reality.

In a similar vein, VR pioneer and technology critic Jaron Lanier argues in *You Are Not a Gadget* that the crowdsourcing of content that the Internet enables has resulted

in a regrettable objectification of technology users, one that users and designers should resist. He posits that technology shapes composing, which impacts the individuals depicting themselves:

Individual web pages as they first appeared in the early 1990s had the flavor of person-hood. MySpace preserved some of that flavor, though a process of regularized formatting had begun. Facebook went further, organizing people into multiple-choice identities while Wikipedia seeks to erase point of view entirely.

If a church or government were doing these things, it would feel authoritarian, but when technologists are the culprits, we seem hip, fresh, and inventive. People accept ideas presented in technological form that would be abhorrent in any other forms (48).

Later, he elaborates on the way that people shape their communication to particular technological forms: “When we ask people to live their lives through our models, we are potentially reducing life itself. How can we ever know what we might be losing?” (70). Ultimately, Lanier proposes that there will be existential consequences to this technology: “I fear that we are beginning to design ourselves to suit digital models of us, and I worry about a leaching of empathy and humanity in that process” (39). Lanier posits that users should be treated more as humans than as objects, not merely for the benefit of individuals, but for humanity as a whole. Technology’s tendency to absent the user’s humanity, their “person-hood,” impacts human communication with far-reaching effects. In Mixed Reality, the person, the human body, is both present and absent in communication, as a result of the merger of the virtual and augmented with the actual.

Exploring Mixed Reality

Mixed Reality offers hybrid reality, a merger of the actual with the virtual and/or augmented worlds together. MR presents a combined view of the physical world with an additional overlay—one which might be a virtual world, might be a recorded media version of the actual world, or might be another contemporaneous view into the actual, albeit elsewhere. As such, understanding Mixed Reality relies on an expectation for representations of multiple realities within a single textual interface. As noted previously, Milgram and Kishino define Mixed Reality as a sort of umbrella term, encompassing anything between the poles of absolute reality and absolute virtuality on their reality-virtuality continuum. This means Mixed Reality could present either Augmented Reality or Virtual Reality. Because of MR's potential to be either, the MR user must function with the awareness of potentially always needing to change interpretive lenses between augmentation or virtualization of reality.

In contrast to Virtual Reality, which many are familiar with through popular culture, Mixed Reality presents simultaneously both a definitional challenge and even greater relatability. To elaborate the concept of Mixed Reality, I will present here both technical, hardware-oriented definitions of MR, as well as more theoretical approaches. As previously discussed, however, theoretically-based nomenclature does not always align with marketing terminologies, particularly as emerging technologies continue to develop. For example, while manufacturers refer to their products as Mixed Reality tools, journalists may apply the more familiar Augmented Reality term to the product or apply both AR and MR to a product.

While MR can indeed incorporate AR, as well as VR, the concept of MR is distinct from AR in both technicality and values. The term Augmented indicates enhancement, while the designation of Mixed focuses on combination. The key technological differentiator between Augmented Reality and Mixed Reality is that AR displays digital content in *combination* with a digitally-mediated view of the actual world. By contrast, the Mixed Reality user views digital content while also perceiving their surrounding actuality *without* digital mediation. Despite the frequency—at least in common parlance—with which the term AR seems to be a synonym for MR, it is worthwhile to maintain these distinct terminologies.

The visual characteristics of Mixed Reality make it distinct from Virtual Reality. Focusing on display capability, Kevin Kelly forwards an understanding of Mixed Reality as one of digital representations as convincing as the surrounding actuality. He distinguishes between MR and VR: “Mixed reality has fewer inherent dangers than VR” (Dadich), pointing to a way in which MR differs from pure VR. Mixed Reality users can safely navigate through their physical surroundings because they perceive their surrounding actuality. In addition, the digital representation in MR often presents with a different transparency courtesy of computational rendering. As Kelly notes, “All MR systems labor under a second challenge that VR systems don’t: ideally, in a mixed reality, the virtual teacup you see on your desk would be lit in the same way as your real desk. The mismatch in the lighting is another weak link in the chain of persuasion.” What Kelly points to is the tension between the user’s perception of physical absence and presence in their textual experience.

While Kelly focuses on MR's visual characteristics, Intel CEO Brian Krzanich offers detailed technical specifications for Mixed Reality focused on movement, positionality, and increased technology that is "less visible." In another example of terminology slippage, however, Krzanich uses the term "merged reality" to describe Intel's Project Alloy Head-Mounted Device, perhaps to distinguish Intel's product from the competing Microsoft HoloLens or Magic Leap product, both of which embrace the Mixed Reality designation. His description of merged reality as a combination of "physical, real-life movement and environments with simulated virtual objects, environments and actions" makes clear that the technology being described is an implementation of Mixed Reality. Krzanich outlines five characteristics of merged reality: 1) Six degrees of mobility (axes of movement), 2) Integrated position tracking, 3) "More Natural" manipulation, 4) No wired connection to power, CPUs, or speakers, 5) Digitized real-world content. The first four items correspond to the individual's ability to move freely through physical space and to have that movement and interaction detected by the technology. The fifth point, albeit one that contradicts my distinction between augmented and mixed reality, still corresponds with the combination of the actual and the virtual. However, the capabilities of Mixed Reality-sensing technologies represent additional means of interacting with digital texts, ways in which technologies will interpret actual audience bodily interaction as user input into the digital text.

Krzanich's definition indicates, for some, the key differentiating character of Mixed Reality as necessitating position tracking for digital objects in the actual world. This means that the technology scans the user's environment and displays visuals in a

position-dependent location. Position-dependence means that the display of virtual objects is fixed in particular ways. For example, when MR texts display a virtual fish tank, it does not float in the air, or rotate in ways that conflict with actual physics, but instead “rests” on a tabletop in an appropriate orientation. A toy robot likewise sits on a shelf or the floor, conforming to the user’s environment rather than in a fixed or pre-set manner depending on the way the text was originally designed. Position dependence provides a deeper integration of texts within the user’s immediate environment. This enables the simulated text to appear in “logical” places within the user’s actuality, obeying the same physical laws that material objects do.

While Krzanich engages in marketing hyperbole in describing this technology as “The Best of All Worlds” in which “the new reality is that you can have it all,” his use of the word “all” indicates the inclusiveness of technologically mediated and nonmediated realities within Mixed Reality. Indeed, MR represents a combination of realities, such that Krzanich positions other technologies as ones that necessitate the user choosing “to limit [their] reality.” What Krzanich means is not merely choosing to limit one’s self (or texts, or interpretive frameworks) to actuality or to one particular digital reality. What he proposes is thinking of Mixed Reality as providing even more expansive opportunities for the user. He suggests that MR could support such possibilities as providing the user the capability to “[p]lay a virtual piano with one hand and a cello with your other hand. That’s right: play two instruments at the same time—an impossible real-world feat by even the most talented musicians.” What Krzanich describes is a changed view of the body’s capabilities for interacting with texts through this new form of textual experience.

Whether through maintaining or expanding the body's capabilities for interacting with the actual world, MR can emphasize bodily presence, whether of the creator or the audience. Steve Benford and Gabriella Giannachi emphasize that MR offers these hybrid possibilities for creator and audience, identifying for MR texts—or, in their research, “performances”—“a triangle of core roles: performers, spectators, and orchestrators” (25). The authors discuss how participants move between these different roles, “readjusting their position between everyday life performance in the physical world and performance in the digital world, resulting in the two contaminating one another” (25). Mixed Reality thus emphasizes the actual by involving living bodies—whether those of the creators or audience members—through interactions with the text. The involvement of creators and audience in MR collapses the usual binary opposition of static text / live interaction by including the potential for live performance and interactivity. Benford and Giannachi note that in the hybrid space of MR, the physical and the virtual are “often juxtaposed or adjacent rather than superimposed upon one another” (23). This “seeming dichotomy between the physical and the virtual turns these hybrid environments into spaces of disjuncture, in which participants are made to feel ‘off balance’” (23). This bodily sensation emphasizes the embodied potential for the audience who can shift from receiving to a participating, text-producing role.

Similarly recognizing the embodied potential of MR, Mark B. N. Hansen reimagines Virtual Reality as a Mixed Reality, going so far as to claim that all reality is

Mixed Reality, meaning that everybody—*every body*—is always present in MR.⁶⁵ As one of his titles indicates—*Bodies in Code*—technology has significant ramifications for human bodies. Hansen argues that bodies now have a new relationship with technology, one that extends the body, echoing Haraway’s notion of the cyborg. While Hansen defines Mixed Reality as taking place in those “fluid and functional crossings between virtual and physical realms,” he positions Mixed Reality less in terms of the technical, but instead as inclusive of the analog body. Speculating on hybrid digital-body ecosystem, Hansen posits:

What comes to the fore in this reimagining is the central role played by the body in the interface to the virtual. With the convergence of physical and virtual spaces informing today’s corporate and entertainment environments, researchers and artists have come to recognize that motor activity—not representationalist verisimilitude—holds the key to fluid and functional crossings between virtual and physical realms. (2)

Hansen’s broad approach to Mixed Reality points toward the way that our experiences are often technologically mediated—by texts and even by such assistive devices as glasses and contact lenses.

Benford and Giannachi offer an important perspective in their presentation of the concept of Mixed Reality as one taking place in actuality, supported by digital simulation. Such usage places emphasis on the human actors and their actions rather than on the technology. Mixed Reality artists employ digital technologies to create interactive and distributed theatrical expressions that blend the actual and the virtual, as well as live

⁶⁵ Hansen builds from the understanding of Mixed Reality that Monika Fleischmann and Wolfgang Strauss demonstrated in their artistic-based presentation of data at the intersection of interactive art, science, and technology.

performance and technology. Benford and Giannachi analyze a series of these performances to determine that they “generate hybrid realities that span physical environments and virtual worlds” (23). Rather than privilege the digital, MR co-emphasizes the physical, actual world, combining the digital with the physical.

