SALVE REGINA UNIVERSITY

A SEMIOTIC ANALYSIS OF VIRTUAL REALITY

A DISSERTATION SUBMITTED TO
THE FACULTY OF THE HUMANITIES PROGRAM
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

BY

WAYNE D. BELANGER

NEWPORT, RHODE ISLAND

APRIL 2009

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.
In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

ABSTRACT

The research question addressed by this dissertation is: How might semiotics (i.e., the study of signs) assist in understanding the cultural and possible political ramifications behind virtual reality? Because human culture is an expansive subject, the proposed research specifically assesses it in terms of virtual empiricism, which is the difficulty associated with interpreting meaning from cultural interactions and subsequent experiences with the signs of virtual reality media. Virtual empiricism concerns the dependency between the mind of an observer and the phenomena produced by virtual reality technology (VRT), when considered as signs which resemble real-world objects. VRT is viewed as a sign system similar to language. As an idea, language has comprised the first form of virtual reality. As a technology, virtual reality forms a bridge between human senses and computer outputs. Because the relationship between general media and culture is complex, the use of an analytical tool is necessary to understand its workings. Semiotics is an effective means by which to analyze virtual empiricism because it acknowledges meaning derived from both this technology's content and its unique expression. A semiotic analysis will be conducted here on three types of case studies, including cinema, advertising and video gaming.

Virtual empiricism is further examined in terms of phenomenology and symbolic realism because the meanings derived from virtual reality technology's signs are interconnected with perceptions and social interactions. The examination reveals a capitalist ethos that pervades VRT manifested as the dual thread of competition and consumption. This ethos has ideological ramifications in that it assists in the forging of an unequivocally secularized world-view. Capitalist ethos is exposed as a motivating agent behind the meaning of virtual reality technology's signs. It is further revealed that by championing alternatively false renditions of mythology, capitalist ethos clashes with and tends to trivialize the guiding principles of traditional myths. In conclusion, the analysis reveals a tightly coupled synergism between the signs of virtual reality and culture, which, precipitated by the underlying capitalist ethos, distorts the significance of tradition.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION AND EVALUATIVE FRAMEWORK

Introduction

The research question to be addressed by this dissertation is: How might semiotics, or the study of signs, assist in understanding the cultural and possible political ramifications behind virtual reality? Human culture, which is becoming increasingly globalized through media manifested as cinema, advertising and the Internet, will be considered here in terms of "virtual empiricism" or the difficulty associated with interpreting meaning from individuals' interactions and subsequent experiences with virtual reality media, which generate phenomena that resemble those that emanate from real world objects.

The common ambiguity between the terms virtual and virtual reality "can lead to significant misunderstandings" (Guerlac 2006, 187). Prior to proceeding, the term virtual must be explained because it has had a myriad of definitions. One influential definition of the virtual is as a "real idealization" (Shields 2003, 28). In this sense, the virtual relates to author Marcel Proust's often quoted expression for it as "real without being actual, ideal without being abstract" (2006, 1151). Proust's expression has most notably been used by twentieth century French philosopher Gilles Deleuze as a key component of transcendental empiricism. Deleuze bases much of his theory on the observations of his predecessor Henri Bergson. A Bergsonian scholar and Professor of French Studies at the University of California, Berkeley, Suzanne Guerlac explains Bergson's concept of the virtual:

> By this he means that it [the virtual] really exists, only outside our consciousness. It involves a mode of being that is not actual in the precise sense that it cannot act in the present. The present is sensori-motor; it concerns the introduction of movement—or change—into the world. The past exists virtually in the sense that it

> is powerless to act materially in the present. It exists in the mode of that which no longer acts . . . The term "virtual" is to be thought in relation to the movement of time. "Virtual" involves a mode of existence of the past; it also participates in a process of becoming present, or of self-actualizing, in the process of attentive recognition. (2006, 187)

Deleuze's reading of Bergson has been loosely referred to as a "virtual empiricism" (Koefoed 200, 7). This term was never formally used by Bergson or Deleuze, however, the reference is meant to indicate that Deleuze's transcendental empiricism is not a form of empiricism in the usual or basic sense, which observes a separation between subject and object. A transcendental empiricist emphatically does not view the world in terms of this separation (Deleuze 2005, 8). Yet, as with Bergsonianism, transcendental empiricism encompasses the virtual.

