

"A NEW PLACE TO STAND":  
Virtual Reality on Stage at the University of Kansas

by

Copyright 2004  
David-Michael Allen  
University of Kansas, 2004

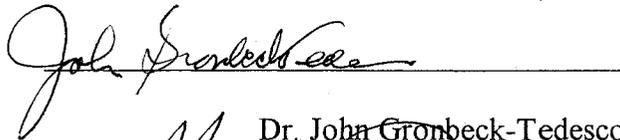
Submitted to the Department of  
Theatre and Film and the Faculty of  
the Graduate School of the University  
of Kansas in partial fulfillment of  
the requirements for the degree of  
Doctor of Philosophy

---



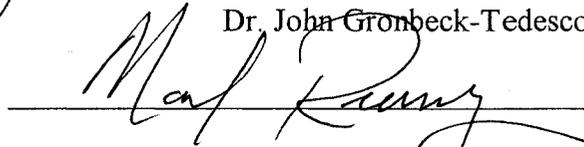
Dr. Dennis Christilles, Chair

---



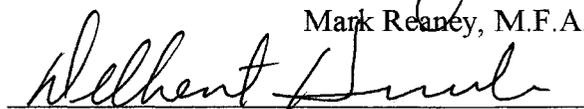
Dr. John Gronbeck-Tedesco

---



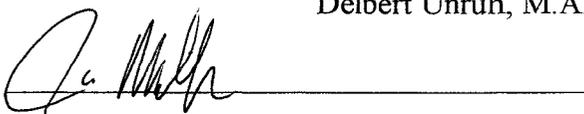
Mark Reaney, M.F.A.

---



Delbert Unruh, M.A.

---



Dr. James Miller

Date Submitted: \_\_\_\_\_

UMI Number: 3185120

Copyright 2004 by  
Allen, David-Michael

All rights reserved.

#### 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.

**UMI**<sup>®</sup>

---

UMI Microform 3185120

Copyright 2005 by ProQuest Information and Learning Company.

All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company  
300 North Zeeb Road  
P.O. Box 1346  
Ann Arbor, MI 48106-1346

## ABSTRACT

David-Michael Allen, Ph. D.  
Department of Theatre and Film, December 2004  
University of Kansas

In 1995, the University of Kansas Department of Theatre and Film produced the first “live, virtual reality” experiment that involved a traditional script. The Adding Machine: A Virtual Reality Project started with Elmer Rice’s expressionistic script and actualized it by employing actors performing in front of, and interacting with, computer-generated scenery displayed on a projection screen and manipulated in real time. Mark Reaney, Ron Willis, and Lance Gharavi were the key people who brought about this accomplishment.

Various technologies were employed for the production. The scenery was created using Virtus WalkThrough, software originally designed for use by architects. Green-screen technology allowed actors’ images to be inserted in the computer-generated scenery. Mirrors and left eye/right eye views sent through the two projectors allowed audience members wearing glasses with polarized lenses to see the projected scenery in three dimensions.

Through personal interviews, detailed descriptions, and digital images, this dissertation documents how the project came about, what was needed to bring it about, and how the subsequent experiments tested and expanded the boundaries of virtual reality and theatre. The dissertation begins with a brief history of virtual reality as an intellectual and technological concept, and is followed by four appendices containing documentation pertinent to The Adding Machine: A Virtual Reality Project, including the edited script used for the production.

For Preston Julius Allen-Hernández, who came along some time after I started this endeavor but who became the primary motivation for seeing it through to the end.

Te quiero, mi hijo.

## Acknowledgements

The members of my committee deserve a great deal of thanks for their flexibility, patience, and help. John G-T provided support and guidance during the darkest times of my journey. Mark was always available when I needed additional materials and advice. Jim provided needed expertise and insight about computers and the history of technology. Dennis graciously agreed to be the Chairperson even though I asked him to join the committee late in this process. Del joined my committee at the “last minute,” but his commitment helped me fix the many typographical errors that had crept into the work. Any mistakes remaining in this document are my fault, alone.

During the past year, life tried to get in the way of my efforts, and my father came to my aid on more than one occasion. If not for his help with things unrelated to the dissertation, I could not have finished the dissertation. My love and thanks to him.

I doubt I would have been able to complete this without the support of my friends, who believed in me and never gave me a chance to forget it. To everyone: my heartfelt thanks and appreciation.

And, last, I must thank Drs. Heather Frost and Linda Keeler at the University of Kansas Counseling and Psychological Services. They have helped me to understand why I was pursuing this goal, imparted perspective when events attempted to disrupt the goal, and provided assistance when health problems kept me from completing the goal. I am a better scholar and person because of them.

Table of Contents

List of Photographs, Diagrams .....	vi
Introduction.....	7
A Place with No Name .....	9
An “Undiscovered Country” .....	17
“A New Place to Stand” .....	42
“Look with favor on a bold beginning.” .....	102
Appendix A.....	113
Appendix B .....	116
Appendix C .....	120
Appendix D.....	128
Appendix E .....	188

List of Photographs, Diagrams

Fig. 1. Seating and stage areas for The Adding Machine: A Virtual Reality Project. .... 61

Fig. 2. Actors Brian Paulette and Betsy Atkinson performed onstage while Andrew Patrick Ralston and Ally Z. Freund appeared on the projection screen.. .... 66

Fig. 3. Digital sound station schematic. .... 75

Fig. 4. Video board schematic. .... 77

Fig. 5. Virtual Agent and Virtual Environment Stations schematic ..... 79

Fig. 6. Green Screen room schematic for single projection of characters..... 81

Fig. 7. Green Screen schematics for “Party” and “Courtroom” scenes..... 82

Fig. 8. Schematic for projection of slides in three-dimensional views. .... 84

Fig. 9. and Fig. 10. John Garretson, portraying the “Boss,” performed in the Green Screen space, and his recorded image was displayed on the center projection screen. .... 90

Fig. 11. The actor’s projected image was manipulated to reveal Zero’s emotional state..... 90

Fig. 12. The “Jury” scene, where Brian Paulette as Zero pleaded his case. .... 91

Fig. 13. Brian Paulette, as Zero, and Eben Cople, as Shrdlu, interacted with computer-generated character. .... 93

Fig. 14. Brian Paulette, as Zero, and Megan E. Parr, as Daisy, danced in place while the projected scenery changes. .... 96

Fig. 15. Brian Paulette, as Zero, operated an enormous adding machine in the  
afterlife..... 97

## Introduction

“Onstage, invented men and women walk and talk, make sense of an invented world, and yet, sitting in the darkness of the theater, we can use the artifice of those ingeniously fabricated minds to obtain new insights into our own.” Jeremy Campbell, The Improbable Machine, 1989 (1)

In the spring of 2003, the University of Kansas (KU) Theatre and Film Department produced Mozart’s The Magic Flute, the department’s latest experiment with “live, virtual reality” theatre. This opera, first performed in 1791, is set in a fantastical kingdom ruled by the Queen of the Night and in it we find a dragon, magic bells, and, of course, a magic flute. What distinguishes the KU production from previous ones is the use of virtual reality technologies to depict characters and locales. According to Delbert Unruh, the director, the milieu of the opera “is almost its own universe, and our job is to stage Mozart’s imaginative world in a fluid and seamless fashion” (“The Magic Flute: Virtual Reality Lends Magic”). When asked in a post-production e-mail interview how VR enhanced the theatre event, he replied, “the technology made the event possible. The opera is filled with fantastic and sometimes preposterous situations and events[. . .] The VR technology allowed us to create this fantastic and magical world[. . .]”.

Unruh’s remarks have touched on the shared similarity of “theatre” and

“virtual reality”: both are created spaces. Let go of the notion of theatre as artistic expression. Let go of the notion of virtual reality as computer technology. Regardless of venue or backstage space, regardless of update speeds or electronic accouterments, these “machines” transport participants to distant or unfamiliar locales. Theatre artists and technicians have accomplished this feat for thousands of years. Software designers and computer technicians have achieved this feat during the past thirty years. As theatre has adopted technological advances as they became available, it should not be considered unusual that “theatre” and “virtual reality” would eventually come together to create a new and shared space.

The first meeting of these technologies took place in 1994, at the University of Kansas. Mark Reaney and Ron Willis were looking, to use the words of Brenda Laurel, for “a new place to stand.” They revealed that “place” in the spring of 1995, with the first experiment in “live, virtual reality” theatre. Though this documentary history will examine what led to this first production, the production itself, and its aftermath, this exploration must begin with a brief history of virtual reality. Such an exploration must follow two interwoven paths. One path reveals “virtual reality” as an intellectual and artistic concept. The other path reveals how the technology came about that would eventually make The Adding Machine: A Virtual Reality Experiment possible.

## A Place with No Name

“Trying to trace the idea of virtual reality is like trying to trace the source of a river. It is produced by the accumulated flow of many streams of ideas, fed by many springs of inspiration.” --

Benjamin Woolley, Virtual Worlds: A Journey in Hype and Hyperreality, 1992 (40)

Just as stones and trees existed long before people gave them names, virtual reality existed as a concept long before someone decided to assign a name to it.

Howard Rheingold speculates that caves decorated with prehistoric paintings might have been places where people were immersed in alternate realities (379-80). Leaning on the work of paleontologist John Pfeiffer, Rheingold describes a possible ritual, where “the first technological secrets were imparted”:

The deliberately sensitized psyches of the novices were reframed by carefully crafted sequences of sights and sounds, imprinted with the secrets of fire and metal, the connections between seeds and stars. An early form of the most powerful idea at the basis of technological civilization--that it is possible to observe the world and learn from it and apply that knowledge to the requirements of daily life--was burned into our forebears’ brains to the accompaniment of a three-dimensional sound and light show. (379)

Though Rheingold suggests this hypothetical ritual served the purpose of transferring information, he also implies the presence of theatricality. The elements include an audience (novices), performers (mentors), and sets (paintings). Theatricality is an inherent component of the virtual reality paradigm, existing hand-in-hand with technological innovations, however nascent or advanced.

The idea, the concept, of what we think of virtual reality existed long before the technology made it possible for us to experience virtual reality. The idea of VR existed in the imaginations and the creative efforts of science fiction writers, such as Laurence Manning (“City of Light,” Wonder Stories May 1933), Arthur C. Clarke (The City and the Stars, New York: Harcourt, Brace & World, 1956), and Harlan Ellison (“The Silver Corridor,” Infinity Science Fiction October 1956), to name but three. Though people are quick to point to William Gibson’s 1984 novel Neuromancer as the seminal work depicting VR, Ray Bradbury might have been the first writer to describe and explore virtual reality, the immersive and interactive arena in which participants experience different milieus, different environments, different worlds, and encounter situations unlike those in everyday life.

In his short story “The Veldt,” a children’s playroom recreates milieus, such as an African veldt, with such clarity that a user can not only hear the lions but can also smell them:

The walls were blank and two dimensional [sic]. Now, George and Lydia Hadley stood in the center of the room, the walls began to purr and recede into crystalline distance, it seemed, and presently an

African veldt appeared, in three dimensions, on all sides, in color, reproduced to the final pebble and bit of straw. The ceiling above them became a deep sky with a hot yellow sun. (16)

How evocative of the holodeck, the virtual reality chamber depicted in the second incarnation of the Star Trek television series. The playroom, though, turns out to be more real than virtual. Threatened by the loss of their playroom, the children arrange for the lions to kill their parents. “The Veldt,” then, is a horror story. It does not explore how society is affected by this kind of technology. Bradbury takes this step in the 1953 novel Fahrenheit 451.

With the outlawing of books, people in this future society must find other ways to escape the everyday. Bradbury offers two possibilities, both “enjoyed” by the wife of fireman Guy Montag. Both are immersive, one is also interactive. Consider Bradbury’s description of the first:

Without turning on the light he imagined how this room would look. His wife stretched out on the bed, uncovered and cold, like a body displayed on the lid of a tomb, her eyes fixed to the ceiling by invisible threads of steel, immovable. And in her ears the little Seashells, the thimble radios tamped tight, and an electronic ocean of sound, of music and talk and music and talk coming in, coming in on the shore of her unsleeping mind. The room was indeed empty. Every night the waves came in and bore her off on their great tides of sound, floating her, wide-eyed, toward morning. There had been no night in the last

two years that Mildred had not swum that sea, had not gladly gone down in it for the third time. (42)

From Montag's perspective, from Bradbury's perspective, this immersive "escape" is not a positive thing. In fact, Montag discovers that Mildred has taken too many sleeping pills before giving herself up to the Seashells.

The next afternoon, after he has saved his wife's life and she has returned home, Montag finds her in the "TV parlor," where three of the four walls are covered by TV screens. Mildred is reading a script:

"What's on this afternoon?" he asked, tiredly.

She didn't look up from the script again. "Well this is a play comes on the wall-to-wall circuit in ten minutes. They mailed me my part this morning. I sent in some box tops. They write the script with one part missing. It's a new idea. The homemaker, that's me, is the missing part. When it comes time for the missing lines, they all look at me out of the three walls and I say the lines. Here, for instance, the man says, 'What do you think of this whole idea, Helen?' And he looks at me sitting here center stage, see? And I say, I say--" She paused and ran her finger under a line on the script. " 'I think that's fine!' And then they go on with the play until he says, 'Do you agree to that, Helen?' and I say, 'I sure do!' Isn't that fun, Guy?" (49-51)

Mildred then asks when they can afford to buy a screen for the fourth wall. "'If we had a fourth wall,'" she explains, "'why it'd be just like this room wasn't ours at all,

but all kinds of exotic people's rooms” (50).

Over 30 years after Bradbury wrote Fahrenheit 451, the Palo Alto Research Center (PARC) ran experiments in what it termed “Electronic co-presence,” which bear a striking similarity to Bradbury’s “TV parlor.” Rheingold, in Virtual Reality, offers this description:

One wall of a room at PARC showed the video view of a room at another Xerox research facility in Oregon. People would schedule meetings, or they would just wander into their respective ends of the two-way, full-time, shared video space, and strike up a water-cooler conversation. (127)

PARC’s “Electronic co-presence” was but one of many examples of “pre-VR media cultures” that attempted, during the 1970s and 1980s, to bring a visually inclusive dimension to distant communications.

Despite the occasional success (the communications satellite, the slidewalk, the linear accelerator), science fiction is not a genre of prediction. At its best, science fiction holds up a mirror to society, and, in the reflection, society might see something about itself that it was not aware of. Fahrenheit 451’s 50-year old mirror remains clear and focused: declining literacy levels, youth violence, increasing militarization, and electronically generated realities. Bradbury’s “TV parlor” anticipates Myron Krueger’s VIDEOPLACE and Kit Galloway and Sherrie Rabinowitz’s “Hole in Space.” The shift from reflection to reality, though, involved several intermediate steps.

The invention of, and the popularity of, the motion picture were essential in the development of virtual reality. Actors had been performing in front of audiences for thousands of years, but a stage places limitations on the degree of intimacy and on the type of story that could be told. As well, the perceived size of the actor and the setting are chiefly determined by an audience member's distance from the stage. The concept of being "larger than life" might exist in an audience member's imagination, but the actualization of that concept on stage is much more difficult. A consequence of depicting stories through motion pictures is that everything, everyone, on the screen is larger-than-life.

As well, on film, any setting can be depicted in exquisite detail and stories can be told from any point-of-view. An audience can look over a character's shoulder, view a battle from up high, or see inside the human body. These allow for a more immersive experience than traditional theatre provides. But the immersive element missing from this new form of story telling was the third dimension.

Most films are projected in the two-dimensional plane, with width and height, but no actual depth. Before the computer-linked head-mounted display, before left eye/right eye computerized images were projected on screens, filmmakers were tackling the third dimension. Experiments with stereoscopic technologies had been taking place since 1858 (66). Edwin Land's work with polarization techniques led to the production of a 3-D film for the 1939 World's Fair (67). Unlike the red/green lens worn by viewers of some 1950s horror films, polarized lens are clear, but designed only to accept light with the correct polarity. This process allows for full-color, 3-D

films, because changes in polarity are invisible to the human eye.

Two filmmakers, one influenced by the other, helped prepare the way for virtual reality. In the late 1930's, Fred Waller linked several projectors and screens in order to provide "a wider field of view for films" (54). Waller then designed a flight simulator for the Air Force that employed five cameras and five projectors (54). His next efforts were more commercial, involving a system that required three cameras and three projectors (54). Movies filmed for Cinerama were "photographed by three synchronized cameras from slightly different angles, then projected in synchrony onto three screens that curved inward to wrap around the audience members' peripheral visual field" (54).

Sitting in a theater, watching a Cinerama film, Morton Heilig realized the importance of this new form (55). Describing watching TV or a movie as "looking at another reality through an imaginary transparent wall," he then imagined what would happen if that wall is expanded to provide a "visceral sense of personal involvement" (qtd. in Rheingold 55). He envisioned an "experience theater" that would "create a total illusion of reality" (qtd. in Rheingold 55).

Starting in 1954, Heilig began developing his ideas and trying to find someone, or some organization, to listen to him. What he wanted to do was "create an artificial experience that could fool people into believing they were actually occupying and experiencing a movie set" (55). His efforts, or the failure of his efforts, led him to Mexico, where he filmed documentaries and met the muralist David Alfaro Siqueiros (1896-1974). After sharing his ideas with various professionals who met

regularly at the home of Siqueros, he was encouraged to write an article that then appeared in the Mexican journal Espacios (55).

In the late 1950's, after failing to secure sustained funding, he built "a one-man version to convince the one man who would make the decision about the theater version" (qtd. in Rheingold 57). This booth-like device:

provided the user with a unique combination of 3-D visuals, stereo sound, vibration, wind sensations and city smells. The user sat on a seat and underwent a simulated motorcycle ride through Manhattan. Not only were the visuals compelling, the sounds realistic and vibration effects convincing, the introduction of smells such as exhaust fumes and food smells added to the realism. (Kalawsky 19)

"Sensorama was conceived as the ultimate film experience," Krueger explains, but "since it did not contemplate interactivity, was not an artificial reality as that term is currently understood" (66). The Sensorama Simulator appeared briefly in an arcade in New York City, but was "simply too complex for the arcade treatment" (58-59).

Heilig's efforts did garner two patents: Sensorama Simulator, #3,050,870, 28 August 1962, and Stereoscopic Television Apparatus for Individual Use, #2,995,156, 4 October 1960. The second patent was for a device that was the analog precursor of the computer-linked head-mounted display. Despite Heilig's foresight, he lacked the technological resources to successfully actualize his vision. What he needed was a computer.

## An “Undiscovered Country”

“The computer was the child of modern logic, an offspring of the marriage that took place between logic and algebra in the nineteenth century.” Jeremy Campbell, The Improbable Machine, 1989 (38)

The idea of the modern computer has existed since 1834. Charles Babbage (1791-1871) was a British mathematician whose varied interests and achievements influenced other thinkers and mathematicians, including Menabrea and Lady Ada Lovelace, for whom a programming language is named. He is chiefly remembered for his attempts to build computational devices. Through the early 1800s, Babbage attempted to build a large-scale “differential engine.” This device could “speedily” figure various tables, such as navigation and ballistics. The small-scale version sufficiently impressed the British government that it provided funding for his efforts.

By 1834, when the British government withdrew monetary support due to escalating costs, Babbage had moved on to a new idea, the “analytical engine.” The device never left the planning stage, but “it is remarkably similar in logical components to a present day computer” (O’Connor and Robertson). These components were the mill (central processing unit), the control (software), the store (memory), and the input (a keyboard, for example), and the output (a CRT display, for example).

Nearly a hundred years passed before technology and theory began to catch up

with Babbage's vision. The journey from Alan Turing's work on information theory to today's powerful and versatile personal computers proved complicated and erratic (Cortada 13). Technology advances, described as "generations," are distinguished by increased processing speeds, greater memory storage, and reduction of equipment size. Subsequent changes in human interaction with the computer paralleled each new generation. These changes can be divided into four overlapping stages marked by the number of people who have direct access to computers and the variety of ways that users engaged with the technology, leading to the advent of virtual reality and the unique space created by the University of Kansas Department of Theatre and Film.

Computer usage, at first, required a high degree of skill and knowledge on the part of the user. Computer operators were more often engineers than programmers, because the first computers, clunky and large, required regular maintenance and repairs. The great expense and technological limitations of computers also limited the number of organizations employing these devices. By 1954 the IBM 704, for example, had a memory capacity of only 8,192 words (46). "Only with such increasing amounts of memory," observes Cortada, "could one hope even to begin performing useful applications" (46).

As technology and software languages improved throughout the 1950's high-level staffs were still required, but computers now appeared in service-related industries. Still, these resources were centralized. "Users" submitted requests to the computer staff and the results were returned to the "users." Software applications chiefly involved number crunching and data processing.

Along with advances in hardware, software development was an important part of increasing computer usage. Cortada suggests: “One could [ . . . ] just as easily argue that developments in the 1940s and 1950s in software were at least as important [ . . . ]” (51). He adds, “Without the initial efforts in software, use of the computer would not have been possible, let alone practical” (51). The current prominence and promulgation of personal computers would not have been possible without advances in software development that are almost as comparable to those in the areas of processors and memory storage.

During the next progression in computer usage, the Defense Advanced Research Project Agency (DARPA), led by J.C.R. Licklider, began research into preventing disruption of electronic communications. Robert Taylor, while working for Licklider, was “responsible for initiating the creation of the ARPAnet,” the forerunner of the Internet. Intra-networks became inter-networks, enabling computer users across the country to communicate and interact with other users.

These, and other researchers, were involved in the development of shared computer resources. “The idea,” according to Rheingold, “was to create computer systems capable of interacting with many programmers at the same time, instead of forcing them to wait in line with their cards or tapes” (Tools 147). Keyboards and monitors made it possible for users to have their own workstations and take advantage of centralized computer processing resources. These “time-sharing” resources were allocated among users so projects requiring large amounts of computer time were not disrupted. Users needed a certain level of training and

knowledge, though not as much as in previous stages. Some users discovered there were times when computer resources were not in use, particularly at night, and took advantage of this “down time” for personal projects and games. These experiments took place at a level that still required users to be technicians and programmers, but according to Rheingold, “It is Taylor’s belief that the idea of personal computing was a direct outgrowth of what Licklider started in the early 1960s with time-sharing research” (Tools 209).

Before the locked door to virtual reality could be thrown open, though, computers and programs needed to be more accessible to all users. The Xerox Corporation, at the direction of Peter McColough, established the Palo Alto Research Center (PARC), where, during the 1970s, and led by George Pake and Robert Taylor, researchers developed tools and approaches that led to this necessary accessibility. For example, as early as 1974, PARC researchers had been using the Alto--a “personal computer” (205).

The Alto was Babbage’s “analytic engine” made small. The box containing the “mill” (central processing unit), the “store” (memory), and “the control” (software) fit beneath an office desk. The keyboard (“input” device) was joined by a palm-sized controller that the world would come to know as a “mouse.” The CRT display (“output”) provided a high-resolution screen with bit-mapped images. The Alto also possessed a feature that Babbage had not foreseen. The first Ethernet connection allowed users to communicate and interact with other connected users.

In about 30 years, the computer had advanced from an enormous device

requiring near-constant attention from trained professionals (stage one) to a “shared resource” that allowed access by multiple users (stage two) to the Alto, a “personal computer” that required minimal training by a user (stage three).

An increase in software applications, along with growing discussions concerning human/computer interaction, takes place during the overlap of the third and fourth stage. “In order to use computers effectively, people have had to make quite considerable changes in their habits and values,” contend Smith and Green, editors of the 1980 Human Interaction with Computers (vii). They and the other contributors recognized “how researchers in different disciplines approached problems of the impact of computers systems on human behavior” (vii). For example, M. J. Fitter and M. E. Sime came from the MRC Social and Applied Psychology Unit, at the University of Sheffield. In their essay “Creating Responsive Computers,” they note that the “quality of the [computer’s] response has become a matter of concern” during the previous decade, “with the development of the field of ‘Software Engineering’” (39). What made this possible, according to Fitter and Sime, were:

developments in interactive software due to improved graphics and manual input facilities which have permitted the user to be (and feel) in control of the system in a manner analogous to a driver being in control of his car. (39)

This analogy was a weak one, even in the 1970s, and will be further weakened as software and hardware improve and change to accommodate new computer users possessing little or no technical background.

Works published before 1983 demonstrate an attempt by computer engineers to grasp and to understand what was needed for the uninitiated to successfully interact with computer software. A list of design factors provided by Fitter and Sime included:

The quality of the interaction:--Most of the above factors combine so that when 'each is at its most demanding' the user, if he/she is to remain sane and stay in the job, will need a high quality interaction with the automated decision processes. There must be in some sense a genuine dialogue between the user and the computer. (41)

The language and thinking of computer experts was changing to accommodate not only leaps in technology but also the inclusion of non-expert users. Phrases such as "People-responsive," "quality of interaction," and "dialogue between the user and the computer" indicated a new awareness among experts of how the non-expert users needed and wanted to engage with this technology.

The increasing availability of the desktop computer, or "PC," as IBM would dub it, led to the fourth and current stage of computer use. Shifts in software design paradigms were as crucial to this stage as were advances in computer technologies. Exponential leaps in miniaturization, processing speed, memory, and reliability, allowed software programmers to become software designers. The realization that more and more computer users were not programmers, would not be interested in the inner workings of the computer, and would require, if not demand, applications that performed tasks similar to those accomplished without computers led Apple

Computer's designers to develop the first mass-marketed desktop display--  
iconographic, familiar, and accessible.

The Apple Lisa was not just the next leap in computer technology. It represented the paradigm shift needed for the personal computer to become a more direct extension of the untrained user. Benjamin Woolley, in Virtual Worlds, describes his first encounter with Lisa:

Notwithstanding the absence of any sort of manual, I set about seeing what I could learn in the allotted time [20 minutes]. Soon after switching on, I saw what was then the revelatory sight of a "bit-mapped" display, the full graphic glory of Lisa's "desktop." I quickly learnt how to use the mouse to perform simple operations, such as "picking up" an icon depicting a folder marked "blank paper," "dragging" it across the screen and "dropping" it into another little icon entitled "rubbish bin." There were pictures of a clock, a calculator, both fully operational, plus icons depicting filing cabinets and stationary cupboards. (148)

Today, computers users not only take for granted these desktop options, but also expect a great deal more from the Graphical User Interface (GUI). Lisa, and her descendant the Macintosh©, heralded the end of the monochrome screen, with its blinking cursor representing the only key to unlock the computer's potential.

Apple Computer only led the way. The Microsoft Corporation, a few years later, introduced Windows©, its version of a desktop display. Video game makers,

such as Atari, were also changing previously held notions about human-computer interfaces, incorporating sound and various input devices that allowed users to readily manipulate and interact with the onscreen images. Increasing computing power, changes in thinking regarding software, and the availability of varied input and output devices lifted “virtual reality” as a concept off the figurative drawing board, creating a laboratory space where engineers, thinkers, and artist could begin to explore this “invented world.”

## At the Crossroads

“VR as we know it today did not flower directly from the work of Heilig or Krueger, but from an intersection of computer science, stereoscopy, and simulation, in academic, military, and commercial research laboratories” --Howard Rheingold, Virtual Reality, 1991  
(127)

The men and women who “discovered” the worlds of virtual reality should be thought of as explorers. But, are their accomplishments similar to those of past explorers? In order to find their way to the “New World,” European explorers required the invention of devices that would aid them in determining a ship’s location on the ocean and the path it must follow to reach a distant shore. The compass, the astrolabe, the telescope, and a clock that could function on a moving ship were the devices necessary for Europeans to locate the American continents and return to them on a regular basis. The value of the clock remains apparent in the manner in which minute global locations are identified by the use of hours, minutes, and seconds. The distinction that must be made, however, is that just as these devices did not help explorers discover a “New World,” these same devices did not help create a “new world.” The same distinction cannot be made of the input/output devices that allowed engineers and artists--explorers in their own right--to find their way to the “created spaces” of virtual reality.

The commonly held, and incorrect, mythology of Christopher Columbus describes him valiantly attempting to persuade Europeans of the notion that the world is round. In that vein, though, Doug Englebart struggled for more than a decade to convince computer experts that their world was indeed round and that undiscovered countries could be reached by allowing computer users to interact with this device. Even when notice was taken in the early 1960s, the attention was limited to two like-minded men and an obscure U.S. government agency. J. C. R. Licklider and Bob Taylor believed in the shape of the computer's world, and the Advanced Research Projects Agency (ARPA) provided the "jewels" so they and Englebart could go exploring (Rheingold Tools 178-81).

Everything Englebart pursued, first for ARPA, then for his Augmented Research Center (ARC) was driven by the premises he set out in his 1963 paper "A Conceptual Framework for the Augmentation of Man's Intellect." For him, "[A]ugmenting man's intellect involved "increasing the capability of a man to approach a complex problem situation, gain comprehension to suit his particular needs, and to derive solutions to problems"" (qtd in Rheingold Tools 181). Achieving this increase in the capability of people would require four "augmentation means": Artifacts, Language, Methodology, and Training (182). These components can be assembled to form a "'repertory hierarchy'" (183):

"This repertory looks like a toolkit. Just as the mechanic must know what his tools can do and how to use them, so the intellectual worker must know the capabilities of this tools and have suitable methods,

strategies, and rules of thumb for making use of them.” (183)

The computer, as the “artifact,” would become the central tool that linked and held together all of these augmentation means.

The conceptual underpinnings of today’s desktop computers were fashioned during the 1960s by Englebart and his team at ARC. Consider the feature that allows users to engage in “word processing”:

“This hypothetical writing machine thus permits you to use a new process of composing text. For instance, trial drafts can rapidly be composed from rearranged excerpts of old drafts, together with new words or passages which you insert by hand typing.” (184)

For today’s users of Microsoft Word© or Adobe WordPerfect©, the above is obvious because word-processing programs are now jejune. Yet, this description appeared in Englebart’s seminal 1963 essay, wherein he described a tool that existed only in his imagination. He and ARC researchers believed, and acted on the belief, that the computer as a tool could be used for more than entering data or issuing commands to other devices.