Of the reality media, Mixed Reality may be the most prevalent in everyday life as the result of the rise of ubiquitous computing. Ubicomp makes possible an infrastructures underpinning hybrid spaces that shape “the mixed reality performances that occur within them so that the site of performance may constantly shift during a given event due to changing coverage or accuracy of the technology used” (Benford and Giannachi 24). As such, these theorists resist Milgram and Kishino’s reality-virtuality continuum, although noting that the continuum does encompass the fully real and fully virtual as being contained within Mixed Reality. Instead, the scholars propose that the rhizomatic model better depicts Mixed Reality, enabling representations of “the real and virtual to be overlaid or juxtaposed rather than opposed to one another” (3). In other words, MR resists the binary and presents the physical and the digital simultaneously.

Hybrid Reality as Mixed Reality

Although still supporting an understanding of the way the physical and the digital occur in combination, some theorists have used the term Hybrid Reality to indicate a combination or mixture of multiple realities. While such usage further confounds the terminology issues related to reality media, especially given that Mixed Reality appears as the predominantly used term in scholarship, these terms distinguish these the combined Mixed Reality from Virtual Reality, which delivers only the singular

immersive, digitally-generated reality. The primary proponent of the term Hybrid Reality, Adriana de Souza e Silva theorizes Hybrid Reality Games (HRGs)—those games that take place simultaneously in actuality and Virtual Reality. Through mobile devices such as smartphones and tablets, HRGs offer digital game play in the physical realm, rather than in cyberspace. De Souza e Silva and Delacruz define HRGs by three main characteristics: “(a) They use mobile and location-aware interfaces, (b) they bridge physical and digital spaces, and (c) they transform the city space into the game board, rather than taking place solely in a simulated computer environment” (232). Echoing Kraznich’s definition of Mixed Reality, De Souza e Silva and Delacruz describe Hybrid Reality as a transformation of physical spaces into interactive environment in their discussion of Hybrid Reality Games for educational purposes.

Rather than being limited to the simulated environments that mimic but are disconnected from the real world, the HRG’s physical environment is so important that De Souza e Silva and Delacruz deem HRG’s use of the physical world an “immersion” through merger of physical and digital spaces (231). Awareness of a student-user’s physical location and making it relevant to the task is “what HRGs can bring to education” in comparison with other virtual educational gaming environments (246). While augmented reality games may provide students with additional information from handheld computers and other devices as they move through their environments, HRGs valuably necessitate higher order skills such as collaboration and the bridging of spaces (246). Combining physical and digital space situates content in actual physical space, rather than in the computer-simulated, making learning more meaningful: “HRGs force

players to look at familiar spaces from unfamiliar perspectives and at content learned in the classroom from a different viewpoint, using learning principles such as elements of social, experiential, and situated learning” (246). Thus, the productive spatial aspect of Hybrid Reality Gaming is not only bridging the digital and the physical, but also the familiar and the unfamiliar. Familiar spaces can be viewed through unfamiliar perspectives to provide learning opportunities.

Similarly seeing computer games as representing a new way to consider realities, one with positive potential, gaming designer and theorist Jane McGonigal contends that the skyrocketing numbers of hours and dollars that gamers spend annually provides proof that “[r]eality, compared to games, is broken” (3). Although gamers have real-life jobs, families, schools, communities, and other obligations, they spend increasing amounts of time and money in game worlds; as they do so, “the *real* world increasingly feels like it’s missing something.” Gamers end up asking: “Where, in the real world, is that gamer sense of being fully alive, focused, and engaged in every moment? Where is the gamer feeling of power, heroic purpose, and community? Where are the bursts of exhilaration and creative game accomplishment?” (3). McGonigal argues that games can, instead, change actuality through massive player games focused on motivation and collaboration and even has announced an aspiration to see a game designer nominated for the Nobel Peace Prize, ideally by 2023. Although initially stating that “compared with our very best games, reality is broken,” McGonigal ultimately argues that reality is “*better*,” that it is “our destiny” (348). As such, humans should “engage with reality, as fully and as deeply as we can, every waking moment of our lives” (349). Doing so does not mean giving up

video games; instead, it “means that we have to stop thinking of games as only escapist entertainment” (349). Instead, McGonigal proposes we focus on how games offer a means of providing positive emotions, positive experiences, and positive social interaction (349). In other words, games are not part of a real-virtual dichotomy, but span that continuum. Thus, what McGonigal points to in her claim that games, mediated realities, can change the actual world corresponds with the claims by the Mixed Reality Lab, Benford and Giannachi, and Hansen, among others, that mediated experiences affect the actual experiences of creators, audiences, and textual subjects. If nothing else, such texts can “apply reason to imagination for the better moving of the will,” even though Francis Bacon may not have anticipated this particular expression of rhetoric.

Mixed Reality games, whether operating under the term Hybrid Reality or another term, collapse the binary of entertainment versus real world by engaging with the actual world as a text rather than erasing it. McGonigal contends that gaming can achieve real world effects through alternate reality games. While I’ve previously discussed virtual reality (replacement), augmented reality (adding to), and mixed reality (adding virtual and/or augmented reality), as well as pointing toward a range of other terms—including augmented virtuality, simulated actuality, mirror reality, mediated reality, McGonigal’s presentation offers one more term: Alternate Reality. Rather than functioning as a synonym for virtual reality, alternate reality functions in real time and real space, but presents a narrative and/or framework in a digital environment. McGonigal offers such examples of alternate reality games as *Chore Wars*, *SuperBetter*, *Cruel 2 B Kind*, and *Quest to Learn*. In each of these, users have digital profiles and missions, such as

completing real-world cleaning, engaging in healthy behaviors, paying compliments, performing school reading, and so forth, that are carried out in the real world. McGonigal defines alternate reality games as “antiescapist,” meaning “ARGs are games you play to get more out of your real life, as opposed to games you play to escape it” so users “participate as fully in our everyday lives as we do in our game lives” (125). Although ARGs have included promotional games designed to get users to make purchases, McGonigal’s ARG examples demonstrate that individuals might seek to make immediate differences in their own lives and their local contexts through gaming.

Although it has been present in theory and artistic expression for decades, Mixed Reality has lately re-emerged as new digital technologies have come into being. While Virtual Reality focuses on replacing one reality with another, and Augmented Reality overlays a digital addition to the actual, Mixed Reality then offers an intermixing of realities, one in which the audience member perceives the digital and the actual simultaneously, which represents new challenges for creators. For example, the creator must consider the actual environment as part of the text, even though the creator may not know the ultimate context in which the Mixed Reality text will be displayed. Indeed, although the creator can anticipate many common real world locations for displaying the text, they certainly cannot anticipate every site in which a Mixed Reality text will take place. Further, as Benford and Giannachi’s analysis of Mixed Reality performances suggests, MR texts are often experiential, with a blurring between creator and audience, as well as mixing of actual and virtual, present and absent, entertainment and real world. As with the previous chapters addressing Virtual and Augmented Reality, I contend that

while Mixed Reality texts have started rising to attention through digital production, they have been part of the textual repertoire, since long before digital technology arose, as I will demonstrate in the following comparative analysis.

Antiquated Media Mixed Reality Semiotic Learning: United States Holocaust Memorial Museum

The United States Holocaust Memorial Museum (USHMM), a “*living* memorial to the Holocaust” located on the National Mall in Washington, D.C., dedicated in 1993, engages multiple strategies of Mixed Reality in fulfillment of its purpose (“About,” their emphasis). As both memorial and museum, the USHMM presents on-site, traveling, and online exhibits concerning the Holocaust of World War II, as well as commemorating the Holocaust’s victims, such as by leading the nation’s Days of Remembrance. The USHMM arises from the 1978-1979 recommendations of President Jimmy Carter’s Commission on the Holocaust, chaired by Elie Wiesel. The Commission recommended the creation of a national museum/memorial with special emphasis “on the American aspect of the Holocaust” (Wiesel 10). The USHMM’s mission is multiple, focused on education about the Holocaust—“including the inability of people to believe that the Holocaust was happening or to translate information into effective action” (Wiesel 11), genocides, freedom, democracy, and “the myth of progress. . . and the need to prevent genocide” (“About”).

To carry out the Commission’s injunction to remember as well as to educate, the USHMM features multiple museum exhibits, including a three-story, self-guided permanent exhibition *The Holocaust*, an exhibit designed for children named *Remember*

the Children: Daniel's Story, and rotating exhibits. These exhibitions combine multiple new and antiquated media, including historical artifacts, audio, text, images, and video, all to engage the paradox of presence / absence to convey the story of the Holocaust.

Through its material artifacts and multimodal exhibits, the USHMM employs strategies of Mixed Reality to remember the past and to memorialize those lost in the Holocaust, as well as to advocate for continued attention to human rights issues. The USHMM presents both material artifacts and immaterial media, combining digital new media with analog displays of physical, historical artifacts. Although multiple exhibits within the USHMM employ strategies of absence and presence, I focus here on three particular exhibits to demonstrate how the USHMM engages the absence-presence paradox to effectively represent genocide designed to deny the existence of a population. I specifically explore how *Remember the Children: Daniel's Story* and the Permanent Collection's Tower of Faces and display of Victim's Shoes each engage in Mixed Reality's absence-presence paradox through antiquated media.

Remember the Children: Daniel's Story

An experience specifically designed for children over the age of eight, *Remember the Children: Daniel's Story* presents a narrated experience through an immersive, historically accurate exhibition space. *Remember the Children: Daniel's Story* tells the story of the Holocaust of a German Jewish boy, Daniel, between 1933 and 1945. In this simulated environment, visitors can walk through a simulated prewar representation of the boy's home (see Figure 6) and neighborhood in pre-war Germany, then his family's forced relocation first to the Lodz ghetto in Poland then to a concentration camp, and

finally Daniel's post-liberation life. Daniel's perspective, through voice narration and representational pages from his diary, guides the visitor through the experiential exhibit. A voice narration from the adult Daniel informs and guides the reader through this "story of millions of kids and grownups too" ("Remember").



