

Transpose MR

by

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A Thesis Submitted to the Graduate

Faculty of Rensselaer Polytechnic Institute

in Partial Fulfillment of the

Requirements for the degree of

Master of Fine Arts

Major Subject: Electronic Arts

Approved:

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Rensselaer Polytechnic Institute
Troy, New York

May, 2009

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ACKNOWLEDGMENT

I would like to thank my thesis committee and the Arts Department as a whole for their support during a really rough time two years ago. You have helped me immensely and it is much appreciated. Individually I would like to thank: My father, thank you for leaving your tools behind for me to work with as well as giving me the skills to use them, rest well. Carolyn Tompkins, Charles Veasey, Erin Shaefer, Michael Century, Mary Ann Staniszewski, Kathy High, Ethan Bach, Liz Blum, Susan Gordon Lawson, Bill Bergman, William Ganus, Casey Mullens, Kathleen Ruiz, Tomie Hahn, Danny Goodwin, Bosely, the iEAR staff and faculty, and last but not least my thesis advisor, Shawn Lawson. Thanks, and thank you all.

ABSTRACT

The MRI (magnetic resonance imaging) apparatus is a popular method of obtaining images from the human body. These images are seen across mediums, from billboards to television screens. Their presence in media is tailored to connote a variety of messages. However, the image the MRI produces, the subject of many academic studies, is but one small, culturally visible, aspect of the MRI. In *Transpose MR*, a multimedia and animated artwork, I focus on the MRI apparatus itself rather than the already heavy leaden image. My goal in this work is to create a variable understanding of the MRI historically, philosophically, and narratively.

My investigation into the MRI, its situation in everyday life, stems from a personal history with the spaces and situations of the hospital. The MRI's situation is what I call the medical imaging situation, comprised of the medical imaging apparatus, patient, doctor, and technician. The medical imaging situation and its parts are ultimately viewed through the respective lenses of philosophers Jean Baudrillard, Vilem Flusser, Immanuel Kant, and Michele Foucault. These lines of thought address prime issues concerning the MRI: simulation, image and apparatus, curiosity, power and control. Each vector of inquiry both illuminates and complicates the MRI, providing a conceptualization of it as more than just an imaging device.

In Addition, the medical imaging situation is compared to both Ray Bradbury's short story *The Veldt* and to the Oracle of Apollo at Delphi from classical Greece. While seemingly unrelated, similarities are drawn that reveal the MRI as an entity both animal-like and oracular, a lion and a decipherer of bodies.

I have, through my art making practice, worked to make sense of the multiplicity of the MRI by reproducing, in small-scale model form, the environments that the MRI is home to. I have coupled these small-scale environments with a peep-box viewer and a semitransparent video display that places the MRI as a specimen to be watched. The situation of the MRI is reversed in *Transpose MR*, the apparatus that once imaged the human body is now the subject of scrutiny.

1. Introduction

1.1 Awaiting Interpretation

The large doughnut shape filled one side of the room, an overbearing presence that physically pushed away any want or need to be near it. Surveying the beast was a test of nerves, its open maw and forward thrust lower mandible a frightening composition of textured plastics in sickly white and void mute beige. It was the kind of coloring found on decrepit PC's, their skins beginning to yellow with age. Occasionally the large carapace was marred by a diaphanous streak of pale greenish-blue, no doubt a trait that was evolved so that its appearance was less sinister, an inviting, yet cautionary, hue that was to be found similarly on those that kept and cared for the beast's needs. There was always one or two of the keepers about the room, checking in, taking notes, entering and exiting. No eyes broke from the softly contoured shell, it was blind to our light, but it was capable of sight just the same. Its rays, its magnetic pull, its vision penetrated deeper than any human could muster. Bone, flesh, veins, even the hidden grey matter was opened up to its eye; a gaze that turned pellucid whatever it happened upon. A keeper entered, directly to the apparatus' side, and stood there for a moment, hand placed on the textured plastic. The beast's hide was intermittently disrupted by the phosphorescent luciferin glow of small groups of protuberances. These especially attracted the careful attention of the keepers. They pressed and prodded the luminous bumps to what I could only construe as the delight of the beast next to them. It whirred and whined under their delicate ministrations, its great jaw lowering, raising, extending. The keeper was doing this now. Setting the beast, the apparatus, for my entrance into its throat, I would slide on in along the vestigial tongue, its bed the same inviting, yet cautionary, greenish-blue. Worn thin by magnetic forces more potent than those of the earth, the body would unleash its grasp for the moment as it was pulled, polarized, eaten by the beast on whose tongue I lay. Then, there on the screen, I would appear as translucent; my body, my truth, my insides laid bare. I would see there on the screen myself but, something entirely not myself. It would reside there for some time, waiting for its translation, its interpretation so that I could finally understand it.