In 1968, at the Fall Joint Computer Conference, in San Francisco, Englebart, sitting alone onstage, but linked to his team by way of microwave relays, demonstrated to thousands of his peers what the “New World” looked like. What they saw would be familiar to most of today’s computer users: a searchable word-processing program and an accessible system for file organization, as examples. He was, according to Rheingold, “the very image of a test pilot for a new kind of vehicle

that doesn't fly over geographical territory but through what was heretofore an abstraction that computer scientists call 'information space'" (190).

As far as virtual reality is concerned, Englebart's presentation involved the use of a never-before-seen device. Cameras linked to projection displays allowed his peers to see his computer station and what he did there. They could see the typewriter keyboard where he entered text, a five-key number pad where he entered commands (specifically to change camera views), and a palm-sized device that let him navigate through the "informationscape" of his computer (190). This device, which years later would be dubbed "the Mouse," was the first input device designed to take advantage of the computer as a location, or "space."

The effect of this innovation on the thinking about and the advancement of computers can be compared to the effect Galileo's telescope had on the science of astronomy. Though this telescope was not even powerful enough for Galileo to discern the formations orbiting Saturn as rings, his observations demonstrated that the universe was greater and more varied than previously realized. Armed with this insight, astronomers pushed at the boundaries of observation with not only more powerful optical but with devices able to view the universe in ways the human eye cannot. So it was with the "mouse."

During the years between Englebart's introduction of the "mouse" and 1989, when "Virtual Reality" became a familiar enough expression to get its own topic heading in The Reader's Guide to Periodical Literature, a range of input devices appeared on the scene. Light pens, joysticks, scanners, and data gloves, for example,

provided computer users the means to enter information other than text and numbers, and, in the process, create spaces and locations that could only exist in the computer. The next (and sometimes concurrent step) was to develop output devices to allow users to more fully experience these spaces.

Researchers such as J. C. R. Licklider and Ivan Sutherland began to develop more sophisticated output devices and graphics software. Licklider had turned to the nascent field of computer modeling to develop a visual, digital means to examine data from his work as a psychoacoustician (Rheingold Virtual Reality 79-81). Programs like Whirlwind and SAGE made it possible to depict, for the first time, aircraft controls that looked and performed like the real thing (80). Rheingold asserts that Licklider's appointment as director of DARPA's Information Processing Techniques Office "marked the beginning of the beginning of the age of personal computing, and set the stage for virtual reality technology in more than one way" (81). The door to virtual reality had been unlocked.

Sutherland, hired by Licklider, was the first to peek inside the door to the wide-open rooms of virtual reality. During the mid-1960s, he began experimenting with computer-generated graphics that, when linked to head-mounted output devices, immersed the user in a virtual world. The devices were ungainly and heavy. The computer-generated graphics were three-dimensional objects composed of gridlines, which suggested little of an immersive artificial reality.

Several years before Jaron Lanier popularized the phrase "virtual reality" (Kalawsky 35), Myron Krueger had created computerized worlds under the rubric

“Artificial Reality,” which is also the title of his 1983 book, revised in 1991. He writes, in the 1991 preface, “Artificial reality perceives human actions in terms of the body’s relationship to a simulated world. It then generates sights, sounds, and other sensations that make the illusion of participating in that world convincing” (xii).

Howard Rheingold, in his 1991 book Virtual Reality claims Krueger “qualifies to be called one of the founding fathers of cyberspace technology” (114). Rheingold devotes space to lamenting the lack of recognition for Krueger’s contributions. The most public example occurred in “April, 1989, when The New York Times ran their first front-page article on ‘What is Artificial Reality?’” (115). Though Krueger “invented the term,” his name was not mentioned.

One of his more delightful experiments in the creation of convincing simulated realities is the Auto-Desk HiCycle. A participant, wearing a head-mounted display (HMD), while riding a ten-speed bicycle attached to an exercise wheel, views a simulated landscape moving relative to the speed of the pedaling. If the cyclist pedals fast enough the landscape falls away and is replaced by the impression of flight. Altitude, velocity, and distance are all determined by the effort of the cyclist. The role of observer, or audience, becomes tertiary to the roles of participant and collaborator.

The people thinking in-depth about this fast growing, quickly evolving phenomenon appeared reluctant to provide a solid definition of virtual reality. It is possible that these thinkers did not want to get pinned down to avoid having their definitions come back and bite them in their hindquarters if and when the direction of

the field shifts. What I want to do here is offer three perspectives on virtual reality, and then closely inspect their contents to reveal what I believe to be the core requirements of any VR construct.

Krueger underscores his assessment of artificial reality with this particular codicil:

Since the complete repertoire of video, computer graphics, and electronic music are amenable to computer control, rich relationships can be established between an individual and the environment. The environment can be controlled by a preexisting program, or operators can intercede and use the computer to amplify their ability to interact with other people. (xii)

The operator's ability to "intercede and use the computer" as part of the VR event has become the dominant paradigm of human/VR interactions. From VR games, such as 'Dactyl Nightmare, to the training simulators for professional pilots, we want to be able to participate, not merely observe. Krueger's HiCycle isn't a preprogrammed journey that is merely witnessed by the participant. The operator decides how high and where to fly in the simulated reality. This interaction leads to the second perspective on virtual reality.

In Virtual Worlds: A Journey into Hype and Hyperreality, Benjamin Woolley offers, as an example of Randal Walser's "cyberspace playhouse," Virtual World Entertainments' BattleTech Center, "described by its developers as 'the world's first multiplayer, interactive, real-time simulator allowing people to exist and interact in a

virtual universe” (162). This claim ignores the history and prevalence of text-oriented on-line games known as MUDs, or Multi-User Dungeons, played by college students over the Internet years before BattleTech came on the interactive scene. The BattleTech Center allows participants to “sit in a simulated battle tank cockpit, which they maneuver around a virtual space seen through a 25-inch screen,” and by networking these battle tanks, participants are able to see the other vehicles as their drivers attempt to destroy one another (162).

In this example, the VR event is determined and actualized by the participants. The purpose of the event is straightforward: victory over your opponents. But it is in the efforts of the six players that the VR event is created—an event that will, despite occasional similarities, never be duplicated from game to game. Therein lays the magic and vitality of virtual reality: the ability to create a unique, interactive event in real time. The same can be said of the theatre event, in which the audience participates, if only on an empathic level. The theatre events takes place in real time, and is never the same from performance to performance.

My hands-on experience with VR technologies before my involvement with The Adding Machine: A Virtual Reality Project included ‘dactyl Nightmare and the Black Hawk helicopter training simulator at Ft. Riley, Kansas. In 1993, I encountered ‘dactyl Nightmare at Fort Hays Community College, in Hays, Kansas, where I was shepherding high school speech students. This game was part of a tour of colleges and universities. For \$2 each, two participants stepped onto circular platforms surrounded by a waist-high rail, which prevented the HMD-wearing players from

falling off the platforms. Players also wore a belt containing electronic components connected to a cable that led to a mock pistol.

Players saw through the HMD goggles a computer-generated landscape composed of a black sky, freestanding columns and arches, and a checkerboard floor extending to the horizon line in every direction. The object of the game was to destroy one's opponent by shooting a slow, lazy white dart from the pistol. When the dart struck the simplistic form that represented the other player in this VR world the computer-generated figure would explode in to several pieces. To complicate this activity, opponents had to keep a look out for a pterodactyl that might swoop down, pick up an opponent, and fly away. At a certain height, the animal would drop the player, who would then experience a fall to the ground before breaking apart. The graphics were in primary colors, there were no shadows or much dimension to objects, and the update speed of the graphics was just below what the human mind expects.

The 1993 graphics for the multimillion dollar military helicopter simulator were as primitive as those for 'dactyl Nightmare, but the equipment surrounding the output devices made up for this simplicity. Housed in its own building on the Army post, the simulator rests in a room the size of a small airplane hanger. A mock-up of the helicopter's snout and pilot control assembly sits atop an arrangement of hydraulic lifts and motorized armatures that simulates the motion of the helicopter in flight.

My guide, the day I visited the simulator, was Wallace Bonds, a friend and

Black Hawk helicopter pilot. After he introduced me to the computer technician, he directed me to sit in the pilot's seat. He took the co-pilot's seat and the technician sat behind us next to a computer display connected to the supercomputer housed in a large, metal case. The windshields were actually computer monitors that displayed a simplified exterior: green for the ground and hills, dark blue for rivers and other bodies of water, and light blue for a sky occasionally interrupted by clouds.

Wallace directed me to fasten my safety harness while he started the engine, which was accompanied by the appropriate sounds and vibrations. While he operated controls, I watched the computer-generated scenery change, providing the illusion of movement as Wallace gently got us airborne. Once we were several hundred feet above the ground (according to the altimeter and the computer graphics), he set the helicopter to hovering and provided brief instruction on how to operate the foot pedals and hand controls.

It was when I took "control" of the helicopter that I noticed how thoroughly the mechanical part of the simulator responded to a trainee's efforts. My complete lack of flight experience caused the cabin area to be tossed about as if it were a small boat on heavy seas. Wallace proved to be a patient and steady instructor, taking control of the craft when it appeared it was about to crash. Within minutes I gained a modicum of control and began flying about.

Before I could get too cocky about operating a simulator of a multi-million dollar military aircraft, the computer technician decided to participate. A keyboard command introduced a Soviet HIND helicopter to the computerized landscape.

Depicted in red, and composed only of simple geometric shapes, this aircraft was still a threat to us, which became obvious when it launched a missile. Wallace demonstrated his training when he launched a missile in return and told me to turn to starboard. The technician also proved he could manipulate the vehicle's flight controls. As I was flying us back to the helipad, he directed the computer to cause something to malfunction. The helicopter lost power and started losing altitude. Before I could even ask what to do, Wallace reached up to flip a switch. Power returned, and he explained that a generator had failed. The technician allowed us to return to base without further difficulties.

Upon reflection, I realized 'dactyl Nightmare and the Black Hawk simulator possessed a degree of theatricality. Each had performers, conflict, and an audience. The performers were the players and pilot trainees. The conflicts were straightforward, whether it be defeating one's opponent or keeping a helicopter airborne, but still proved compelling for the participants. For 'dactyl Nightmare, the audience was made up of those people who stood around the computer monitors linked to the game. The audience could watch the opponents fight each other and try to avoid the pterodactyl. The computer technician was the immediate audience for the helicopter simulator, for he observed the trainees' efforts from his computer monitor. Unlike traditional audiences, though, he could and did influence the outcome of the action. This link between VR technologies and theatre brings me to the third perspective about VR.

Mark Reaney, the designer/technologist for the University of Kansas

production of The Adding Machine: A Virtual Reality Project, sets out in his 1995 article “Virtual Reality on Stage” to examine similarities and differences between theatre and VR. One of the similarities between “VR and theatre is that both occupy three-dimensional space and, more often than not, rely on some form of illusion to suggest the form of that space” (37).” He also contends “Theatre is the original virtual reality machine. Accessing it audiences can visit imaginary worlds which are interactive and immersive” (28).

Reaney has, in those two words, “interactive and immersive,” boiled VR down to its ultimate essence. Through the use of HMDs, or cockpit simulators with computer screens for windows, which limit peripheral views and outside intrusions, a participant or operator is immersed in the particular world displayed on the screens. Once there, the technology creating the imaginary world offers the operator choices to become a part of that world and to interact with other users in the virtual landscape.

For centuries, though, long before Ivan Sutherland, the “father of computer graphics,” proposed the concept of the “head-mounted three-dimensional display” (Woolley 41), traditional theatre, from the amphitheatres of ancient Greece to the thrust arrangement of the Guthrie Theatre in Minneapolis, offered experiences that were indeed immersive and interactive, and made possible by the technological means available at the time. Reaney refers to theatre as a “machine” for a reason. Theatre is just that--a machine composed of animate and inanimate parts that make it possible to transport audiences to other worlds.

Richard Schechner, in Environmental Theater, has described this traditional

theatre as “an autonomous, self-contained (separate) drama performed by one group of people who are watched by another group” (45). This simple rendering is, on the surface, and, as it serves Schechner’s purposes, accurate; but it neglects theatre’s interactive and immersive qualities--qualities so interconnected one is not available without the other. It begins with a contract between audience and artist. An audience agrees to remain attentive and to respond appropriately to the developing action if the artists, in turn, create an experience that is compelling and engaging. The audience, then, gives itself up to, or immerses itself in, the world generated by the playwright and revealed by directors, designers, technicians, and actors.

Interaction usually takes place on an empathic level. We can recognize most readily those audience responses that register audibly: laughter, surprise, applause. Yet, some other exchange also takes place. As an actor, I have often experienced what I describe as an exchange of energy across the fourth wall. When the audience is with me, when I am doing my job and the audience is engaged in the play, those people give something to me that I transform and add to my performance, then send back out across the footlights. This is interaction, participation, and collaboration. The more successfully an audience can be engaged, the closer it is brought to the theatre event.

If interaction and immersion have been a part of theatre for centuries, why bring virtual reality technologies into the mix? In what ways can VR improve the theatre event? Mark Reaney set out to answer these questions when he first proposed a virtual reality production at the University of Kansas.

Before examining how the first “live, virtual reality” experiment came about, it is worthwhile to take a brief glimpse at the work of one person who, in the years preceding Mark Reaney’s decision to put VR onstage, explored how theatre theory could benefit human-computer interaction.

As mentioned before, virtual reality staked its place as a cultural concept in 1989, when The Reader’s Guide to Periodical Literature listed it as a topic heading for the first time. Two article titles appear beneath the heading: “Surgery in Space,” by Ann Gibbons, in Technology Review, and “Mondo Media,” by Stewart Brand, in PC Computing. The first article describes experiments in “telepresence,” with the goal of providing medical care to astronauts in space while the doctor remains on earth. The starting place was the “virtual environment workstation” (9). This “headset [. . .] tested by scientists at NASA’s Ames Research Center in Mountain View, Calif., and physicians at Stanford University Medical Center” attempted to provide the feeling of “standing in an operating room hundreds of miles away” (9-10). The phrase “virtual reality” only appears in the final sentence, when Gibbons sums up NASA’s efforts: “Aspiring surgeons could enter a virtual reality,” where “they would operate on virtual patients with virtual scalpels, at worst taking virtual risks.” (10). The phrase “virtual reality” does not appear at all in “Mondo Media.” Stewart takes the reader on a tour of MIT’s Media Lab, “built around Negroponte’s conviction that something big and convergent is happening to the whole gamut of communication media,” wherein computers were “infesting and transforming all of them” (140). Except for a grand piano connected to a computer, which could “record every imaginable nuance of the

masters [. . .] invited to play it” (146), the Media Lab projects described in the article did not have as their focus art and technology.

Brenda Laurel, though, had spent the 1980s putting her theatre background to use to help improve human-computer interface design. In 1977, while a graduate student in theatre, Laurel went to work for CyberVision, “working primarily on interactive fairy tales and educational programs for children” (11). When that company became defunct, she was hired by Atari, where she found “the notion of ease of use as a design criterion fit neatly and permanently into my developing intuitions about how theatrical expertise could inform the art of designing software” (11-12). From 1977 to 1991, she designed computer games, researched ways to improve human-computer interfaces, completed her dissertation Toward the Design of a Computer-Based Interactive Fantasy System, edited a mammoth essay collection The Art of Human-Computer Interface Design, and wrote a book that brought together her two great interests.

Computers as Theatre offers “a dramatic theory of human-computer activity” (xvii). As well, it “attempts to provide a comprehensive theory of form and structure for representations in which both humans and computers participate” (xix). In his foreword, Donald Norman, founder of the Institute for Cognitive Psychology and author of Things that Makes Us Smart, asks, “When we look toward what is known about the nature of interaction, why not turn to those who manage it best--to those from the world of drama, of the stage, of the theatre?” (xii). The notion of “representation” is the key to linking theatre and “human-computer activities” (22).

For Laurel, these “activities are ‘really not real’ in precisely the same ways” (22). “Without representation,” she argues, “there is nothing at all--and theatre gives good representation” (22). The text provides an examination of human-computer interface design, an explanation of theatre theory, and an exploration of how theatre as an interface metaphor can contribute to improving software design.

The 1991 version of the book concludes with a chapter titled “New Directions in Human-Computer Activity,” wherein Laurel extrapolated upon existing technology to reveal possible trends. One of those trends concerned virtual reality. The idea of VR existed on a “continuum that is older even than science fiction,” and the precursors of this relatively new phenomenon had a similar objective: “Heightened experience through multisensory representation” (187). So, Laurel offered this summation and assessment of the state of the technology in 1990:

What we have in today’s virtual-reality systems is the confluence of three very powerful enactment capabilities: sensory immersion, remote presence, and tele-operations. These capabilities do indeed hold enormous promise, but they will not make the central challenge go away--that is, designing and orchestrating action in virtual worlds.

(188)

VR, for Laurel, had potentials but shortcomings. The 1993 revised version of Computers as Theatre includes a new chapter titled “Post-Virtual Reality: Now that the Hype is Over.”

“A lot has happened in the last three years.” begins Laurel. “In 1990, as I was

finishing up this book [. . .] the VR phenomenon was approaching the elbow in its pop-culture curve” (199). She goes on to describe how VR was oversold by the entertainment industry, comparing virtual reality’s sudden decline to that of Atari’s in the 1980s (199-202). “VR pundits learned, or should have learned,” writes Laurel, “that the worst thing you can do is fire up public expectations when you can’t deliver product by Christmas” (202). This passing of a fad was not the passing of virtual reality, though.

Ongoing research demonstrated that “VR was the nexus that revealed new synergies and gave each of them new impetus and arenas of expression” (202). Underlying these “synergies” and “arenas” was a greater realization that fundamental interaction with a computer is “not sensory or perceptual but cognitive” (203). Laurel observes: “Our experiences with VR to this point also confirm that human experiences in virtual environments are enhanced by dramatic forms and structures that support complex emotional textures” (203). Interaction with computers requires a cognitive and an emotional component actualized through purpose.

Laurel’s professional purpose is to employ theatre theories to improve the human-computer interface. Computers as Theatre does not include an examination of how computer theory could improve theatre--either in theory or in performance. In 1994, the University of Kansas Department of Theatre and Film decided to apply virtual reality technologies to theatre. The eventual result, The Adding Machine: A Virtual Reality Project, was the testing ground for incorporating VR technologies and paradigms in the production of a traditional, established play.

## “A New Place to Stand”

“At some point, several thousand years ago, the older physiological intoxicants of plant infusions, song, dance, and sexual frenzy were replaced by new abstractions--dialogue and plot, props, masks and choruses--that simulated the original Dionysian ecstasies by arousing similar feelings in the audience. Indeed, the famous masks of Greek drama are now known to have been audio devices designed to amplify the sounds of the actors' voices in the open-air amphitheaters, which were also constructed for their acoustic properties; and devices such as cranes to suspend flying figures of the gods were used to create special three-dimensional effects.” Howard Rheingold, Virtual Reality

Theatre scholars and artists are often intrigued by and eager to explore collaboration between actors, between director and actor, and between designer and director. But theatre, by its immediate nature, involves another collaboration as vital to the theatrical event as those between actor and director, of artist and audience. The development of the technical side of theatre has often concerned with improving the audience's participation in the theatre event. Electric lighting, for example, not only improved the audience's ability to see what took place on the stage, but also allowed designers to integrate lights into the presentation of theme and metaphor. If the theatrical event can be viewed as taking place somewhere between the actor and the

audience, then these technical improvements have shortened the distance of the audience from that event and have increased the level of collaboration. What, though, of new technologies, such as those upon which virtual reality is based? Can these technologies decrease the distance of the audience from the event and in the process increase collaboration? An analysis of this question must involve an examination of a specific attempt at VR theatre--the 1995 production of The Adding Machine: A Virtual Reality Project, at the University of Kansas.

An exploration of the University of Kansas Department of Theatre and Film's experiments with live virtual reality theatre must begin with the people who made it possible. Of the many artists, technicians, and performers involved, from 1995 to 2001, Mark Reaney, Ron Willis, and Lance Gharavi were the trailblazers. Each, in their own way, laid the groundwork, set the direction, and set out on the different experimental paths.

Often listed as designer/technologist, Reaney is tall, with a boyish face, and an easy manner that masks a quiet passion for theatre and computers. While an undergraduate, he "studied computer programming for about a year" because his mother wanted him to "have something to fall back on" (Personal Interview). He adds, "that was back in 19--probably '80 or '79 or something like that--so we were studying Basic and Pascal and Advanced Basic and all of those currently archaic programming languages."

He went on to earn a Bachelor of Arts in theatre, at St. John's University, graduating in 1981. By 1984, he had earned a Master of Fine Arts from the University

of Wisconsin, Madison. In 1986, during his final year of teaching at the University of Tulsa (1984 to 1987), he returned to his interest in computers. He began linking his pursuit of theatre and interest in computers while at the University of Kansas (1987 to the present).

A new faculty grant allowed him to buy a Mac+, a pen plotter, and software, which was “drafting and some basic paint programs back in those days.” Reaney explains:

It was all bitmap black-and-white . . . and it was all self-taught. None of that had anything to do with anything I learned in computer programming class. It was just using commercial software in new ways, which has been the hallmark of all [our] work ever since, perverting perfectly good software into theory as theatre users.

He describes these early efforts to apply computer technology to theatre as “terribly naïve.” But he also realizes that “at the time, no one was doing anything because these new . . . tools were new to everyone.” He then describes the progression as moving from “simple bitmapping and photo manipulation and basic drafting and then a couple of years later to modeling, and after modeling, then real-time modeling, and finally, into virtual reality.”

Specifically, Reaney began designing and modeling sets using Virtus WalkThrough. The program, chiefly designed for architects, allowed a user to generate geometrical designs for three-dimensional depictions of buildings, rooms, or landscapes. Having created these spaces, a user could “move” around them, seeing a

building from all angles, then “walking through” a wall to move about inside. Reaney would create a stage setting then print a line drawing of the view an audience would see. He would then paint a rendering of the set to show to the director and production staff:

The early experiments, we typically disguised the technology before showing it to the director. I’m not sure Jack Wright, with Streetcar, ever knew, because that was one of the earliest ones that that came from a computer program.

He let the directors of Laundry and Bourbon and Lone Star in on his secret, because “We were . . . completely reconfiguring the stage, and so people weren’t sure how that was going to look, so the computer model helped sort that business out.”

As part of an experiment, Reaney set up a projection screen on the Crafton-Preyer mainstage. He then projected his Virtus Walkthrough design of A Streetcar Named Desire on the screen. He demonstrated to other faculty and staff how computer-generated set designs manipulated in real time could allow a director to “walk around” on a set before it was built.

Early on, though, directors and actors looked at the technology first and its purpose, second. Ron Willis’ “response probably was typical”:

You have to deal with the reaction to the technology as a separate issue first. The director will sit there and go “Oh, cool, look at that!” without even thinking about the show. They want to see this and kind of see how it looks and how it works . . . and then later you have to

talk about the show.

“And it could be,” Reaney decides, “that it was too new at that time.” He hasn’t encountered that reaction “since those early days.” Now, when he presents a computer model of a scenic design, the directors offer an “‘Oh,’ and then start talking about the design right away rather than talking about how it was done, how it was modeled and junk like that, which is good.” He contends, “We’re past talking about the hammer for the sake of it’s a hammer--‘Wow!’--and talking about what it’s building, what it’s being used to build.” If theatre artists, at least those at the University of Kansas Department of Theatre and Film, are “past talking about the hammer,” it is the result of efforts by Reaney, and others, to experiment with computers, software, and theatre.

Reaney, though, had to first decide to fashion that hammer. He describes the moment of inspiration thusly:

[I]t was one of those sort of scary moments of inspiration[. . .] the idea sort of fell on me all at once. I think it was during one of those early peer research trials projecting something on the stage and standing out in front and looking at it and everything like that. And it just sort of occurred to me all at once that we could have a moving, real-time Virtual scene going on, and as a designer I’ve kind of learned to not trust those flashes of inspiration. Usually that means you haven’t thought it out really to the end, and I think to some extent that might have been true. I thought it would be an easy thing to do. And so then

I just had to sort of sit down and think, you know, would this work? How would this work? What would we need? And it all looked doable. So then I said, "Let's do it." I guess that's what peer research is for, to often inspire practical research. That's exactly what happened in this case.

Reaney knew he couldn't do this experiment by himself. He could design the scenic elements and assemble the technological components, but he needed a collaborator, a director to gather the discrete pieces in to an artistic whole. He found, in Ron Willis, that collaborative force.

"I decided to do it," says Reaney, "and I proposed it to the production committee about the same time that I went right to Ron and said I have to do this, I want you to direct it." During Reaney's first five years in the KU Department of Theatre and Film, he and Willis had not worked together due chiefly to scheduling conflicts. "And then all of a sudden we did about four or five [shows] in a row as we got into The Adding Machine. By that time, I mean, he liked computers, I liked computers, we were going to do this thing, so he was the obvious choice."

Now Professor Emeritus, Willis is a bear of a man, with a permanent mischievous gleam in his eye. His directing experience is inclusive, running the gamut from Greek tragedy to Shakespeare to American realism to original works. He has taught and directed for the University of Kansas Theatre and Film department since 1970.

He describes his technology background as "very sparse. I'm a user of E-mail

and other low end needs, so I didn't bring to this transaction very much in the way of computer expertise at all" (Personal Interview). Yet, Willis has had a tendency to adopt new technologies. When e-mail became available to University of Kansas students, he required his Introduction to Theatre students (who numbered in the 100 plus, each semester) to obtain an address so he could communicate with them. Regarding virtual reality, he admits, "I think I had some interest in it simply because it's an interesting thing generally." Reaney, though, says Willis:

was just excited about the technology. We could talk about the technology and he'd be excited about that, and we could talk about the design and how the show looked, separately, because he's always been a technophile, so, you know, you just couldn't do anything wrong.

(Personal Interview)

Lance Gharavi's experience and background were similar to Willis'. In 1993, while in his twenties, he "was a Mac user, and that was back in the very, very early days of electronic communication by computer." He remembers, "I was using e-mail, and the web was pretty new at the time. . . . [I]t hadn't reached the point where [ . . . ] Reynolds Wrap was putting their web address on boxes quite yet."

Gharavi was pursuing a Master's Degree in theatre when he attended a presentation given by Reaney, who described his use of Virtus WalkThrough to design sets and present them to directors (Personal Interview). "And that was all very fascinating to me and wonderful," Gharavi said, "and then he started talking about what he wanted to do was try to create a production that skipped the building process

and just used these virtual designs as the scenery themselves.” His excitement about “this prospect and by the [ . . . ] interesting possibilities it might create for theatre production and for the theatre not just as a spectacle but a kind of philosophical inquiry into reality” led him to approach Reaney at the end of the presentation. “Mark, this just sounds fantastic, but we have to [ . . . ] actually try this and not leave it on the drawing board. I want to be involved in it. Do you need a director?” Reaney told Gharavi that Willis and he had decided to pursue this and that Willis would direct whatever production was selected. Reaney, though, invited this Master’s student to join them. “While still in the process of selecting a script,” Gharavi explains, in his essay “i.e. VR: Experiments in New Media and Performance,” “Reaney and Willis invited me on board the project as an assistant (or ‘general factotum,’ as Willis referred to me)” (255).

The University Theatre, the production arm of the Theatre and Film department, had to approve Willis and Reaney’s proposal, and a play had to be selected for this experiment. At this time, the University Theatre production committee selected a season by reviewing proposals submitted by faculty and students. The formal proposal required the submitter to answer three questions. What is the play? Why do you want it produced? How would you go about producing it? Of these three, the first question was the most important question for the committee. Reaney describes the production committee as very “title driven”:

There seems to be some idea that you can formulate a season that will be successful on titles alone. You know, this one will sell; this one

won't sell, rather than what you're going to do with it or whom it appeals to or anything like that. (Personal Interview)

Willis, who had served as the director of University Theatre from 1976 to 1989, was well aware of this aspect: "You have to bear in mind that when we did this, we did this with an idea toward virtual reality exploration, but we still were trying to fit into a season" (Personal Interview).

To compound their difficulties, they were proposing a theatrical and technological experiment with no precursors. Willis explains:

I want to underscore, that for The Adding Machine this was all in the realm of theory and hoped for expectations. We didn't have much in the way of a track record in any direction to look to. We wanted to do the virtual reality project. That's what we decided first--that we wanted to do something that would allow virtual reality to be tested as we envisioned it.

Reaney confirms this take: "We just knew we were going to do it. And the production committee humored us. At least they let us keep the proposal on the table while we searched frantically for a title."

They were searching for a play that contained two qualities. First, the play had to have already been produced, to have had a "track record" within traditional, conventional settings. This criterion was to be the distinguishing element of the experiment. The creative forces driving this effort wanted to "avoid the stigma of gimmickry" (Gharavi 255). To do so, Willis and Reaney sought "a play that would be

impacted by the use of this technology, a play that would allow them to explore the expressive and interpretive capabilities of VR [. . . .]” (255). Reaney and Willis sought to incorporate virtual reality technologies and paradigms into a previously produced work. As Reaney explains, “if we could find a good existing theatre piece that fits into a good existing notion of what ‘virtual reality’ is [. . .] that would be a good first experiment” (Personal Interview). “But what we wanted,” Willis clarifies, “was something that would allow some fantastical development, something that involved multiple changes, something that had a strong emotive context that would allow us to hook visual imagery to some kind of inner emotional state” (Personal Interview).

Willis describes the search for a title: “we started with the possibility of any shows that would meet these demands.” Many titles were considered, including A Midsummer Night’s Dream and Ionesco’s Marin with Bags. According to Reaney, they “searched titles for the longest time. And then, finally [. . .] I remember, we were sitting in The Green Room and [. . .] we were talking about some other American titles, expressionism, that suggested it to us. And, suddenly: The Adding Machine.” He adds, “I just remember doing it when I was in grad school and what a great idea that would be.” What swayed the decision, according to Willis, is that “Adding Machine also has a great advantage of having a kind of need to be performed again. I mean, I’m sure that there are a lot of people who don’t believe they have to see yet another Midsummer Night’s Dream, and Ionesco’s piece was a relatively obscure piece.” By deciding that The Adding Machine had a kind of need to be performed

again, “Willis, et al. produced the first experiment of live, virtual reality theatre using a play that was, when first produced, at the vanguard of a new artistic movement.