Figure 6. Daniel's Room.

This image is a 360-degree photo the representation of Daniel's Room in the USHMM exhibit *Remember the Children* showing how the museum visitor is surrounded by representation of Daniel's pre-war home. This image may be best be viewed online in a 360-degree viewer: photos.google.com/photo/AF1QipMtcmqgHpU56Zl3bw68EaoEg-u7q8Zuaf55RDVX

Daniel guides the visitor through the exhibit as an absent-present figure. Rather than being based on the experience of one specific individual, Daniel is a composite character based on the writing of children and the accounts of individuals who survived childhood German Holocaust experiences, the Lodz ghetto, and the Auschwitz concentration camp. The character never shares a last or family name. While the exhibit

presents black-and-white historical photos of Jewish figures as representing his “father,” “mother,” and younger “sister Erika,” he is represented by a group photo of young boys arm-in-arm. To show the forced relocation of German Jews to the Polish ghettos, one wall displays a mural-sized black and white print of Jews being forced onto trains. As Daniel is not a specific person, but a conglomerate character, the exhibit’s choice to not depict him through a specific, visual body is an ethical choice suited for visitor identification and does not risk misrepresenting a particular historical figure, particularly those who were and have been the subject of existential hostility. Further, reprinting these specific images keeps in circulation and maintains the historical occurrences as factual events that, as the Museum notes, some wish to deny or to ignore.

Spatially, the exhibit functions as a Mixed Reality experience that operates both as a present recreation of Holocaust-era Germany and Poland, yet the actual World War II era space cannot truly be made present. Daniel directs museum patrons: “Visit my house in Germany. Go to the ghetto. Go to the concentration camp.” Such location suggestions convey a sense of the visitor actually traveling, temporally and spatially. Rather than viewing a collection of artifacts behind a glass case, visitors stand in spaces that resemble an entryway with hanging coats, boots, and skis propped against the wall; they look into a small kitchen with sink, oven, cupboards, storage canisters, and an ice box, filled with the sound of laughter and cooking. At the same time, however, visitors receive reminders that they are in a museum. For example, a sign early states “To Daniel’s House” and directs visitors toward his recreated home; other signage labels items on a shelf as “Daniel’s Shelf,” more in the tradition of American museum signage

than what would have appeared in the home of a German-speaking boy. Directions suggest museum-goers open boxes and otherwise interact with the exhibit items. Such signage reminds visitors that they are in a museum, despite the World War II-era re-creation.

The museum similarly speaks to viewers as the exhibit addresses the rise of Nazi persecution of Jews. With a sign labeled “Scary Changes,” the exhibit shifts from following Daniel’s first-person point-of-view to the objective perspective to warn the viewer “[m]any things were changing in Daniel’s life” as “[t]he Nazis were taking over.” The exhibit thus provides a cue for the viewer to prepare as the subject turns more emotionally-intensive; such signage provides viewers—particularly younger ones— a reminder that while they may be passing through spaces that seem like a 1930s German home or a 1940s Poland ghetto, they are again provided reassurance from their actual surroundings of a contemporary museum space.

In addition to Daniel’s narrated perspective in audio and diary form, other media augment the exhibit, likewise providing a sense of Mixed Reality in the combined use of the virtual and the actual. The exhibit includes audio clips and photographs throughout. Some audio recordings are generic environmental sounds, such as the sounds of fires, ticking clocks, and the heaving of steam locomotives, to help immerse the visitor in World War II. Other audio files aim to convey a specific sense of being in the 1930s-1940s German Jewish environment. To do so, the exhibit intermingles actual audio clips of Nazi chants, and specifically-exhibit-made clips of English language audio files. For example, one radio broadcast contextualizes for the contemporary English-speaking

visitor what was happening in 1938 Munich, Germany, “the capital of the Nazi movement,” where Nazis were “insisting on the removal” on the Jewish population inside and outside Germany. Similarly, while the exhibit engages viewers’ senses in evoking World War II era environments by including symbolic fences and restricted space. To convey the segregation and discrimination, the signs label them in English: “No Jews allowed!” and “Only for Jews!” Similarly, text mirroring that which would have been on display in Europe during the Holocaust, such as the orders for Jews to wear the yellow star, are posted in English. The English simulation of the ghetto rules of behavior appear overtop printed replicas of German-original papers and postings, providing simultaneously a sense of the German World War II experience that can never be fully present while in the contemporary American museum space.

The exhibit uses absence and presence to convey material injuries. For example, early exhibit areas show Daniel’s globe, stuffed teddy bear, books, clothing, and the treasured gift of his father’s World War I medal for bravery, and soccer ball. The warm colors and material plenitude at the beginning of the exhibit give way to the increasingly grimmer and barer existence in the destruction of their synagogue and lifestyle, the spare train ride and the gray ghetto, where wallpaper and family photographs have given way to weathered planks and regulation postings in the Nazi-controlled areas of confinement. Finally, the exhibit shows how Daniel is forced to give up his meager suitcase of belongings in the concentration camp, including his diary, his family pictures, and his father’s medal. The increasing loss and absence of material items throughout the exhibit plays a key role in telling Daniel’s Story.

Remember the Children: Daniel's Story uses Mixed Reality, both through the strategic use of the virtual story and the visitor's actual experience of the exhibit's space. The exhibit aims to provide a child-appropriate experience of the absent World War II reality and to make present a family that may not have specifically existed, but is representative of other families lost in the Holocaust. These techniques work to provide visitors the opportunity to "think about what [they] have seen," as the museum advises throughout the building. Daniel's strategic direction to the visitor to "[r]ead my diary and see how I survived" supports the Commission's efforts to employ "the various ways and means of remembering—and of moving others to remember—the Holocaust and its victims, an event that was intended to erase memory" (Wiesel i).

The Permanent Exhibition

Since its 1993 dedication, the USHMM has featured *The Holocaust* as its Permanent Exhibition. Spanning three floors, each floor tells particular "chapters" of the Holocaust and the death of six million Jews. Two of *The Holocaust's* exhibits—the Tower of Faces and the collection of concentration camp victims' shoes—particularly employ Mixed Reality strategies of presence to communicate absence.⁶⁶

The Tower of Faces aims to make present the horrific magnitude of Nazi decimation of people in representing the totality of impact to one community. The Tower of Faces is a three-story high installation of 1,000 prewar reproduction photographs of 100 Jewish families (see Figure 7). The images depict the Jewish families who, at about

⁶⁶ Although I suggest that the museum engages Mixed Reality strategies to inform museum visitors about the Holocaust experience and to support the survivors' message of "Never again," in no way do I mean to suggest that these texts can convey the full horrors of the Holocaust.

3,000 to 3,500 people, formed the majority population in the Lithuanian town of Eisiskes. The three stories show formal studio and informal exterior portraits, such as school children posing before the library, skiing, going for car rides, and even the portrait of the last Eisiskes bar mitzvah. On September 25 and 26, 1941, the German Einsatzgruppe and their Lithuanian auxiliaries committed the mass murder of these populations of 4,000 to 4,500 men, women, and children. Only 29 Jews escaped.



Figure 7. The Tower of Faces.

This image is a 360-degree photo the Tower of Faces showing how the museum visitor is surrounded by three stories of photographs. This image may be best be viewed online in a 360-degree viewer: photos.google.com/photo/AF1QipMKq1zxWIW8YRTQQ3d-TKGmX0MzOxOxWV4DAtp

In the Tower of Faces and its other exhibits, the USHMM has a mission to represent those no longer present because of the genocide to avoid granting the killers a “posthumous victory”: “Not only did they humiliate and assassinate their victims, they wanted also to destroy their memory. They killed them twice, reducing them to ashes and

then denying their deed. Not to remember the dead now would mean to become accomplices to their murderers” (Wiesel ii). At the same time, however, the Commission enjoined the site to serve as a memorial and also to focus on “the life and culture of the victims and not just the destruction process” (Wiesel 10). In other words, the USHMM has the responsibility of not only documenting the death and injury, but the culture of those targeted and how survivors have carried their cultural histories into the contemporary era. The multi-story Tower of Faces uses photographic media arranged in the towering space to maintain the presence of those murdered by the Nazis.

One of the last and most memorable exhibits in *The Holocaust* is a massive, open case of old, decaying shoes that runs along a museum wall. These shoes are recovered from piles at the Majdanek camp near Lublin, Poland, one of the more than 42,500 Nazi ghettos and camps. As the Soviet troops liberated the Auschwitz-Birkenau and Majdanek camps, “they discovered huge mounds of shoes, hundreds of thousands of pairs, but very few living prisoners” (USHMM). The exhibit’s 4,000 shoes are a fraction of those found and include baby slippers, women’s dress heels, and men’s loafers, wide and narrow, worn and repaired, all on loan from the State Museum of Majdanek in Lublin, Poland.

The shoes make present the magnitude of human loss of life at one particular camp through multiple dimensions and senses, a loss which could not be adequately conveyed by the photographs, videos, or audio recordings used throughout the rest of the exhibition. The footwear is a visual means of personalizing the victims who once owned those shoes. One museum volunteer points to the power of the exhibit as being “one of the few exhibits you can smell,” an odor described as “faint, rubber-tinged fumes that

become more nauseating the longer you stand in the room” (Boyle). While this is certainly not the sensory experience of witnessing a concentration camp, it still represents the massive loss of life in at least one camp.