Deleuze's empiricism is virtual in that it refers to objects that do not exist physically, but that one understands in terms of a proposition of consciousness, or the potentiality of an idea (1994, 201). His theory is based partially on Spinoza's neutral monism. Spinoza postulated that everything is made of one, single substance and henceforth, Deleuze theorizes that the entirety of the universe, including individuals' consciousnesses, exist in a plane of immanence or "transcendental field" (Lapoujade 2000, 190). Within such a field, substance is neither solely physical matter nor thought, but both (194). Accordingly, Deleuze views subjective thought and objective materiality as made of the same elements.

In this dissertation, virtual empiricism will refer to empiricism in the usual sense, which continues to observe a separation between subject and object. However, it will refer to "virtual" experiences stemming from the ability of virtual reality media to generate substitutive phenomena in opposition to objects' real-world phenomena as observed by subjects. Experience

is considered as the intersection of the external world with the inner world of the subject (Guerlac 2006, 59). Here, virtual empiricism is defined specifically in terms of phenomena generated by virtual reality media as the outer world, and observing subjects' inner world interpretations of them.

Because it involves interpretation of substitutive phenomena, virtual empiricism is distinctively associated with virtual reality media signs. VRT generates phenomena that act as signs in that they stand in for, reference or represent what would be perceived or apperceived objects. Virtual empiricism recognizes that the sign system of language influences interpretation by categorizing entities and events, as well as one's world-view. This same influence might be incurred equally from other sign systems such as those created by virtual reality media. The idea behind virtual empiricism is that experiences result from an individual interpreting virtual reality media interactively, along with the cultural conventions that are inferred in the process. Collectively, such experiences form a relationship with culture, which might be in turn analyzed to further understand cultural dynamics.

While basic empiricism maintains that understanding comes from experience through sensory perception, it might further be divided into modalities such as the direct and the indirect, the physical and the emotional, and so forth. Some post-Cartesian philosophies have noted that knowledge and understanding[1] emerge from the "tension and collaboration between immediacy and mediation" (Marsh 1988, 72). Relative to this point, philosopher Roman Ingarden observes a separation between the immediately physical world, and that of the idealistic mind. Ingarden identifies "metaphysical qualities" such as the sublime, shocking, sorrowful, and peaceful as neither physical objects nor mental properties, but situations or events that exist between the two,

[1] Understanding is a consequence of interpreting (Gadamer 2006, 390).

which constitute life's primary experiences[2] (Simons 1999, 207). Such experiences emerge from the interdependence of an interpreting mind and the phenomenal world. Virtual reality creates phenomena that resemble the real world and forge experiences situated between the observer's mind and a simulated environment. In contrast with experiences directly grounded in time and space, virtual empiricism deals with the potential lasting effect on individuals within a culture resulting from a combination of mediated experiences with virtual reality phenomena.

Virtual empiricism relates to theories on understanding just as much as basic empiricism. Hermeneutics philosopher Hans-Georg Gadamer traces the history of the German word *bildung* to study its meaning not merely as its usual translation of education (or the learning process by which one achieves understanding) but, borrowing from anthropologist Johann Gottfried Herder, as individuals' "rising up to humanity through culture" (2006, 9). Gadamer asserts that a rising up to humanity should be interpreted in terms of language and customs as a pre-given body of material that individuals learn to make their own (13). A rising up to humanity solidifies one's disposition along with their neighbors', and it is not limited to language but pertains to all sign systems used in culture. Language and other comparable sign systems socialize thought. Sign systems disseminate cultural knowledge such as judgments of taste and fashion, and the definition of various values and ideals. Each individual's consciousness is affected by his or her own experiences with social institutions, and by the pre-existing history under which he or she is raised.[3] This pre-existing history itself has the structure of experience (341). Virtual empiricism explicitly encompasses historical, cultural knowledge and understanding transferred through sign

---

[2] Ingarden describes metaphysical qualities as events or situations that constitute what makes life worth living in a hidden or deeper sense of existence than the ordinary or practical (1973, 292).

[3] Gadamer refers to this phenomenon as historically effected consciousness (2006, 336).

systems. It involves an additional layer between a subject and an object that is not present in immediately phenomenal reality. For example, the computer-generated imagery of a landscape, under the direction of its producer, mediates what a viewer observes, whereas a viewer's direct observations of a real landscape are exempt of such mediation.