Written by Elmer Rice, The Adding Machine is the second example of expressionism in American theatre. The play appeared shortly after Eugene O’Neill’s expressionistic play The Hairy Ape, produced in 1922 (Brockett 633). Both efforts were the result of the importation of German expression, which theatre scholar Marvin Carlson describes as “the most significant theatre avant-garde of this period [early Twentieth Century]” (346). Dramatists such as Döblin, Sorge, Hasenclever, and Strindberg wrote plays that “exalted subjectivity and vitalism, and favored abstraction, distortion and lyric excess over mimesis and formal beauty” (346-47). Though this movement had much in common with other parallel movements (futurism, surrealism, and dada), many of its practitioners did not share “futurists’ fascination with modern machinery and the products of industrial society” (346). Instead, these artists “tended to feel that the spirit of the individual was being crushed by these developments” (346). The events of World War I seemed to confirm this view, leading the movement, which had “no single leader, no central manifesto,” to bifurcate (347, 348-349). Dramatists like Toller and Hasenclever created a “political drama” that depicted “the struggle of the spirit against reality,” claiming “that we are all sons, but that we are more than sons; we are brothers” (qtd. in Carlson 348). On the other hand, Kornfeld, in “Theatre and anderes” (1918), claims the “modern drama of the soul” [. . .] ‘argues that man is no mechanism, that conscious subjectivity is destructive, and that psychological causality is as unimportant as material’” (349).

In a 1919 essay, Koffka offers a vision of man that seems to be a prescient description of Mr. Zero, the protagonist of The Adding Machine. “[T]here comes a day,” Koffka writes, “when suddenly something unknown awakes in him, a dark, as if subterranean power” (qtd. in Carlson 349). Carlson describes this “power” as “elemental and indescribable, which launches him on a course of alienation and conflict with the world” (349).

The new critical and artistic movements that appeared in Europe at the end of the 18th Century did not fully reach the United States until 1914 (361). These were initially filtered through the Theatre Arts journal, which was begun in 1916 by Sheldon Cheney (361). Cheney, a student of George Pierce Baker, demanded “a nonnaturalistic [sic] aesthetic for the American stage, for a poetic and symbolic treatment of human experience that engaged rather than eliminated the imagination” (Cambridge Guide 106). The “new stagecraft,” as its proponents referred to it, embraced the theoretical works of Appia, Craig, and others.

Opening March 19, 1923, at the Garrick Theatre in New York City, the Theatre Guild production of The Adding Machine ran for only 72 performances (Rice vii, 65). Despite of its lack of appeal to ticket buyers, “this seminal American expressionistic play [. . .] influenced an ensuing wave of expressionistic drama” (Cambridge Guide 25-26). Wilmeth and Miller, in the Cambridge Guide of American Theatre, offer this summation:

Like the German experiments that inspired it, Rice’s play journeys through a series of stylized settings designed imaginatively by Lee

Simonson; unlike European prototypes, this play has an antihero at its center. Mr. Zero is a bigoted, self-centered, fully Americanized, and stupid man who is nonetheless victimized by advancing technology and the big business ethic. (26)

Willis' perspective differs from the description offered in the second part of the final sentence, yet he recognizes how the technology theme contributed to the selection of the play:

Although I don't think that's the center of the play, contrary to what a lot of critics say, when that presented itself, why we thought it was just too delicious an opportunity to pass by, and so we just went at it.

(Personal Interview)

Reaney's describes the choice of script as a:

sort of fortuitous accident that it was a play that was also tangentially about technology and thinking about things in new ways, and so the themes of the play get into the themes of the experiment very well.

(Personal Interview)

Gharavi offers the assessment that The Adding Machine "was exactly the right choice for us to start with, for a great many reasons." When asked for specifics, he provides a list similar to Willis': "There are a number of different changes of scene [. . .] But I think it also has a kind of fantastical element to it that mixes very nicely with the technological capabilities of VR." The aspect that fascinated Gharavi "was that it is a play [. . .] that addresses the dehumanizing effects of technology [. . .]":

Zero is displaced from his job by technology and technology kind of becomes a boding in the play. And eventually, the metaphor of technology comes to seem like technology as metaphor not only for society but humankind itself in some ways. (Personal Interview)

Though appreciating the irony of producing a VR event using a 1920s play, the chief plot point of which is Zero's inability to change in the face of technological innovation, Reaney and Willis were more interested in exploring Zero's interior landscape in as fantastic a fashion as possible.

According to Willis:

What we wanted was something that would allow some fantastical development, something that involved multiple changes, something that had a strong emotive context that would allow us to hook visual imagery to some kind of inner emotional state. (Personal Interview)

The Adding Machine, Elmer Rice's exploration into the life and death of Mr. Zero, a man who can't adapt, proved to be an ideal choice from a thematic and artistic standpoint to incorporate virtual reality into a theatre setting.

Reaney, as the one who convinced others to start on this journey, deserves the final words about the selection of The Adding Machine:

we went shopping for a play that had some very specific requirements because we wanted to make this--we wanted to make a good show. We also wanted--the first time out of the box--we wanted to find a show that would fit what Virtual Reality is good for, or at least what it had

been used for, the way people envision it. That was a big enough challenge: to make a theater piece using “virtual reality” without completely redefining theater and completely redefining “virtual reality” at the same time. (Personal Interview)

Having finally selected a script for, and received approval to produce this experiment for the 1994-95 season, the creative team now had to do the prefatory work necessary for any theatrical production.

In a traditional process, the director would analyze the script, decide upon a thematic approach, and discuss this approach with the designer (or designers). The designer would then create renderings as a means to visualize the director’s approach. A set design, with accompanying floor plan, would have been agreed upon before starting rehearsals with actors. For Reaney and Willis, the traditional process had to be modified, or discarded, for the purposes of this experiment.

It is worthwhile for Willis, who had directed over 70 plays before The Adding Machine, to describe his general perspective about preparing a script for production:

While I have great reverence for scripts, I believe that until you penetrate the script and find its theatricalization, you haven’t really dealt with the script at all. (Personal Interview)

For this reason, he has an “ongoing struggle with people who believe that production is just a play standing on its hind legs with as little intervening creativity from other workers as possible.” His primary goal, then, was to prepare The Adding Machine as a theatre piece that allowed the creative team to be as expressive as possible in order

to provide audiences with an engaging artistic event.

Such preparation did not neglect the history of the play or the intentions of Elmer Rice, the playwright. As Willis explains:

[Rice] talked about the inner life; he talked about the mental processes that we wanted to get out in to the public's domain. And dialogue and characterization and scenic display are the traditional ways of doing that, and we all have done that in our directing and in our scenography.

“Rice did not have available to him the kinds of technology we have,” says Willis. Rice’s play was first produced in 1923, when the chief technological advance in theatre was electric lighting. “I’d like to think that if Elmer Rice were talking about doing the show now,” contends Willis, “he would approve of the kinds of things” the creative team did. He continues, “a script like The Adding Machine . . . looks to me as if it’s a little bit before, I don’t mean a little bit but a good deal before its time.” Willis also believed “the inner life could body forth in yet one other way, and that’s the way we attacked it.”

One means of “attack” involved trimming the length of the original script. The decision to reduce the playing time of the script to about 60 minutes was, according to Willis, “partially because we were in terra incognita”:

We did not know how long the audience would be able to tolerate the mixture of live performance and virtual reality depictions; we didn’t know, if they were going to be ill, from all the movements. Some people, we noticed, had testified to the fact that they were, that they

would get nauseous with a great deal of movement on there, and we didn't know if that was going to happen. Or, what we did not want to have is a good many nauseous people in the audience.

“So we kept it within the realm of an hour,” he concludes, “and we even gave instructions prior to the show telling people how to cope with motion sickness should it befall them.”

Though Willis' approach to this abridgement focused on making “cuts that streamlined the central action line,” he remained cognizant of the intended theatrical experiment. He clarifies: “nothing was taken out because it looked as if it might be too difficult. Nothing was added that made it look as if it might serve virtual reality at the expense of the script.” A good deal of this streamlining took place in certain stretches of dialogue. “[M]y rationale,” Willis offers, “was that the freight was being carried in simultaneous messages with the visual imagery and the actor in ways that the original script did not envision.” He concludes, “I believe that we did nothing to violate what I would call the core integrity of the script”:

Were I doing the show again today without virtual reality, I'm sure that a lot of things that were cut in our production would be restored because I believe we have a different communicating mechanism. When you're restricting yourself to dialogue, why you have to do different kinds of things than we did.

Mark Reaney, as the designer/technologist, was responsible for creating the visual imagery of the reduced script, which he began after discussions with Willis and

Gharavi that established parameters to “maintain the conceptual purity of the VR medium” (Gharavi “i.e. VR” 255) These parameters included avoiding “certain non-real-time media such as prerecorded video and taped computer animation sequences” (255). They also decided that typical stage settings “would be unfavorably incongruous with the fluidly changing virtual environments” (255-56). Reaney’s task, then, was to design sets that actors would never touch, enter or exit from, or even sit on. What Reaney needed to design first, though, was a theatre space that provided a stage for the live actors to perform on and a place for the audience to be seated.

Murphy Hall, at the University of Kansas, contains two theatres. The William Inge Memorial Theatre is the “black box” space--a cube of a room that can accommodate various stage arrangements by rearranging moveable seating platforms. The Crafton-Preyer Theatre can seat hundreds and contains a proscenium stage. For the purposes of this first experiment in “live, VR theatre,” the William Inge was considered too confining for both the audience and the technology.

The Crafton-Preyer proved unsuitable for two reasons. Due to the state of projection technology in 1994, it was determined that people seated at the back of the house would not be able to effectively view computer-generated scenery that would be not only projected in three-dimensions, but would be also in near-constant motion. Sightlines were the other reason for not utilizing this mainstage theatre. For traditional theatre events, designers and directors ignore the issue of sightlines at their artistic peril. If audience members seated to the far right or left cannot see what is taking place on stage due to the placement of scenery, furniture, or actors, they will

not be effectively engaged in the theatre event. As The Adding Machine: A Virtual Reality Project would forego actual sets and set pieces, blocking audience members' view did not concern Reaney; what did concern this designer/technologist was the ability to view images projected three-dimensionally.

For people watching the play while wearing glasses with polarized lenses, a straight ahead position would be the ideal angle from which to view the three-dimensional effect created by these lenses. The angled seating available to the left and right of the Crafton-Preyer house would severely minimize the intended effect. Reaney overcame these limitations by designing a new theatre space on the Crafton-Preyer stage itself.

Bleacher-style seating for 150 people was placed on the stage facing the house, which was hidden by curtains, flats, and three large projection screens. A small, dark-carpeted stage, with a trapdoor, fronted the screens. It was here that most of the actors appeared and interacted with each other and the images projected on the screens. Now that Reaney had a place for audience and the actors he could turn his attention to designing "scenery."



Based on the edited version of the script, Reaney had to provide designs for eight scenes, or locations. The locations included Zero's apartment bedroom, Zero's workspace, Zero's apartment living room, a jail cell, a courtroom, a graveyard, Elysian Fields, and a way station where souls waited to be returned to new bodies. It is worthwhile to describe how Reaney might have actualized these different locales using "traditional" design and construction techniques.

Starting with the overall design concept, he could have taken one of two approaches. A unit set would have allowed for each of the eight locations to be revealed in a presentational or abstract fashion, without needing to devote time or to expend resources changing set pieces. The other approach would be representational, providing for a "realistic" design for each location. ("Realistic" can be a troublesome word when applied to theatre design. My use of the word implies two requirements, that the set design be internally consistent with the play's milieu, and that it be sufficiently grounded in a familiar reality that audiences can think "Yeah, that's what it would look like.") When applicable, scenes would require furniture, working doors and windows, and those elements necessary to reveal a quotidian existence. Regardless of approach, Reaney would still be required to do architectural drawings, floor plans, and painted renderings.

Technicians and artists would need these specific depictions of his plans in order to build the set he envisioned for the play. These plans would aid the shop foreman, who needed to determine how much lumber and hardware purchase. The lead scenic painter would need to figure out how much of each color of paint to buy

or mix. The floor plans would help the director and actors know where set pieces were located so blocking could be decided long before the scene shop built the set. Reaney would have to supply the plans for others to actualize his vision.

With computer-generated scenery, Reaney could be both designer and builder. His efforts, though, were bound by various limitations; he could not fall back on previously tried methods or hardware for design purposes for this first experiment with “live, virtual reality” theatre. In addition to creating new spaces using untested software and techniques, he also had to generate scenery that fit in with the conceptual approach to the play.

However much Willis edited the script, neither he nor Reaney forgot that this traditional script existed long before this experiment and that it was an example of an established genre. This recognition proved to be a hallmark of their working relationship. According to Willis, “that’s one of the things that made [. . .] the work patterns between Mark and me so comfortable.” However much Reaney was, as Willis describes him,

obviously hell bent for seeing what virtual reality could do in as many formats and ways as possible, he never insisted upon something that did not connect to that inner life of the script, and since I had brought to the table, really, frankly, a lifetime of working with shows as a director, I couldn’t let go of that either. (Personal Interview)

“Although I wanted to be open to the scenographic emphases that the show had,” concludes Willis, “I just couldn’t walk away from those theatrical concerns. Happily,

we found a good working arena to mull those things over and to thrash those things out.” In the end, they found ways to allow virtual reality, and other technologies, to reveal, and sometimes expand upon the expressionistic possibilities located in the world of the script.

Reaney, as the designer and lead experimenter, points out that the play already contained many locales that could be considered starting places for scenic design, “and several of them were rather fantastic while still being possibly grounded in architectural reality, a geographic kind of reality, [so] that they weren’t just a complete expressionistic statement, at least they didn’t have to be” (Personal Interview). Not that he was unaware of how the design limitations of computer software: “We could have done the Elysian Fields, just with, you know, the big pink ooze, but instead we put it in a garden because software at that time was more adept at making gardens than it was to making a big, pink ooze.” Reaney confirms that traditional nature of The Adding Machine remained a grounding force for many of the design decisions: “it had recognizable places that we could build on the computer-bedroom, jail cells, things like that. . . . [T]here again, the play was a happy choice for that idea.”

The Adding Machine may take place over multiple locales, but it is also a highly internal play in terms of depicting Zero’s processes. The scenery, Reaney explains, “was architecturally based [. . .] but it is still a work of expressionism.” He continues:

It’s about the inner workings of the, in this case, primarily one

character's mind, which is good. Again here, it was manageable for us. It wasn't just a lot of open-ended expressionistic statement that was a product of the playwright or the audience or all the characters on the stage or whatever. We sort of limited a little bit to what was happening to Zero. And I think, you know, we did that as much as possible. Where I say it wasn't a big, pink ooze, it was also not strict realism either. I refer to the jury scene, primarily, and the homecoming when he [Zero] comes back from killing the Boss. So in that case, those scenes were, perhaps more surrealistic than realistic. (Personal Interview)

The "homecoming" scene (depicted in the image that follows that of the "Jury" scene) involves a party that has been going on long before Zero arrives at his apartment. By using green-screen technology, combined with video mixing, two actors were able to play the roles of the six couples attending the party. The actors' images appeared in various places on the center projection screen while the actress portraying Zero's wife stood on stage and interacted with the projected images of the actors.



Fig. 2. Actors Brian Paulette and Betsy Atkinson performed onstage while Andrew Patrick Ralston and Ally Z. Freund appeared on the projection screen. Photo courtesy of Mark Reaney.

The computer-generated scenery depicted objects that might be found in a home--an overstuffed chair, a piano, a lamp with a large, conical shade. But, none of these realistic objects were arrayed in a way to suggest stability or comfort, for Zero does not have these things in his home. The party scene also serves as an example of the design changes that were required throughout the production process.

“Well, there were tremendous difficulties in just getting everything to work the way we wanted it to,” Reaney explains. “We were constantly re-inventing our various systems to make them all work the way we wanted to.” It is important to clarify that the “various systems” required for this experiment went beyond platforms,

lighting instruments, and painted flats. Reaney was designing scenery that had to be revealed through the integration of computers, video mixers, digital sound, and green-screen and three-dimensional display technologies. Such integration could only be tested effectively during the rehearsal process, when actors were present and in motion.

The first design for the party scene, for example, did not meet expectations. “We had planned on something else,” Reaney remembers, “But we couldn’t do it. It turned out that it just flat didn’t work.” So, in the thick of the rehearsal process, another solution had to be found:

We were just pushing buttons on the video mixer trying to see what else we could do and we stumbled on that one, and that was very hairy because that one required the video operator to control the two video mixers simultaneously, one control in the left hand and one control in the right hand, and pan this odd flipping kind of fader exactly the same [. . .] He just practiced that for hours and hours until he got so that both videos popped into the same places at the same time.

This description leads Reaney to make a connection between previous design methods and this experiment.

As he observes, “the rules of traditional theater don’t go out the window just because you’re putting some new technology in.” He continues:

you have a plan, an idea, a picture in your head or on paper or in the computer or whatever, and you try to make it work, and then you

realize that the reality doesn't exactly look like what you had in your head. So, you either change it until it looks closer to what you had in your head or you revise what you had in your head to reflect what's actually going on.

Reaney then offers another comparison between existing design techniques and what he was trying to accomplish with The Adding Machine: "Look at the sketch of a scenic designer and then go up and see what the show actually looked like. Of course, there's always this split between actual and theoretical."

The state of virtual reality technology in 1995 contributed to "this split between actual and theoretical." In addition to projection technology that couldn't provide the degree of illumination Reaney desired, he also struggled with "getting the simulations to run in good time with good detail and texture." Detail, after all, is nothing but computer code, and the more computer code the more processing resources are required, which slows down output. (As someone who trains adults on how to use computers, I have often heard the complaint, "My computer is too slow." I politely disagree and explain that the particular computer is being expected to do more than it is designed for.) Reaney acknowledges that accommodating such limitations "is always the sort of the give and take of designing for virtual reality--not just in the theatre, but in any aspect of the industry." In the end, he admits "the graphics were so much more simplistic, much more geometric looking than perhaps I had originally intended, and that just sort of ended up being the aesthetic for the show." He and the other artists and technician were attempting to locate a "medium

ground between what virtual reality applications were good for [. . .], building houses, and what we could do to push it in an artistic setting that we were perhaps more interested in.”

As Willis describes it, the production team sometimes located new ground through “little accidents” (Personal Interview). Gharavi was involved in one these accidents, “when we were just fooling around in the lab, you know, testing the technology” (Personal Interview). They discovered a quirk of the technology that would be incorporated in the final production and performance.

The lab Gharavi refers to was the William Inge Memorial Theatre, the previously mentioned “black box” space. With two projectors in place and one projection screen, they began exploring the design possibilities of the equipment and software. Willis remembers, “Gharavi went up stage of the screen to do something, to fix something, and it was startling” (Personal Interview). They discovered that “when a body is upstage of the rear projection screen and you have the two projectors on and you are wearing the glasses” it appears to the viewer that the “character, that shadow figure, that silhouette, is actually downstage of the screen.” This discovery provided another opportunity to reveal the inner lives of characters.

During the scene where Zero is at work, the actor sits at a tall desk recording numbers in a ledger. The actress playing Daisy, Zero’s coworker, sits opposite him reading aloud receipt totals. Located behind the back-lit projection screen were two actors, revealed as shadows, seated at desks, working. When Zero and Daisy left their stools to interact and reveal their feelings--at least to the audience--the shadow

characters continued to work. This “low tech” device opened this workplace scene so the characters were depicted as “mere shadows of their former selves while their real inner lives took over the scene.”

The above is an example of Reaney and Willis’ commitment to the script over the technology. “The thing that guided us,” Willis explains, “was that we didn’t have to use virtual reality in every moment, but what we had to do was unlock the script at every moment.” He adds, “If virtual reality would allow us to do that, we would; and if darkness would allow us to do that, we did.”

Unlocking the script required the efforts of the entire production team, not just the designer and director. Just as Reaney was called upon to attempt things he had never attempted before, so were the actors and technicians. Actors, in particular, found themselves part of a rehearsal process that involved interacting with moving scenery and projected actors and characters that were not available during much of this process.

Willis admits the performers “were presented with a major obstacle, and they took a lot of things on faith.”

It was all in my head and Mark’s head, and we thought it would work, and we directed the performers to that end. That is, we directed them by saying such things as well, “you’re going to have to behave such and such a way here because, behind you, you have to remember there’s a dominant image.”

Due to “hardware supply problems . . . we did not have available for a long period before the opening of the show the imagery the actors could integrate into it.”

For the actors, rehearsals and performances were a “a combination of live stage performance and working with a camera,”

because there were places where they had to hit their mark and behave on faith that the things around them would be in place, but that they were not able to take their cues from the same stimulus that the audience saw because they couldn’t see it, at least not as clearly.

The reason for this is that their close proximity to the projection screens prevented them from clearly seeing the projected images.

Interacting with projected images also demanded different acting styles--depending on the nature of a particular scene. Willis offers, as an example, the opening scene, where Zero, played by Brian Paulette, is onstage reading a newspaper. The newspaper, however, is a projected image and Paulette stands in such a way to give the impression he is holding the paper. When Zero’s wife exits, the newspaper is replaced with a window, which he is looking out of to watch a woman in another apartment building--without changing the position of his hands. When his wife returns, he is reading the newspaper again. “So we see his covert life,” explains Willis, “and the actor involved with this simply stand in a position that will allow his hands and posture to do double service while all of the movement, if you will, the progress is done with the virtual reality stuff.” Paulette, “being a good actor and an expressive actor, naturally wants to do more.” In order to serve the script and the

technology, though, “he had to do less.” But, Willis points out that such minimal acting was not always called for. Sometimes the performers “had to move more extravagantly than felt comfortable,” he explains, “because behind them there was a scene that was much more dynamic than the live actors simply because of the size, the coloration and movements that were depicted.”

An additional factor contributed to the challenge confronting the actors, which was that they had to interact with projected characters and scenery they couldn't see clearly. What appeared on the screens was directed at the audience, whose members, wearing glasses with polarized lenses, were able to see the projected in images in three dimensions. Without the glasses, without the distance provided by audience seating, the performers couldn't do so. “It was a massive blur to them,” explains Willis, “and they really just had to take their cues from the faith statements that Mark and I were making; and I have to say they did that wonderfully.”

What was expected of the actors was “not outside the realm of what is acting, but it typically doesn't happen in live stage performance because there is usually something there in the . . . corporeal world that allows the actor to relate to it in much the same kind of way that the audience member is.” He is quick to amend this perspective by saying that it is “only a matter of degree”:

when the actor drinks whisky on stage, it's really tea and he gulps as if it's whisky. So, the function of being an actor was stretched a little bit, but it wasn't really alien to what it is actors do if they are good actors, whether they're in front of the camera or on stage.

For this production, however, Willis admits that “the principal focus was . . . not going to be on the actor as we traditionally know it.” Instead, “It was going to be a spectacle that they had to contend with.” It was an “integration” that Willis and Reaney had “envisioned, right from the beginning, and the actors took it on faith pretty easily, so that when it finally was integrated, we felt pretty good.” The actors were aware they “were in on something at the ground floor” says Willis. “They didn’t quite know how it was going to turn out or how their participation would work, but they took all of that in stride.”

The backstage technicians also didn’t know how it was going to turn out because their participation also differed from what was normally expected of these theatre artists. They were not backstage to hand props to actors, or to fly in scenery, or to haul set pieces around for scene changes. Instead, they were backstage at computers, video cameras, and other electronic devices (see the guide to backstage technology that follows). Mouse clicks and keyboard commands were required to haul scenery, not sturdy gloves and strong backs.

But, one technician, the Virtual Reality Driver (VED), hauled the scenery in real time, based in large part on what the actors were doing. By watching the actors on a video monitor, connected to a camera pointed at the stage, the VED would move the scenery, using a mouse, to coincide with the movement of the actors. For Willis, the VED “became as much of a live performer for us as the actor on stage and no one ever saw him.”

Along with the VED, the technical side of this experiment required real-time

video interaction played against a green-screen, stage lighting, stereo-image projected slides, digital and analog sound effects, and computer-generated scenery displayed on a rear-projection screen. All these elements were necessary for this virtual-reality production of Elmer Rice's The Adding Machine. Though these components were integrated to bring about the desired effects, a detailed description requires a separate explanation for each component, which will include the occasional repetition due to the overlapping nature of the backstage technology.

(A diagram accompanies the following explanations, and the numbers attached the specific textual descriptions refer to diagram details.)

#### Stage Manager and Crew Stations

Several computers and playback devices, located behind the rear-projection screens, power the technology-side of this production. Of the six technicians needed to operate this equipment, the stage-manager (SM) is the only one without a computer terminal. However, the SM orchestrates the various elements of the production through the use of a backstage monitor connected to a camera located behind the audience and focused on the stage.

To the left of the SM were the Virtual Environment Driver (VED), operating Computer # 1, the Virtual Agent Operator (VAO), seated at Computer #2, and the Light Board Operator (LBO). To the right of the SM were the Video Board Operator (VBO) and the Digital Sound Operator (DSO).

## The Digital Sound Station

Digital sound effects were played on Sound Machine software on a PowerBook 150, the sound effects computer (1). Music for The Adding Machine was located on a CD player (2), and a CD-ROM (3) connected to a Macintosh LC. The music computer (4) uses QuickTime sound software. Both computers are connected to an analog mixer board (5). Sound and music cues were channeled through this mixer, which was in turn connected to a second analog mixer board. Sound and music cues were routed through this second analog mixer board because it was already pre-patched into the theatre sound system speakers.

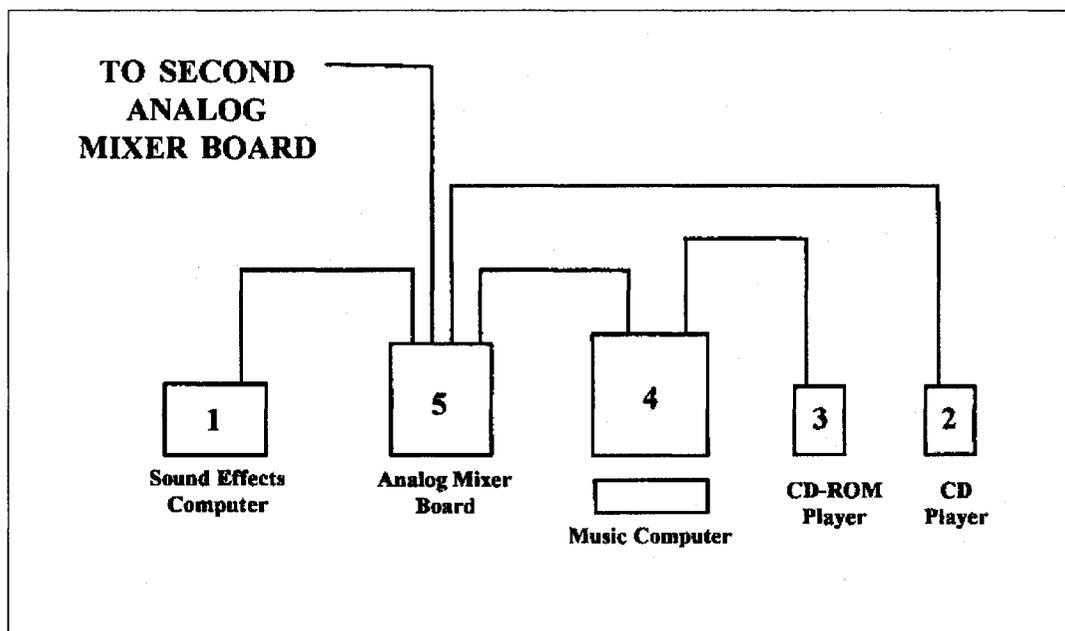


Fig. 3. Digital sound station schematic.

## The Video Board Station

The various video and computer-generated effects were routed through two video mixers (1) that sent output to the two LCD projection pads (2) placed on top of two Dukane overhead projectors (3). Each mixer was connected to a preview monitor (4), which allowed the Video Board Operator (VBO) to view the separate images before combining them and sending these images to the LCD pads.

Images of green screen actors were sent from the green screen camera to the video amplifier (5a). The video amplifier split the signal into two separate signals. This signal splitting was essential to creating the stereo images necessary for the three-dimensional effects.

Each of the two stereo computer images from the virtual environment computer were routed, on their way to the video mixers, through a video encoder, one internal, one external. These encoders prepared the computer images for video processing by the video mixers.

Computer images from the virtual agent computer were routed through one external video encoder. The encoder prepared the signal for video broadcast, then sent the signal to one of the video amplifiers (5b), where the signal was split into two, separate signals.

The two video mixers each received one of the split signals. Preview monitors were connected to each video mixer, and the mixers sent the signal to these monitors, allowing the Video Board Operator to monitor and mix the various incoming signals. The final destination for the split signals was the LCD projection pads, which, with

the aid of theatre quality overhead projectors, displayed the images on the center projection screen.