As with the Tower of Faces, the Permanent Exhibition’s exhibit of the shoes provides a Mixed Reality experience in which users encounter a present absence as they move along the length of the display and see the several foot wide and foot plus depth of shoes. They can sense the decay, the change, and loss. As the visitors, wearing their own shoes, move their bodies along the display by walking or moving past in wheelchairs, they can perceive through the shoes’ various sizes and styles, that individuals once placed these shoes upon their bodies. In this way, museum visitors can gain a sense of absent bodies. The physical movement of the visitor through the exhibit magnifies the sense of absent bodies who were targeted by the genocide. In the museum’s presentation of “a history of incomprehensible evil,” in the end, “[t]he shoes say more than words ever could” (Boyle). The memorial-museum engages multiple textual and sensory-engagement strategies both to preserve the memory of bodies, lives, and cultures that the Nazis aimed to obliterate and to educate those living now as cautions against the future. To fulfill its forward-looking mission, the memorial-museum successfully employs antiquated Mixed Reality media.

New Media: Mixed Reality via the Microsoft HoloLens

Contemporary digital Mixed Reality builds from a 50 year history of head-mounted displays. As one example, the Microsoft HoloLens is a wearable, visor-style device with both visual and audio output and input capabilities. Underneath the shaded

front lens, smartglasses display what Microsoft deems Mixed Reality “holograms” (“General”).⁶⁷ Unlike other, comparable VR head-mounted displays, the HoloLens is a self-contained computing package, with no wires connecting to external cameras or a computer. This means the user is free to move about their surroundings, without wired connections or power cords, supporting texts that move with the audience.

Microsoft claims that environmental awareness is key to believability. Having holograms “look and sound like they’re part of your world” means the holograms are three-dimensional representations capable of responding, or adjusting their display, based on the user’s physical surroundings, for example, by displaying as if placed on a tabletop in the user’s surroundings, “giving your holograms real-world context and scale, allowing you to interact with both digital content and the world around you” (“Go”). The implication of this blending of digital content over the actual world is that a user’s locale is now a user interface (or at least part of it), as virtual objects appear integrated into the local environment.

With its sophisticated display optics, the HoloLens operates at present with an emphasis on the visual, both unmediated and mediated vision, to deliver Mixed Reality. The HoloLens bears some resemblance to a medical appliance, such as glasses or contacts, because, for optimum functioning, the HoloLens must be configured for each user’s individual interpupillary distance for optimum display (as each person has unique

⁶⁷ While most scientific definitions of holography focus on a recording of a light field that displays a three-dimensional image, Microsoft’s HoloLens does not project three-dimensional images. Instead, Microsoft defines their hologram as “an object like any other object in the real world, with only one difference: instead of being made of physical matter, a hologram is made entirely of light” (“General”). In other words, the HoloLens display of digital texts and user interfaces is one made of light projections on the visor.

distances between their pupils). As a Mixed Reality tool, the HoloLens is not an immersive display by design. Microsoft describes the peripheral vision as “unobscured,” (“Go”). This means that the user perceives in the periphery of their vision unmediated actuality while the holograms are placed in the centrality of the user’s vision because the holographic frame positions them where the user’s “eyes are most sensitive to detail” (“Go”).

However, while the HoloLens focuses on the visual, it also includes sound, pointing toward how Mixed Reality is multi-sensory. Using speakers mounted on the headband seated above the user’s ears, the HoloLens is capable of binaural sound, that is, a sound that mimics the unmediated perception of sound by the individual’s two ears. As with the visual display, the speakers do not occlude the user’s perception of sound from their surrounding actuality. This means that the user can experience two auditory realities: aural actuality and that presented by the HoloLens device.

Not only does the HoloLens have the capability to deliver multimodal texts, users interact with the HoloLens’s multisensory interface using multiple modes, indicating that Mixed Reality interfaces are multimodal both in output and input. Users can issue commands to the hardware and software via gaze, gesture, and voice. Each of these human-computer interactions correspond with existing human-human interactions, such as looking, speaking, and pointing. Users can, for example, speak to Cortana, Microsoft’s artificial intelligence assistant, to perform searches, in an interaction that mirrors that of other voice-driven interfaces. Similarly, the HoloLens takes inputs that exist in desktop computing or screen-based interactions, such as mouse-clicking or tapping a choice or

speaking a command into a voice-activated interface. Microsoft directs HoloLens wearers to interact with the interface by using “simple gestures to open apps, select and size items, and drag and drop holograms in your world” (“Go”). While other technologies use motion controlling hardware, such as smart gloves or wearable finger controls, the HoloLens device visually detects and interprets the user’s gestural interaction or “listens” to the spoken commands.

Mixed Reality Composing

Texts for digital Mixed Reality can be composed in either traditional computing environments or using Mixed Reality hardware, such as the HoloLens. Microsoft’s Actiongram software provides a model of one authoring application supported on the HoloLens that may herald the development of other MR textual creation tools.

Actiongram is a story creation tool for the holographic environment. Users without 3D skills and visual effects experience can record holographic video content using Actiongram’s inventory of stock actors, characters, objects, and creatures, combining the stock characters and recording them interacting with the creator and the creator’s surrounding actual environment using the HoloLens’s Mixed Reality capture (MRC) capability. They can create videos that “would otherwise be impossible or impractical” and then share the videos with others, who might or might not have a HoloLens. In other words, users no longer need be experts in holograms, computer-generated imagery, or film special effects to create videos with dinosaurs, sword fights, space scenes, historical figures, or cartoon cats.

When viewed on the HoloLens, the Actiongram “films” enable the user to view and to interact with the texts in the MR environment—that is the combination of the actual and the digital. Just as they can interact with the objects in their actual surroundings, MR users can also view their digital content in multiple dimensions. Because the HoloLens is not connected by wire to another power source or to peripherals, the user can not only view, but freely move *around* the content. That means that the holographic representations have width, depth, and height; the user can move around the text to see all sides of the representation, as well as their actual surroundings. The user can gauge the scale of the representation in relation to their own physical presence. However, the text is displayed to scale, meaning the amount of text that the HoloLens user can see corresponds to the device’s perspective. For example, as the HoloLens does not display in the user’s peripheral vision, the text might be displayed only partially or abruptly cut off, depending on the location of the user, the scale of the text, and the direction of the HoloLens’s gaze. This means that if a viewer is examining a Mixed Reality capture film of a dinosaur shown to-scale, the view might hold only display of the dinosaur’s tibia, or femur, without being able to view the entirety of the dinosaur without moving their gaze. Regardless, this means that the user is able to perceive their surroundings as actuality and the text as a constructed presence. Viewing such limited portions of texts through the HoloLens underscores how Mixed Reality texts present through the paradox of absence and presence, that is, texts present in the device and also absent from actuality.

Mixed Reality in Educational Application

Mixed Reality shows potential for changing education in both texts and as a class medium. In terms of texts, students learning about dinosaurs might view for homework a dinosaur that is scaled to their living room, enabling the learner to understand how enormous—or conversely—small dinosaurs could be. Bringing long-absent past objects into familiar surroundings for contrast with one’s own material body provides one affordance of learning through Mixed Reality.

In a joint effort, Case Western Reserve and Cleveland Clinic created the first third-party Microsoft HoloLens app, both text and a learning environment (“CWRU”). As a text, HoloAnatomy provides medical school-level, three-dimensional holograms of human systems through the HoloLens. The app displays labels for organs and systems or can leave them blank for testing purposes. Wearers can view the entire body, or focus on individual systems. The user can, with a gesture, rotate the contents or zoom in to see additional detail, or listen to the heartbeat. In addition to displaying holograms, the HoloAnatomy app enables users to interact in a classroom setting or as remote instruction, with the professor quizzing students viewing what students are looking at. In remote instructions, HoloAnatomy enables individuals not only to speak to each other, but to point to and to share basic textual interactions, such as highlighting and directing visual gaze. The HoloAnatomy app thus demonstrates how digital MR can support both a focus on individual systems and multiplicity of textual examples and manipulation of the text by the reader through paradoxical presence and absence.

New Media: The HoloLens's Mixed Reality Paradoxical Semiocy

Mixed Reality operates through a paradoxical logic of absence and presence in combination, as the HoloLens demonstrates. The HoloLens displays texts that merge actuality—that is, physical objects in the user's actual surroundings—and the digital, immaterial textual objects displayed on or through the MR device. As I noted in Chapter I, theorists have called for the development of screen literacy, which I argue is too limiting a way of approaching literacy. The rise of devices and paradigms such as the HoloLens demonstrate the limits of literacy focused on particular output devices during an era of rapidly evolving technologies. While Alex Kipman, a Microsoft Technical Fellow Operating Systems Group, Research & Development, contends that human life is presently dominated by screens—phones, computers, televisions, and more—from the time we awake through our work day to our home entertainment, he argues that the HoloLens heralds a time when computer users will “do things . . . with no screens at all” (Microsoft News). His prediction, which aligns with his design paradigm, supports my claim that we should move beyond a screen-focused literacy to one that is technology-agnostic, open to whatever text delivery forms that might arise in the coming future.

Mixed Reality conveys a sense of presence by simulating reality through, among other means, a sense of three-dimensionality in the user's actuality. Mark Griswold at Case Western Reserve University claims that the Mixed Reality of the HoloLens offers the opportunity to advance medical instruction “by bringing 3d content into the real world” addressing “one of the biggest challenges for students learning anatomy [which] is understanding the body in three dimensions and how all the different systems fit

together” (Microsoft News). Of course, this Mixed Reality simulated dimensionality is not actual, but representational, another expression of the paradoxical absence-presence of MR.

While the holographic representations convey a presence through three-dimensionality, that sense of presence becomes fragile when users can easily and dramatically manipulate the text. For example, HoloAnatomy enables users to separate the holographic body into individual systems or different body parts through simple tap and pinch gestures. Although body systems are squeezed into small and overlapping spaces, the ability to remove organs or systems enables users to see through body parts that might block the view, such as the pancreas’s location behind the stomach, might mirror traditional dissection. However, the ability to add such systems back in through a tap gesture demonstrates that holographic dissection is unlike actual dissection. Similarly unlike physical lab experiences, students can focus in, for example, on the femur and also view simultaneously demonstrations of the different types of fractures of that same femur. During quizzes, the instructor can not only see students’ textual answers, but also their vision lines—that is, what parts of the body they are looking at during their responses. Such dynamic, interactive text demonstrates digital Mixed Reality capabilities that come in tension with the perception of the holograms as actual materials, while simultaneously transforming the understanding of the environment as a text that can be written upon. As an MR text, HoloAnatomy ultimately engages without resolving the binary of absence/presence.