Virtual empiricism is problematic because it at times leads to negative or demoralizing implications, inclusive of ethical and political dimensions that will be revealed and explained in the ensuing examination. Since the focus is on VRT as media, the research frame of reference will mostly pertain to communications technologies leading up to and including the modern epoch of the last century. Virtual reality is considered as a type of media because it is a powerful means of communication (Davis and McGee 1991, 4). In this context, a medium is defined as "the physical means by which some system of signs for recording ideas can be realized" (Danesi 2002, 2).

Theologian Dennis Ford underscores how the search for meaning is itself a daunting task, which has been addressed through a plethora of methodologies, including no less than the mythic, philosophical, scientific and postmodern (2008, 22). Though Ford's search for meaning concerns the metaphysical rather than commonplace experience, the derivation of meaning even in the fundamental sense is difficult to assess within the complex dynamics of culture, especially relative to society's interactions with media. Because human culture and its relationship with media are complex and dynamic, semiotics (i.e., the study of signs) will be applied here as an analytical tool with which to conduct this examination. As a field, semiotics parallels the study of language, which is the quintessential sign system.

Experimental psychologist Steven Pinker argues that the study of language reveals what people are thinking and feeling (2008, 3). Certainly, the metaphors of language are central to the

human thought process (Lakoff and Johnson 1999, 543). Metaphors and analogies are used by the mind to understand concepts that are otherwise inaccessible even if they might not be the only mechanisms (Pinker 2008, 241). Often, humans think in terms of "metaphors grounded in physical experience" (245). Consequently, the study of metaphor parallels the study of signs because each concerns constructs that stand in for something else.

Virtual reality media create experiences when individuals interact with signs generated by their underlying technologies. Semiotically, meaning is defined in terms of the alignment between the intentions of a sign's producer, and the function or effect it has on an observer. The observer must interpret these signs to establish meaning, and therefore has a role in the production of this meaning, which is subject to individual perceptions. Because each type of media inherently includes an element of mediation, no medium is limited to an exclusive or discrete function. Media also refer to institutional and social dimensions in which they are produced and observed (Thwaites, Davis, and Mules 2002, 143). Thus, semiotics promises to be a worthwhile means with which to examine virtual empiricism.

VRT is a particularly interesting form of media because, while it exhibits many of the same traits as other forms of media, it is a unique and nascent form of technology designed specifically to furnish surrogate experiences. VRT's uniqueness is apparent in its aesthetic expression, which exploits computer capabilities. According to virtual reality historian Howard Rheingold, the ultimate goal of VRT is to excite "all the channels for communicating with the human being that the mind already knows how to interpret" (1992, 38). This definition pinpoints the aspects of VRT that set it apart from other media. VRT's producers seek to employ it so as to excite as many human senses as possible. Although this technology might eventually enable an individual's total sensory immersion within a synthetic environment, the intent of this

dissertation is to assess it in its current state as opposed to its speculative or future incarnations. Therefore, cutting-edge innovations, such as head-mounted displays and data-gloves, will be excluded in favor of contemporary artifacts used in entertainment and advertising that promote the use of imagery and provide a rudimentary level of interactivity. The precise area of study will be VRT that is accessible to the general public instead of its instantiations in specialized venues such as military or scientific applications.

Multi-media scholars Frank Biocca and Mark Levy assert that virtual reality technologies act as vehicles to transport consciousness through the information superhighway of the Internet (1995, 21). However, these technologies might also act through various other digital media, such as Compact Disk (CD) players and recorders, Digital Versatile Disk (DVD) players and recorders, cellular telephony, digital cameras, laser contour mapping, and animation in movies and video gaming. While all are constituents of virtual reality, their main shared attribute is that they form a bridge between human senses and computers by converting or translating phenomena observable through these senses into and from digital reproductions. This translation represents the focal point of the case studies to be considered within this dissertation.