1.2 Medical Imaging Exposure: A Brief Personal History

My first hand experience with medical imaging has come mainly from personal experiences involving family and friends over the course of my life. The bearing that these events have had on my conceptual shaping and understanding of the medical imaging machine is great. I believe it is important that this personal relationship be told so that a greater understanding can be found and the germination of my ideas can be traced.

My understanding of, and experiences with, medical imaging has primarily been through the observation of medical imaging sessions with family members and friends, during hospital tours, through various scholarly sources, television, internet, and print media. This short history is meant to engage on a more personal level my experiences, some of which may be similar to your own, and how they have shaped my overall view and conceptualization of these machines. This history is not entirely transparent in my work, but it is essential to how I came to create it.

The medical imaging machine has always existed during my lifetime. I was born well after the discovery and use of the X-ray as a diagnostic technique and only a few short years before the popularization of ultrasound as a part of the routine checkup on fetal development in pregnant women during the later part of the eighties.¹ As a result, sadly, my family never saw me as a fetus via sound waves, there was never an image of me in vitro magnetized to the refrigerator door as a first picture, a first representation. I was, however, subjected to several rounds of dental X-rays from a crooked dentist that was cruelly intent on boring into every deciduous tooth I ever produced. Apparently I had cavities that my new, permanent, teeth would never have been able to deal with. So, from age seven to age twelve, the dental X-ray machine and I had a good relationship, lead apron and all. Rather than being daunted by my predicament, fillings are never fun, I began to develop an interest in the dental X-ray machine. The machine was a standard model that suspended from the ceiling and looked more like it belonged attached to some kind of military vehicle than pointed at the face of a child. It was entirely painted in scrubs green and buzzed whenever used. More than anything I remember the taste of the film, it left an odd taste in the mouth, dusty and metallic. The experience was a first step in the formation of my interest in medical imaging.

Another step took place in 1989. I was witness to the aberrant car accident that nearly took my mother's left foot, not to mention her life, in the parking lot of a bait shop in the town we lived in. I was eight years old at the time and still remember, rather indistinctly, the many hospital visits, surgeries, patient rooms, and waiting rooms. Two images arise first and foremost in my mind when thinking about this event. The first image is my mother's left foot propped up on several pillows in the living room of our house as she sat in a recliner. The foot was, quite literally, held together and in place by several stainless steel pins that protruded from the top and side of her foot. The wound was open and wouldn't completely heal for another two years. At age eight I helped my father change her bandages, pulling the spent gauze from the wound, and I saw how the flesh and blood inside contrasted to the purity of the stainless steel pins.

My second mental image is a Computed Tomography (CT) scan taken of her foot during this time. The image is rather beautiful, a ghostly black and white scan garnered from the CT's X-rays. You can clearly see the bones in her foot, the missing bone creating a blank black void, as well as the steel pins. The pins appear in bright white contrast to the rest of the image while the bone has a ghostly appearance, except where multiple layers of bone cause overlap and the image goes to white. This CT image and that of my mother's foot lying open before me have undergone a subtle superimposition over the years in my mind. They have become inextricably linked to one another in my memory. One, so blatantly revealing, horrific in its exposure of the vitals, the flesh and blood, of the body, and the other, beautifully clean, ghostly, unmarred by violence and gore. Safe. The schematic-like CT image offered solace, a stand in, for the open wound. The two images are at once mutually opposing and supportive of one another.