As Case Western demonstrates, not only can students view anatomical texts in the MR environment, they can also interact with each other and their instructor in an MR classroom, both remotely and in face-to-face setting. In either scenario, students and instructor can wear the HoloLens and interact. Griswold claims that through dual instructor-student usage he can maintain the “important connection with my students when we’re both wearing a HoloLens, [that] I can see what they’re looking at, interacting with” (Kipman). He notes that he can assess progress and that they can communicate with the instructor and each other “naturally.” For example, students in the physical classroom can not only look at the holographic text, they can also perceive their instructor through the HoloLens, “which makes us feel connected” (“Introducing”). They can ask questions. Case Western’s Dean Davis argues that the HoloLens supports learning “beyond the single classroom” (“Introducing”). Through Mixed Reality learning, students can view a holographic representation of their remote instructor. Griswold claims that the holographic presence means students have a sense of his body language; such Mixed Reality instruction is “changing what it means to be ‘in’ class” (“Introducing”). Thus, MR has the potential to alter what we consider “present” and “absent” in the classroom.

Digital Mixed Reality thus operates as a mixture of presence and absence, as a combination of the actual and digital. While Kipman contends that the inclusion of human body movement in the MR environment offers additional presence, the full human body is absent from MR at this time. The HoloLens supports only a limited number of gestures—resulting in only a few bodily interactions that are meaningful within the

Human-MR interface. Further, the HoloLens's sensors perceive only a few feet to either side of the user. Users must also ensure that they align their fingers with the holographic menus in order for the HoloLens to correctly interpret their interaction. In a HoloPool game demo, a technology as paradoxically natural as its actual equivalent, the pool table hovers like a mirage, present in the sense in that it calls forth interaction but absent in its physical manifestation and properties. The user experience involves walking around a table-like space to play the game; however, rather than use movements approximating holding and sliding a cue stick, the game player issues the verbal command of "shoot" to play the game. For Mixed Reality to attain Kipman's "more reality," MR must support greater integration of the digital through users being able to be more physically interactive with the digital objects in the MR environment. Although designers may believe or claim the human body is present in Mixed Reality through movement, that claim is one worth exploration as MR development continues.

Mixed Reality maintains its paradox of absence and presence through the representation of actual objects in the digital realm. In a demonstration of the HoloLens, a Microsoft employee named Darren shows that he can include a weather-app hologram, essentially a remediation of a newspaper weather map ("Microsoft's HoloLens"). He also demonstrates how he can watch media, such as movies, on a holographic "screen" instantiated within the HoloLens and pinned to the physical wall displaying through the MR interface. Darren claims that through the HoloLens he can create as many monitors and televisions as he wants. While this creates a presence that replicates a physical television screen, when Darren moves the "television screen" with the verbal command

of “Follow me,” the “television screen” moves down the physical wall as he walks beside it. The movement is a reminder that this object, while corresponding with an object from the actual world, is a digital simulation, and thus physically absent from one of the environments that Darren occupies. Users will no longer be limited to the same physical lack of resources if they have access to a HoloLens and can instantiate as many virtual screens or monitors as they wish to simulate—at least until the HoloLens experiences a memory leak.

The HoloLens user’s body is, in many ways, highly present in its interaction with this MR technology. The device itself offers a physical reminder of its hardware and the embodied nature of textual interaction when users first wear the visor. Although communications technologies become naturalized, the physical location for seating the MR delivery mechanism presents unfamiliarity and the potential for physical discomfort. The device’s headband, along with an overhead strap, reduces the weight of the device on the user’s nose by distributing the current 1.27 pounds of weight across the band. While the HoloLens’s weight might not be substantial for many users, it presents a challenge for individuals with neck injuries, for example. Users interact with the HoloLens through either gestural or spoken commands and sound and visual output. Gestural input would be challenging to individuals with movement issues; however, the spoken command provides a redundant means for accessing the interface (assuming developers include multiple entries into the interface).

Although Mixed Reality devices like the HoloLens make assumptions about the user’s body, such as “normal” vision and hearing, MR hardware might provide assistive

devices. At present, individuals with imperfect vision can wear the HoloLens over glasses by removing the device's nose piece. Some have speculated that the HoloLens might provide augmentations for the partially sighted or to provide reminders to help individuals with memory impairment (Mackie). In other words, while the HoloLens might present challenges for users, it also holds the potential for accommodations. Indeed, while the Xbox Kinect *The Gunstringer* game enables users to envision themselves as a game avatar, the HoloLens might, for example, support recovery of amputees dealing with phantom limb pain; where individuals engage in conflict, the HoloLens might enable viewers to engage in exercises of envisioning the world through the gaze of others—whether of different genders, nationalities, ethnicities, abilities, and so forth.

Mixed Reality composing for the HoloLens represents a blended environment, one not as immersive or as focused on the singular as in Virtual Reality. Reviewers have compared the HoloLens as providing views not dissimilar from that of a fifteen inch monitor, albeit one that cuts off the view of displayed objects and data (Fitzsimmons). This means that the user's view of texts is one that varies substantially, depending on the user's gaze, rather than necessarily exactly what the creator determined. Mixed Reality incurs a loss of textual control as the fully designed text may not appear within the viewer's vision at one time.

Comparative Analysis: The Paradox of Mixed Reality Semiocy

Both the United States Holocaust Memorial Museum and the Microsoft HoloLens present texts through a merger of the virtual with the actual, and by using strategies that

engage an absence-presence paradox. While museums often engage in display of artifacts to help interpret history or other information, museums such as the USHMM face the challenge of telling a history in which so much destruction took place. The USHMM thus engages in Mixed Reality to represent, for example, places distant in time and location to tell the story of the Holocaust. It has, as Scarry suggests is possible, turned the pain and absencing of the past into a productive work that seeks a better future. The HoloLens enables users to consider their relationship with immaterial, virtual representations, for example, to consider sites and texts from their first-person perspective. Each of these texts presents an opportunity for considering the importance of physical “thing-ness” in comparison with virtual “thing-ness.” Such consideration yields relevance in an era of rising digital objects.

MR technology has the potential to change education in both the way we compose and read texts, as well as in the way we interact in classroom environments, whether in hybrid face-to-face classes using devices to augment communication or in fully remote settings. Griswold’s example suggests that not only can Mixed Reality be an educational tool for students, but an opportunity for more advanced learners to see and learn in new ways. If Mixed Reality centralizes users’ bodies, educators may conceive of student-centered classes in new digital forms.

Much as prior forms of literacy have become naturalized, digital technology is becoming less visible, erasing itself from the user interface. In Mixed Reality, the user’s actual environment may seem to be neutral, but in fact the user’s surroundings have become part of the user interface. As Cindy Selfe and Richard Selfe recognized decades

ago, interfaces have political significance. As the actual world and the human body become part of the input device, it remains important to consider the Mixed Reality interface, remaining and teaching others to be critics as well as users (never mere users) and being active in interface design.

Beyond that, however, digital Mixed Reality users will interact with their physical surroundings as part of the interface. When the user's own environment becomes part of the user interface, reality may need to be evaluated in new ways. Myron Krueger's historical *Metaplay* VR representation necessitated a simulation of an interactive environment; unable to implement technological representations of people, Krueger had to use living people, including the artist, in his *Metaplay*. Hansen points out that Andy Cameron notes that this choice is an "odd and oddly productive reversal of the classic Turing test, the 'participants would think they were interacting with an interactive environment, but in fact would be interacting with concealed human beings'" (Hansen 32-33). By combining actual objects in the physical world with ones that are computer-generated, Mixed Reality represents a challenge to a singular definition of reality, that "real-reality" that neopragmatists refer to as actuality. With the rise of digital Mixed Reality, future research will need to address how, when users turn off their Mixed Reality systems, they read their surrounding space. When actuality becomes part of the user interface, users may need a test to determine whether they are reading real or simulated

space, whether our digital representations have achieved a new stage of Baudrillardian simulation.⁶⁸

Mixed Reality Existentialism

I began this chapter with the Simonides story of the memory palace as a textual device to recover people who had disappeared, ultimately, literally. As noted in Chapter I, many twentieth-century technologists presented utopic potentials for their creations, which could offer democratic and equal representation. Others have critiqued the actuality of representation in the actual implementations of digital technologies. For example, Kali Tal argues that the supposed democratic potentials are instead a means of eliding the representation of particular bodies:

I have long suspected that the much vaunted ‘freedom’ to shed the ‘limiting’ markers of race and gender on the Internet is illusory, and that in fact it masks a more disturbing phenomenon—the whitinizing of cyberspace. The invisibility of people of color on the Net has allowed White-controlled and White-read publications like *WIRED* to simply elide questions of race.⁶⁹

Taking into consideration Tal’s critiques, I do not wish to repeat the same mistake of earlier technologists and suggest that Mixed Reality technologies in and of themselves will be ameliorative of the issues of representation; however, existing Mixed Reality

⁶⁸ In describing his experiences using Google’s Tilt Brush, Tobias van Schneider describes sensations of sadness and disappointment in leaving VR and returning to actuality in a syndrome of what he terms “post-VR sadness” (Searles). This shouldn’t be surprising, as Searles notes, when “VR’s very purpose is to make it difficult to distinguish simulation from reality.”

⁶⁹ Kali Tal argues that “African American critical theory provides very sophisticated tools for the analysis of cyberculture, since African American critics have been discussing the problem of multiple identities, fragmented personae, and liminality for over a hundred years.”

texts, both in antiquated and digital forms, have engaged issues of representation by critiquing absences and by using absences as a presence.