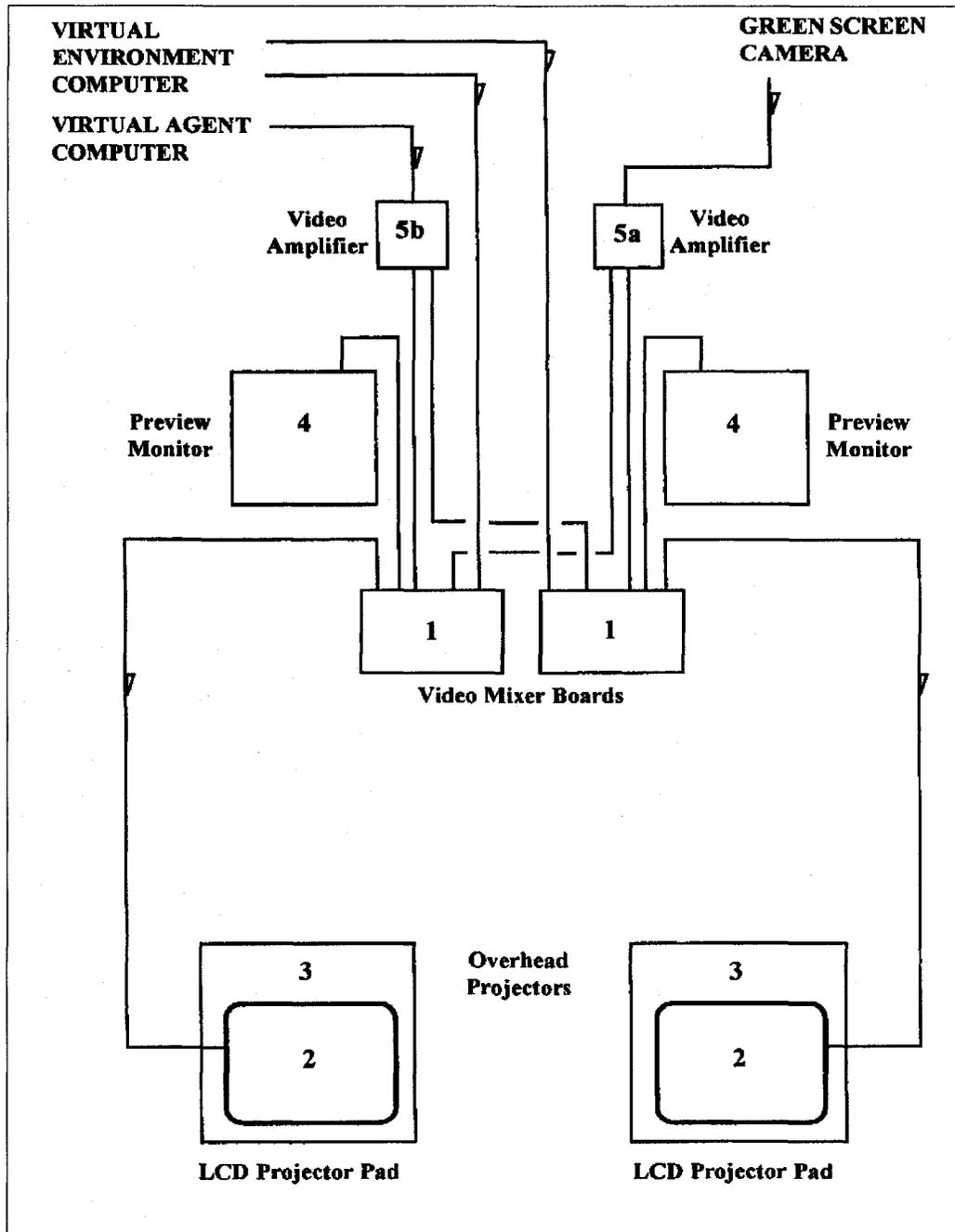


Fig. 4. Video board schematic.

## The Virtual Environment Station

The virtual scenery was designed using a pre-beta version of Virtus WalkThrough 2.5. This same software displayed the scenery on the monitor of the virtual environment computer (1) during performances. The Virtual Environment Driver (VED) uses a mouse to manipulate the scenery to coincide with the movement of the actors onstage.

Virtus software created two stereoscopic views of the virtual scenery. Two video cards within the virtual environment computer sent output of these views to the video mixers. One view was converted to standard video by one of the video cards. The other card required an external VIDEO ENCODER (2) to convert the image to standard video.

After these images were relayed to the video mixers they were sent to the LCD projection pads and finally displayed, with the aid of the overhead projectors, on the rear-projection screen. The separate views allowed the audience members--wearing glasses with polarized lenses--to see the virtual scenery in three dimensions.

## The Virtual Agent Station

The computer-generated character that appears at the end of the graveyard scene was designed using HyperCard software with InterFace add-on. An image was generated by the virtual agent computer (3), then translated into standard video by a video card and an external video encoder (4), and, lastly, this image was split in to two separate signals by a video amplifier. These images were then sent to the video

mixers.

After these images were relayed to the video mixers they were sent to the LCD projection pads and finally displayed, with the aid of the overhead projectors, on the rear-projection screen. The separate views allowed the audience members--wearing glasses with polarized lenses--to view the projected images in three-dimensions.

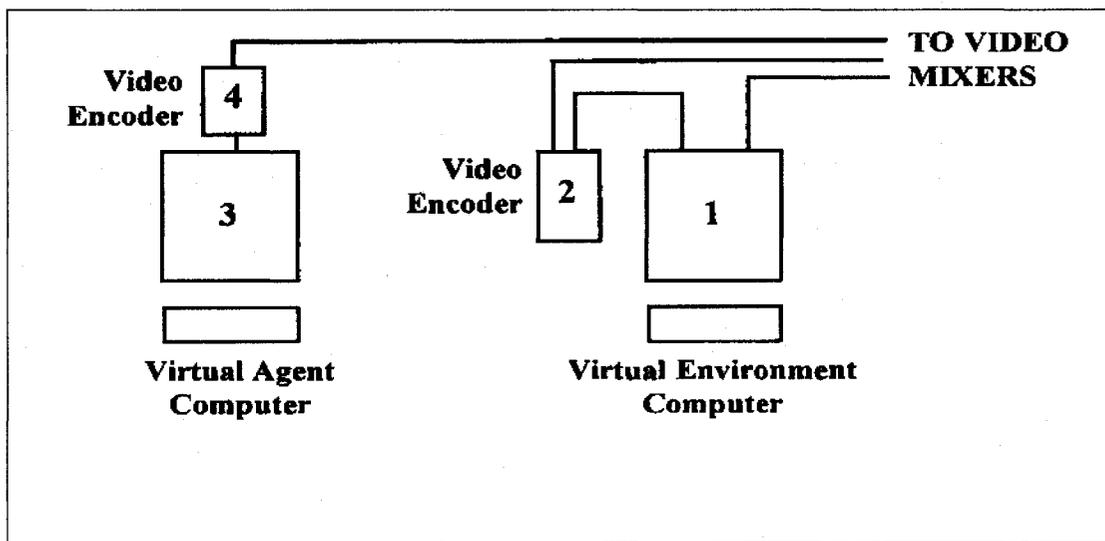


Fig. 5. Virtual Agent and Virtual Environment Stations schematic

## The Green Screen “Room”

The green screen “room” was composed of an arrangement of piping from which lighting equipment and the green screen itself was suspended. Additional equipment included two stools, a wooden frame, painted green and placed on a stand, a red flag for signaling, a black torso drape, and a multi-image lens placed on a stand and located to the right of the green screen.

Actors standing in front of the screen were unable to distinguish hand signals from the camera operator due to the contrast between the lighting of the screen and the dark backstage; for the reason it was necessary for the camera operator to signal the actors by means of a red flag.

The frame was placed a specific distance in front of the camera and was used for the scene with the “Boss.” By aiming the camera through the frame, the camera operator could zoom out on the “Boss” without any disruption of the green screen effect. For the “party” scene, the frame was removed and two actors were seated next to each other on the stools.

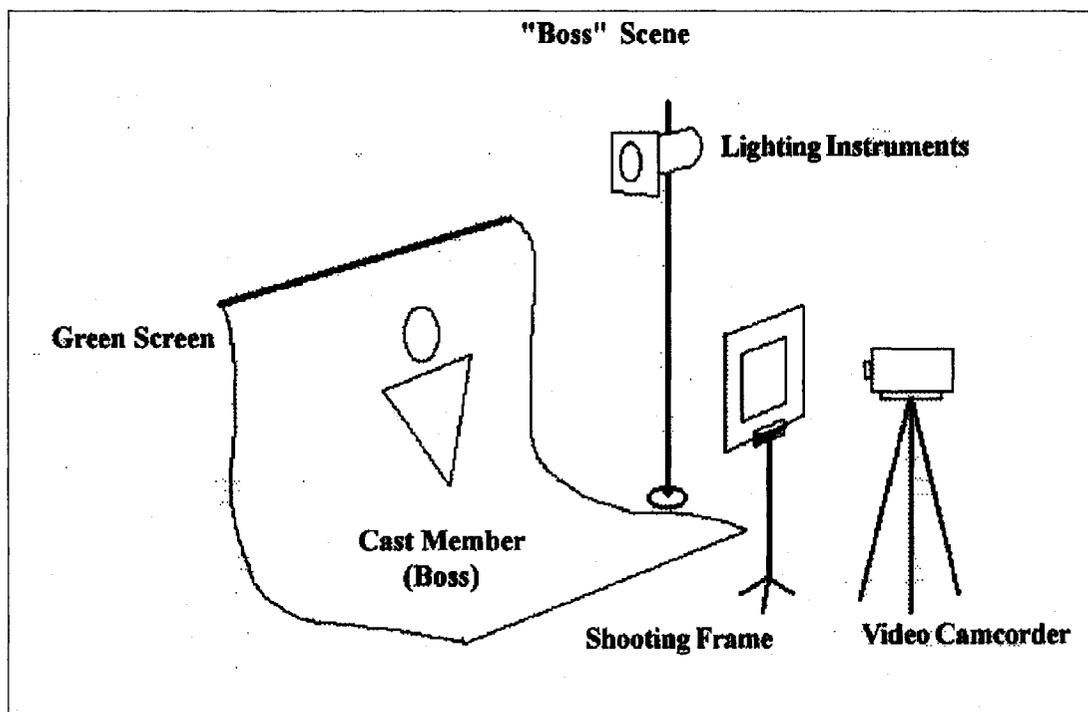


Fig. 6. Green Screen room schematic for single projection of characters.

At the end of this scene, the actors moved the stools to a position right of the green screen for the courtroom scene. They seated themselves with their backs to the black stage wall. They were now seated in front of the multi-image lens. The black torso drape was placed over their chests and shoulders. The camera operator repositioned the camera so that it was pointed at the lens. This lens was designed to multiply the image of each actor by six. The cumulative effect, when displayed before the audience on the main projection screen was that of 12 floating faces against a black background.

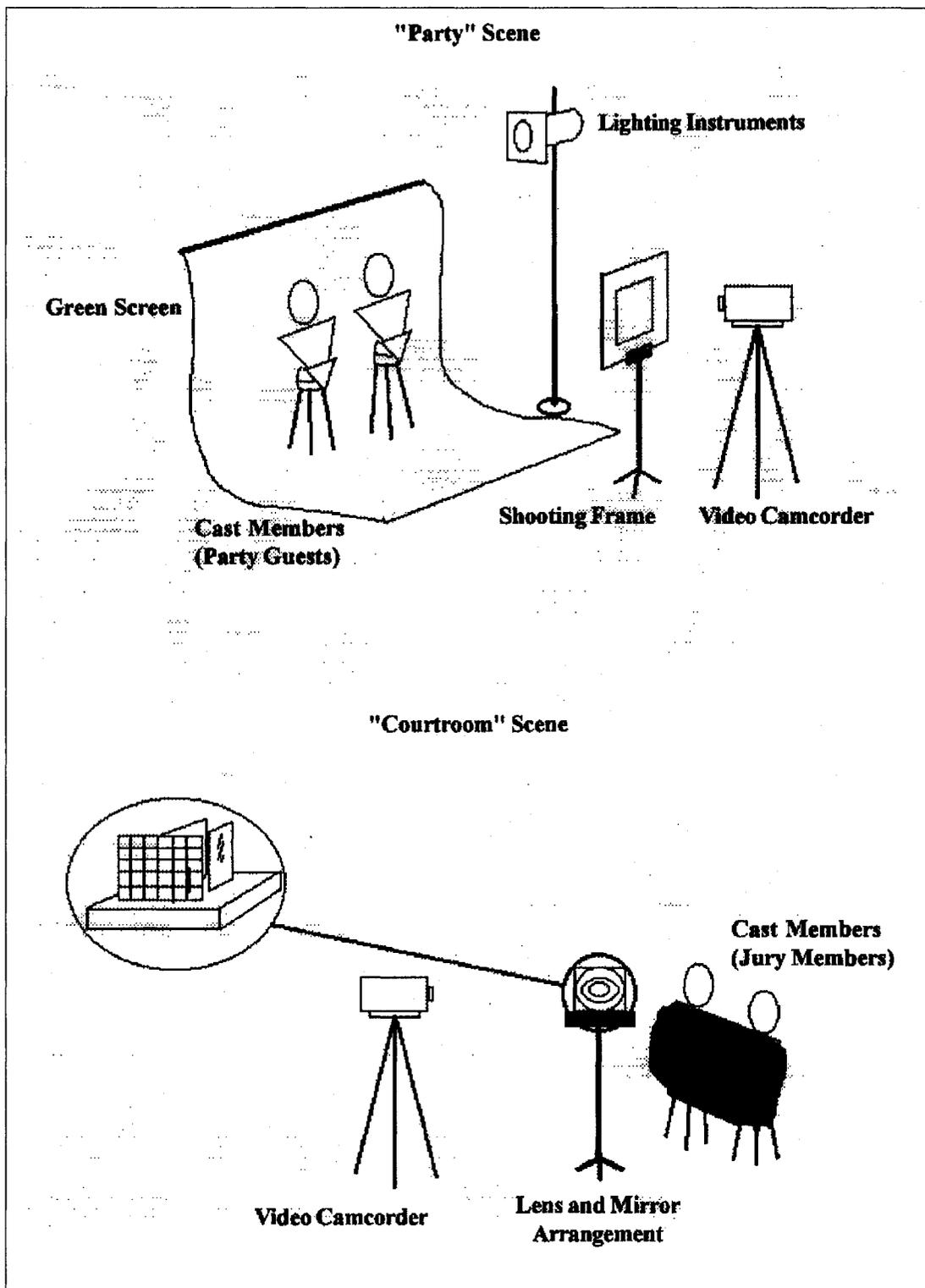


Fig. 7. Green Screen schematics for "Party" and "Courtroom" scenes.

### Additional Technical Stations

A Mini-Palette computer made up the light board station, from which the light board operator controls the various lighting instruments, including houselights and two follow spotlights.

Complimenting the computer-generated scenery were two slide-projectors located in the front of the balcony of the theatre. These slide-projectors display color images on rear-projection screens located to the sides of the main projection screen.

To maintain the overall three-dimensional effects, and to avoid the necessity of four slide-projectors, special slides, containing a left-eye and a right-eye view were used. Two mirrors arranged in front of each projector split the outgoing image so the left-eye/right-eye views line up properly on the projection screens as part of the three-dimensional effect. A technician, located in the balcony, operates the slide projectors.

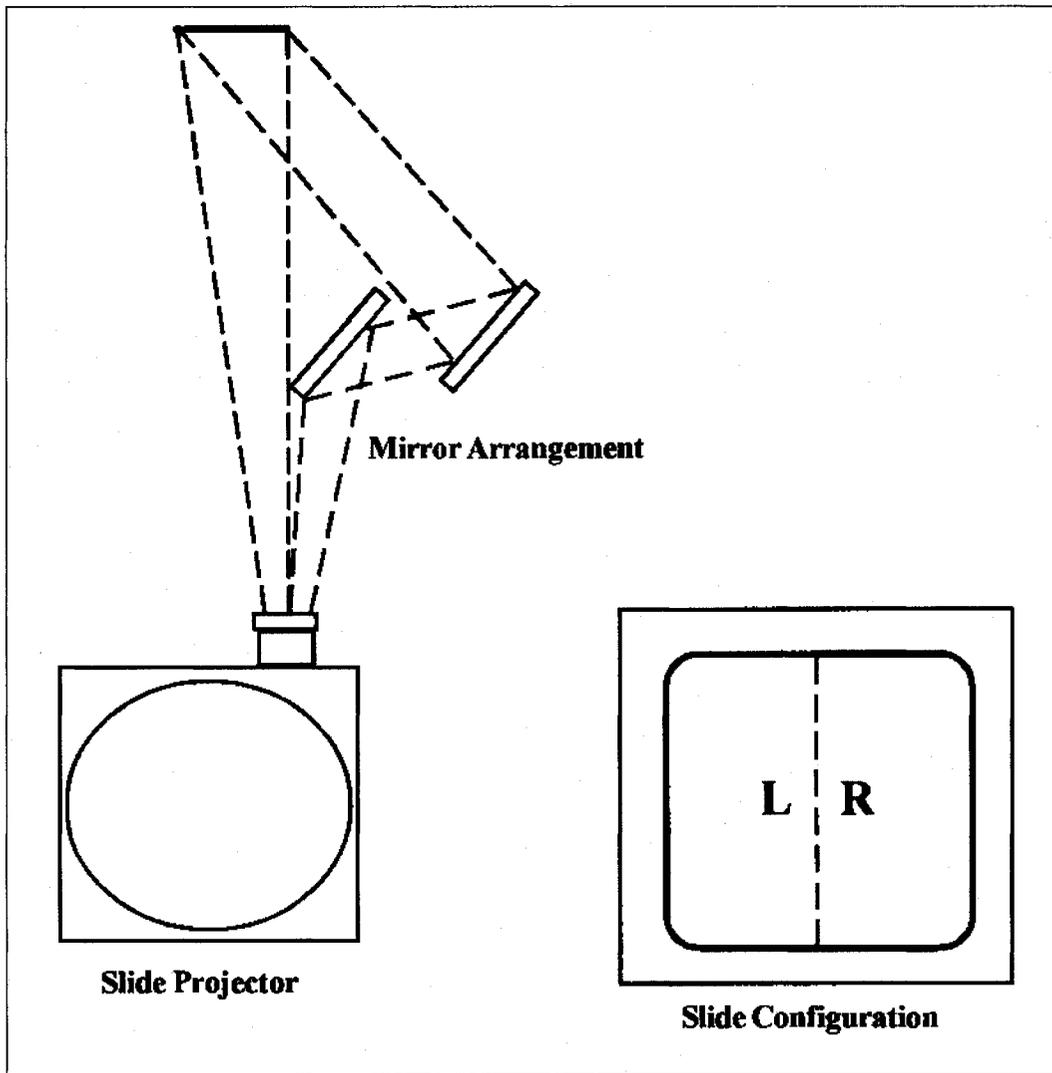


Fig. 8. Schematic for projection of slides in three-dimensional views.

In addition to rehearsals and the “building” of sets, three other activities took place during the pre-production process. Gharavi, in his role as the general factotum, was responsible for two of these tasks and had a part in the third. He was responsible for spreading the word, researching this experiment’s place in the history of “live, virtual reality” theatre, and for co-writing the video script for Act Two of The Adding Machine: A Virtual Reality Project.

Gharavi used e-mail, listservs, and the newly arrived World Wide Web to let the world know about this experiment. His success can be measured by the number of requests for more information, updates, and articles written about the department’s efforts. Two researchers from the Netherlands traveled to Lawrence, Kansas, in order to observe the final week of preparations and attend the production.

A question Reaney and Willis did not have an answer for when they started down this road concerned whether or not they were the first ones to travel this path. Had a production team before the KU Department of Theatre and Film employed virtual reality technology? Gharavi was charged with finding out. In an e-mail response, Gharavi offered this summation: “We all kind of checked this out. I think you would be safe in asserting we were the first.”

#### The Production

From April 18 to April 30, 1995, the production of The Adding Machine: A Virtual Reality Project added the final, and necessary, variable to this experiment. The audience is a required element of any experiment in theatre. After all, theatre is a

performative medium and a production is not fully actualized--not fully complete--until this final element, the audience, is added to the creative mix. Even in a traditional theatre event, the audience remains a variable whose behavior cannot be fully predicted or controlled. For an experimental theatre event, an audience is tested just as much as the acting style, the design components, or the technology. The creative team for this project made every effort to prepare audiences for participation in this experiment.

The demands and the limitations of the technology required limiting the audience to 150 people and seating them on a bleacher-style arrangement on the stage itself. The audience faced the house, which was hidden by curtains, flats, and three large projection screens. A small, dark-carpeted stage fronted the screens. It was here that most of the actors appeared and interacted with each other and the images projected on the screens. As they entered the seating area, audience members were given a program and a pair of plastic glasses with polarized lenses.

Two tuxedo-clad hosts (Gharavi and I were two of three people who assumed this role) came onstage to provide advice, direction, and thanks (see Appendix B). Research had determined that a small number of people could have an adverse reaction to watching moving, three-dimensional images, so the hosts offered instructions about the use of the glasses and advice for any person experiencing difficulties:

TWO: The glasses you have been given are an important part of the production.

ONE: Their lenses are polarized. The glasses fit right over your regular glasses--if you wear them.

TWO: The glasses enable you to see the scenery in three dimensions.

ONE: But, one word of advice. Don't work too hard at trying to see things in three dimensions.

TWO: The illusion works better, we have found, if you simply relax and let the effect happen naturally.

ONE: One other note. The scenery sometimes moves. That's part of virtual reality's special illusion.

TWO: If you are one of the very few people who are sensitive to such movement and begin to feel disoriented, remember you can stop that awkward sensation at any time by simply closing your eyes.

ONE: But, of course, we hope you won't keep them closed.

TWO: The scenery doesn't move that much.

After informing the audience that Act II would be a video documentary of how the production came about, followed by a question-and-answer session, Host Two said, "While we realize we have only begun to scratch the surface, we are pleased to be underway."

The production got underway with Mr. Zero alone onstage, sleeping in his bedroom. The VR component is immediately obvious to the audience. Brian Paulette, portraying Mr. Zero, stands near the center projection screen, and behind

him, on the screen, seen from a bird's eye view, are a bed and other bedroom accoutrements. With the scene set, Zero awakes and rolls out of bed, which is depicted scenically by the rotation of the computer-generated bedroom. So began a production that employed various technologies to indicate scene changes, emotional states, and thematic issues.

This first scene was, according to Willis, an example of one of the “moments that were most striking for audience members [. . .] ones in which they found themselves reorienting their perspective (Personal Interview). With the bedroom scene, it was a change in “simple spatial perspective”:

Audiences got that with no problem at all. It suggested that they could let loose of their other expectations, that is, their common expectations about what happens in a living room or a bedroom-based show with a bed on stage, and they could, if you will, enjoy the flights of fancy that the script provided.

Willis explains, “we consciously did some of those things early in the show to kind of cue audience members in,” and such cues for audiences were “where I think the impact was strong--a small moment--but the impact was strong” and audiences “sort of got with the program because of that.”

Throughout the production, Willis and Reaney were able to achieve a number of their goals. Through the use of computer graphics and real-time television techniques, the production explored the mental state of Mr. Zero more successfully than traditional production techniques. An example that Willis cites is the scene

where the Boss fires Zero. The actor portraying the Boss character was located in the “green screen” space. His image was combined with the computer-generated scenery of the accounting office on the rear-projection screens. Zero’s dismissal comes as a complete surprise to him, and, as his anger and feelings of impotence increased, the image of the Boss expanded in size until his laughing face filled the center screen, which is “not unlike the psychological experience that people testify to when they talk about fixating on something so that it seems larger and stronger and bigger than it is in real life as seen from an objective perspective.”

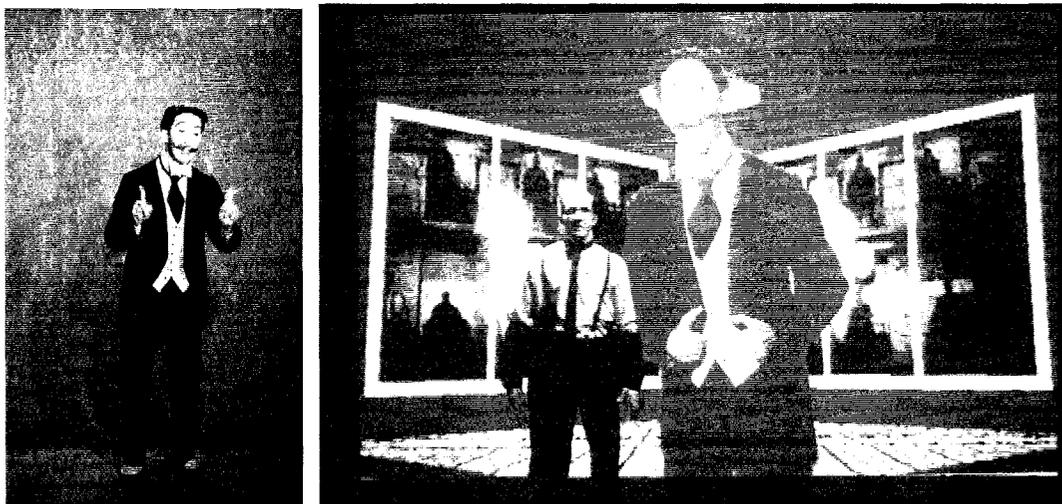


Fig. 9. and Fig. 10. John Garretson, portraying the “Boss,” performed in the Green Screen space, and his recorded image was displayed on the center projection screen.

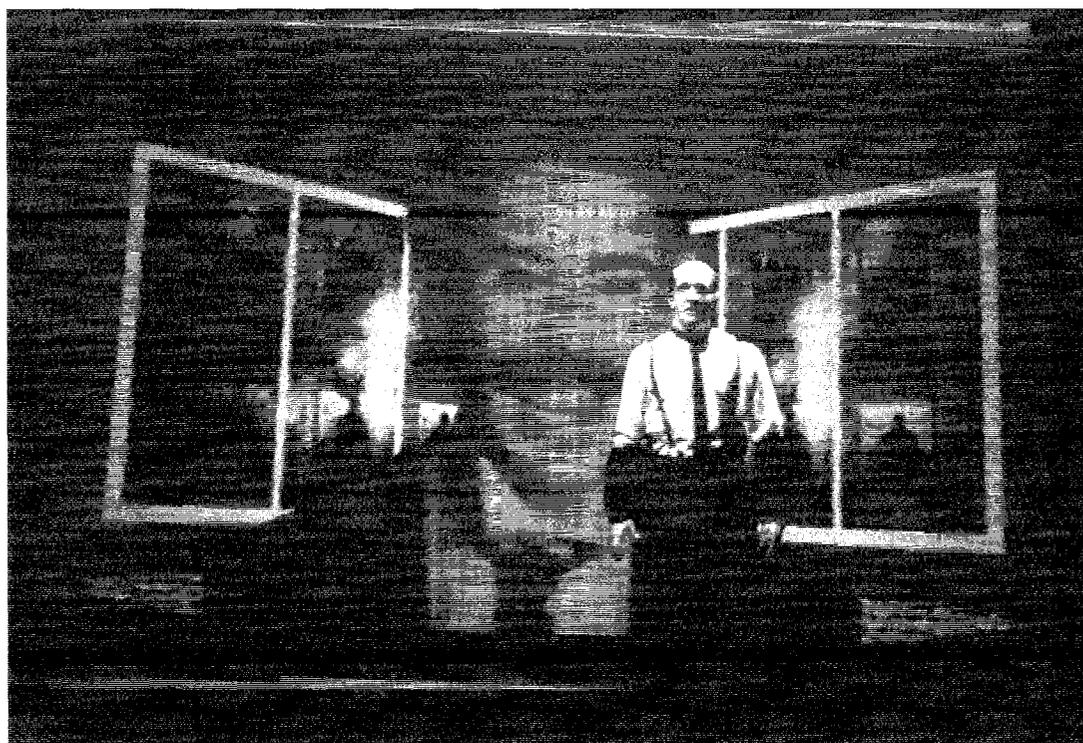


Fig. 11. The actor’s projected image was manipulated to reveal Zero’s emotional state. Photos of figures 9-11 courtesy of Mark Reaney.

Reaney singles out another effective scene, one that is not often performed (Personal Interview). “The scene in the jail is almost never performed,” clarifies Reaney, “but we got it out of a book somewhere and stuck it back in.” Using the same techniques that made it possible for three actors to appear as multiple guests in the party scene, the production started with two performers and multiplied their images to create twelve jury members on the screen behind the actor playing Zero. From Reaney’s perspective, as the designer/technologist, the inclusion of this scene “greatly enhanced the quality of the production and the value--the enjoyableness of the VR experience.”



Fig. 12. The “Jury” scene: Zero pleaded his case. Photo courtesy of Mark Reaney

Reaney achieved another goal by designing and inserting a computer-generated character into the production. After his execution for the murder of his boss, Zero reawakens in a graveyard where he meets Shrdlu, another executed murderer. The scene ends when an enormous floating head appears and frightens Zero and Shrdlu away.

THE HEAD: Hey! Can't you shut up and let a guy sleep?

ZERO: Put on the soft pedal.

SHRDLU: It won't be long now! We'll receive our summons soon.

THE HEAD: Are you goin' to beat it or not? Hey, Bill, lend me your head.

ZERO: Look out!

THE HEAD: Missed 'em. Damn cats! I'll get 'em next time. Ho hum!  
Me for the worms! (Appendix D 166)

The head was created, animated, and given a voice using HyperCard software with an Interface card. HyperCard allowed for the placement of text or graphics on separate "cards," which can be accessed and displayed sequentially. Interface, a now out-dated program, allowed designers to create characters that could, with a pre-recorded speech and timing file, speak and display facial expressions.