Today the pins are gone, leaving behind scars to mark their presence. The wound has long since healed leaving behind yet another scar. She now walks with only a slight limp, thanks to advances in bone grafting and reconstructive surgery, and has returned to her job of teaching elementary school. My mother's recovery has marked nearly a decade of her life with pain and physical scars as a constant reminder.

In late 2006 a friend entered the hospital to have an MRI (magnetic resonance imaging) performed and, knowing my interest in the subject, they asked if I would like to tag along. I answered, "yes" of course. I was excited at the prospect of seeing an MRI in

action. The large machine coming to life in front of me, laying back the skin and bone, penetrating the depths of the hidden body. I couldn't wait. On the day of the scan I drove the two of us to the hospital and made small talk about the upcoming imaging. We were both curious about the upcoming procedure.

Before this event I had only read about MRI and seen them on television in news stories and medical documentaries. I knew the basics of how they worked: a giant and powerful magnet that polarized the hydrogen in the body allowing it to be viewed via radio waves, or something like that. At this time I was most interested in simply being in the same room with one of the large cameras. The machine itself is the object that arrested my imagination, at that point mainly due to its formal aspects. I found the MRI and its doughnut shape both alluring and repulsive.

We arrived and walked to the front desk, quickly being ushered to the imaging area of the hospital. The maze of corridors coupled with the sameness of it all was disorienting. It was no wonder we had to be taken there. We sat for a short time in a small waiting room connected directly to the hallway, its only occupants, before being called in for the session. I was not entirely sure that I would be admitted. We were not relatives, just classmates, and I had some experience trying to wrangle image files from medical records offices before; it was not easy, even if related, due to the Health Insurance Portability and Accountability Act (HIPAA).² I followed a step behind as we entered. Promptly the subject of my entrance came up. Was I a relative? No. Could I observe from the control room? Absolutely not, that might compromise patient privacy. I argued the point shortly with a rather vehement technician saying, truthfully, that I had taken a tour and observed scans in progress, if only briefly, with the head of their imaging wing. No. Getting nowhere we won the concession of my presence in the room with the MRI machine as the scan was taking place. Presumably this was common practice as there was a wooden chair, not metal as that might cause problems, in the room. My friend was off in a changing room, removing all things metallic from their person. I was expected to do the same: remove wallet, watch, belt, change, and jacket. Pacemaker? No. Braces? No. Stints? No. Other metallic medical hardware? No. Cochlear Implant or hearing aid? What? No. Have you been working with metal recently specifically grinding? No. Eventually we were cleared for entrance. I was shown to the

lonely wooden chair and my friend was helped onto the waiting bed of the MRI machine.

What ensued was one of the largest let downs of my life. I sat in the chair and my friend lay very still on the bed with a pair of white plastic headphones covering his ears. The headphones were attached to clear plastic tubing instead of wires. I could only guess that my friend comfortably listened to whatever music they were pumping in. We held our respective positions for about thirty-to-forty minutes. All the while the most annoying buzzing and banging sound emanated from the MRI machine. I was appalled, worse than that I was bored. The real-life experience of the MRI session was nothing like its media portrayals. Reality had let me down when the mediated image had promised me so much. I had expected *something* to happen, lights, a little movement, or even a weird sensation due to the force of the magnet. Nothing. Well, something did happen but not what I had expected, a lot of noise. A week later my friend saw the scans during a visit to their doctor. Answers had been found.