As the examples here demonstrate, digital Mixed Reality can take place with a combination of analog material objects or digital immaterial objects. The HoloLens offers itself as a tool for the future: imagining new creations, new worlds. The USHMM presents as a site for the past and the future: remembering the people who were victims of the Holocaust, but also as an educational opportunity to caution against repeating history. The emergence of Mixed Reality digital technology reminds us that any text is a balancing of absence and presence. To engage in these processes, audiences and creators alike attend to reading absence and reading presence. Through texts, absence—or at least the invocation of a past or current absence—can be rendered into a presence as a powerful form of human symbolic representation to motivating action. The President’s Commission on the Holocaust makes clear the existential importance of engaging in human expression, particularly in representing the messages of those who have been subject to the most extreme discrimination and prejudice resulting in the intentional loss of life and attempt at cultural erasure:

[W]e cannot deny the victims the fulfillment of their last wish; their *idée fixe* to bear witness. What the merchant from Saloniki, the child from Lodz, the rabbi from Radzimin, the carpenter from Warsaw and the scribe from Vilna had in common was the passion, the compulsion to tell the tale—or to enable someone else to do so. Every ghetto had its historians, every deathcamp its chroniclers. Young and old, learned and unlearned, everybody kept diaries, wrote journals, composed poems and prayers. They wanted to remember and to be remembered. They want to defeat the enemy’s conspiracy of silence, to communicate a spark of the fire that nearly consumed their generation, and, above all, to serve as warning to future generations (Wiesel ii)

CHAPTER V

FLESHING OUT LITERACY: WAYS OF SEEING, READING, AND COMPOSING

Stories have been simulating reality for millennia. Our original reality media were the tales we told one another as we gathered on the savanna; they were the stones into which we carved petroglyphs, the scenes acted out on beaches, or the cave walls which we stained with dyes. We bore witness to our existence, whether of the mundane day-to-day or the tragic or the triumphant; we speculated on our origins, why cosmic events occurred, or how our environment came to be; we modeled future plans to ensure our survival. As technologies arose, we found new ways of sharing those stories: paper, scrolls, incunabula, the printing press, and then the ubiquitous PDF. As new technologies emerge, we will continue to simulate our realities, whether the everyday, the instructional, the opportunistic, or the aspirational. After all, humans are symbol-using, story-telling beings.

But what will be our next communication media? Technology is changing rapidly, especially in the emerging realms of AR, VR, and MR. Google Glass, the first available relatively mainstream VR, AR, and MR product, demonstrates the rapidity of change, with a short lifespan of two years.⁷⁰

⁷⁰ It was first announced as available to “Explorers” on Twitter in early 2013, was made available to the public May 15, 2014, and then Google announced its production cessation on January 15, 2015. Google filed an application for a new Google Glass version with the Federal Communications Commission in the second half of 2015, although no new Glass version has appeared.

Since Glass's retirement, Google has undertaken new projects involving visual media, including the Cardboard, Daydream, and other speculative projects under development. Even if it abandoned its first product, Google has not quit its visual reality media work.

As the Glass example demonstrates, recent technology history points to the difficulty of predicting which communication products that will not only survive, but thrive. However, while our past media history suggests it is hard to predict which *particular* forms of media will rise in importance, what we can see is that new media involve aspects of our primary media. To help explain how we can prepare to communicate in the future using continually evolving media—even ones that we cannot predict, I have described in Chapters II, III, and IV how digital reality media—virtual, augmented, and mixed—function less as completely new forms of composing and more as a supervention of literacy practices in prior media. Having defined Virtual Reality as immersive media, Augmented Reality as enhanced or layered reality media, and Mixed Reality as possessing the qualities of AR or VR or both, I have analyzed new media VR, AR, and MR texts, such as video games and mobile applications, alongside comparable antiquated texts, such as dioramas and museum exhibits. Digital and antiquated Virtual Reality share common characteristics, such as concerns with spatial representation and immersion. Likewise, new and antiquated Augmented Reality media function through processes of layering: literal, social, and process-oriented. Mixed Reality, whether digital or analog, functions through a paradox of presence and absence, whether of bodies, technology, or physical objects. Understanding the common characteristics that new

media share with and build upon prior media enables scholars and composers to make fuller use of prior knowledge in today's rapidly evolving new media environment.

While some scholars contend that emerging communication forms require a new literacy theory focused specifically on the digital, I argue that digital new media supervene the composing practices and semiotic characteristics of older media.

Examining VR, AR, and MR, whether in digital or antiquated media, reveals that past, new, and emerging literacy practices operate through processes of dimensions, layering, and absence/presence, demonstrating commonalities between antiquated and new media. Given the rapidity with which software and communications technologies change, an approach focused on a continuity of literacy skills enables composers and instructors to build on familiarity to compose and to teach composing for changing new media, whether for academic, workplace, civic, or personal communication.

Comparing antiquated and new media not only helps us prepare for emerging media, but also provides new opportunities for understanding prior media forms. Donna Haraway's theory of the cyborg—an understanding of humans as being inseparable from their technologies—is an idea appropriate for the digital context, but rhetors have been inseparable from their composing technologies for much longer than the recent era, as Dennis Baron has shown in his revising writing technology history. As such, we have engaged with cyborg literacy longer than digital technology has existed.

At the same time, examining literacy in digital and analog Virtual Reality, Augmented Reality, and Mixed Reality highlights the embodied nature of literacy practices, even of composing in the supposedly disembodied digital era. As all forms of

media make assumptions about the bodies of composers, audiences, and subject matter, critical attention should be applied to all media, digital and non-digital. Examining the intersections of literacy with disability, race, gender, and class enables the critique of power structures associated with literacy and identifies both means of resistance and opportunities for enfranchisement. Critical attention to how communication media make assumptions about and imagine particular bodies, as well as what modes different media privilege, can help rhetors create texts that address multiple bodies rather than one “natural” body. This theoretical understanding supports pedagogical benefits and offers productive opportunities for composers—as such critical awareness can expand who can view and create texts.

A Brave New World

My project ends by articulating the potentials and implications of a literacy theory that recognizes the dimensions, layering, and absence/presence of past, new, and emerging literacy practices. This approach expands our understanding of past and emerging media, enabling us to understand how past and new media are linked and to apply those understandings to compositions in new and antiquated media. This perspective can aid the adoption of new composition methodologies and what we should consider in the design of new literacy technologies and texts, whether for the workplace, classroom, or other site. This conclusion addresses how VR, AR, and MR might be used in the workplace and how such usage might affect teaching, literacy theory, and the ethical production of media. Finally, I explore how VR, AR, and MR research may continue in the future.

Dimensionality is the chief textual characteristic of Virtual Reality, whether the VR is implemented in traditional or digital media. Whether in dollhouses, haunted houses, amusement parks, or video games, CAVES, or VR journalism, Virtual Reality texts are characterized by movement through space as interactions with the text. Understanding texts as dimensional enables understanding the body as an interface with literacy technologies. Understanding texts as dimensional emphasizes how all texts have required movement for composition or consumption. Although dimensionality has been present in antiquated media, audience interaction with the dimensional text has been naturalized, reducing awareness of interactions, whether in body language, turning pages, or moving our gazes across a screen, or movement through space and time as necessary components to texts. Understanding texts as dimensional emphasizes not only the audience interaction, but also opportunities for thinking about the necessary aspects of composing Virtual Reality texts, whether using traditional or digital media. Composing dimensionality means thinking about not only the linguistic aspects of texts, but also how they occupy space and time.

In both antiquated and new media, Augmented Reality is typified by a textual feature called layering. Finding this common feature indicates that new media AR apps supervene such prior texts as garden and arboretum labels and museum exhibit interpretive signage. Analyzing textual layering reinforces that literacy is a layered, complex process, as Barthes notes, of composing in addition to the linguistic, but also literal and symbolic messages. Brandt identifies a “piling up” metaphor to indicate that literacy is an activity of layering, using language and social customs, as the New Literacy

Studies movement has long alluded. Awareness of textual layering enables composers and audience members to attend to multiple, different textual layers, including the material, process, product, cultural, social, mode, or other. Augmented Reality, whether using digital or long-existing media, represents both the literal, material layers of literacy, as well as the conceptual layering of the messages that make texts meaningful. Awareness of the multiple layers of texts enables composers and audiences to gain access to more textual levels.

Mixed Reality functions through a logic of absence/presence, chiefly of the material presence of subjects and rhetors represented in the text. Focused on instantiating realities—whether simulated or an actual experiences, non-spoken texts have traditionally been physical, tangible objects representing intangible ideas and people, places, objects, and events. The paradox of absence/presence as a common characteristic demonstrates that digital Mixed Reality remediates traditional media representations of absence, whether through a museum's or protest site's active use of negative text space, missing or blank areas, and other representative or symbolic choices, all to convey a meaningful textual presence. New media Mixed Reality brings awareness to the immaterial nature of texts in which the digital is represented simultaneously with material objects in the audience's surrounding actuality. Attending to the communicative potential of absence and presence in textual combination provides a resource for thinking about literate resources.

In new and antiquated media, Virtual Reality, Augmented Reality, and Mixed Reality will be used throughout education, journalism, the workplace, entertainment, and

more. Understanding textual dimensionality, layering, and paradoxical absence/presence enables composers and audience to critically create and receive such texts.