Organization

Overall, the dissertation will be organized so as to start with a semiotic analysis of specific case studies of VRT, and then generalize upon the findings. The case study findings will be compared to traditional mythological stories in order to ascertain how VRT might be influencing and possibly adding to the secularization of culture. The analysis will then extend to sensitizing concepts relative to semiotics in order to draw its conclusions. The dissertation will be partitioned into the following chapters:

a) Chapter One presents an introduction on the research topic and the evaluative framework under which it will be conducted. Precisely, the problem of virtual empiricism will be explained in terms of capitalist ethos and the relationship it has with mythology.

b) Chapter Two will provide an overview of Umberto Eco's semiotic theory (the specific theory to be applied in the analysis) along with an explanation of why semiotics applies to virtual reality, and a review of the schism between realism and idealism in which it operates.

c) Chapter Three will present the semiotic analysis of cinema case studies. Eco's theory will be applied in full to one primary case, and less exhaustively to two secondary cases.

d) Chapter Four will continue the semiotic analysis by applying the theory to advertising and video gaming case studies. Again, one primary case will be presented for each, followed by less-detailed secondary cases.

e) Chapter Five will examine the effects of virtual reality on mythology from a semiotics perspective. The examination will start with a definition of traditional mythologies and then assess how they might be affected by the virtual reality technologies included in the case studies. Specifically, the analysis will draw on Joseph Campbell's traditional renditions of myths such as that of the hero to compare them with the case study renditions.

f) Chapter Six will examine the inter-relationships among public perception, interpretation and ideology from a phenomenological perspective. The theories of Maurice Merleau-Ponty and Edmund Husserl will be used in the examination. The case studies will be used to draw conclusions.

g) Chapter Seven will examine the relationship between simulation and reality within the framework of the case studies. Specifically, it will relate the theories of Jean Baudrillard, the Frankfurt School and Guy Debord to virtual reality.

h) Chapter Eight will provide conclusions drawn from the findings of the previous chapters and explain the influence of the capitalist ethos on virtual empiricism.

Methodology

This dissertation will apply semiotic theory to the analysis of three sets of case studies that are indicative of the current implementation of virtual reality and that are accessible to the general public. The analysis will be conducted on a) cinema, b) advertising and c) video games. The cases to be considered for each type of media are presented in Table 1.

Form of Media	**Specific Cases**	**Notes**
Cinema	The Matrix Reloaded	Virtual Cinematography
	Spider-man 3	Morphing Techniques
	Sky Captain and the World of Tomorrow	Blue Screen Technology
Advertising	Coca-Cola commercial aired during the NFL Super Bowl on February 17, 2007	Convergence with Grand Theft Auto video game
	Second Life	Advertising integrated with on-line collaboration
	Digital or Virtual Advertisements	From Sports broadcasts and other sources
Video Games	America's Army	On-line collaboration
	Madden NFL 2007 and NCAA Football 2008	Interactivity
	Wii Sports and Guitar Hero III: Legends of Rock	Tactile sensors

Table 1 List of Case Studies by Media Type

Since the field of semiotics is itself quite broad, the dissertation will adhere to Umberto Eco's theory, which will be specified in detail in the ensuing chapters. The attendant research will

include a review of past semiotic analyses on topics related to the case studies. These past efforts offer foundations from which to examine the artifacts of VRT and their relationships with culture and society. The research efforts will gradually expand to encompass related, sensitizing concepts, and overlapping theories concerning phenomenology and symbolic reality.

The cinematic case studies include three distinct innovations: blue screen technology, morphing techniques, and virtual cinematography. The advertising case studies reflect the agency of VRT in crafting television commercials through computer-generated imagery, the augmentation of public broadcasting via the "chroma key" technique, and advertisements that generate real-life revenues when integrated within an on-line community. The video gaming case studies include an on-line game that merges the military domain with entertainment, pure sports entertainment illustrating the role of public figures, and games that apply tactility (i.e., a sense of touch) to achieve immersion.

The case studies are primarily forms of entertainment, advertising or both. This characteristic is partially due to the nature of the studies that have been selected. But, it also reflects a tendency for these industries to fold this technology into the cultural mainstream. While they provide a broad cross-section of techniques, these products are also widely disseminated and embedded within modern culture. Additionally, the advertising example of *Second Life* and the video game *America's Army* have been selected because they illustrate this technology's unique capacity to include "virtual persons we know through . . . computer networks" (Heim 1997, 112).