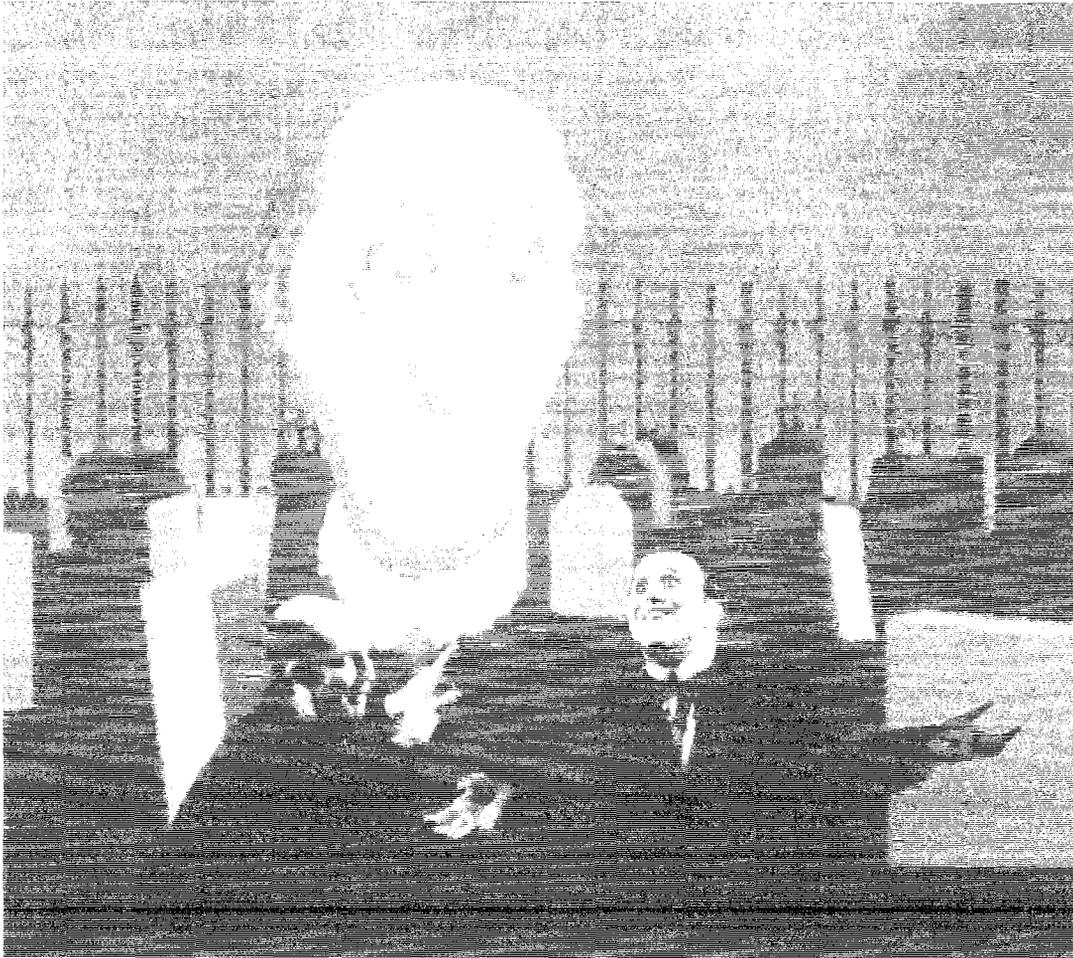


Fig. 13. Brian Paulette, as Zero, and Eben Copple, as Shrdlu, interacted with computer-generated character. Photo courtesy of Mark Reaney

Regarding this new, experimental addition of live theatre, Reaney believes, “the end result was pretty close to what I had in my head” (Personal Interview). He admits, though, “what I had in my head didn’t take into account the live performance of it.” When the computer-generated character appeared, “the audience invariably burst into laughter, which was what I had in mind.”

It was supposed to be this comical looking ghoulish character, and then

he said his two lines and left, and I don't think the audience ever heard his two lines; I don't think in a single show. They were too busy laughing. The actors on stage knew what was being said and they reacted appropriately.

"I think it was just such an incongruous element that we knew it was going to be," Reaney reflects. "This was the only place in the play where anything like that happened." He concludes, "if we did that in the future, we'd add more elements. . . . At the very least we'd add some business or something so that we could give the audience a little time to settle down so that they could hear the lines."

Another component of the production involved the real-time manipulation of the projected scenic elements. This particular task fell to the Virtual Environment Driver (VED), one of the computer operators. The VED, sitting backstage at his station, manipulated the computer-generated scenery in real time in response to the actors' performances or in anticipation of blocking and movement. The VED "took that show around so that he became as much of a live performer for us as the actor onstage and no one ever saw him" (Willis Personal Interview). The freshman student "happened to have a great deal of skill in video games, and so he was backstage doing all of that stuff and we tried to turn that to profit."

In at least one scene, the actors needed to only stand in one place while the VED carried the freight. Zero and Daisy have found each other in the afterlife of Elysian Fields. After having finally admitted their love, they begin dancing to Ravel's Bolero. They do not move about the stage, though; holding each other, they dance in

place, center stage. The dance begins in an enormous field of flowers depicted on the center projection screen. As the couple dances, and the music intensifies, the VED takes over. The field of flowers receded as the dancers appeared to take flight, traveling through blue skies and star-filled heavens. Willis identifies this scene as one that audiences had no difficulty understanding or connecting to. As he explains, the characters were “dancing in the stars, to use a cliché, which is a thing that people in love frequently testify to. . . . and that moment seemed to be aptly captured, and audiences understood what was going on and didn’t seem to have any problem with that.”



Fig. 14. Brian Paulette, as Zero, and Megan E. Parr, as Daisy, danced in place while the projected scenery changes. Photo courtesy of Mark Reaney

The final scene was set in a simple but expansive locale. Alone on stage, Zero pulled repeatedly on the arm of an enormous adding machine, having forgotten who he is or how long he has been doing this repetitive task. His efforts were interrupted by The Fixer, an afterlife figure who has the job of sending souls back to Earth. The Fixer's description of Humankind's long time effort to grow emotionally and intellectually provides another scriptural confirmation that the play's theme is not the dehumanizing effects of technology.

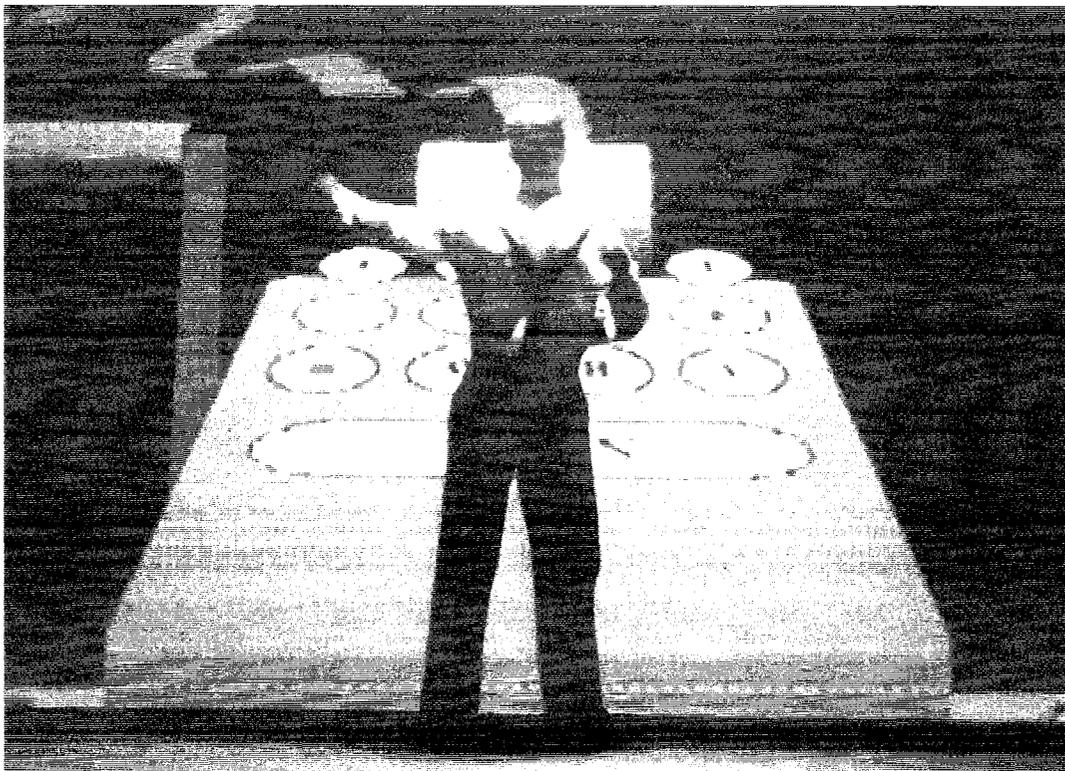


Fig. 15. Brian Paulette, as Zero, operated an enormous adding machine in the afterlife. Photo courtesy of Mark Reaney

Zero is reluctant to leave, wants to keep doing his monotonous task. The Fixer tells him he has to return. At Zero's urging, the Fixer describes what the man's previous lives had been like, and then he describes what the work he will do in the next life. Zero will operate a "super-hyper-add machine," the chief function of which is track each shovel of coal lifted by men working in a mine. Zero's responses enthusiastically, "Say, that'll be some machine, won't it?" The Fixer is not of the same mind, frustrated again at Zero's inability to see the implications of such drudgery:

THE FIXER: Some machine is right. The culmination of human effort, the final triumph of the evolutionary process. For millions of years nebulous gases swirled in space. For more millions of years the gases cooled. Then through inconceivable ages they hardened into rocks. Then came life. Floating green things on the waters that covered the earth. More millions of years and a step upward, an animate organism in the ancient slime. And so on, step by step, down through the ages, the mollusk, the fish, the reptile, then mammal, man! And all so that you might sit in the gallery of a coal mine and operate the super-hyper-adding machine with the great toe of your right foot!

ZERO: Well, then, I ain't so bad, after all.

THE FIXER: You're a failure, Zero. A waste product. A slave to a contraption. The animal's instincts, but not his strength and

skill. The animal's appetites, but not his unashamed indulgence of them. True, you move and eat and digest and excrete and reproduce. But any microscopic organism can do as much. Well, time's up! Back you go, back to your sunless groove, the raw material of slums and wars, the ready prey of the first demagogue who takes the trouble to play upon your ignorance and credulity and provincialism. You poor, spineless, brainless boob, I'm sorry for you! (Appendix D 188-89)

The machine is not at fault, then; it is the person, this person, Mr. Zero.

As a summation of how the audience might make sense of how the inclusion of VR technologies contributes to this production, Willis provides his perceptive:

The fact that computers are involved, the fact that electricity is necessary, the fact that the imagery is controlled from a place, and the fact that auditors can see the seams between live performance and that depicted imagery, and they see the seams before it, but if it's going to make sense to them, they're going to allow them to occupy a world that is unified when another part of their head is telling them it's not unified.

"So, they are able to say, OK, the scenery is moving," he continues.

And the actor is here and the actor is real and the scenery is fake, and the scenery is moving and the actor is still, but if they get with it and use both of those stimuli packages to generate that other coexisting

world that I think is central to theater, then they are able to see, if they're willing, the character moving through space when the character is not moving through space. They are able to see the character's inner intentions made palpable and external because they are depicted in such a way that they have to jump to another place.

Theatre, then, "is always transformative." The producers of theatre "have to transform something for the auditor to participate in it." For Willis and Reaney, "Virtual reality is another kind of transformative device that in this case uses computers, uses imagery, and allows people to be other than they are, so they have to transform themselves and transform the space."

When the play ended, the hosts returned to ask audience members to return the glasses and to take a few minutes to fill out and return a response sheet. At the end of the intermission, the hosts explained to the audience members that they were about to watch a short video documentary about the making of this experimental production. They then reminded people that the production team would be available to answer questions from the audience when the video ended.

Produced in-house, the 30-minute documentary (written by Lance Gharavi and me) provided a glimpse into how Reaney and Willis started this project and how the various technological elements made the project possible. The script (contained in Appendix C) touches on many of the issues expanded upon in this dissertation. The script indicates one narrator, but the produced documentary has the narration handled by various members of the production team.

The documentary's ending remarks link Elmer Rice's original perspective about his play to the goals of this experiment and their implication of VR's future effect on theatre. For Rice:

In the expressionistic play we subordinate and even discard objective reality and seek to express the character in terms of his own inner life. An X-ray photograph bears no resemblance to the object as it presents itself in our vision, but it reveals the inner mechanism of the object as no mere photographic likeness can.

Reaney and Willis sought to determine how the "X-ray photograph" of virtual reality could explore the "inner mechanism" that was Mr. Zero:

The goal was to explore the ways in which the latest computer technologies could aid the depiction of Elmer Rice's expressionistic play. Just as the electric light, early in this century, allowed theatre artists to change how the story of a play was told, virtual reality may very well become another powerful means of punctuating and depicting a play's conflict, thematic issues, and symbolic content. What The Adding Machine: A Virtual Reality Project demonstrates is this: no aspect of the theatrical process, from how the audience sees the show to how sets are designed to how a show is publicized, will be left untouched by the advent of virtual reality and its associated computer technologies.

“Look with favor on a bold beginning.”

(Virgil, qtd in Bartlett 103)

“As we are in life so the theatre is. And as life moves and changes so the theatre moves and changes with it. Now life is changing with such rapidity that we can hardly keep pace with it from one moment to the next.” Robert Edmond Jones, “The Future of the Theatre,” (1952)

Mark Reaney and the University of Kansas Department of Theatre and Film may have found “a new place to stand” with The Adding Machine: A Virtual Reality Project, but they knew it was not a stopping place. What follows is a descriptive list of subsequent experiments in “live, virtual reality theatre.” Each exploration begins at the edge of the territory defined by the previous production (or productions), and then sets out for “terra incognito.”

The first production incorporating VR technologies, following The Adding Machine: A Virtual Reality Project, took place in March 1996, for an audience of six. Lance Gharavi directed and designed this VR version of Samuel Beckett’s Play. Beckett’s script involved three characters contained in urns. In a traditional production, actors would raise their heads from the urns to speak their lines. Gharavi’s experimental production retained the urns, but he created them--and the world they exist in--using Virtus WalkThrough. After videotaping the actors (of which I was one) in 3-D, he inserted their images in Virtus WalkThrough,

programming their heads to appear at the appropriate time.

The six audience members wore i-glasses!, a type of head-mounted display that allowed images to appear in three dimensions. In addition to the three characters, the audience also saw through the lenses of the i-glasses the “ghostly figure” of Gharavi who portrayed “the Light,” a character who controlled the audience viewpoint. This experiment, which was sponsored in part by the United States Institute for Theatre Technology, did not involve live performances, but it did serve as a precursor to the KU Department of Theatre and Film’s next “live, virtual reality” project.

Arthur Kopit originally wrote Wings as a radio play to explore through language how a stroke victim views, remembers, and talks about the world around her. In the fall of 1996, Willis, Reaney, and Gharavi led a production team that set about to explore how VR technologies could reveal the inner workings of the main character Emily, a recent stroke victim who, in her younger days, was an aviatrix. Performed for up to 50 people in the William Inge Memorial Theatre (the department’s black box space), this experiment included new technological features. Audience members wore i-glasses! that included earphones, which allowed for images to be projected in front of the live actors and for the better control of sound. Computer-generated imagery and prerecorded video was also projected in real time on a rear-projection screen. This multiple layering of images, through the inclusion of HMDs, was a first for “live, VR theatre,” but Reaney, the institute for experiments in Virtual Reality, and the KU Department of Theatre and Film continued to incorporate

new technologies in productions of existing plays.

In 1998, the fourth experiment in “live, virtual reality theatre” centered around David G. Fraser’s Tesla Electric. As with The Adding Machine, this contemporary play has, at its center, a technological theme that was only the starting place for a story about the life of one man. Nikola Tesla proved to be the most innovative and outrageous inventor of the late 19th and early 20th century. That people can turn on lights and electric appliances with the certainty there will be power for them is the result of Tesla’s concept of alternating current. His personal life, though, proved to be as amazing as his inventions.

The production of Tesla Electric, directed by Gharavi, with Reaney as lead designer, differed in a key way from previous VR experiments:

In the past we have relied on real-time graphics to give our audience a sense of moving along with the on-stage characters. In order to optimize the real-time animation of the computer generated virtual worlds, the detail and complexity of the scenes needed to be limited. Now, we reversed the principle and created computer generated scenes that did not move but were lavishly detailed and textured. In order to add life to the scene we experimented with interjecting animated objects into the scenes. (“Tesla Electric”)

While actors performed on stage, images were rear-projected on a “panoramic triple screen.” Audience members viewed the scenery “in 3-Dimensions with the aid of special 3-D ‘sunglasses’.”

For the previous experiments, scenery was designed using Virtus Walkthrough. Reaney and his staff designed highly realistic scenery for Tesla Electric using DesignWorkshop and Radiance software. The former program allowed the design team to create the 3-D models, and the latter program served to “depict specific light sources and to calculate all reflected light” on the computer-generated models. The design team included Martin Moeck, “an expert in using Radiance in lighting simulations,” and an assistant professor for the KU Department of Architectural Engineering.

With the 1999 production of Sophie Treadwell’s Machinal, Reaney and Willis returned to American Expressionism for their next experiment. First produced in 1928, the play explores, in nine scenes, how increasing mechanization and the deadening of culture could lead a Young Lady to commit murder and be executed for this crime.

The computer-generated scenery for this production was greatly enhanced by the use of Digital Light Processing projectors, the purchase of which was made possible because of the KU Instructional Technology Fund. The increased illumination from these projectors made it possible for Avi Mor, the lighting designer/modeler, to perform “experiments in pre-visualization of stage lighting”:

Using precise color information on filters supplied by Gam Products Avi was able to simulate stage lighting conditions with Kinetix 3D Studio Viz software. Thanks to the loan of ETC Source4 lighting instruments, Avi had precise, predictable lighting equipment that very

closely resembled the ideal lighting photometrics characteristic of virtual lighting. (“Machinal”)

Updated backstage computers, the latest VR software, and a mixture of real-time and recorded video images also contributed to the overall design of Machinal.

Machinal was produced in the Crafton-Preyer theatre on the University of Kansas campus. In fact, Murphy Hall, which houses Crafton-Preyer and the William Inge Memorial Theatre, had been the starting place for all of i.e.VR’s explorations of the “undiscovered country” of theatre and virtual reality. In 2000, though, Reaney, traveled to the University of Kent, in Cambridge, England, where he collaborated with theatre artists to integrate VR technologies with the production of a play first performed several hundred years ago.

With the help of a Leverhulme fellowship, Reaney traveled to the University of Kent, where he collaborated with members of the Kent Interactive Digital Design Studio (KIDDS) to produce A Midsummer Night’s Dream. According to the i.e.VR Web site, “it was decided that the fantasy world of the fairy forest would be updated to a modern fantasy realm of computer games, cyberspace and science fiction” (“A Midsummer Night’s Dream”). Several factors contributed to this rationale, starting with demonstrating “the value of using digital technologies” in a classical work for “a modern, media-savvy audience.” To do so, the production team sought “a production esthetic [sic] that would compliment the computer generated images that would be used to create the various scenes, thereby making the medium not just a conveyer of the concept but a part of that concept.” On a modern note, these artists, in “creating a

computer-based world inhabited and controlled by fairies,” wanted to “humorously illustrate the understanding many people have of the mysterious mechanical processes inside the computers that they use every day.” They also sought to “draw attention to the interesting manner in which people conceive of electronic communication and interaction mediums as a form of geography.” To that end, they “gave physical form to cyberspaces, replacing the more abstract notions of chat ‘rooms’ and web ‘addresses’.”

In 2001, two years after Reaney’s efforts in England, i.e. VR and the KU Department of Theatre and Film produced Dinosaurs for the KU Theatre for Young People series. This shadow puppet play depicts the discovery by oil surveyors of ten living dinosaurs. For the KU production, computer-generated dinosaurs were projected on screens behind the live actors, who served as “translators,” contributing “emotional detail to the CGI dinosaurs” (“Dinosaurs”). This was achieved through careful “ensemble work between the on-stage actors and the off-stage dinosaur operators,” making certain the “dinos and their human alter-egos moved in unison.”

The technique of combining live actors with computer-generated, projected characters was further developed for the 2003 production of The Magic Flute, the next, and most recent, experiment in “live, virtual reality” theatre. As described in the introduction, Mozart’s opera is set in a world peopled by fantastical characters. The production team’s layered, on-stage depiction of characters and scenic elements proved also fantastical. This layering of the visual components started with two upstage projection screens able to display a “single image 36 feet wide and 13 feet

tall,” an effect made possible by linking computer-generated images from two projectors (“Magic Flute”). A projector located behind the screens also allowed for rear-projected images. These screens were framed by 22 foot tall screens on which were projected additional scenic elements. Six moveable screens added another layer as they were “pushed, pulled, wheeled or carried” about on stage by “Bühnenarabiter,” crew members who are described as “scenic ninjas.” A follow-spot operator in the orchestra pit guided a data projector so that computer-generated images could appear on these screens as they were moved about to interact with the onstage singers.

This production of The Magic Flute was the seventh expedition to the unmapped world of virtual reality and theatre. Each exploration pushed deeper into the hinterland in order to discover where the borders, the boundaries, might be located. To date, no boundaries have been reached. Mark Reaney, i.e. VR, and the University of Kansas Department of Theatre and Film push onward, continuing to find “a new place to stand.”

## Bibliography

- Bartlett, John. Familiar Quotations. 15 ed. Ed. Emily Morison Beck. Boston: Little, Brown and Company, 1986.
- Bradbury, Ray. Fahrenheit 451. New York: Simon and Schuster, 1953.
- . "The Veldt." The Illustrated Man. Garden City, NY: Doubleday, 1951.
- "Brave New Worlds." Compute! Oct. 1989: 28.
- Brockett, Oscar G. History of the Theatre. Fifth ed. Boston: Allyn and Bacon, 1987.
- Cambridge Guide to American Theatre. Eds. Don B. Wilmeth and Tice L. Miller. New York: Cambridge UP, 1993.
- Campbell, Jeremy. The Improbably Machine: What New Discoveries in Artificial Intelligence Reveal about the Mind. New York: Simon and Schuster, 1989.
- Carlson, Marvin. Theories of the Theatre: A Historical and Critical Survey, from the Greeks to the Present. Expanded ed. Ithaca, NY: Cornell UP, 1993.
- Clarke, Arthur C. The Hammer of God. New York: Bantam, 1993.
- Cortada, James W. The Computer in the United States: From Laboratory to Market, 1930 to 1960. Armonk, NY: M.E. Sharpe, 1993.
- "Dinosaurs." The Institute for the Exploration of Virtual Realities. 18 Aug. 2004. <<http://www.ukans.edu/~mreaney/midsummer>>.
- Fitter, M. J., and M. E. Sime. "Creating Responsive Computers." Human Interaction with Computers. Eds. H. T. Smith and T. R. G. Green. London: Academic Press, 1980: 39-66.
- Gharavi, Lance. "i.e. VR: Experiments in New Media and Performance." Theatre in

- Cyberspace: Issues of Teaching, Acting, and Directing. Ed. Stephen A. Schrum. *Artists and Issues in the Theatre*, 10: 249-271.
- . "Re: Dissertation Materials Requests." E-mail to David-Michael Allen. 29 Dec. 2003.
- Gibbons, A. "Surgery in Space." Technology Review Apr. 1989: 9-10.
- Jones, Robert Edmond. Towards a New Theatre: The Lectures of Robert Edmond Jones. Ed. Delbert Unruh. New York: Limelight Editions, 1992.
- Kalawsky, Roy S. The Science of Virtual Reality and Virtual Environments. Wokingham, England: Addison-Wesley, 1993.
- Krueger, Myron W. Artificial Reality II. Reading, MA: Addison-Wesley, 1991.
- Laurel, Brenda. The Art of Human-Computer Interface Design. Reading, MA: Addison-Wesley, 1990.
- . Computers as Theatre. Reading, MA: Addison-Wesley, 1993.
- "Machinal." The Institute for the Exploration of Virtual Realities. 18 Aug. 2004. <<http://www.ukans.edu/~mreaney/machinal>>.
- "The Magic Flute: Virtual Reality Lends Magic to The Magic Flute." The Institute for the Exploration of Virtual Realities. 12 March 2004. <<http://www.ukans.edu/~mreaney/flute>>.
- Manovich, Lev. "Virtual Worlds." Telepolis. 24 January 2002. <<http://www.heise.de/tp/english/special/sam/6030/1.html>>.
- "A Midsummer Night's Dream." The Institute for the Exploration of Virtual Realities. 18 Aug. 2004. <<http://www.ukans.edu/~mreaney/midsummer>>.

- Norman, Donald A. Foreward. Computers as Theatre. By Laurel, Brenda. Reading, MA: Addison-Wesley, 1993.
- O'Conner, J.J. and E.F. Robertson. "Charles Babbage." <<http://www-history.mcs.st-and.ac.uk/history/Mathematicians/Babbage.html>>. 3 Dec. 2000.
- Reaney, Mark. Personal Interview. 18 July 2001.
- . "Virtual Scenography: The Actor, Audience, Computer Interface. Theatre Design and Technology Winter 1996: 36-43.
- . "Virtual Reality on Stage." VR World May/June 1995: 28-31.
- Reynolds, R. "Electronic Movie Stars." Maclean's Mar. 28, 1988: 56.
- Rheingold, Howard. Virtual Reality. Summit: New York, 1991.
- Rice, Elmer. Seven Plays. New York: Viking, 1950.
- Saffo, P. "Desperately Seeking Cyberspace." Personal Computing May 1989: 247-48.
- Schechner, Richard. Environmental Theater. An Expanded New Edition. New York: Applause, 1994.
- Schroeder, M. "Computers You Control With the Wave of Your Hand." Business Week Feb. 20, 1989: 142+.
- Smith, H.T., and T.R.G. Green, eds. Human Interaction with Computers. London: Academic Press, 1980.
- Sutherland, Ivan. "The Ultimate Display." Proceedings of the IFIP Congress 1965: 506-508.
- "Tesla Electric." The Institute for the Exploration of Virtual Realities. 18 Aug. 2004. <<http://www.ukans.edu/~mreaney/tesla/>>.

Willis, Ron. Personal Interview. 25 September 2001.

Woolley, Benjamin. Virtual Worlds: A Journey in Hype and Hyperreality. Oxford,

UK: Blackwell, 1992.

## Appendix A

Program:

The Adding Machine: A Virtual Reality Project

The Adding Machine

by Elmer Rice

Director

Designer/Technologist

Hosts:

Ronald A. Willis

Mark Reaney

David-Michael Allen

Lance Gharavi

Natalie Hamilton

Cast (in Order of Appearance)

Zero

Brian Paulette

Mrs. Zero

Betsy Atkinson

Daisy Dortha Diana Devore

Megan E. Parr

Boss

John Garretson

Mr. One through Six

Andrew Patrick Ralston

Mrs. One through Six

Ally Z. Freund

Policeman

John Garretson

Jurors

Andrew Patrick Ralston

Ally Z. Freund

Blair Bitters

The Fixer

Steve Willingham

Guard

John Garretson

Judy O'Grady

Blair Bitters

Young Man

Andrew Patrick Ralston

Shrdlu

Eben Copple

Joe

John Garretson

There will be a 10-minute intermission between the live production and the videotape. Produced by special arrangement with Samuel French, Inc.

Production Staff

Assistant Directors

James M. Gilbert

Jeffrey J. Ryan

Assistant Scenic and Costume Designer

Betty Groenewold

Assistant Lighting Designer

David Fulton

Assistant Sound Designer

Silas Hoover

Assistant Make-Up Designer

Natalie Hamilton

Stage Manager

Tuyet Snow Pham

Graphic Designer

Jeffrey Link

Historian/Dramaturg/General Factotum

Lance Gharavi

The Making of The Adding Machine: A Virtual Reality Project  
Scriptwriters: David-Michael Allen, Lance Gharavi  
Camera Persons/Video Editors: Bill Wachspres, Natalie Hamilton

#### Acknowledgements

This production is co-sponsored by BANK IV of Lawrence; Lawrence City Commission; the United States Institute for Theatre Technology; Victor Maxx Technologies, Inc., manufacturers of affordable VR equipment and supporting software; and the Virtus Corporation, makers of affordable VR software for personal computers. Thanks also to Marks Bridal and Formal for providing formal wear for the front-of-house staff.

The scenic projection equipment being used for the first time in this production was made possible through the extraordinary efforts of FRiends Of the THEatre and the following corporate and individual donors:

Hallmark Cards, Inc.  
Mercantile Bank of Lawrence  
Commerce Bank-Lawrence  
J. Hammond McNish  
Raney Drug  
Scotch Fabric Care Services, Inc.  
Kief's  
Alvamar Development Corporation  
Glenn Livingood Penzier Architects, PA  
Emprise Bank

The investigation for this production was supported by the University of Kansas General Research allocation #3963-60-0039.

BANK IV N.A., is a principal subsidiary of Fourth Financial Corporation, a regional banking company providing a full line of financial products and services to individuals and businesses. In addition to BANK IV Kansas, other major subsidiaries include BANK IV Oklahoma, N.A., and BANK IV Missouri, N.A. In Kansas, the company operates 87 banking offices in the metropolitan markets of Kansas City, Lawrence, Topeka, and Wichita, and in 34 other communities. The company's headquarters are located in Wichita. Founded in 1968, Fourth Financial has its roots with the Fourth National Bank in Wichita, which was established in 1887. In sponsoring this University Theatre production, BANK IV continues its tradition of community support and involvement.

#### Production Notes

The production of The Adding Machine you are about to see is truly experimental, an

example of emerging technology applied to a performing art. In this experiment we merge real-time interactive computer graphics (virtual reality or VR) with real-time conventional performance (live theatre).

The notes you are now reading were written more than a month ago. We sincerely hope we have learned a lot from this project between then (when we processed these words) and now (when you process them).

But, of this much we are sure, both then and now: It is an exciting and worthy experiment. Like all worthy experiments, it will undoubtedly bring to light an array of assumptions, some mistaken and some accurate, about the impact of VR technology on the practice of theatre. We are grateful to many people-you among them-who have opted to undertake this adventure with us.

In a sense we feel a little like Zero. Like him, we are confronting an engine with a powerful potential for change. Like him, we are called upon to find a way of accommodating ourselves to it or it to us. And, like him, we are discovering some things about ourselves and "the way things are" that we had been taking for granted-things that deserve to be looked at again.

Your presence here testifies to your willingness to share that sometimes uncomfortable--but nonetheless exhilarating--sense of adventure. The extent to which the project is seen to pose a threat or a promise is yet to be determined. In exploring this question, too, we hope you will help us.

Thanks for joining us.

Ronald A. Willis  
Mark Reaney

Appendix B

HOSTS DIALOGUE--DRAFT TWO, 4/12/95

ONE: Good Evening, my name is \_\_\_\_\_

TWO: I'm \_\_\_\_\_. Hello.

ONE: On behalf of the University of Kansas, its University Theatre, and——most especially, the production team for tonight's show——we are pleased to welcome you to The Adding Machine . . .

TWO: A Virtual Reality Project.

ONE: We're excited about your being here.

TWO: Which is why we dressed up.

ONE: We are pleased you have chosen to be a part of this experiment.

TWO: And it is an experiment, as well as a challenge and a privilege to explore the links between live theatre and VR.

ONE: Virtual Reality.

TWO: It couldn't have been done without the unflagging assistance of many, many people.

ONE: And several corporations.

TWO: All of whom deserve sincere thanks.

ONE: We hope you will take note of their names in your program.

TWO: The glasses you have been given are an important part of the production.

ONE: Their lenses are polarized. The glasses fit right over your regular glasses--if

you wear them.