New Realities for Workplace Writing

While I have discussed digital Virtual, Augmented, and Mixed Reality games, VR, AR, and MR have other purposes, whether in digital or antiquated forms. Although Virtual, Augmented, and Mixed Reality are in use in professional communication, such workplace uses of these media will continue to evolve, particularly with new hardware and software changes. Boeing, for example, has completed Augmented Reality trials of using Google Glass for installing the electrical systems in their airplanes (Boeing). In this implementation, Glass helps technicians view digital design information for the “wire harnesses,” or the wires and cables that transmit signals or electrical power, as they are physically assembling and joining the different wires throughout the entire airplane.⁷¹ This process is so complex that it is difficult-to-impossible to automate and necessary to complete with reference materials. Without Glass, wire harness technicians have to stop looking at the wiring they are working on and remove their hands and attention from the wiring to look up PDF-based assembly instructions on their laptops. With Glass, technicians can keep their attention on the wiring and glance at the hands-free wearable computer design in the corner of their vision to locate the appropriate wires and to perform the appropriate actions on them. Responsive to voice commands, Boeing’s Glass project also supported collaboration, so if technicians cannot solve a problem on their

⁷¹ Wire harness assembly involves a range of tasks from cutting wires, crimping the ends, plugging, soldering, and twisting wires, as well as routing connecting wires together, crimping multiple wires into one terminal, routing wires through sleeves, and fastening strands of wires with tape, clamps or cable ties.

own, they can get assistance from an expert by streaming a point-of-view video of the wire harness. Boeing's project points to the way that technical communication is shifting from paper-based (even if reproduced via PDF) to digital forms of communication.⁷²

VR, AR, and MR are also in use for workplace training. Japan Airlines is using HoloLens-based supplemental training for engine mechanics and for flight crew trainees who want to be promoted to co-pilot status (Choney). Rather than train with traditional 2D videos and printed cockpit panel instruments and switches, the HoloLens will help transfer "trainees' intellectual memory to muscle memory" (Choney). The NFL is exploring VR as a tool for training staffers and players about bias by having trainees placed in immersive scenarios. Wearing head-mounted displays, trainees are immersed in different, first-person interactive situations, which support different gendered and raced identities that might or might not align with the user's actual gender and racial identities. In one scenario, "[w]hen the user reflexively lifts his or her arms in self-defense, the hands feature black skin" (della Cava, "Virtual"). Jeremy Bailenson, director of Stanford University's Virtual Human Interaction Lab, claims, "Feeling prejudice by walking a mile in someone else's shoes is what VR was made for" (della Cava). VR's potential as a training tool for developing long-term empathy and perspective on unconscious bias issues remains to be seen. Reality media can support multiple pedagogical approaches.

Augmented and Mixed Reality media have been used in commercial home design and planning for individual's homes. In 2013, IKEA created an AR catalog app to help customers visualize how the furniture company's Kullen, the Hurdal, the Hemnes, and

⁷² Boeing claims the hands-free system decreased the assembly time by 25 percent and significantly reduced error rates (Sacco).

Trysil pieces, for example, would fit into their home decor. Lowe's Home Improvement Stores has implemented a Mixed Reality home design tool to view and to interact with potential home interior changes. While Mixed Reality "takes some getting used to, because we're all used to pinching to zoom to get closer to things instead of just walking forward," Kyle Nel, executive director of Lowe's Innovation Lab, predicts MR is here to stay: "The idea of using small samples and swatches to try and imagine what a room looks like seems very antiquated now" (della Cava, "Microsoft"). Whether using IKEA or Lowe's tools, users are not merely using digital MR or AR to view a static text, but to change their actual world space. We have used other texts to transform our surrounding environments before: whether via blueprints or via samples and swatches; the HoloLens is only the newest composition tool to compose the world around us.

VR, AR, and MR have multiple uses in commercial and entertainment products. Taqtile Mobility has created AR software to show 3D models of PGA golf courses with different holes overlaid with individual player statistics (Takahashi). For the younger crowd, Crayola has Augmented Reality design toys and coloring books. Such products demonstrate the everyday potential for VR, AR, and MR beyond games, as well as the range of uses and purposes for which professional communicators must be prepared to address.

Whether as the materials for day-to-day work, for training, for planning, or as commercial products themselves, VR, AR, and MR are in use throughout business and the workplace, well beyond the video game industry. As such, professional communication education should address not only such new media communication tools

as the infographic, the web page, and the video, but also VR, AR, and MR media.

Composition, rhetoric, and technical communication instructors must take into account not only the inclusion of such media as assignments, but also pedagogy to prepare our students for creating those media.

Preparing for an Unpredictable Future

Some might ask why, particularly, rhetoric and composition scholars should engage in an exploration of Augmented, Virtual, or Mixed Reality. Three decades ago, the computers and writing subdiscipline formed around the question of how digital technology might affect the composition process and the types of texts produced using digital technology. Now, it is expected that much college writing composition takes place on computers and phones; Laura Gurak and Smiljana Antonijevic observed that the phrase “digital rhetoric” could be considered redundant in an era when individuals compose rhetoric primarily on digital technology, are subject to constant recording, and texts such as public speech, writing, and visuals are easily digitized. So much text produced via digital technology has led Andrea Lunsford to claim—reasonably—that we have become the most literate people who have ever lived. A decade into computers and writing research, Cynthia Selfe warned that it is important to pay attention to technology. With the rise of communications technologies, her recommendation remains relevant.

Through emerging technologies, such as AR, VR, and MR, creators will be able to compose new forms of digital texts. We do not know the ultimate forms those texts or those technologies will take, any more than thirty years ago we could have predicted the exact nature of the digital composing tools we use on a day-to-day basis now. It is for

such a reason that I contend we should pay attention to the composing capabilities that are emerging and to continue to pay attention. Because it is difficult to predict how technologies will evolve, I offer a historicized view of literacy that finds practices of reading and composing exist across display and composing technologies. Rather than bind a theory of literacy to particular display media—whether the screen or paper, I contend that theories of literacy should not focus on specific media. Instead, I have posited that we understand how new media supervene antiquated media in a continuity of composing practices.

Seeing new and antiquated media as sharing common characteristics aids the inclusion of VR, AR, and MR assignments. Preparing communicators for future work with this and evolving media means focusing on developing versatility and flexibility. As previously noted, Lisa Dusenberry, Liz Hutter, and Joy Robinson argue that technical communicators should aim to be “adaptable communicators,” who can willingly “approach and manage unfamiliar communication modes, tasks, and technologies” (302). Adaptability should be a goal of technical communication educators and multimodal pedagogy supports adaptability. To cultivate communicators who are flexible, Dusenberry, Hutter, and Robinson argue that we can help our students develop adaptability by exposing them to unfamiliar modes of communication and inquiry and by building their multimodal composing skills. I extend their argument by adding that we should help our students work not only with multimodality, but also multiple media.

While Dusenberry, Hutter, and Robinson are focused on the technical communication classroom, I argue that we should create classrooms, regardless of their

foci, that foster adaptability. Communication technologies are evolving rapidly, offering new media, new genres, and new digital tools headed toward professional and everyday production and consumption of texts. To continue their work, students in their future composing will need to draw from past knowledge and practice, whether of the visual, the alphabetic, the spoken, the body, or in combination. Our students will be asked to create new forms of texts, and to do so, they will need to transfer multimodal literacy from the familiar into the less familiar, to extend their existing knowledge and skills even when composing in new digital environments.

A VR, AR, and MR Composition Pedagogy

VR, AR, and MR have two major potential impacts to the communications-focused classroom. First, digital VR, AR, and MR instigate opportunities for thinking about VR, AR, and MR texts—from the standpoints of critical analysis and creation. These texts could be digital or antiquated media (or both). Second, VR, AR, and MR technologies have the potential to offer new classroom settings. Both should require and foster adaptability.

To Teach VR, AR, and MR

Teaching VR, AR, and MR means incorporating reality media as educational content and as composition tools. Reality media pedagogy means understanding these texts as not just communication, but also as social and thinking tools. Teaching VR, AR, and MR in the classroom means taking seriously the range of reality media texts across art, entertainment, journalism, education, activism, and beyond.

1) *Ensure access*. The first step in teaching literacy in VR, AR, and MR composition is providing our students with access to reality media technology and texts. As Adam Banks points out, access to the materials of consumption and production is only the first step to ensuring students have digital literacy. Banks goes on to note that we must provide our students functional access, that is the ability to productively use technology; experiential access, the ability to use technology as an important and relevant part of their lives; and critical access, the determination of the benefits and drawbacks of employing technology for a given purpose (40-46). Because much of VR, AR, and MR is what I refer to as “invisible digital rhetoric,” those texts that are immaterial but present only through highly specialized tools of access, ensuring access is an essential step in teaching VR, AR, and MR.⁷³ The following steps address these additional forms of access.

2) *Draw from the familiar*. Guide students through comparison of past media as models to enable them to transfer their literacy and knowledge of composing practices to the unfamiliar. Students can visit museums or gardens to consider the affordances and constraints of Augmented Reality. Class discussion can address the characteristics of dioramas, haunted houses, and amusement parks to consider what gets included in Virtual Reality texts and what may be left out. Questions can prompt students to articulate

⁷³ Invisible digital rhetoric—rhetorical construction which is intangible and immaterial, accessible only via specialized technology—includes both the digital as well as formerly material objects rendered digital. Invisible digital rhetoric functions via competing logics of preservation and loss of (immediate) access. For example, museums preserve material objects as digital texts—as scans that could be 3D printed, as materials that could be viewed through mixed, augmented, or virtual reality. However, such texts necessarily require technologies that may limit access and may ultimately render the objects invisible through obsolescence of viewing and preserving technologies in ways not previously faced by material objects.

features that they value in their existing compositions to prepare for composing in new digital media.

3) *Start small*. This guideline suggests that instructors can begin the process of ensuring digital reality media access through incremental inclusion: Instructors can include only one reality media module, assignment, or text in their courses. Much as course calendars typically include reading assignments, an instructor can assign reality media texts that can augment student understanding of course material; for example, students can use VR to view a stage or a brief performance clip, or take a tour of an agora or other rhetorical setting pertinent to course reading.

Rather than develop an entire VR game, instructors can have students take 360-degree or spherical photographs using either special cameras or software. Students can then view their constructions using VR devices. Class discussion can involve considering how students' images and processes differ or resemble more traditional photographs. Students can compare a traditional print piece on carcerality with *6x9: A Virtual Experience of Solitary Confinement*. They can analyze the Mixed Reality strategies of the Korean, Spanish, and Paris climate change protests, which use holography or actual shoes in place of living bodies, while considering what strategies those might have in common with other protest work.