The following year I had another chance to observe an MRI session in progress, but under very different circumstances. An auto accident in April 2007 with a drunk driver had taken my father's life and sent my mother back into the hospital with a dislocated hip, some scratches and bruises, and some minor internal injuries. I lived in Troy, New York at the time and found myself unable to be with her for the hip resetting or any diagnostic imaging performed directly after the accident. However, the following summer saw my mother under the prying magnetism of an MRI, a last scan to check the progress of her internal injuries.

My mother was apprehensive of the scan this time. The MRI machine and the act of being scanned did not trouble her. She couldn't bear the thought that there might be something else wrong, something else hiding in that hip of hers that would require additional surgery, more hospitalization, the expenses of which we knew were mounting.

The MRI machine was located at an off-hospital imaging center, a clinic whose specialty was medical imaging. We arrived, parked, and I helped my mother to the door. By this time she could walk, but with a limp. The experience began as usual, front desk, sign in, peruse a magazine you have little interest in, patient name called, see the technician or doctor. The MRI session, due to the location of the injury, called for a contrast

agent to be ingested by the patient before scanning. The contrast agent, in this case I believe it was a barium-based agent, would allow the MRI machine to image more specifically and selectively the delicate interior of my mother's abdomen; it would increase the differences between her tissues. A contrast agent takes time to reach maximum absorption, so after about an hour we were admitted to the machine. I had spoken with the technician before hand and she was positive towards my presence during the scanning. As a family member I was allowed into the control room without question. The experience, as a whole, contrasted sharply to my prior observation of an MRI procedure.

The scan began with my mother easing onto the bed with the help of the technician and myself. I sat there a moment with her as she made adjustments to the bed height, extension, and made sure she was comfortable. Then I followed the technician to the small control booth, little more than a closet space with a computer station, a task chair, and a small table covered with papers, a small white foam cup half full of coffee, and a couple ominous looking manuals. The technician took a seat at the computer and I leaned against the back wall of the control room, curiously looking over their shoulder at the screen, keyboard, and GUI of the imaging software. A preliminary scan pointed out that my mother was positioned correctly and that the MRI was on the mark. Then began the main scan.

What unfolded before me was quite beautiful, and much more interesting than the noise from the previous MRI session. Some time passed while the MRI machine hummed and thumped to itself in the other room, my mother resting on its bed. Then, on the screen, coalesced an image, it was the lower half of my mother's abdomen, detailed in black and white. The organs were there, some recognizable even to my untrained eye. My mother, her body, had been rendered translucent for a matter of seconds and then those parts imaged had migrated, unfolded on the screen. She was partially doubled, her body in two places at once. This double would then be used in comparison to a previous double, and again in comparison to her current corporeal body. An answer would not come for another week, until the doctor had seen the scans and found, or not found, what he was looking for.

1.3 Introduction to the Discourse

I have approached writing this paper in a manner similar to my model making practice and my elucidation here is to build a connection between my art making practice and my process of formalizing ideas. The method is known as kit-bashing. Kit-bashing is selecting and taking individual pieces from model kits, which on their own make little sense, and putting them together to make a model of your own choosing. Building the kit as per the instructions produces a recognizable form, an automobile or a plane. Building a model using kit-bashing produces a model that is informed by the selected pieces, as well as pieces crafted by the builder. The resulting model is also a recognizable form but, one that no longer resembles the tank or battleship. The kit-bashed model has parts that only allude to the form that they were originally designed to create. I go about writing in this manner, selecting pieces and parts of sources to create the recognizable form of a whole. A whole that you could say is the product of concept-bashing.

My focus in *Transpose MR*, the artwork and research, is on the apparatus, the MRI, rather than on the image it produces. MRI images, the subject and material of many artists' work, carry a very different meaning than the apparatuses that created them. The images are used as proofs or maps against which our bodies are measured and compared; they are seen to represent an objective 'truth.' Although, according to authors Marita Sturken and Lisa Cartwright, "images do not embody truth, but always rely on context and interpretation for their meanings."³ Because of this interpretation, the scanned image of the body is also far from being an objective image. They hold a cultural weight, much like the X-ray images discussed by Lisa Cartwright, that at once bring to mind connotations of life, death, health, sexuality, voyeurism, and control.⁴ Instead, my interest is the means of production of the medical image, the apparatus, and its situation in our lives. I believe, however debatable, that to understand the MRI image and properly confront it, an understanding of the situation, and of the space, of their production is necessary.