TWO: The glasses enable you to see the scenery in three dimensions.

ONE: But, one word of advice. Don't work too hard at trying to see things in three dimensions.

TWO: The illusion works better, we have found, if you simply relax and let the effect happen naturally.

ONE: One other note. The scenery sometimes moves. That's part of virtual reality's special illusion.

TWO: If you are one of the very few people who are sensitive to such movement and begin to feel disoriented, remember you can stop that awkward sensation at any time by simply closing your eyes.

ONE: But, of course, we hope you won't keep them closed.

TWO: The scenery doesn't move that much.

ONE: Following the 70 minute production will be a brief intermission. After the intermission we will screen a short video that addresses some key questions about the show.

TWO: Members of the production team will then answer your questions in a brief feedback session.

ONE: We are interested in your responses to the event. Please take a moment or two during the intermission to fill out the brief response sheet provided by the ushers.

TWO: It will help guide our thinking in important ways.

ONE: We are excited about VR's potential for theatre. We hope after you see the show you will be too.

TWO: While we realize we have only begun to scratch the surface, we are pleased to be underway.

ONE: Thank you, again, for taking the time to be part of this project.

TWO: And now, ladies and gentlemen, The Adding Machine . . .

ONE: A Virtual Reality Project.

#### AT THE START OF THE INTERMISSION

ONE: That's it for the first part of the show.

TWO: Please return your glasses to the ushers.

ONE: And, if you would, please take a moment to complete a response sheet and return it to an usher.

TWO: We'll see you again after the intermission.

#### AT THE END OF THE INTERMISSION

ONE: Welcome back.

TWO: The short video you are about to see was put together by the members of the production team.

ONE: It gives a glimpse into the background of the production.

AT THE END OF THE SCREENING

ONE: Here, ladies and gentlemen, are some members of the production team. For about the next ten minutes they will be happy to respond to your questions.

[Hosts now call on those audience members who pose questions, see to it that the question is heard by other members of the audience--repeating it if necessary--and generally keep the session orderly and the commentaries brief. The time for the whole session should be about ten minutes.]

## Appendix C

Though this script indicates there is only one narrator, the videotaped documentary used various members of the production staff as narrators.

“The Making of The Adding Machine: A Virtual Reality Project,”

Written by David-Michael Allen and Lance Gharavi, April 1995, Edited 3rd draft.

Narrator: Theatre in the 20th century has changed with every advance in technology.

The electric light, for example, changed not only how we saw a play, but how the story of the play was told. Three years ago, Mark Reaney, associate professor of scenography in Theatre and Film at the University of Kansas, decided to link theatre and one of the most exciting technologies of our day, virtual reality. The Adding Machine: A Virtual Reality Project was the result.

Narrator: Reaney came to KU in 1987 from the University of Tulsa. He has written and lectured on the uses of computer graphics in stage design. Sample articles include “The Theatre of Virtual Reality,” and “VR on Stage.” He began exploring virtual reality as a scenic design tool with the 19 of “Lone Star” and “Laundry and Bourbon.” Sets were designed using Virtus WalkThrough, a software application designed originally for architects by the Virtus Corporation. This same software had been used previously in making the popular films *The Abyss* and *The Firm*. Virtus WalkThrough allowed Reaney

to do just what the name implies: design a set and, using a computer and a lot of imagination, “walk” through it before actually constructing it.

Narrator: Reaney’s next goal was to take the design off the computer terminal and display it on a rear projection screen so that it could be viewed by designer and director together. These projections could be life-sized M’ viewed in the actual theatre that would later house the final setting. And Reaney did just that with his design for A Streetcar Named Desire.

Narrator: At this point, he had a brainstorm. Why not circumvent the building process and using the projected virtual design as the scenic medium.

[Mark talking about his efforts and inspiration. Would it be worthwhile to have Jack Wright talk about his reaction to the projection screen set?]

Narrator: But theatre is a collaborative effort and requires many other artists and technicians before it can even approach success. At this point Reaney enlisted the help of Ron Willis, another KU theatre professor. The two had teamed up previously, most recently in the spring of 1994 on the University Theatre’s production of Assassins.

Narrator: In directing The Adding Machine, Willis feels a keen responsibility to help Reaney, whom he describes as the “designer/technologist,” explore and realize his vision.

[Ron talking about his involvement, which leads into a discussion of the production’s goals.]

Narrator: At the heart of Reaney’s vision is the much-touted new computer

technology “virtual reality” or VR. In VR, a computer generates an artificial environment or “virtual world” within which a person can navigate freely. The sense, “navigating” occurs when the image on the screen changes and thus alters the viewer’s perspective in a fluid way.

Narrator: What we have to come to think of as virtual reality had its beginnings in the early 1960’s, when Ivan Sutherland, a scientist at Massachusetts Institute of Technology, began to theorize about virtual worlds and the “ultimate” computer display. He designed and implemented one of the first computer-generated environments. Sutherland also created the first prototype of the now familiar head-mounted display. Reaney has built his own head-mounted display which has played an important part in his research and experimentation.

[Mark with equipment.]

Narrator: VR can also be accessed through the other types of user interface. Shutter glasses which blink on and off in synchronized time to alternating computer images, projection rooms or “CAVEs”, simulated cockpits, or polarized glasses through which we view 3-D projections such as those used in “The Adding Machine” all can induce a variety of VR experiences. The common element is that all VR systems present an illusion of a virtual world which can be manipulated in “Real-time.” That is, the changes from moment to moment are not pre-recorded. In this crucial definition, VR is much like theatre. In his article, “Virtual Reality on Stage,” Reaney draws strong parallels between

theatre and virtual reality. “Theatre,” he writes, “is the original virtual reality machine. Accessing it, audiences visit imaginary worlds which are interactive and immersive.”

Narrator: In late 1993, Reaney and Willis began searching for a script that allowed them to integrate virtual environments and live actors. A number of elements would prove important for this experiment. Reaney commented, ‘We are looking for either a well established, classical script or one that was written ten minutes ago for the specific purposes of this production.’”

Narrator: In order to best show off the potential of the technology, the play should contain multiple locations. In addition, since virtual reality allows for the creation of fantastical environments with unique physical laws, Reaney and Willis decided to seek a non-realistic play. After investigating dozens of scripts, they finally settled on Elmer Rice’s The Adding Machine.

Narrator: Rice’s classic expressionistic play dates from 1923. It was first produced by The Theatre Guild, with Dudley Digges in the lead role. Among the issues Rice skillfully articulated was the fear of humanity’s dubious place in an increasingly mechanized society. Many have appreciated the irony in using this particular play as the springboard for introducing virtual reality into live theatre.

[Ron and Mark talking about the selection of The Adding Machine.]

Narrator: Exploring the theatrical possibilities of virtual reality may well be a laudable focus for the project, but it is only through the dedication and

commitment of uncounted people behind the project that it can happen. One such person is Lance Gharavi, who Willis describes as the show's "general factotum."

Narrator: Gharavi, a professional actor and director before he returned to school to pursue his doctorate, took on myriad tasks and responsibilities in preparing this production.

[Lance talking about his job, and Mark and Ron commenting on Lance's contribution.]

Narrator: One thing Gharavi's was to do was disseminate information about the production via the Internet. The Internet is the system of internationally-linked computers that enables hundreds of thousands of students, educators, and others to exchange ideas, correspondence, software, photographs, and even moving images. Much information is exchanged through listservers, specialized e-mail systems whereby one message can be easily distributed to all the listserve subscribers. The goal wasn't so much to get people to see the show, but rather to disseminate information about The Adding Machine and the experimentation surrounding it to as many people as possible.

Narrator: Gharavi began by simply posting short news releases on theatre list servers and virtual reality list servers, but as people from around the world became first aware and then increasingly interested in KU's production of The Adding Machine.

Narrator: The arrangement of the seating for the audience is important to the

experimental staging of The Adding Machine. To enhance visibility and increase the illusion and sense of immersion within the virtual settings, the audience is seated on a set of steeply raked platforms in close proximity to the playing area and projection screen. This made it necessary to locate the audience within the stage house itself, foregoing the existing seating of the much larger Crafton-Preyer Theatre.

Narrator: Live actors work in front of (and occasionally behind) the large rear-projection screen. Fourteen-foot high towers placed in each of the wings support follow-spots that provide most of the lighting for the live actors.

Narrator: The stage is covered with dull, black carpeting to minimize light spilling onto the projection screen. There is little “actual three-dimensional” scenery and props of any kind. Two projection screens are placed on either side of the main screen. Slides projected onto these screens augment the virtual environments projected on the main screen.

Narrator: Behind the main projection screen is the engine that powers the virtual scenery. An Apple PowerMac computer generates the virtual environments. Two theatre-quality overhead projectors equipped with liquid crystal display projection pads allow the images imported from the computer to be projected in much the same way as images on a transparency are projected in a classroom.

Narrator: Just off stage, a special green-screen is set up. A pair of video cameras, placed side by side in close proximity are aimed at live actors as they perform

in front of the green background. The signal from these cameras is fed through a video-mixer which edits out the background but leave the image of the actors intact. This is similar to the chroma-key techniques that enable television weather persons to interact with maps that seem to be behind them-- but really are not. The videoed images of the actors can be fed through the projector pads and projected onto the screen so that they appear to exist within the computer-generated, virtual environment. In addition to the "video actors", another computer is used to generate a "virtual agent", that is, a character that is completely computer-generated and manipulated in real time.

Narrator: Twin projectors project stereo images of the virtual environments and video actors onto the rear-projection screen. One projector projects the right-eye image, the other, the left-eye image. Before they reach the screen, the two images are polarized in opposition to each other by the use of special filters. The audience then views the projections using polarized glasses that match these filters. Through the glasses, each audience member sees one projection with their left eye, and another with their right eye. When the brain coordinates these two views a three-dimensional effect is generated.

Narrator: It's important to stress that all elements of this production are manipulated in real time. The virtual environments are improvisationally navigated each night by the person we have named the "virtual environment driver" or VED. The VED responds to the subtle or sometimes not so subtle changes that can take place from performance to performance, in live theatre.

Narrator: Even the work of the actors is affected by the implementation of virtual reality. Modified acting strategies and techniques need to be employed.

[Ron and actors talking about process and challenges.]

Narrator: Elmer Rice's advice to Dudley Digges, advice seventy-two years old seemed to confirm Willis' own advice: "in the expressionistic play we subordinate and even discard objective reality and seek to express the character in terms of his own inner life. An X-ray photograph bears no resemblance to the object as it presents itself in our vision, but it reveals the inner mechanism of the object as no mere photographic likeness can."

Narrator: Recreating objective reality was not the goal of the reinstated production team of Reaney and Willis. The goal was to explore the ways in which the latest computer technologies could aid the depiction of Elmer Rice's expressionistic play. Just as the electric light, early in this century, allowed theatre artists to change how the story of a play was told, virtual reality may very well become another powerful means of punctuating and depicting a play's conflict, thematic issues, and symbolic content. What The Adding Machine: A Virtual Reality Project demonstrates is this: no aspect of the theatrical process, from how the audience sees the show to how sets are designed to how a show is publicized, will be left untouched by the advent of virtual reality and its associated computer technologies.

## Appendix D

Where Ron Willis indicated, each scene is preceded by a heading the lists the number of the edited version and the date of the editing.

### The Adding Machine

#### Scene I

MRS. ZERO: I'm sick o' them Westerns. Sick of 'em. I like them sweet little love stories. They're nice an' wholesome. I think we'll start goin' to the Peter Stuyvesant. They got that big Grace Darling feature, A Mother's Tears. Mrs. Nine read in Pictureland that she ain't livin' with her husband. He's her second, too. They say some Pittsburgh millionaire is crazy about her, that's why she ain't livin' with her husband. Mrs. Seven was tellin' me her brother in—law has a friend used to go to school with Grace Darling. Her name ain't Grace Darling at all. Her right name is Elizabeth Dugan. She's sweet, though. Mrs. Eight was tellin' me A Mother's Tears is the best picture she ever made. "Don't miss it, Mrs. Zero," she says. "It's sweet," she says. "Just sweet and wholesome. Cry!" she says, "I nearly cried my eyes out." It's at the Peter Stuyvesant Wednesday night, so don't be tellin' me you want to go to the Rosebud. The Eights seen it downtown at the Strand. They go downtown all

the time. But you wouldn't go downtown, not if wild horses was to drag you. You wait till they come uptown! Well, I don't want to wait, see? I want to see 'em when everybody else is seem' them, not a month later. Don't tell me you ain't got the price. You could dig up the price if you wanted to. An' don't pull that stuff about bein' tired. "I been workin' hard all day. Twice a day in the subway's enough for me." Tired! What about me? Scrubbin' your floors, cookin' your meals, washin' your dirty clothes. An' you sit on a chair all day, just addin' figgers an' waitin' for five-thirty. No five—thirty for me! I don't get no whistle. I don't get no vacations. What's more I don't get no pay envelope every Saturday night. An' what have I got to show for it? I was a fool for marryin' you. I wish I had it to do over again. You was goin' to do wonders! You wasn't goin' to be a bookkeeper long. You was goin' to show 'em. Well, I've been waitin'— Twenty five years! I ain't seen nothin' happen. Twenty five years in the same job. Twenty-five years tomorrow! Somethin' to be proud of, ain't it? Sittin' twenty five years on the same chair, addin' up figures. An' me here. Home. Lookin' at the same four walls an' workin' my fingers to the bo to make ends meet. Seven years since you got a raise! An' if you don't get one to—morrow, I'll bet you won't have the guts to go. an' ask for one. You ain't much to be proud of. She ain't walkin' around to-night, you can bet your sweet life on that. An' she won't be walkin' around any more nights, neither. Not in this house. The idea of her in a house with respectable people. Should 'a' gave her six years, not six months. If I was the judge I'd of

gave her life. Guess you're sorry she's gone. Guess you'd like to sit home every night an' watch her goin's—on. ∴ You'd better not start nothin' with women. ' I put up with a lot, but I won't put up with that. If you was any kind of man you'd have a decent job an' I'd be gettin' some comfort out of life. I've stood it for twenty-five years, but don't you go startin' nothin' with women.

Edited version 2--2/27/95

Scene II

DAISY: Three ninety-eight. Forty-two cents. A dollar fifty. A dollar fifty. A dollar twenty five. Two dollars. Thirty-nine cents. Twenty-seven fifty.

ZERO: Speed it up, cancha?

DAISY: What's the rush? To—morrer's another day,

ZERO: You make me sick.

DAISY: You make me sicker.

ZERO: Go on. Go on. We're losin' time.

DAISY: Then quit bein' so bossy. Three dollars. Two sixty—nine. Eighty-one fifty. Forty dollars. Eight seventy-five. Who do you think you are, anyhow?

ZERO: Never mind who I think I am. You tend to your work.

DAISY: Aw, don't be givin' me so many orders. Sixty cents. Twenty—four cents.

Seventy-five cents. A dollar fifty. Two fifty. One fifty. One fifty. Two fifty. I

don't have to take it from you and what's more I won't.

ZERO: Quit talkin'.

DAISY: I'll talk all I want. Three dollars. Fifty cents. Fifty cents. Seven dollars. Fifty cents. Two fifty. Three fifty. Fifty cents. One fifty. Fifty cents.

ZERO: You make me sick. Always shootin' off your face about somethin'. Talk, talk, talk. Just like all the other women. Women make me sick.

DAISY: Who do you think you are, anyhow? I don't have to take it from you, and what's more I won't.

ZERO: Women make me sick. They're all alike. The judge gave her six months. I wonder what they do in the work—house. Bet she's sore at me. Maybe she'll try to kill me when she gets out. I better be careful. Hello Girl Slays Betrayer. Jealous Wife Slays Rival. You can't tell what a woman's liable to do. I better be careful.

DAISY: I'm gettin' sick of it. Always pickin' on me about somethin'. Never a decent word out of you. Not even the time o' day.

ZERO: She wouldn't have the nerve. Maybe she don't know it's me. They didn't even put my name in the paper, the big bums. Maybe she's been in the work—house before. She didn't have nothin' on that one time, nothin' but a shirt. You make me sick. I'm sick of lookin' at your face.

DAISY: Gee, ain't that whistle ever goin' to blow? You didn't used to be like that. Not even good mornin' or good evenin'. I ain't done nothin' to you. It's the young girls. Goin' around without corsets.

ZERO: Your face is gettin' all yellor. Why don't you put some paint on it? She was puttin' on paint that time. On her cheeks and on her lips. And that blue stuff on her eyes. Just sittin' there in a shiimny puttin' on the paint. An' walkin' around the room with her legs all bare.

DAISY: I wish I was dead.

ZERO: I was a goddamn fool to let the wife get on to me. She oughta get six months at that. Livin' in a house with respectable people. She'd be livin' there yet, if the wife hadn't o' got on to me. Damn her!

DAISY: I wish I was dead.

ZERO: Maybe another one'll move in. That would be great. But the wife's got her eye on me now.

DAISY: I'm scared to do it, though.

ZERO: You oughta move into that room. It's cheap. I better tell you about it. I don't mean to be always pickin' on you.

DAISY: Gas. The smell makes me sick.

DAISY: Whadja say?

ZERO: Nothin'.

DAISY: I thought you did.

ZERO: You thought wrong.

DAISY: A dollar sixty. A dollar fifty. Two ninety. One fifty-two.

ZERO: Why the hell should I tell you? Fat chance of you forgettin' to pull down the shade!

DAISY: If I asked for carbolic they might get on to me.

ZERO: Your hair's gettin' gray. You don't wear them shirt waists any more with the low collars. When you'd bend down to pick somethin' up.

DAISY: I wish I knew what to ask for. Girl Takes Mercury After All-Night Party.  
Woman In Ten-Story Death Leap.

ZERO: Wonder where'll she go when she gets out. I'd like to make a date with her.  
Why didn't I go over the night my wife went to Brooklyn? She never woulda found out.

DAISY: I seen Pauline Frederick do it once. Where could I get a pistol though?

ZERO: Didn't have the nerve.

DAISY: You'd be sorry then you been so mean to me. Though——maybe you wouldn't.

ZERO: Nerve! I got nerve. I'm on the level, that's all. I'm a married man and I'm on the level.

DAISY: Anyhow, why ain't I got a right to live? I'm as good as anybody else. I'm too refined, I guess. That's the whole trouble.

ZERO: The time the wife had pneumonia I thought she was goin' to pass out. But she didn't. The doctor's bill was eighty-seven dollars. Hey! Didn't you say eighty-seven dollars?

DAISY: What?

ZERO: Was the last eighty-seven dollars?

DAISY: Forty-two fifty.

ZERO: I made a mistake. Wait a minute. All right. Shoot.

DAISY: Six dollars. Three fifteen. Two twenty-five. Sixty—five cents. A dollar twenty. You talk to me as if I was dirt.

ZERO: I wonder if I could kill the wife without anybody findin' out. In bed some night. With a pillow.

DAISY: I used to think you was stuck on me.

ZERO: I'd get found out, though. They always have ways.

DAISY: We used to be so nice and friendly together when I first came here. You used to talk to me then.

ZERO: Maybe she'll die soon. She was coughin' this mornin'.

DAISY: Used to tell me all kinds o' things. You were goin' to show them all.

ZERO: Then I could do what I damn please. Oh, boy!

DAISY: Maybe it ain't all your fault neither. Maybe if you'd had the right kind o' wife, somebody with a lot of common—sense, somebody refined, me!

ZERO: I guess I'd get tired of bummin' around. A feller wants some place to hang his hat.

DAISY: I wish she would die.

ZERO: Start goin' with women, you're liable to get into trouble. Lose your job maybe.

DAISY: Maybe you'd marry me.

ZERO: I wish I'd gone over there that night.

DAISY: Then I could quit workin'.

ZERO: Lots o' women would be glad to get me.

DAISY: You could look a long time before you'd find a sensible, refined girl like me.

ZERO: Yes, sir, they could look a long time before they'd find a steady meal—ticket  
like me.

DAISY: I guess I'd be too old to have any kids. It ain't safe after thirty-five.

ZERO: Maybe I'd marry you. You might be all right.

DAISY: I wonder, if you don't want kids, whether if——there's any way——

ZERO: Hey! Hey! Slow up! What do you think I am, a machine?

DAISY: What do you want, anyhow? First it's too slow, then it's too fast. You don't  
know what you want.

ZERO: Never mind. Just slow up.

DAISY: I'm gettin' sick o' this. I'm goin' to ask to be transferred.

ZERO: Go ahead. Can't make me mad.

DAISY: Aw, keep quiet. Two forty-five. A dollar twenty. A dollar fifty. Ninety cents.  
Sixty-three cents.

ZERO: Marry you! I guess not! You'd be as bad as the one I got.

DAISY: You wouldn't care if I did ask. I got a good mind to ask.

ZERO: I was a fool to get married.

DAISY: Then I'd never see you at all.

ZERO: What chance has a guy got with a woman tied around his neck?

DAISY: That time at the store picnic, the year your wife couldn't come, you were  
nice to me then.

ZERO: Twenty-five years holdin' down the same job!

DAISY: We were together all day, just sittin' around under the trees.

ZERO: Wonder if the boss remembers about it bein' twenty five years.

DAISY: Comin' home that night, you sat next to me in the big delivery wagon.

ZERO: I got a hunch there's a big raise comin' to me.

DAISY: I wonder what it feels like to be really kissed. Men, dirty pigs! They want  
the bold ones.

ZERO: If he don't come across I'm goin' right up to the front office and tell him  
where to get off.

DAISY: I wish I was dead.

ZERO: "Boss," I'll say, "I want to have a talk with you." "Sure," he'll say, "sit down.  
Have a Corona Corona." "No," I'll say, "I don't smoke." "How's that?" he'll  
say. "Well, boss," I'll say, "it's this way. Every time I feel like smokin' I just  
take a nickel and put it in the old sock. A penny saved is a penny earned,  
that's the way I look at it." "Damn sensible," he'll say. "You got a wise head  
on you, Zero."

DAISY: I can't stand the smell of gas. It makes me sick. You coulda kissed me if you  
wanted to.

ZERO: "Boss," I'll say, "I ain't quite satisfied. I been on the job twenty—five years  
now and if I'm gonna stay I gotta see a future ahead of me." "Zero," he'll say,  
"I'm glad you came in. I've had my eye on you, Zero. Nothin' gets by me."  
"Oh, I know that, boss," I'll say. That'll hand him a good laugh, that will.

“You’re a valuable man, Zero,” he’ll say, “and I want you right up here with me in the front office. You’re done addin’ figgers. Monday mornin’ you move up here.”

DAISY: Them kisses in the movies, them long ones, right on the mouth...

ZERO: I’ll keep a-goin’ right on up after that. I’ll show them.

DAISY: That one the other night, The Devil’s Alibi, he put his arms around her, and her head fell back and her eyes closed, like she was in a daze.

ZERO: Just give me two years, I’ll show them where to get off.

DAISY: I guess it’s like--a kinda daze, when I see them like that, I just seem to forget everything.

ZERO: Then me for a place in Jersey. And maybe a little Buick. No tin Lizzie for mine. Just wait, I’ll show ‘em.

DAISY: I can see it when I kinda half—close my eyes. The way her head fell back. And his mouth pressed right up against hers. Oh, Gawd! it must be grand!

DAISY and ZERO: The whistle!

ZERO: G’night, Miss Devore.

[Daisy exits. BOSS enters.]

BOSS: Oh, er, Mister, er—

ZERO: Yes, sir. Do you want me, sir?

BOSS: Yes. Just come here a moment, will you?

ZERO: Yes, sir. Right away, sir.

BOSS: Mister, er, er—

ZERO: Zero.

BOSS: Yes, Mr. Zero. I wanted to have a little talk with you.

ZERO: Yes sir, I been kinda expectin' it.

BOSS: Oh, have you?

ZERO: Yes, sir.

BOSS: How long have you been with us, Mister—, er, Mister——

ZERO: Zero.

BOSS: Yes, Mister Zero.

ZERO: Twenty-five years today.

BOSS: Twenty-five years! That's a long time.

ZERO: Never missed a day.

BOSS: And you've been doing the same work all the time?

ZERO: Yes, sir. Right here at this desk.

BOSS: Then, in that case, a change probably won't be unwelcome to you.

ZERO: No, sir, it won't. And that's the truth.

BOSS: We've been planning a change in this department for some time.

ZERO: I kinda thought you had your eye on me.

BOSS: You were right. The fact is that my efficiency experts have recommended the  
installation of adding machines.

ZERO: Addin' machines?

BOSS: Yes, you've probably seen them. A mechanical device that adds  
automatically.

ZERO: Sure. I've seen them. Keys, and a handle that you pull.

BOSS: That's it. They do the work in half the time and a high-school girl can operate them. Now, of course, I'm sorry to lose an old and faithful employee...

ZERO: Excuse me, but would you mind sayin' that again?

BOSS: I say I'm sorry to lose an employee who's been with me for so many years—  
——But, of course, in an organization like this, efficiency must be the first consideration——You will draw your salary for the full month. And I'll direct my secretary to give you a letter of recommendation.

ZERO: Wait a minute, boss. Let me get this right. You mean I'm canned?

BOSS: I'm sorry, no other alternative, greatly regret, old employee, efficiency——  
economy, business, business, BUSINESS.

Edited version 2--2/27/95

Scene III

(MRS. ZERO is discovered. ZERO Enters.)

MRS. ZERO: Nice of you to come home. Only an hour late. Ain't you even got sense enough to come home on time? Didn't I tell you we're goin' to have a lot o' company tonight? Didn't you know the Ones are comin'? An' the Twos? An' the Threes? An' the Fours? An' the Fives? And the Sixes? Didn't I tell you to be home on time? I might as well talk to a stone wall. You musta had some important business to attend to. You gotta tough life, you have. Maybe the

boss kept you late tonight. Tellin' you what a big noise you are and how the store couldn't 'a' got along if you hadn't been pushin' a pen for twenty five years. Where's the gold medal he pinned on you? Bet he gave you a big raise, didn't he? A fat chance you got o' gettin' a raise. All they gotta do is put an ad in the paper. There's ten thousand like you layin' around the streets. You'll be holdin' down the same job at the end of another twenty-five years, if you ain't forgot how to add by that time. There's the door—bell. The company's here already. Wait a minute! Don't open the door yet. You want the company to see this mess? Go put on a clean collar. You got red ink all over it. I'd think after pushin' a pen for twenty-five years, you'd learn how to do it without gettin' ink on your collar.

[ZERO Exits to bedroom.]

MRS. ZERO: I guess I can stay up all night now washin' dishes. That's what a man's got a wife for, ain't it? All she's gotta do is cook the meals an' do the washin' an' scrub the floor, an' wash the dishes when the company goes. But, believe me, you're goin' to sling a mean dish-towel when the company goes tonight!

[ZERO enters from bedroom.]

MRS. ZERO: There's the bell again. Open the door, cancha?

[MESSERS and MRS. ONE, TWO, THREE, FOUR, FIVE, and SIX Enter.]

MRS. ZERO: How de do, ladies.

ALL WOMEN: How de do, Mrs. Zero.

SIX: Some rain we're havin'.

MRS. SIX: I like them little organdy

FIVE: Never saw the like of it. dresses.

FOUR: Worst in fourteen years, paper says.

THREE: Y' can't always go by the papers. MRS. FIVE: Yeh, with a little lace trimmin' on the sleeves.

TWO: No, that's right, too.

ONE: We're liable to forget from year to year. MRS. FOUR: Well, I like 'em plain myself.

SIX: Yeh, come t' think, last year was pretty bad, too.

FIVE: An' how about two years ago?

FOUR: Still this year's pretty bad.

THREE: Yeh, no gettin' away from that. MRS. THREE: Yeh, what I always say is the plainer the more refined.

TWO: Might be a whole lot worse.

ONE: Yeh, it's all the way you look at it. Some rain, though. MRS. TWO: Well, I don't think a little lace does any harm.

MRS. ONE: No, it kinda dresses it up.

MRS.ZERO: Well, I always say it's all a matter of taste.

MRS. SIX: I saw you at the Rosebud Movie Thursday night, Mr. One.

ONE: Pretty punk show, I'll say.

TWO: They're gettin' worse all the time.

MRS. SIX: But who was the charming lady, Mr. One?

ONE

Now don't you go makin' trouble for me. That was my sister.

MRS. FIVE: Oho! That's what they all say.

MRS. FOUR: Never mind! I'll bet Mrs. One knows what's what, all right.

MRS. ONE: Oh, well, he can do what he likes, 'slong as he behaves himself.

THREE: You're in luck at that, One. Fat chance I got of gettin' away from the frau  
even with my sister.

MRS. THREE: You oughta be glad you got a good wife to look after you.

THE OTHER WOMEN: That's right, Mrs. Three.

FIVE: I guess I know who wears the pants in your house, Three.

MRS. ZERO: Never mind. I saw them holdin' hands at the movie the other night.

THREE: She musta been tryin' to get some money away from me.

MRS. THREE: Swell chance anybody'd have of gettin' any money away from you.

FOUR: They sure are a loving couple.

MRS. TWO: Well, I think we oughta change the subject

MRS. ONE: Yes, let's change the subject.

SIX: Did you hear the one about the Did      MRS. SIX: Did you hear about the  
you travellin' salesman?                              Sevens?

FIVE: It seems this guy was in a sleeper.      MRS. FIVE: They're gettin' a divorce.

FOUR: Goin' from Albany to San Diego.      MRS. FOUR: It's second time for him.

THREE: And in the next berth was an  
old maid,

TWO: With a wooden leg.

ONE: Well, along about midnight--

Six: I think this woman suffrage is the  
bunk.

FIVE: It sure is! Politics is a man's  
business.

FOUR: Woman's place is in the home.

THREE: That's it! Lookin' after the kids,  
'stead of hangin' around the  
streets.

TWO: You hit the nail on the head that  
time.

ONE: The trouble is they don't know  
what they want.

MRS. ZERO: Well, believe me, I tell mine where he gets off.

SIX: Business conditions are sure bad.

FIVE: Never been worse.

FOUR: I don't know what we're comin'  
to.

THREE: I look for a big smash-up in

MRS. THREE: They're two of a kind, if  
you ask me.

MRS. TWO: One's as bad as the other.

MRS. ONE: Worse.