Students can analyze VR, AR, and MR games, which, while not the entirety of reality media, are a popular expression of them. Analysis is a key function in being both a critical consumer and producer of VR, AR, and MR. Students can create basic digital Augmented Reality texts and compare those with augmented antiquated media.

4) *Use the unfamiliar as an affordance.* The unfamiliar is the future of composition. Instructors can use the unfamiliar as a pedagogical benefit; they can help students recognize how to remediate the familiar and respond to the unfamiliar. For example, instructors can model dealing with the unfamiliar for their students by acknowledging that the form is new to them in discussions with students. They can have students first compose a familiar form, and then engage in remediation of the familiar form to an unfamiliar one. They can have students reflect on what they have learned about the familiar form from working with the unfamiliar. Class discussions can consider whether the unfamiliar sheds new perspective on the familiar.

5) *Teach students to be critical producers and consumers.* Much as Stuart Selber and Adam Banks call for rhetoric and composition instructors to teach students to become *critical producers* of technology, I likewise call for us to extend an understanding of critical literacy to VR, AR, and MR and teach students to become critical consumers, designers, and producers of ethical reality media and technologies. This pedagogical step need not be separate from others; in engaging in critical consumption, individuals might engage in comparative analysis of digital reality media with similar non-digital texts.

VR pioneer and technologist Jaron Lanier offers guidance about the importance of this critical work:

When I work with experimental gadgets, like new variations on virtual reality, in a lab environment, I am always reminded of how small changes in the details of a digital design can have profound unforeseen effects on the experiences of the

humans who are playing with it. The slightest change in something as seemingly trivial as the use of a button can sometimes completely alter behavior patterns. (4)

He goes on to note the applicability of such small changes in the virtual environment:

Stanford University researcher Jeremy Bailenson has demonstrated that changing the height of one's avatar in immersive virtual reality transforms self-esteem and social self-perception. Technologies are extensions of ourselves, and, like the avatars in Jeremy's lab, our identities can be shifted by the quirks of gadgets. It is impossible to work with information technology without also engaging in social engineering. (4)

To address these concerns, Lanier argues for “a new digital humanism” to take place before software engineers' design decisions, which he claims fundamentally shape users' behavior, become “frozen into place by a process known as lock-in” (7). Rhetoric and composition courses, as humanities courses, can help guide that digital humanism. Course reading materials could include critical materials such as Cynthia Selfe and Richard Selfe's essay on “The Politics of the Interface,” selections from Adam Banks' *Digital Griots* and Susan Delagrange's *Technologies of Wonder*, cyberethos articles by Carolyn Miller and Kristie Fleckenstein, and accessibility pieces by Melanie Yergeau, Stephanie Kerschbaum, and Jay Dolmage, among others. Such pieces can guide consideration of the social-cultural impacts reality media have on accessibility and access. As reality media continue to evolve, they will need continued critical attention to issues of inclusion, bias, and ethics.

Reality media designers should be cognizant of ethical responsibilities in working with media, especially inclusionary practices in regards to race, class, gender, abilities,

and other subjective aspects of identity. Given the paucity of diversity in existing developer populations, this issue presents with urgency in the need to design technologies that support usability, accessibility, access, and rhetorically effective communications for and by those populations. Rhetoric and composition classes, theory, and pedagogy can address concerns around digital humanism by teaching the critical consumption and production of texts in order to create ethical media.

6) *Be prepared for future change.* As noted previously, the future of composition is change; as such, instructors should keep informed about new texts and new communication technologies to make sure they remain aware of all of the available means of persuasion (this was a much simpler process in Aristotle's time, although proliferation does not progression). VR, AR, and MR have choric possibilities; let's see where they may take us.

VR, AR, and MR Classrooms

As we move forward with this VR, AR, and MR pedagogy, we have the potential to deliver greater and greater portions of our classes in these reality media. Case Western has begun using MR technology in its medical school education and students from kindergarten to college have worked with basic AR technology. JL Lemke, as well as Mary Leigh Morbey and Carolyn Steele, call for Virtual Reality classrooms to provide immersive settings for studying different places. New educational uses will likely emerge for these technologies. To fully engage VR, AR, and MR composition, we should have classes in these media, in whole or in part. As De Certeau observes, "the kinds of spaces

we occupy determine, to some extent, the kinds of work we do or the types of artifacts we can create” (157).

Peer Review

As we move into such classrooms, past practices from composition and pedagogy classrooms remain relevant. For example, composition has long used peer review in helping students understand audience response to their writing. As students begin to compose in new and emerging media, they will need to receive the same sorts of feedback on their new media compositions. As such, we will need to apply and to expand peer review to AR, VR, and MR texts. Students often express anxiety about their initial use of peer review even for writing forms with which they are familiar; their anxiety about responding to new media texts can be even greater. Providing students with models—or, better, having them locate them—can provide students with opportunities for honing their critical faculties against which to consider other texts.

Long used in the face-to-face classroom, peer review has been remediated for online usage (Kastman-Breuch; Blevins). As Ann Hill Duin, Joe Moses, Megan McGrath, and Jason Tham point to in their discussion of Google Glass classroom texts, new technology offers the potential to expand peer review processes: “With Glass, the focus of review is shifted from the written comments to the spoken critiques. Students employed a think-aloud protocol when reviewing their peers’ drafts.” Not only do students have the ability to use new media to interact with each other, turning peer review into a multimodal process, they can also critique their works using all of the multimodal expression that these new media are capable of. Using for peer review the multimodal

forms corresponding to the multimodal text being reviewed provides students further opportunities for considering their compositions.

Concluding the Future

The interventions I offer in this project further our understanding of literacy, and also point to how we will continue to expand our understanding of composing and communication as our media continue to change. However, this dissertation does not comprehensively address and explore every idea related to reality media and literacy, rhetoric, or the English studies classroom. As much as this project is a presentation of how digital media supervene prior media and thus provide composers a means of transferring existing literacy into emerging media, with implications for literacy as embodied and assumptions about rhetor, audience, and subject bodies, it is also a call for continued research.

Much of the hardware and software supporting digital VR, AR, and MR is not yet widely available for mainstream use, nor are many software tools available. For example, the most mature Mixed Reality hardware tool is the HoloLens, which has few users and very few software applications. As such, future study of VR, AR, and MR should attend to the technology changes, as well as the uses and users of those technologies. Speaking about digital composing in general, Pamela Takayoshi points out that little is currently known about the processes by which individuals are actually composing in digital writing environments. As VR, AR, and MR are sites of continued development in hardware, software, usage, and theorization, future study could examine the evolving composing

processes individuals use in VR, AR, and MR through ethnographic and quantitative measures.

This project has compared digital, immaterial compositions with corresponding analog, material compositions and found that they share characteristics. In composing, students will be called upon in the future to work with dimensionality, layering, and the paradox of presence / absence. Our students will do this work in analog materials, digital media, *and* combinations of the two. For example, 3D printing enables students to create through digital media non-digital projects. Students can learn about the material objects of the past, such as sixth-century swords (Starr) or artifacts stored in far-flung museums (Ultimaker; Smithsonian), or produce multidimensional designs of their own inventions using 3D printing. To create 3D printed objects, users must integrate visual, spatial, and dimensional knowledge and skills, such as taking photographs and compositing. While students will be able to make swords via printing, such projects require different skills from those of traditional swordmakers. This work, however, represents the sort of modeling and making students will be called upon to present in their future classroom, professional, and civic lives.

I have expressed throughout this project concern for the assumptions about the bodies of composers, as well as the depictions of bodies in new media. Emerging new media will allow us to represent the body in new ways. In her 2011 *Alone Together*, Sherry Turkle identifies our contemporary context as, and expresses concern with, our “robotic moment” (3). Turkle remarks that increasing numbers of individuals say they would prefer the company of robots over other humans or put their hope in robots over

humans to take care of their needs, whether emotional, medical, or other. Since the publication of her book, science fiction has taken up the concerns and issues of robotic humans. While Turkle does not identify the robots as such, I contend they are an emerging form of Mixed Reality media, combining new and antiquated materials. The 2015 movie *Ex Machina*, about the development of artificial intelligences in bodies that appear human, points to the potential of robots as the next new media. Designed by one male, the robots in this movie resemble females of very particular body forms, raising ethical implications about representation and the ultimate purposes of these forms. The HBO television series *Westworld*, based on Michael Crichton's novel of the same name, features a high-tech, Western-style virtual theme park in which 3D-printed robotic "hosts" engage in role-playing adventures with fee-paying visitors called "newcomers" or "guests." The visitors participate in narrative adventures in the park, and can commit whatever acts they wish with and to the hosts without repercussion—including torturing and killing them—while the robotic hosts are not allowed to harm the guests. The show sparks questions regarding what ethics pertain to harming objects that resemble humans and possess intelligence that may in fact be greater than human. While I have proposed Turing-style tests for determining whether a reality is actuality, as AI and human tissue printing technologies continue to develop, we may need more traditional Turing tests to determine whether intelligences are human or mergers of digital and analog media. Given the coming potential for rendering rhetorical objects that resemble symbol-using animals, literacy education should entail social, ethical, and cultural responsibilities of diverse representation and composing by diverse individuals.

One of the questions I have been asked is whether my project belongs in English Studies. I counter with questions of my own: If we don't pay attention, who will? If we don't now consider VR, AR, and MR as part of our purview now, do we lose the ability to research and to critique it in the future? If we don't consider VR, AR, and MR to be part of English Studies, what happens when those media may represent the future of the book, in whole or in part? Our use of VR, AR, and MR is connected to human existence, small—in individual lives—and large—in the existence of whole peoples. Our media usage is how we understand and discuss humanity's historical, contemporary, and future existence. Through Virtual, Augmented, and Mixed Reality, as we compose our past, present, and futures, we compose ourselves.

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