2. Historical and Theoretical Network

People endowed the machine with the capacity to produce objective visual inscriptions of imperceptible manifestations of the inner body, and, by the same token, they believed that the penetrative eye of the new technology would reveal the most intimate secrets of the human soul. The new technology was just one in a long series of devices that separated the actual body – both in time and space – from its representation.⁵ (Jose Van Djick)

2.1 Magnetic Resonance: Overview

I will not detail and describe the history and workings of magnetic resonance imaging; it is not in the interest of this text to do so. However, I believe it will be helpful to present the basics: a general understanding of the MRI, how it works, its development, and how it came to be an imaging apparatus.

2.1.1 History, Development, and Image Production

The MRI can be seen as a very large magnetic camera, one of the reasons I am so attracted to it. It is primarily used to create images of the less dense soft tissues of the body as opposed to the images of the skeletal structure found in X-ray and CT imaging. MRI then is a very different kind of imaging from its predecessors. Its focus fills in where the CT scan stops. As journalist and author Bettyann Holtzmann Kevles states when discussing the differences between MRI and X-ray or CT images, “The act of visual penetration no longer carries the association of stark white skeletons, and death.”⁶ This is not to say that the MRI image does not carry its own weight. Its images are connected to both hope and despair as the images it creates do not just show breaks in our frames, or denser areas of tissue than those around it; it can show more insidious afflictions that extend throughout a body.

MRI first began its life as NMR (Nuclear Magnetic Resonance) spectroscopy. Isidor Isaac Rabi, an American physicist, first introduced the term in 1937. NMR was, at first, solely researched and made use of by physicists during and just after World War II. It was a method of measuring the magnetic moment, or spin, of an atom’s nucleus through the use of powerful magnets and was only later used by chemists in the identification of molecular structures.⁷ Two scientists, Edward Purcell and Felix Bloch, drew upon Rabi’s

research to almost simultaneously conduct research that allowed NMR measurements to be taken in bulk matter, the results of which gained them a shared Nobel Prize in Physics in 1952.⁸ This method consisted of using a magnetic field, alternating magnetic induction set to the radio frequency of a particular atom, usually hydrogen, and a receiver to glean two kinds of measurements known as T₁ and T₂. These measurements are explained by Bettyann Holtzman Keveles.

“T₁ and T₂ are both relaxation times, that is, they are the measures of the times in which the components of the net magnetization of the excited nuclei return to equilibrium. T₁ is the relaxation time for the component in the direction of the external field; T₂ is the relaxation time for the component perpendicular to that field. T₂ can never exceed T₁. The difference between T₁ and T₂ from point to point reveals subtle differences in adjacent tissues.”⁹

While this early research and eventual use in the chemists’ laboratory had little to do with medical imaging, it was soon discovered that NMR could be safely used on animals. Jay Singer used NMR in 1959 to track blood flow in laboratory mice, setting the stage for the development of NMR for clinical use.

The 1960’s and on to the early 1980’s were the formative years of the MRI we know today. MRI coalesced from NMR in fitful bounds and no single scientist, researcher, or physician could claim total credit, although there were several whose ideas greatly affected its development. A dynamic research physician at New York’s Downstate Medical School in Brooklyn, Raymond Damadian, was the first to propose, implement, and create a full body NMR instrument that used a superconducting magnet with a bore capable of holding a human adult.¹⁰ Damadian’s hope was to make an instrument that would be capable of detecting tumors in a human body, one of MRI’s uses today. The downside of Damadian’s machine, while a landmark for NMR, was its lack of a clinically useful image.