MRS. ZERO: They say that she---

MRS. SIX: Men sure get me tired.

MRS. FIVE: They sure are a lazy lot.

MRS. FOUR: And dirty.

MRS. THREE: Always grumblin' about  
somethin'.

MRS. TWO: When  
they're not lyin'!

MRS. ONE: Or messin' up the house.

MRS. SIX: My aunt has gall—stones.

MRS. FIVE My husband has bunions.

MRS. FOUR: My sister expects next  
month.

MRS. THREE: My cousin's husband

about three months.

has erysipelas.

TWO: Wouldn't surprise me a bit.

MRS. TWO: My niece has St. Vitus's

ONE: We're sure headin' for trouble.

dance.

MRS. ONE: My boy has fits.

MRS. ZERO: I never felt better in my life. Knock on wood!

SIX: Too damn much agitation, that's at the bottom of it.

FIVE: That's it! Too damn many strikes.

FOUR: Foreign agitators, that's what it is.

THREE: They ought be run outa the country.

TWO: What the hell do they want, anyhow?

ONE: They don't know what they want, if you ask me.

SIX: America for the Americans is what I say!

ALL: That's it! Damn foreigners! Damn dagoes! Damn Catholics! Damn sheenies!

Damn niggers! Jail 'em! Shoot 'em! Hang 'em! Lynch 'em! Burn 'em!

ALL: "My country 'tis of thee, Sweet land of liberty!"

MRS. FOUR: Why so pensive, Mr. Zero?

ZERO: I'm thinkin'.

MRS. FOUR: Be careful not to sprain your mind.

MRS. ZERO: Look at the poor men all by themselves. We ain't very sociable.

ONE: Looks like we're neglectin' the ladies.

MRS. ZERO: Sh! The door-bell!

ZERO: I'll go. It's for me.

[POLICEMAN Enters.

POLICEMAN: I'm lookin' for Mr. Zero.

ZERO: I've been expectin' you.

POLICEMAN: Come along!

ZERO: Just a minute.

POLICEMAN: What's he tryin' to pull? I got you covered.

ZERO: Sure, that's all right. I just want to give you somethin'.

POLICEMAN: What's that?

ZERO: The collar I wore.

POLICEMAN: What do I want it for?

ZERO: It's got bloodstains on it.

POLICEMAN: All right, come along!

ZERO: I gotta go with him. You'll have to dry the dishes yourself.

MRS. ZERO: What are they takin' you for?

ZERO: I killed the boss this afternoon.

(POLICEMAN and ZERO Exit.)

#### Scene IV

ZERO: Sure I killed him. I ain't sayin' I didn't. Them lawyers! Half the time I don't know what the hell they're talkin' about. Objection sustained. Objection overruled. What's the idea of objectin'? You got a right to know. If one bird

kills another bird, you got a right to call him for it. Don't let 'em fill you full of bull about red ink on the bill file. It was blood, see? I killed him. Right through the heart with the bill file. Get that right, all of you. One, two, three, four five, six, seven, eight, nine, ten, eleven, twelve. Six and six. That makes twelve. I figgered it up often enough. Six and six makes twelve. And five is seventeen. And eight is twenty-five. And . . . Damn figgers! Can't forget 'em. Twenty-five years. Eight hours a day, exceptin' Sundays. And July and August half-day Saturday. One week's vacation with pay. Another week without pay if you want it. Who the hell wants it? Layin' around the house listenin' to the wife. Nix! An' legal holidays. New Year's, Washington's Birthday, Decoration Day, Fourth o' July, Labor Day, Election Day, Thanksgivin', Christmas. Good Friday if you want it. An' if you're a Jew, Young Kipper an' the other one, I forget what they call it. Dirty sheenies, always gettin' two to the other bird's one. Sure I killed him. Why didn't he shut up? I felt like sayin': "For Christ's sake, shut up!" He went on talkin', sayin' how sorry he was, see? Standin' right close to me. An' the bill file on the desk. Right where I could touch it. It ain't right to kill a guy. I know that. But I thought he was goin' to give me a raise, see? He never talked to me before, see? Except one mornin' we happened to come in the store together and I held the door open for him and he said "Thanks." An' when I seen him comin' up to me . . . I got a kind o' taste in my mouth like when you get up in the mornin'. didn't have no right to kill him. I never said I didn't kill him. But

that ain't the same as bein' a regular murderer? Do I look like a murderer? Do I? I never did no harm to nobody. Ask anybody. You wouldn't count that one time at the Polo Grounds. That was just fun like. Everybody was yellin', "Kill the empire! Kill the empire!" An' before I knew what I was doin' I fired the pop bottle. Yeller dog! Callin' that one a strike, a mile away from the plate. Anyhow, the bottle didn't hit him. An' that time in the subway. I was readin' about a lynchin', see? Down in Georgia. They took the nigger an' tied him to a tree. An' poured kerosene on him and lit a big fire under him. Dirty nigger! Boy, I'd of liked to been there, a gat in each hand, puinpin' him full of lead. I was readin' about it in the subway, see? Right at Times Square where the big crowd gets on. All of a sudden this big nigger steps right on my foot. Lucky for him I didn't have a gun on me. I'd of killed him sure, I guess. I guess he couldn't help it on account of the crowd, but a nigger's got no right to step on a white man's foot. I told him off all right. Dirty nigger. But that didn't hurt nobody either. I'm just a regular guy like any body else. Like you birds, now. Suppose you was me. You'd 'a' done the same thing. That's the way you oughta look at it, see? Suppose you was me.

JURORS: GUILTY!

[JURORS Exit.]

ZERO: Wait a minute. Jest a minute. Jest give me a chance an' I'll tell you how it was. I'm all mixed up, see? On account of them lawyers. And the figgers in my head. But I'm goin' to tell you how it was. I was there twenty—five years,

see? An' they gave her six months, see?

Edited version 2--2/27/95

## SCENE V

GUIDE: Ladies and gentlemen, right this way! A little closer so's everybody can hear. This, ladies and gentlemen, is a very in—ter—est—in' specimen; the North American murderer, Genus homo sapiens, Habitat North America. Don't push. There's room enough for everybody. This specimen, ladies and gentlemen, exhibits characteristics typical of his kind. Opposable thumbs, large cranial capacity, and highly developed prefrontal areas which distinguish him from all other species. He learns by imitation and has a language which is said by some eminent philologists to bear many striking resemblances to English. He thrives and breeds freely in captivity. This specimen was taken alive in his native haunts shortly after murdering his boss. Tried, convicted and sentenced in one hour, thirteen minutes and twenty—four seconds, a new record for the territory east of the Rockies and north of the Mason and Dixon line. Take a good look at him, ladies and gents. It's his last day here. He's goin' to be executed at noon. And now, friends, if you'll kindly give me your kind attention for just a moment. I have a little souvenir folder, which I'm sure you'll want to have. It contains twelve beautiful colored views relating to the North American Murderer you are looking at. These include a picture of the

murderer, a picture of the murderer's wife, the blood—stained weapon, the murderer at the age of six, the spot where the body was found, the little red schoolhouse where he went to school, and his vine—covered boyhood home with his sweet—faced, white—haired old mother plainly visible in the foreground. And many other interesting views. Don't be afraid to look at them. It don't cost anything to look at them. All right now, friends, if you'll just step this way. Keep close together and follow me. A lady lost her little boy here one time and by the time we found him, he was smoking cigarettes and hollering for a razor.

[GUIDE Exits. MRS. ZERO Enters.]

MRS. ZERO: Hello.

ZERO: Hello, I didn't think you were comin' again.

MRS. ZERO: Well, I thought I'd come again. Are you glad to see me?

ZERO: Sure. All dolled up, ain't you?

MRS. ZERO: Yeh, you like it?

ZERO: Some class.

MRS. ZERO: I always look good in black.

ZERO: How much all that set you back?

MRS. ZERO: Sixty-four dollars and twenty cents. And I gotta get a pen yet and some writin' paper, you know, with black around the edges.

ZERO: You'll be scrubbin' floors in a year, you go blowin' your coin like that.

MRS. ZERO: Well, I gotta do it right. It don't happen every day.

ZERO: Maybe this time next year you'll be with some other bird.

MRS. ZERO: Not on your life.

ZERO: You never can tell.

MRS. ZERO: Not me. Once is enough for me.

ZERO: I guess you're right. Still, you might jest meet some guy.

MRS. ZERO: Well, if I do, there'll be time enough to think about it. No use  
borrowin' trouble.

ZERO: How do you like bein' alone in the house?

MRS. ZERO: Oh, it's all right.

ZERO: You got plenty room in the bed now, ain't you?

MRS. ZERO: Oh yeh. It's kinda lonesome though, you know, wakin' up in the  
mornin' and nobody around to talk to.

ZERO: Yeh, I know. Same with me.

MRS. ZERO: Not that we ever did much talkin'.

ZERO: Well, that ain't it. It's just the idea of havin' somebody there in case you want  
to talk.

MRS. ZERO: Yeh, that's it. I guess maybe I use t'bawl you out quite a lot, didn't I?

ZERO: Oh well, no use talkin' about it now.

MRS. ZERO: We were always at it, weren't we?

ZERO: No more than any other married folks, I guess.

MRS. ZERO: I dunno.

ZERO: I guess I gave you cause, all right.

MRS. ZERO: Well, I got my faults too.

ZERO: None of us are perfect.

MRS. ZERO: We got along all right, at that, didn't we?

ZERO: Sure! Better'n most.

MRS. ZERO: Remember them Sundays at the beach, in the old days?

ZERO: You bet. Remember that time I ducked you? Gee, you was mad!

MRS. ZERO: I didn't talk to you for a whole week.

ZERO: Yeh, I remember.

MRS. ZERO: And the time I had pneumonia and you brought me them roses.

Remember?

ZERO: Yeh, I remember. And when the doctor told me maybe you'd pass away, I

nearly sat down and cried.

MRS. ZERO: Did you?

ZERO: I sure did.

MRS. ZERO: We had some pretty good times at that, didn't we?

ZERO: I'll say we did!

MRS. ZERO: It's all over now.

ZERO: All over is right. I ain't got much longer.

MRS. ZERO: Maybe, maybe, if we had to do it over again, it would be different.

ZERO: Yeh. We live and learn.

MRS. ZERO: If we only had another chance.

ZERO: Too late now.

MRS. ZERO: Don't seem right, does it?

ZERO: It ain't right. But what can you do about it?

MRS. ZERO: Ain't there somethin', somethin' I can do for you, before,

ZERO: No. Nothin'. Not a thing.

MRS. ZERO: Nothin' at all?

ZERO: No. Can't think of anything. You're takin' good care of that scrapbook, ain't you? With all the clippings in it?

MRS. ZERO: Oh, sure. I got it right on the parlor table. Right where everybody can see it.

ZERO: Must be pretty near full, ain't it?

MRS. ZERO: All but about three pages.

ZERO: Well, there'll be more tomorrow. Enough to fill it, maybe. Be sure to get them all, will you?

MRS. ZERO: I will. I ordered the papers already.

ZERO: Gee, I never thought I'd have a whole book full of clippings all about myself. Say, that's somethin' I'd like to ask you.

MRS. ZERO: What?

ZERO: Suppose you should get sick or be run over or somethin', what would happen to the book?

MRS. ZERO: Well, I kinda thought I'd leave it to little Beatrice Elizabeth.

ZERO: Your sister's kid?

MRS. ZERO: Yeh.

ZERO: What would she want with it?

MRS. ZERO: Well, it's nice to have, ain't it? And I wouldn't know who else to give it to.

ZERO: Well, I don't want her to have it. That fresh little kid puttin' her dirty fingers all over it.

MRS. ZERO: She ain't fresh and she ain't dirty. She's a sweet little thing.

ZERO: I don't want her to have it.

MRS. ZERO: Who do you want to have it then?

ZERO: Well, I kinda thought I'd like Miss Devore to have it.

MRS. ZERO: Miss Devore?

ZERO: Yeh. You know. Down at the store.

MRS. ZERO: Why should she have it?

ZERO: She'd take good care of it. And anyhow, I'd like her to have it.

MRS. ZERO: Oh you would, would you?

ZERO: Yes.

MRS. ZERO: Well, she ain't goin' to have it. Miss Devore! Where does she come in, I'd like to know, when I got two sisters and a niece.

ZERO: I don't care nothin' about your sisters and your niece.

MRS. ZERO: Well, I do! And Miss Devore ain't goin' to get it. Put that in your pipe and smoke it.

ZERO: What have you got to say about it? It's my book, ain't it?

MRS. ZERO: No, it ain't. It's mine now, or it will be tomorrow. And I'm goin' to do

what I like with it.

ZERO: I should of given it to her in the first place, that's what I should of done.

MRS. ZERO: Oh, should you? And what about me? Am I your wife or ain't I?

ZERO: Why remind me of my troubles?

MRS. ZERO: So it's Miss Devore all of a sudden, is it? What's been goin' on, I'd like to know, between you and Miss Devore?

ZERO: Aw, tie a can to that!

MRS. ZERO: Why didn't you marry Miss Devore, if you think so much of her?

ZERO: I would if I'd of met her first.

MRS. ZERO: Ooh! A fine way to talk to me. After all I've done for you. You burn!  
You dirty bum! I won't stand for it! I won't stand for it!

[MRS. ZERO Exits. THE FIXER Enters.]

ZERO: Who are you?

THE FIXER: I'm the Fixer, from the Claim Department.

ZERO: Whaddya want?

THE FIXER: It's no use, Zero. There are no miracles.

ZERO: What you're talkin' about?

THE FIXER: Don't lie, Zero. Now that your course is run, now that the end is in sight, you believe some thunderbolt, some fiery bush, some celestial apparition will intervene between you and extinction. But it's no use, Zero. You're done for.

ZERO: It ain't right! It ain't fair! I ain't gettin' a square deal!

THE FIXER: They all say that, Zero. Just tell me why you're not getting a square deal.

ZERO: Well, that addin' machine. Was that a square deal, after twenty-five years?

THE FIXER: Certainly, from any point of view, except a sentimental one. The machine is quicker, it never makes a mistake, it's always on time. It presents no problems of housing, traffic congestion, water supply, sanitation.

ZERO: It costs somethin' to buy them machines, I'll tell you that!

THE FIXER: Yes, you're right there. In one respect you have the advantage over the machine, the cost of manufacture. But we've learned from many years' experience, Zero, that the original cost is an inconsequential item compared to upkeep. Take the dinosaurs, for example. They literally ate themselves out of existence. I held out for them to the last. They were damned picturesque, but when it came to a question of the nitrate supply, I simply had to yield. And so with you, Zero. It costs a lot to keep up all that delicate mechanism of eye and ear and hand and brain which you've never put to any use. We can't afford to maintain it in idleness, and so you've got to go.

ZERO: Gimme a chance, gimme another chance!

THE FIXER: What would you do if I gave you another chance?

ZERO: Well, first thing I'd go out and look for a job.

THE FIXER: Adding figures?

ZERO: Well, I ain't young enough to take up somethin' new.

[GUARDS Enter.]

THE FIXER: Put the skids under him, boys, and make it snappy.

ZERO: NO! Don't take me away! Don't kill me! Gimme a chance! Gimme another  
chance!

GUARDL Ah, come on! Be a good fellow! It'll all be over in a minute!

ZERO: I don't want to die! I don't want to die! I want to live!

GUARD: H'm!

THE FIXER: Well?

GUARD: He says he wants to live.

THE FIXER: No. He's no good.

GUARD: Yes sir!

[GUARDS Exit with ZERO.]

[AX MAN Enters.]

AX MAN: O.K.

THE FIXER: What?

AX MAN: O.K.

THE FIXER: Oh, all right.

[AX MAN Exits.]

THE FIXER: That makes a total of 2,137 black eyes for Jeff.

[THE FIXER Exits.]

SCENE VI

[JUDY O'GRADY and YOUNG MAN Enter.]

JUDY: Come on, this is the place.

YOUNG MAN: This! Why this here is a cemetery.

JUDY: Aw, quit yer kiddin'!

YOUNG MAN: You don't mean to say,

JUDY: What's the matter with this place?

YOUNG MAN: A cemetery!

JUDY: Sure. What of it?

YOUNG MAN: You must be crazy.

JUDY: This place is all right, I tell you. I been here lots o' times.

YOUNG MAN: Nix on this place for me!

JUDY: Ain't this place as good as another? Whaddya afraid of? They're all dead ones here! They don't bother you. Oh, look, here's a new one.

YOUNG MAN: Come on out of here.

JUDY: Wait a minute. Let's see what it says. Z—E—R—O. Z—e—r—o. Zero! Say, that's the guy--

YOUNG MAN: Zero? He's the guy killed his boss, ain't he?

JUDY: Yeh, that's him, all right. But what I'm thinkin' of is that I went to the hoose—gow on account of him.

YOUNG MAN: What for?

JUDY: You know, same old stuff. Tenement House Law. Section blaa—blaa of the Penal Code. Third offense. Six months.

YOUNG MAN: And this bird---

JUDY: Him? He was mama's white-haired boy. We lived in the same house.

Across the airshaft, see? I used to see him lookin' in my window. I guess his wife musta seen him, too. Anyhow, they went and turned the bulls on me. And now I'm out and he's in. Say, say--

YOUNG MAN: What's so funny?

JUDY: Say, wouldn't it be funny, if, if---That would be a good joke on him, all right.

He can't do nothin' about it now, can he?

YOUNG MAN: Come on out of here. I don't like this place.

JUDY: Aw, you're a bum sport. What do you want to spoil my joke for?

YOUNG MAN: What's that?

JUDY: It's only the cats. They seem to like it here all right. But come on if you're afraid. You nervous men sure are the limit.

[JUDY O'GRADY and YOUNG MAN Exit.]

[ZERO Enters from grave.]

ZERO: Funny! I thought I heard her. But I don't see nobody. Well, no use goin' back.

Can't sleep. Might as well walk a little.

ZERO: It's lonesome here!

[A loud sneeze is heard. The sneeze is repeated.]

ZERO: What's that?

SHRDLU'S VOICE: It's all right. Nothing to be afraid of.

[SHRDLU appears.]

SHRDLU: I hope I didn't frighten you.

ZERO: No—o. It's all right. I wasn't expectin' to see anybody.

SHRDLU: Newcomer, aren't you?

ZERO: Yeh, my first night. I couldn't sleep.

SHRDLU: I can't sleep, either. Keep each other company, shall we?

ZERO: Yeh, great. I been feelin' lonesome.

SHRDLU: I know. Will you have a Camel?

ZERO: No, I don't smoke.

SHRDLU: It helps keep the mosquitoes away. Mind if I smoke, Mr., Mr.---?

ZERO: No, go right ahead.

SHRDLU: Thank you. I didn't catch your name. I say I didn't catch your name.

ZERO: I heard you. I'm scared if I tell you who I am, what I done, you'll leave.

SHRDLU: No matter what your sins may be, they are as snow compared to mine.

ZERO: Guess again. My name's Zero. I'm a murderer.

SHRDLU: Yes, I remember reading about you, Mr. Zero.

ZERO: You still think you're worse than me?

SHRDLU: A thousand times worse, Mr. Zero, a million times worse.

ZERO: What did you do?

SHRDLU: I, too, am a murderer.

ZERO: You're kiddin'!

SHRDLU: Truth, Mr. Zero. I am the foulest, the most sinful of murderers! You only murdered your employer, Mr. Zero. But I, I murdered my mother.

ZERO: The hell yer say!

SHRDLU: Yes, my mother! My beloved mother!

ZERO: Say, you're not Mr.--

SHRDLU: Yes.

ZERO: I read about you in the papers.

SHRDLU: Yes, my guilt has been proclaimed to all the world. But that would be a trifle if only I could wash the stain of sin from my soul.

ZERO: I never heard of a guy killin' his mother before. What did you do it for?

SHRDLU: Because I have a sinful heart. No other reason.

ZERO: Did she treat you square?

SHRDLU: She was a saint, a saint. She cared for me and watched over me as only a mother can.

ZERO: You didn't have a scrap or nothin'?

SHRDLU: Never a harsh or an unkind word. Nothing except loving care and good advice. From my infancy she devoted herself to guiding me on the right path. She taught me to be thrifty, to be devout, to be unselfish, to shun evil companions and to shut my ears to all the temptations of the flesh—, in short, to become a virtuous, respectable, and God—fearing man. But it was a hopeless task. At fourteen I began to show evidence of my sinful nature.

ZERO: You didn't kill anybody else, did you?

SHRDLU: No, thank God, there is only one murder on my soul. But I ran away from home.

ZERO: You did!

SHRDLU: Yes. A companion lent me a profane book, the only profane book I have ever read, I'm thankful to say. Treasure Island. Have you ever read it?

ZERO: No, I never read books.

SHRDLU: It is a wicked book, a lurid tale of adventure. It kindled in my sinful heart a desire to go to sea. So I ran away from home.

ZERO: What did you do, get a job as a sailor?

SHRDLU: I never saw the sea. Luckily, my mother's loving intuition warned her of my intention and I was sent back home. She welcomed me with open arms. Not an angry word, not a look of reproach. But I could read the mute suffering in her eyes as we prayed together all through the night.

ZERO: That must 'a' been tough. Gee, the mosquitoes are bad, ain't they?

SHRDLU: I thought that experience had cured me of evil and I began to think about a career. I wanted to be a missionary at first, but we couldn't bear the thought of separation. So we decided I should become a proof—reader.

ZERO: Say, slip me one o' them Camels, will you? I'm gettin' bit up.

SURDLU: Certainly.

ZERO: Go ahead. I'm listenin'.

SHRDLU: By the time I was twenty I had a good job reading proof for a firm that printed catalogues. After a year they promoted me and let me specialize in shoe catalogues.

ZERO: Yeh? Must 'a' been a good job.

SHRDLU: A very good job. I was on shoe catalogues for thirteen years. I'd been on them yet, if I hadn't---

ZERO: They oughta put a shot o' citronella in that embalmin' fluid.

SHRDLU: We were so happy together. I had my steady job. Sundays we would go to morning, afternoon, and evening service. It was an honest and moral mode of life.

ZERO: It sure was.

SHRDLU: Then came that fatal Sunday. Dr. Amaranth, our minister, was having dinner with us, one of the few pure spirits on earth. When he had finished saying grace, we had our soup. Everything was going along as usual, we were eating our soup and discussing the sermon, just like every other Sunday I could remember. Then came the leg of lamb--- I see the whole Scene before me so plainly, it never leaves me, Dr. Amaranth at my right, my mother at my left, the leg of lamb on the table in front of me and the cuckoo clock on the little shelf between the windows.

ZERO: What happened?

SHRDLU: Well, as I started to carve the lamb . . . Did you ever carve a leg of lamb?

ZERO: No, corned beef was our speed.

SHRDLU: It's very difficult on account of the bone. And when there's gravy in the dish there's danger of spilling it. Mother used to hold the dish for me. She leaned forward, just as she always did. I could see the gold locket around her neck. It had my picture in it and one of my baby curls. I raised my knife to

carve the leg of lamb, and instead I cut my mother's throat!

ZERO: You must 'a' been crazy!

SHRDLU: No! Don't justify me. I wasn't crazy. At the trial they tried to prove I was crazy. But Dr. Amaranth saw the truth! He saw it from the first! He knew it was my sinful nature, and he told me what was in store for me.

ZERO: Well, your troubles are over now.

SHRDLU: Over! Do you think this is the end?

ZERO: Sure. What more can they do to us?

SHRDLU: Do you think there can ever be any peace for such as we are, murderers, sinners? Don't you know what awaits us, flames, eternal flames!

ZERO: They wouldn't do that to us.

SHRDLU: No escape, no escape for us, I tell you. We're doomed! Unspeakable torments through all eternity.

[THE HEAD Appears.]

THE HEAD: Hey! Can't you shut up and let a guy sleep?

ZERO: Put on the soft pedal.

SHRDLU: It won't be long now! We'll receive our summons soon.

THE HEAD: Are you goin' to beat it or not? Hey, Bill, lend me your head.

ZERO: Look out!

THE HEAD: Missed 'em. Damn cats! I'll get 'em next time. Ho hum! Me for the worms!

Edited version 2--2/27/95

SCENE VII

[SHRDLU is discovered. ZERO Enter.]

ZERO: Well . . . Hello, Buddy!

SHRDLU: How do you do, Mr. Zero? I'm very glad to see you again.

ZERO: Same here. This is a kinda nice place. I wouldn't mind restin' here a while.

SHRDLU: You may if you wish.

ZERO: Boy, this feels good. My feet are sore. I ain't use to so much walkin'. Say, I wonder would it be all right if I took my shoes off; my feet are tired.

SHRDLU: Yes. Some of the people here go barefoot.

ZERO: Yeh? They sure must be nuts. But I'm goin' t' leave 'em off for a while. So long as it's all right. This sure is a nice place. What do they call this place, anyhow?

SHRDLU: The Elysian Fields.

ZERO: The which?

SHRDLU: The Elysian Fields.

ZERO: Oh! Well, it's a nice place, all right.

SHRDLU: They say that this is the most desirable of all places. Only the most favored remain here.

ZERO: Yeh? Well, that let's me out, I guess. But what are you doin' here? I thought you'd be burned by now.

SHRDLU: Mr. Zero, I am the most unhappy of men.

ZERO: Why, because you ain't bein' roasted alive?

SHRDLU: Nothing is turning out as I expected. I saw everything so clearly, the flames, the tortures, an eternity of suffering as the just punishment for my unspeakable crime. It has all turned out so differently.

ZERO: Well, that's pretty soft for you, ain't it?

SHRDLU: No, no! It's right and just that I should be punished. I could have endured it stoically. All through those endless ages of indescribable torment I should have exulted in the magnificence of divine justice. But this, this is maddening! What becomes of justice? What becomes of morality? What becomes of right and wrong? It's maddening, simply maddening! Oh, if Dr. Amaranth were only here to advise me!

ZERO: You mean they ain't punished you for cuttin' your mother's throat?

SHRDLU: No! It's terrible! I was prepared for anything, anything but this.

ZERO: What did they say to you?

SHRDLU: Only that I was to come here and remain until I understood.

ZERO: What do they want you to understand?

SHRDLU: I don't know! If I only had an inkling of what they meant--- Just listen; do you hear anything?

ZERO: Nope.

SHRDLU: You don't hear any music? Do you?

ZERO: Music? No, I don't hear nothin'.

SURDLU: People here say the music never stops.

ZERO: They're kiddin' you.

SHRDLU: You think so?

ZERO: Sure. There ain't a sound.

SHRDLU: Perhaps. They're capable of anything. But I haven't told you my bitterest  
disappointment.

ZERO: Spill it. I'm gettin' used to hearin' bad news.

SHRDLU: When I caine to this place, my first thought was to find my dear mother.  
To ask her forgiveness. For her to help me understand.

ZERO: She couldn't do it?

SHRDLU: She's not here! Here where only the most favored dwell, that wisest and  
purest of spirits is nowhere to be found.

DAISY'S VOICE: Mr. Zero! Mr. Zero!

SHRDLU: If you were to see the people here, the things they do.

ZERO: Wait a minute. I think somebody's callin' me.

DAISY'S VOICE: Mr. Ze-ro! Mr. Ze-ro!

ZERO: Who the hell's that? My wife on my trail already? Swell! figured on her bein'  
good for another twenty years.

DAISY'S VOICE: Mr. Ze-ro! Yoo-hoo!

ZERO: That ain't her voice. Yoo-hoo. Ain't that the way? Just when a guy is takin'  
life easy! Here she comes, whoever she is. Well, I'll be--! Well, what do you  
know . . .

[DAISY DIANA DOROTHEA DEVORE Enters.]

DAISY: I thought I'd never catch up to you. I've been followin' you for days callin' an' callin'. Didn't you hear me?

ZERO: Not till just now. You look winded.

DAISY: I am. I can't hardly catch my breath.

ZERO: Well, sit down. It's all right, he's a friend of mine. Buddy, I want you to meet my friend, Miss Devore.

SHRDLU: How do you do, Miss Devore?

DAISY: How do!

ZERO: You don't mind if she sits here a while, do you?

SHRDLU: No, certainly not.

ZERO: I was just takin' a rest myself. I took my shoes off on account of my feet bein' so sore.

DAISY: Yeh, I'm kinda tired, too. Say, ain't it pretty here, though?

ZERO: Yeh, it is.

DAISY: What do they call this place?

ZERO: Why, er, let's see. He was tellin' me just a minute ago. The, er, I don't know.

Some kind o' fields. I forget. Say, buddy, what do they call this place again?

He don't hear me. He's thinkin' again.

DAISY: What's the matter with him?

ZERO: He's the guy murdered his mother.

DAISY: Is that him?

ZERO: Yeh. He figgered they was goin' t' roast him or somethin'. Now they ain't goin' to do nothin' to him. It's kinda got his goat.

DAISY: Poor feller!

ZERO: Yeh. He takes it kinda hard.

DAISY: He looks like a nice young feller.

ZERO: Well, you sure are good for sore eyes. I never expected to see you here.

DAISY: I thought maybe you'd be kinda surprised.

ZERO: Surprised is right. I thought you was alive an' kickin'. When did you pass over?

DAISY: Oh, right after you. A coupla days.

ZERO: Yeh? What happened? Get hit by a truck?

DAISY: No. You see, I blew out the gas.

ZERO: Go on! What was the big idea?

DAISY: I don't know. You see, I lost my job.

ZERO: Sorry you did it now, ain't you?

DAISY: No, I ain't sorry. Not a bit. Mr. Zero, I been thinkin'---

ZERO: What?

DAISY: I been thinkin' you an' me could kinda talk things over.

ZERO: Sure. What do you want to talk about?

DAISY: Well,--we ain't really ever talked things over, have we?

ZERO: No, we ain't. Well, let's go to it.

DAISY: Could be alone, just the two of us, see?

ZERO: Oh, yeh! Yeh, I get you. He's dead to the world. Say, Buddy! Say, Buddy!

SHRDLU: Were you speaking to me?

ZERO: Yeh. How'd you guess it? I was thinkin' maybe you'd like to walk around a little, look for your mother.

SHRDLU: It's no use. I've looked everywhere.

ZERO: Maybe over there they might know.

SHRDLU: No, no! I've searched everywhere. She's not here.