Virtual Reality and Its Relation to Semiotics

Virtual reality has several definitions ranging from simple metaphor, narrative and human computer interaction to a rendering of the imagination and total immersion in and transparency

with artificial surroundings. In grouping these widespread manifestations, it is important to distinguish between virtual reality as an idea, and as a technology (Hillis 1999, xiii). As an idea, language has instantiated the first fundamental form of virtual reality. And because semiotics uses the study of language's signs as its base, semiotics comprises an effective means with which to study it. Language that portrays fiction and fantasy essentially recreates a world imagined by the originator in the mind of the reader or listener as in the case of mimesis. Aristotle defined mimesis as "the psychological resonance that enables dramas to move people emotionally" (Rheingold 1992, 308). Ever since, it has been recognized that language as fiction can produce strong reactions similar to real-life situations (Ryan 2001, 148). By processing the content through their perceptions, individuals link what is expressed through language with their own personal feelings. Relative to this point, literary scholar Marie-Lauré Ryan observes a phenomenology of reading, which she describes as "experience through which a fictional world acquires the presence of an autonomous language-independent reality populated with live human beings" (2001, 14). Ryan argues that, although they are limited to what might be termed "quasi-emotions" because they do not produce a lasting effect, the fate of fictional characters might sometimes solicit dramatic results (154). The main takeaway here is that language, as a form of virtual reality, creates a sort of experience for the individual, and in this regard it is virtually empirical.

Semiologist and linguist Ferdinand De Saussure distinguished between language as *la langue* (i.e., semantic rules and codes), and *la parole* (i.e., its active use such as speaking and story-telling) (Cobley and Jansz 2004, 15). Storytelling and written texts do not "make the real present, but [they do] re-present it through codes and signs" (Thwaites, Davis, and Mules 2002, 86). As *la langue*, language is a system in which each word is a discrete symbol comprising a narrative

that enables people to construct imaginary worlds governed by its rules (Ryan 2001, 44). The rules governing signs' relations and how they fit within a storyline make it possible for people to reconstruct a facsimile world within their imaginations. The most endearing stories are those that individuals can relate to their own personal and immediate experiences, and imagine how they would feel. Two essential ingredients shared by storytelling in general are a) imagination, which replaces "everyday sensory reality [with] user-generated illusions driven by cues from a medium" (i.e., words themselves are a medium) and b) illusory space, which is a "mutually accepted make-believe space" (Biocca and Levy 1995, 132). This re-creation of make-believe relies on language's capacity to act as a medium for transferring the imagination from the storyteller or author to the recipient. Along these lines, computer scientist Alan Kay observes that "anyone who wishes to receive a message embedded in a medium must first have internalized the medium so it can be 'subtracted' out to leave the message behind" (2002, 124). Moreover, he contends, "every message is, in one sense or another, a simulation of some idea" (175). With regard to the medium of language, this simulation is manifested in the imagination.

The make-believe or "virtual reality" of language is exemplified by poetry, the goal of which is to represent or disclose. The original Greek meaning of *poiesis* was as a "bringing-forth, or bringing into presence" (Collins and Selina 1999, 161). Poetry requires work and a semblance of faith on the part of the reader in order to engage it. Samuel Taylor Coleridge wrote of this poetic faith in describing the inclination poetry readers must have toward a "willing suspension of disbelief" (1967, 6). Poetic faith refers to the tendency of readers to want to believe the fiction or fantasies they read.

Certainly, the essence of make-believe lies in the observer's willingness and ability to become immersed in it (Ryan 2001, 105). For, without this willingness to believe, language is

somewhat pointless or at least less effective at touching its audience. The effectiveness of language as a medium then depends on the interpreter's ability to conceptualize ideas that the signs of language reference, including those that are ideal. As such, belief in the existence of an object is not required to elicit an emotional response (154). Since objects are being recreated in the interpreter's mind, objects in the ideal sense are just as likely to affect the observer or listener as objects that are concrete or tangible. This works when the observer is able to associate the signs of language with his or her own perceptions. Rheingold asserts, "Ritual and drama serve to invoke mental and emotional states through the highly developed human power of association" (1992, 301). Language as a medium relates sender and receiver via several associations and metaphorical allusions to ideals or experiences. The mimetic effect singled out by Aristotle functions by engaging the emotions through these associative symbols and experiences. Theater works on this same premise by employing various devices, including mythologies and perception-alerting technologies to entice the audience member into a "specific state of mind" (304). Hence, a virtual experience involves perceptions just as would direct experience.