ZERO: Listen, old shirt, my friend here and me, we used to work in the same store.

An' we got some things to talk over, business, see?, kinda confidential. So if it ain't askin' too much--

SHRDLU: Why, certainly! Excuse me!

[SHRDLU Exits.]

ZERO: He's a good guy at that.

DAISY: Sure is pretty here, ain't it?

ZERO: Sure is.

DAISY: I'm crazy about the country, ain't you?

ZERO: Yeh. It's nice for a change.

DAISY: Them store picnics, remember?

ZERO: You bet. They sure was fun.

DAISY: One time, I guess you don't remember, the two of us, me and you, we sat together just like we're doin' now.

ZERO: Sure I remember.

DAISY: Go on! I'll bet you don't.

ZERO: I'll bet I do. It was the year the wife didn't go.

DAISY: That's right! I didn't think you'd remember.

ZERO: An' comin' home we sat together in the truck.

DAISY: Yeh! There's somethin' I've always wanted to ask you.

ZERO: Well, why didn't you?

DAISY: It didn't seem refined. But I'm goin' to ask you now, anyhow.

ZERO: Go ahead. Shoot.

DAISY: Well, while we was comin' home, you put your arm up on the bench behind me, and I could feel your knee kinda pressin' against mine.

ZERO: Yeh, what about it?

DAISY: What I wanted to ask you was, was it just kinda accidental?

ZERO: Sure it was accidental. Accidental on purpose.

DAISY: You mean it?

ZERO: Sure I mean it. You mean you didn't know?

DAISY: No. I've been wantin' to ask you--

ZERO: Then why did you get sore at me?

DAISY: Sore? I wasn't sore! When was I sore?

ZERO: That night. Sure you was sore. If you wasn't sore why did you move away?

DAISY: To see if you meant it. I thought if you meant it you'd move up closer. When you took your arm away I was sure you didn't mean it.

ZERO: I thought you was sore. That's why I took my arm away. I thought if I moved

up you'd holler and I'd be in a jam, like you read in the paper about guys  
gettin' pulled in for annoyin' women.

DAISY: I was wishin' you'd put your arm around me. Wishin' all the way home.

ZERO: What do you know about that? That sure is hard luck, that is. If I'd 'a' only  
knew! You know what I felt like doin', only I didn't have the nerve?

DAISY: What?

ZERO: I felt like kissin' you.

DAISY: I wanted you to.

ZERO: You 'd 'a' let me?

DAISY: I wanted you to! Oh, why didn't you--why didn't you?

ZERO: I didn't have the nerve. I sure was a dumbbell.

DAISY: I'd 'a' let you all you wanted to. I wouldn't 'a' cared. I know it would 'a'  
been wrong but I wouldn't 'a' cared. I wasn't thinkin' about right an' wrong  
at all. I didn't care, see? just wanted you to kiss me.

ZERO: If I'd only knew. I wanted to do it, I swear I did. But I didn't think you cared  
nothin' about me.

DAISY: I never cared nothin' about nobody else.

ZERO: You mean it, on the level? You ain't kiddin' me?

DAISY: No, I ain't kiddin'. I mean it. I'm tellin' the truth. I ain't never had the nerve  
to tell you before, but now I don't care. It don't make no difference now. I  
mean it, every word of it.

ZERO: If I'd only knew it.

DAISY: Listen. There's somethin' else. I may as well tell you everything now. It don't make no difference now. About my blowin' out the gas, see? You know why I done it?

ZERO: Yeh, you told me, on account o' bein' canned.

DAISY: That ain't the real reason. The real reason is you.

ZERO: On account o' me passin' out ?

DAISY: Yeh. I didn't want to go on livin'. What did I want to go on livin' for? I didn't have nothin' to live for with you gone. I thought of doin' it before. But I never had the nerve. Anyhow I didn't want to leave you.

ZERO: An' me bawlin' you out, about readin' too fast an' readin' too slow.

DAISY: Why did you do it?

ZERO: I don't know, I swear I don't. I was always stuck on you. An' while I'd be addin' them figgers, I'd be thinkin' how if the wife died, you an' me could get married.

DAISY: I used to think o' that, too.

ZERO: An' then before I knew it, I was bawlin' you out.

DAISY: Them was the times I'd think o' blowin' out the gas. But I never did till you was gone. There wasn't nothin' to live for then. But it wasn't so easy to do anyhow. I never could stand the smell o' gas. An' all the while I was gettin' ready, you know, stuffin' up all the cracks, the way you read about in the paper, I was thinkin' of you and hopin' that maybe I'd meet you again. An' I made up my mind if I ever did see you, I'd tell you.

ZERO: I'm sure glad you did. I'm sure glad. But it don't do much good now, does it?

DAISY: I guess it don't. But there's one thing I'm goin' to ask you.

ZERO: What's that?

DAISY: I want you to kiss me.

ZERO: You bet I will!

DAISY: Not like that. I don't mean like that. I mean really kiss me. On the mouth. I  
ain't never been kissed like that.

[ZERO kisses her. A long embrace.]

DAISY: So that's what it's like. I didn't know it could be like that. I didn't know  
anythin' could be like that.

ZERO: Your cheeks are red. And your eyes are shinin'. I never seen your eyes  
shinin' like that before.

DAISY: Listen, you hear it? You hear the music?

ZERO: No, I don't hear nothin'!

DAISY: Yeh, music. Listen, you'll hear it.

ZERO: Yeh! I hear it! He said there was music, but I didn't hear it till just now.

DAISY: Ain't it grand?

ZERO: Swell! Know what?

DAISY: What?

ZERO: It makes me feel like dancin'.

DAISY: Me, too.

ZERO: Come on! Let's dance!

DAISY: I can't dance. I ain't danced in twenty years.

ZERO: I ain't, neither. Come on! I feel like a kid!

DAISY: Wait a minute! Wait till I fix my skirt.

[ZERO and DAISY dance.]

ZERO: Wait a minute! I'm all winded. Wait a minute! Let me get my wind!

DAISY: Whew! I sure am winded! I ain't used to dancin'.

ZERO: Gee, my heart's goin' a mile a minute.

DAISY: Why don't you lay down an' rest? You could put your head on my lap.

ZERO: That ain't a bad idea.

DAISY: It was swell, wasn't it?

ZERO: Yeh. But you gotta be used to it.

DAISY: Just imagine if we could stay here all the time, you an' me together,  
wouldn't it be swell?

ZERO: Yeh. But there ain't a chance.

DAISY: Won't they let us stay?

ZERO: No. This place is only for the good ones.

DAISY: We ain't so bad, are we?

ZERO: Go on! Me a murderer an' you a suicide. Anyway, they wouldn't stand for  
this, the way we been goin' on.

DAISY: I don't see why.

ZERO: You don't! You know it ain't right. Ain't I got a wife?

DAISY: Not any more you ain't. When you're dead that ends it. Don't they always

say “until death do us part?”

ZERO: Well, maybe you’re right about that but they wouldn’t stand for us here.

DAISY: It would be swell, the two of us together, we could make up for all them years.

ZERO: Yeh, I wish we could.

DAISY: We sure were fools. But I don’t care. I’ve got you now.

ZERO: I’m sure crazy about you. I never saw you lookin’ so pretty before. Your hair hangin’ down. You got swell hair.

DAISY: We got each other now, ain’t we?

ZERO: Yeh. I’m crazy about you. Daisy I That’s a pretty name. It’s a flower, ain’t it? Well, that’s what you are, just a flower.

DAISY: We can always be together now, can’t we?

ZERO: As long as they’ll let us. I sure am crazy about you. Watch it!

DAISY: What’s the matter?

ZERO: He’s comin’ back.

DAISY: Is that all? What about it?

ZERO: You don’t want him to see us layin’ around like this, do you?

DAISY: I don’t care if he does.

ZERO: You oughta care. You don’t want him to think you ain’t a refined girl, do you? He’s an awful moral bird, he is.

DAISY: I don’t care nothin’ about him. I don’t care nothin’ about anybody but you.

ZERO: Sure, I know. But we don’t want people talkin’ about us. You better fix your

hair an' pull down your skirts.

[SHRDLU Enters.]

ZERO: Well, you got back all right, didn't you?

SHRDLU: I hope I haven't returned too soon.

ZERO: No. We were just havin' a little talk. About business an' things.

DAISY: We were wishin' we could stay here all the time.

SHRDLU: You may if you like.

ZERO AND DAISY: What!

SHRDLU: Yes. Any one who likes may remain.

ZERO: But I thought you were tellin' me.

SHRDLU: As I told you, only the most favored do remain. But anyone may.

ZERO: I don't get it. There's a catch somewheres.

DAISY: It don't matter as long as we can stay.

ZERO: We were thinkin' about gettin' married, see?

SHRDLU: You may or not, just as you like.

ZERO: You don't mean to say we could stay if we didn't, do you ?

SHRDLU: Yes. They don't care.

ZERO: There's some here that ain't married?

SHRDLU: Yes.

ZERO: I don't know about this place, at that. They must be kind of a mixed crowd.

DAISY: It don't matter, so long as we got each other.

ZERO: Yeh, I know, but you don't want to mix with people that ain't respectable.

DAISY: Can we get married right away? There must be a lot of ministers here, ain't there?

SHRDLU: Not as many as I had hoped to find. The two who seem most beloved are Dean Swift and the Abbe Rabelais. They are both much admired for some indecent tales which they have written.

ZERO: What! Ministers writin' smutty stories! Say, what kind of a dump is this, anyway?

SHRDLU: I don't know, Mr. Zero. All these people here are so strange, so unlike the good people I've known. They seem to think of nothing but enjoyment or of wasting their time in profitless occupations. Some paint pictures from morning until night, or carve blocks of stone. Others write songs or put words together, day in and day out. Still others do nothing but lie under the trees and look at the sky. There are men who spend all their time reading books and women who think only of adorning themselves. And forever they are telling stories and laughing and singing and drinking and dancing. There are drunkards, thieves, vagabonds, blasphemers, adulterers. There is one---

ZERO: That's enough. I heard enough.

DAISY: What are you goin' to do?

ZERO: I'm goin' to beat it, that's what I'm goin' to do.

DAISY: You said you liked it here.

ZERO: Liked it! Say, you don't mean to say you want to stay here, do you, with a lot of rummies an' loafers an' bums?

DAISY: We don't have to bother with them. We can just sit here together an' look at the flowers an' listen to the music.

SHRDLU: Music! Did you hear music?

DAISY: Sure. Don't you hear it?

SHRDLU: No, they say it never stops. But I've never heard it.

ZERO: I thought I heard it before but I don't hear nothin' now. I must 'a' been dreamin'. What's the quickest way out of this place?

DAISY: Won't you stay just a little longer?

ZERO: Didn't yer hear me say I'm goin'? Good—bye, Miss Devore. I'm goin' to beat it.

[ZERO exits.]

DAISY: I won't ever see him again.

SHRDLU: Are you goin' to stay here?

DAISY: It don't make no difference now. Without him I might as well be alive.

[DAISY Exits.]

Edited version 2A--3/5/95

SCENE VIII

[ZERO is discovered. THE FIXER and JOE Enter.]

THE FIXER: All right, Zero, cease firing.

ZERO: Whaddja say?

THE FIXER: Stop punching that machine.

ZERO: Stop?

THE FIXER: Yes. Joe, give me a hand.

ZERO: What's the idea? Lemme alone?

THE FIXER: How long you been here?

ZERO: Jes' twenty—five years. Three hundred months, ninety—one hundred and  
thirty-one days, one hundred thirty-six thousand---

THE FIXER: That'll do! That'll do!

ZERO: I ain't missed a day, not an hour, not a minute. Look at all I got done.

THE FIXER: It's time to quit.

ZERO: Quit? I ain't goin' to quit!

THE FIXER: You've got to.

ZERO: What for? What do I have to quit for?

THE FIXER: It's time to go back.

ZERO: Go back where? Whaddya talkin' about?

THE FIXER: Back to earth, you dub. Where do you think?

ZERO: Aw, go on, who you kiddin'?

THE FIXER: I'm not kidding anybody.

ZERO: What's this about goin' back?

THE FIXER: Time's up. You must be pretty thick. How many times you want to be  
told?

ZERO: This is the first time I heard about goin' back. Nobody ever said nothin about

it before.

THE FIXER: You think you were going to stay here for ever?

ZERO: Why not? I did my bit. Forty five years. Twenty-five in the store. Then the boss canned me and I did him in. Guess you ain't heard about that---

THE FIXER: I know. What's that got to do with it?

ZERO: I done my bit! That oughta let me out.

THE FIXER: You think you're through, do you?

ZERO: Sure. I did the best I could while I was there and then I passed over. Now I'm sittin' pretty here.

THE FIXER: You've got a fine idea of the way they run things. You think they're going to all the trouble of making a soul just to use it once?

ZERO: Once is enough, it seems to me.

THE FIXER: Seems to you. Who are you? What do you know about it? Man, they use a soul over and over again, over and over until it's worn out.

ZERO: Nobody ever told me. How was I to know?

THE FIXER: Use your brains! Where would we put them all? We're crowded enough as it is. This place is a repair and service station. We get souls by the bushelful. We clean them up. You ought to see them. The muck and the slime. Phoo! And as full of holes as a flour-sifter. But we fix them up. We disinfect them, give them a kerosene rub, mend the holes, and back they go, practically as good as new.

ZERO: You mean I've been here before, before the last time, I mean?

THE FIXER: You poor boob, thousands of times, fifty thousand, at least.

ZERO: How is it I don't remember nothin' about it?

THE FIXER: Well, partly because you're stupid. But mostly because that's the way they fix it. Souls would get worn out quicker if they remembered.

ZERO: Don't any remember?

THE FIXER: Some. The type that gets a little better each time. We just give them a wash and send them through. Then there's another type, the type that gets a little worse each time. That's where you belong!

ZERO: Me? I'm gettin' worse all the time?

THE FIXER: A little worse each time.

ZERO: What was I when I started? Somethin' big? A king or somethin'?

THE FIXER: A king! The first time, a monkey.

ZERO: A monkey!

THE FIXER: A hairy, chattering, long tailed monkey.

ZERO: Musta been a long time ago.

THE FIXER: A million years or so. Seems like yesterday to me.

ZERO: Whaddya mean by sayin' I'm gettin' worse all the time?

THE FIXER: You weren't so bad as a monkey. Of course, you did what the other monkeys did, but it kept you out in the open air. And you weren't women-shy, there was one little red--headed monkey--Well, never mind. Yes, you weren't so bad then. But even then there was some bigger and brainier monkey you kowtowed to. The mark of the slave was on you from the start.

ZERO: You ain't very particular about what you call people, are you?

THE FIXER: You wanted the truth. If there ever was a soul labeled slave it's yours.

All the bosses and kings have left their trademarks on your backside.

ZERO: It ain't fair, if you ask me.

THE FIXER: Don't tell me about it. I don't make the rules. All I know is you've been getting worse--worse each time. Even six thousand years ago you weren't so bad. Hauling stones for one of those big pyramids in Africa. Ever hear of the pyramids?

ZERO: Them big pointy things?

THE FIXER: That's it.

ZERO: I seen a picture in the movies.

THE FIXER: You helped build them. A long step down from the jungle, but a good job, even though you didn't know what you were doing and your back was striped by the foreman's whip. But you've been going down, down. Two thousand years ago, a Roman galley—slave. On one of the triremes that knocked the Carthaginian fleet for a goal. Again the whip. But you had muscles then, chest muscles, back muscles, biceps. Phoo! A bunch of mush! Wake up, you mutt! Where do you think you are! Another thousand years, a serf, a lump of clay digging up other lumps of clay. Wore an iron collar then, white ones hadn't been invented yet. Another long step down. But where you dug, potatoes grew, and helped fatten the pigs. Something. And now, well, I don't want to rub it in.

ZERO: Rub it in?! Seems to me I got a pretty healthy kick comin'. I ain't had a square deal! Hard work! That's all I've ever had!

THE FIXER: What else were you ever good for?

ZERO: That ain't the point. The point is I'm through! Enough! Let 'em find somebody else to do the dirty work. I'm sick of bein' the goat! I quit right here and now!

[There is a thunder-clap and a bright flash of lightning.]

ZERO: Ooh! What's that?

THE FIXER: It's all right. They're telling you they don't like you to talk that way. Pull yourself together and calm down. You can't change the rules, nobody can, they've got it all fixed. A rotten system, but what are you going to do about it?

ZERO: Why can't they stop pickin' on me? I'm satisfied here--doin' my day's work. I don't want to go back.

THE FIXER: Got to, I tell you. No way out of it.

ZERO: What chance have I got, at my age? Who'll give me a job?

THE FIXER: You big boob, you don't think you're going back this way?

ZERO: How then?

THE FIXER: You've got to start all over.

ZERO: All over?

THE FIXER: You'll be a baby again, a bald, red-faced little animal. Millions like you, all with their mouths open, squalling for food. When you get a little older

you'll learn things, all the wrong things and all the wrong way. You'll eat the wrong food, wear the wrong clothes and live in swarming dens where there's no light and no air! You'll learn to be a liar and a bully and a braggart and a coward and a sneak. You'll learn to fear the sunlight and to hate beauty. By that time you'll be ready for school. There they'll tell you the truth about things you don't give a damn about and lies about things you ought to know. About all the things you want to know, they'll tell you nothing at all. When you get through you'll be equipped for your life work. You'll be ready to take a job.

ZERO: What'll my job be? Another adding machine?

THE FIXER: Yes. But not one of these antiquated adding machines. A superb, super-hyper-add machine, as far from this old piece of junk as you are from God. Something to make you sit up and take notice, that adding machine. An adding machine installed in a coal mine to record the individual output of each miner. As each miner takes up a shovelful of coal, the impact of his shovel will automatically set in motion a graphite pencil in your gallery. The pencil will make a mark in white upon a blackened, sensitized drum. Then your work comes in. With the great toe of your right foot you release a lever which focuses a violet ray on the drum. The ray playing upon and through the white mark, falls upon a selenium cell which in turn sets the keys of the adding apparatus in motion. This way the individual output of each miner is recorded without any human effort except the slight pressure of the great toe of your

right foot.

ZERO: Say, that'll be some machine, won't it?

THE FIXER: Some machine is right. The culmination of human effort, the final triumph of the evolutionary process. For millions of years nebulous gases swirled in space. For more millions of years the gases cooled. Then through inconceivable ages they hardened into rocks. Then came life. Floating green things on the waters that covered the earth. More millions of years and a step upward, an animate organism in the ancient slime. And so on, step by step, down through the ages, the mollusk, the fish, the reptile, then mammal, man! And all so that you might sit in the gallery of a coal mine and operate the super-hyper-adding machine with the great toe of your right foot!

ZERO: Well, then, I ain't so bad, after all.

THE FIXER: You're a failure, Zero. A waste product. A slave to a contraption. The animal's instincts, but not his strength and skill. The animal's appetites, but not his unashamed indulgence of them. True, you move and eat and digest and excrete and reproduce. But any microscopic organism can do as much. Well, time's up! Back you go, back to your sunless groove, the raw material of slums and wars, the ready prey of the first demagogue who takes the trouble to play upon your ignorance and credulity and provincialism. You poor, spineless, brainless boob, I'm sorry for you!

ZERO: Then keep me here! Don't send me back! Let me stay!

THE FIXER: Didn't I tell you I can't do anything for you? Come on, time's up!

ZERO: I can't! I can't! I'm afraid to go through it all again.

THE FIXER: You've got to!

ZERO: What did you tell me so much for? Couldn't you just let me go, thinkin' everythin' was goin' to be all right?

THE FIXER: You wanted to know, didn't you?

ZERO: How did I know what you were goin' to tell me? Now I can't stop thinkin' about it! I can't stop thinkin'! I'll be thinkin' about it all the time.

THE FIXER: All right! I'll do the best I can for you. I'll send a girl with you to keep you company.

ZERO: A girl? What for? What good will a girl do me?

THE FIXER: She'll help make you forget.

ZERO: She will? Where is she?

THE FIXER: Wait a minute, I'll call her. Oh! Hope! Yoo-hoo! [THE FIXER turns his head aside and speaks in the manner of a ventriloquist imitating a distant feminine voice.] Ye-es. Then in his own voice.] Come here, will you? There's a fellow who wants you to take him back. [Ventriloquosly again.] All right. I'll be right over, Fixer dear. Kind of familiar, isn't she? Fixer dear!

ZERO: What did you say her name is?

THE FIXER: Hope. H-o—p—e.

ZERO: She good-lookin'?

THE FIXER: Good-looking! Wait until you see her! A blonde with big blue eyes and red lips and little white teeth and---

ZERO: Say, that listens good to me. Will she be long?

THE FIXER: She'll be here right away. There she is now! Do you see her?

ZERO: No. Where?

THE FIXER: The corridor. No, not there. Over farther. To the right. See her blue dress? And the sunlight on her hair?

ZERO: Oh, sure! Now I see her! What's the matter with me, anyhow? Say, she's some jane! Oh, you baby vamp!

THE FIXER: She'll make you forget your troubles.

ZERO: What troubles you talkin' about?

THE FIXER: Nothing. Go on. Don't keep her waiting.

ZERO: You bet! Oh, Hope! Wait for me! I'll be right with you! I'm on my way!

[ZERO Exits.]

JOE: [Bursts into uproarious laughter.]

THE FIXER: What in hell's the matter with you?

JOE: Did you get that? He thinks he saw somebody and he's following her!

THE FIXER: Shut your face!

JOE: What's the idea? Can't I even laugh when I see something funny?

THE FIXER: Funny! You keep your mouth shut or I'll show you something funny.  
Go on, hustle out of here and get something to clean up this mess with.

There's another fellow moving in. Hurry now.

[JOE Exits.]

THE FIXER: Hell, I'll tell the world this is a lousy job!

## Appendix E

Representative bibliography of articles about KU Theatre and Film  
Department's experiments with live, virtual reality theatre.

"3D Stage Sets" Aberdeen Press & Journal ( March 13, 2000)

"The Adding Machine Draws Attention." Spotlight 3:1 (Fall 1995) 2.

Albright, Kay. "Play Brings Virtual Reality to KU Stage."

----- "Virtual Reality Play Offers Audiences a New Experience: Audience limited to  
60." Oread (November 15, 1996) 4.

Adler, Eric. "Theater's Computerized Scene Shop: Make-believe worlds can be  
designed and perfected through the technology of virtual reality." Kansas City  
Star (January 24, 1993).

Allen, David-Michael. "The Nature of Spectatorial Distance in VR Theatre" Theatre  
in Cyberspace: Issues of Teaching, Acting and Directing. Stephen A. Schrum  
ed., American University Studies, Series XXVI, Theatre Arts, Vol. 28, Peter  
Lang Publishing New York, (1999) pp. 239-248.

----"The Spectator's Edge in the 3D Theatre of The Adding Machine: A Virtual  
Reality Project." Association for Theatre in Higher Education, New York,  
August 1996.

Arnold, Jake. "All the World's a Virtual Stage: A Virtual Reality Play Comes to KU  
Tonight." University Daily Kansan (April 1~, 1995) 8A.

----- "Avant-Garde Play is Virtually Real." University Daily Kansan (April 18, 1995)

8A.

Bauchard, Franck. "Nouvelles technologies: Le theatre et la realite virtuelle." Du theatre, La revue 10 (October 1995) 64-66.

----- "Theatre et Realite Virtuelle: Une Introduction a la Demarche de Mark Reaney." Les Ecrans Sur la Scene, pp. 225-245, L'age d'Homme, Lausanne, Switzerland 1998

Berg, Chuck. "Theatrical 'Virtual Reality' to Debut: Theater through the Looking Glasses." The [Topeka] Capital-Journal (April 16, 1995) D1.

Brady, Jenny "3D Stage Sets", South Wales Evening Post. (March 16, 2000)

---- "A Week in the Lab: The Virtual Theatre Show", Bristol Evening Post, (March 18, 2000)

Brosius, Liz. "Virtual Theatre." Spring 1995.

Cage, Mary Crystal. "Actors Joined by Computer Imagery in U. of Kansas Production." The Chronicle of Higher Education, June 30,1995, A18+.

"Case Studies, Technology across the Campus: Virtual Theater. The University of Kansas." Syllabus, January 1996, 40.

Gharavi, Lance. "A Brief History of i.e.VR at the University of Kansas." Association for Theatre in Higher Education, New York, August 1996.

-----. "Consorting with the Demon: The Death of Theatre and Other Minor Matters." Why Theatre? Conference, Toronto, November 1995.

----"i.e.VR: Experiments in New Media and Performance" Theatre in Cyberspace: Issues of Teaching, Acting and Directing. Stephen A. Schrum ed., American

University Studies, Series XXVI, Theatre Arts, Vol. 28, Peter Lang  
Publishing New York, (1999) pp. 249-271

----- "Subtracting People, Adding Machines, Equaling Beckett: Playing with  
Presence in Cyberspace." Beckett Festival, University of Victoria, May 1996.

Gianetto-Adams, Judy. "The Edge of Reality: KU's Ron Willis and Mark Reaney  
Break Free of Traditional Theatre to Embrace the Cyber World of Virtual  
Reality." Kansas City Magazine (April 1995) 36.

Gibbons, Frachra. "Computers 'enhance' Shakespeare's Bottom". The Guardian,  
London, (April 18, 2000) 11

King, Mason. "Camera Reality?: Live actors merge with high-tech imagery in 'The  
Adding Machine,' a ground-breaking virtual- reality theater production at  
KU." Lawrence Journal-World (April 16, 1995) D1.

----- "Interface with Theater: KU Professor Steps into New World with Homespun  
Virtual Reality System." Lawrence Journal-World.

Londre, Felicia Hardison. "Virtually Zero." American Theatre (July/Aug. 1995) 66-  
67.

Luce, Mark. "Room with a Virtual View Audiences Will Have to Gear Up for  
'Wings" Lawrence Journal-World. KU edition, (August 1996) 3F.

Mahoney, Diana Phillips. "Live Theater Gets a Virtual Boost: At the University of  
Kansas, computer-generated scenery sets the stage for a one-of-a-kind  
production." Computer Graphics World (July 1995) 76-78.

Near, Mitchell. "KU theatre stages 3-D production." The Mag, Lawrence Journal-

World. (October 28, 1999) 8

Neil, Denise. "Professor Interfaces with Theater: KU's University Theatre will break new ground this spring with a production integrating a 1920s play, human actors and virtual reality technology." *Lawrence Journal-World*.

Popovich, George. "Artaud Unleashed: Cyberspace Meets the Theatre of Cruelty." *Theatre in Cyberspace: Issues of Teaching, Acting and Directing*. Stephen A. Schrum ed., American University Studies, Series XXVI, Theatre Arts, Vol. 28, Peter Lang Publishing New York, (1999) pp. 221-237

"Not in Kansas Anymore" *American Theatre* (Dec. 1996) 50

"A Preview of Fall '96 Productions." *Spotlight* 4:1 (Fall 1996) 3.

Reaney, Mark. "Digital Scenography: Bringing Theatre into the Information Age", *Art et Numerique*, 2000, Vol.1, No.1, Paris France

----. "KU Establishes the Institute for the Exploration of Virtual Realities (i.e.VR)." *Spotlight* 4:1 (Fall 1996) 4.

----. "The Theatre of Virtual Reality: Designing Scenery in an Imaginary World." *TD&T*(Spring 1993) 29-32.

-----. "Virtual Reality en Drama: Een gesprek met Mark Reaney," interview by Judith van Wessel. *Theater & Educatie, Tijdschrift voor Drama* 2:3 (August, 1995) 27-23.

----"Virtual Reality and the Theatre: Immersion in Virtual Worlds", *Digital Creativity*, 1999 Vol. 10, No.3, pp. 183-188.

-----. "Virtual Reality on Stage: VR Valuable for design, performance, and remote

- viewing in the theatre." VR World (May/June 1995) 28-31.
- "Virtual Scenography: The Actor Audience Computer Interface." TD&T (Winter 1996) 36-43.
- and Lance Gharavi. "Virtual Reality in Performance: The Adding Machine." United States Institute for Theatre Technology, Fort Worth, March 1996.
- and Ronald A. Willis. "Virtual Theatre." New England Theatre Conference, Providence, November 1996.
- Ruling, Karl G. "VR Scenery Onstage." TCI April 1996,49.
- Schleier, Curt. "Van Gogh Meets Virtual Reality: How the Computer is Revolutionizing the Arts." A&E Monthly (September 1995) 33- 35.
- Shuttleworth, Ian. "Is this curtains for ushers? Ian Shuttleworth views the prospects for virtual theatre: Future Stages." London Observer, March 5, 1995.
- Smith, Bunny "Technology Challenges KU production" The Mag, Lawrence Journal World (Nov. 1996) 12.
- Streeter, April "VRML paving the way for 3-D designers" MacWeek (Dec. 12, 1996) 47, 49-50.
- Sutherland, Amy. "Virtual Reality Takes the Stage." Ovation.
- "University of Kansas Blends VR with Live Theatre." Real Time Graphics 8:4 (October/November 1999) 6.
- Unruh, Delbert. "Virtual Reality in the Theatre: New Questions about Time and Space." TD&T (Winter 1996) 44-47.
- Unruh, Delbert. "Virtualni Realita v Divadle: Pocitaci Stroj--Projekt Virtualni Reality

- na Kansaske Univerzite." Svet & Divadlo (1995) 14-24.
- Watkins, Adam with Watkins, Kirsten "Virtual Limelight" Computer Graphics World  
(March 2000) 36-40
- "Virtuelles Theater" Spektrum der Wissenschaft (July 7, 2000) 91 (German  
Associate- Scientific American)
- "Virtual Reality to Hit Stage at KU."
- "Virtual reality play takes audience to new level" St. Joseph News- Press (Nov. 29,  
1996) D15.
- "Virtual Reality Used in Live Theatre." Real Time Graphics 4:3 (September 1995)  
17.
- "VR Theater Uses HMDs." Real Time Graphics 5:4 (Oct.-Nov. 1996) 9.
- Willis, Ronald A. [titles, etc.]
- Woodard, Bill. "Scenic Routes: 1990s high tech sets project the drama of a 1920s  
play, turning virtual reality into real artistry." Kansas Alumni Magazine  
(June/July 1995) 28-29.