These associative techniques equally apply to virtual reality as a technology. Rheingold specifically ties mimesis to virtual reality (1992, 30). And, virtual reality scholar Larry Stevens argues that virtual reality as a technology has the capacity to invoke the same willing suspension of disbelief (1994, 3). But, VRT differs from the abilities of poets and writers to portray a virtual world in its ability to render the imagination physically, albeit in two dimensions. While this difference might be considered beneficial in that it augments what the individual imagines, it might also be viewed as detrimental in that it reduces the space for individual incarnations of the imagination. Observers do not need to invoke as much of their own imagined variants of what they are presented because the underlying technology does a lot of it for them. VRT is aimed at

immersing the individual in a world that its producers have imagined. Toward this end, advancements in computer graphics function by providing renditions of imaginary or fictitious content that either resemble real-world objects or concretize abstract concepts that are at times ideal.

Moreover, this nascent medium shifts responsibility for shaping a narrative from solely the author to a collaborative effort between author and reader (Packer and Jordan 2002, xxix). It creates a system in which the observer is an element by adding dynamic properties to representation (Finnemann 1999, 155). When coupled with a pointing device, such as a mouse or joystick, graphics provide a means of interaction as part of a human-computer interface (HCI). In this context, interactivity is the "extent to which users can participate in modifying the form and content of a mediated environment" (Steuer 1995, 46). Here, the environment is in part conjured up by a digital computer rather than solely by a recipient's imagination.

As a technology, the basic components shared by all virtual reality systems are "a human operator, a machine, and a human-machine interface" (Durlach and Mavor 1995, 1). The user interface is the point where humans and computers meet in order for exchange to take place (Grau 2003, 198). Surely, VRT becomes meaningful at the bridge between humans and machines. A University of North Carolina researcher and a pioneer in the field of computer science, Dr. Frederick Brooks, maintains that the cornerstone of VRT lies in asking how to get minds and machines to work together (Pascoe 1998, 11). Toward this goal, technologists have attempted to capitalize on the mind's capacity to perceive analogies and metaphors. Some researchers contend that cognition itself is metaphoric (Hayles 1999, 275). These same assumptions have been derived from the processing of language and its operation. Hence, HCI designs are based on the assumption that humans can naturally process information that is

presented in the form of metaphor. For instance, Ryan observes that the HCI is in many ways an example of metaphorical symbolism (2001, 307). Media scholar Ken Hillis asserts that VRT implies a "relocation of what is concrete to an imaginary or metaphoric space" (1999, xv). And, Stanford University communications scholar Jonathan Steuer notes that existing interfaces are predicated on "metaphor [to] help match controller and controlled" (1995, 48).

Yet, computer graphics developers move beyond metaphorical symbols by employing iconography in HCI design. Modern computer interfaces make extensive use of icons, which are inherently more conducive to "collapsing experiential differences and distances between symbols and referents" (Hillis 1999, xv). HCI icons are different from other forms of media because they both resemble real-world objects and because the user can interact with them (Heim 1993, 111). Evidence of this effect is found in the Apple Lisa, which was developed in 1983 (Finnemann 1999, 19). The Lisa revolutionized the industry by creating an interface based on icons, such as a trashcan cartoon for the deletion of files, a floppy to stand for a disk drive, and an hourglass to inform the user when the machine is busy. The "desktop metaphor" that portrayed files as filing cabinets, electronic mail as envelopes, and deleted files as trash were the first notable examples of the utilization of computers for virtual reality (Rheingold 1992, 69). Apple later applied this design to the Macintosh, which subsequently became the de facto standard for "user-friendly" systems. The Apple HCI was developed following a design methodology that directly employed C. S. Peirce's semiotic theory with a focus on signs in the iconic form (Ockerse and Gokl 1991, 178).

When studying its effects on human culture, it is helpful to recognize virtual reality as a form of media with its own set of messages and communication facilities. Hillis contends that virtual reality "draws together the world of technology and its ability to represent nature, with the broad

and overlapping spheres of social relations and meaning" (1999, xv). In parallel, sociologist and founder of the term "cybernetics," Norbert Wiener suggests that a "society can only be understood through a study of the messages and the communication facilities which belong to it" (1988, 16). Since it is a communications medium that reaches the general public on a large scale, virtual reality has social implications that make it a worthy topic of study. And, as a communications medium, its social implications might be reduced and studied by viewing their effects as signs carrying meaning.

Audio and video signals conveyed as mass media, such as VRT, are essentially forms of signs that inherently suggest ideas or conditions in the mind of an interpreter. Ryan contends that all entities in virtual reality are ultimately digital signs with which the viewer interacts through "conscious symbolic manipulation" (2001, 85). Along similar lines, virtual reality developer and pioneer Jaron Lanier contends that the technology is a form of "post-symbolic communication . . . [meaning] users can stipulate and shape objects and activities in a virtual world, they can share imaginary things and events without using words or real-world references" (Heim 1993, 116). In either case, symbolism has a recognized role in the formulation of meaning through VRT.

Historical Background of Virtual Reality

Jaron Lanier coined the term "virtual reality" in 1988 to refer to a program called RB2, which ran on an Apple Macintosh and included earphones; a three-dimensional, head-mounted display; and a data glove (Staley 2003, 36). The U.S. military was the first group to latch onto VRT when it invested in computer simulation programs to train fighter pilots in the 1960s (91). The adaptation of flight simulation to a computer environment was a natural evolution from previously existing flight trainers. In 1929, Edwin Link invented a training aid for pilots based

on the mechanical mockup of an airplane cockpit (Grady 1998, 21). During World War II, films from the windows of real airplanes were projected onto screens surrounding the simulator's cockpit (23). One of the first flight training systems to employ computer simulations was the Virtually Coupled Airborne Systems Simulator (VCASS), which consisted of the fuselage of an airplane, an instrument panel and a head-mounted display for the pilot (Moody 1999, 23). Its developer, Tom Furness, described his VCASS experience as if "somebody had reached out of the display and pulled you inside, and now you weren't looking at a picture, sitting in a cockpit looking at a picture, you were in the picture" (25).

Since first interconnecting computer simulation and training, the military has expanded to the realm of synthetic environments in which multiple, disparate training systems interoperate over a network. SIMNET was one of the first of these environments (Stone 1999, 275). Users of these systems claim they help to build teamwork techniques (Grady 1998, 129). In many ways, they provide the only means for military personnel to gain experience with their equipment short of actual battle. Thus, a big part of what drove the military's interest in VRT was the need to develop situational awareness or soldiers' "understanding of and responses to things going on around them" (Moody 1999, 55). Military personnel were lured toward virtual reality because it enabled them to "train [soldiers'] minds and reflexes in a way that was impossible on older computer systems or impossibly dangerous and infinitely more expensive in live-fire exercises" (98).

Aside from training, early attempts at developing VRT concentrated on the HCI (Rheingold 1992, 70). Researchers began to recognize machines' utility for ameliorating the newfound problem of information overload spawned by the growing stream of media communications. Vannevar Bush, director of the former U.S. government Office of Scientific Research and

Development, argued that since technologies and their attendant information were ever increasing, humanity must develop means by which to deal with them. In drawing his conclusions he argued that the "publication [process] has been extended far beyond our present ability to make real use of the record" (Bush 1999, 24). As a response, he conceptualized the design of the memex, which was to be a device that would store records and communications for quick retrieval by individual users (33). Subsequently, Massachusetts Institute of Technology psychologist J.C.R. Licklider anticipated the advancement of what he called a symbiotic relationship between humans and computers (Rheingold 1992, 79). Computer architect Alan Turing followed suit with his Human-Computer Interaction Augmentation Research dedicated to exploring "applications that extend people's capacities to create, think, and communicate" (Mayer 1999, 11). And, electronic publishing specialist Ted Nelson envisioned the design of interactive, non-linear links between texts that would operate on associations, which he coined as "hypertext" (18). This innovative idea would later influence the architecture of the Internet.

By the 1970s, Douglas Engelbart of the Stanford Research Institute had pioneered the idea of using a computer as a "mind amplifier" (Rheingold 1992, 72). Like Bush, he sensed that the creations being built by humankind were becoming too complex; thus in the interest of solving this problem, he took his experiences working with radar and applied them symbolically to the computer (74). Later work by Alan Kay at the Advanced Research Projects Agency led to the development of the mouse as a new and innovative interface, which was based on natural human gestures (83). In the process, Kay acknowledged Marshall McLuhan for influencing him to think of the computer as a medium rather than a tool (85). In this sense, it became a device with which to communicate via signs rather than merely an instrument with which to accomplish a function.