Paul Lauterbur, a chemist from NMR Specialties, a company that produced NMR instruments for chemists, is attributed with one of the ingenious sparks that lead to clearer images in NMR approaching those of MRI. His method was to use magnetic field gradients to derive spatial data from a specimen or sample that could produce a one-dimensional image. Then it struck him that, by rotating the magnetic gradient around the object and then combining the projections using computer algorithms similar to those

used in CT scans, a much more complete and detailed image could be made.¹¹ This is the ‘slice’ of MRI imaging. Laterbur’s ideas, and their further development by others, are central to how the MRI currently produces an image.

Peter Mansfield, a physicist at the University of Nottingham, would come to similar conclusions as Laterbur in 1973. His initial approach was the study of solids through NMR using a technique similar to Laterbur’s, but with a “coarser gradient” with the specific thought that it would have applications in Biology.¹² Mansfield and his work gave MRI what is known as k-space. K-space, in my understanding, is the data space of the MRI. According to the MR-Technology Information Portal, a website devoted to magnetic resonance imaging, K-space is a “temporary memory of the spatial frequency information in two or three dimensions of an object” that “contains raw image data before image processing.”¹³ K-space, then, is the image in data form before its conversion into a visual representation both of that data and the object, sample, or specimen imaged.

The broader medical community began to see the potential for NMR in the clinical setting near the end of the 1970’s and the beginning of 1980. Kevles, in part, attributes the gathering acceptance of MRI to the success CT imaging had achieved as a medical tool.¹⁴ The MRI’s path had been well paved by the CT scanner, proving that the machines were both useful and desirable despite their hefty price. It was about this time that the acronym MRI came about in place of NMR, associated as it was with the chemistry lab, and the big medical hardware companies joined the development race, early on GE and Pfizer and later Siemens and Toshiba. The reason for the name change is not entirely known although, according to Kevles, it is thought that, “the change was made to avoid the word *nuclear*, with its connotations of atomic weapons, fallout, and total war.”¹⁵ Regardless, with the big manufacturers supporting MRI development it was only a matter of time before a functional MRI was produced. In 1981 a group in San Francisco, supported by Pfizer then Diasonics and then Toshiba, lead by Alex Margulis, chairman of the Department of Radiology at UCSF, and physicist Leon Kaufman, produced an MRI with millimeter precision and capable of producing an image in minutes.¹⁶ The time period would only grow shorter as developments like fMRI, or fast MRI, would allow simultaneous imaging and surgical procedures.

1981 marked the birth of an imaging apparatus that would come to represent big medicine and the state of the art in medical imaging. Today the cameras are almost taken for granted. Used daily, the MRI and the images it produces can be seen in medical documentaries, popular television shows, billboards, and online as people share the intimate details of their body with others.¹⁷ It also marked the birth of a wholly new human, one whose simulacra stared back from the depths of the screen boneless and devoid of skin, all of its soft interior exposed.

2.2 The Medical Imaging Apparatus

The medical imaging apparatus is what I would like to describe as part of the medical imaging situation, or the various entities that combine to form the space of medical imaging. The situation includes the imaging device, the patient, the technician, and the doctor. These parts form another level of apparatus and in turn are part of another level of apparatus, the health system. I will start by unraveling the MRI as a medical imaging apparatus, then onward to its place in the medical imaging situation.

The MRI is a camera, albeit a highly specialized one, and is viewed as such by medical professionals.¹⁸ Since it is seen as a camera; it is safe to describe the MRI as an apparatus as described by Vilem Flusser:

Apparatuses are black boxes that simulate thinking in the sense of a combinatory game using number-like symbols; at the same time, they mechanize this thinking in such a way that, the future, human beings will become less and less competent to deal with it and have to rely more and more on apparatuses. Apparatuses are scientific black boxes that carry out this type of thinking better than human beings because they are better at playing (more quickly and with fewer errors) with number-like symbols.¹⁹

To clarify this idea, I will discuss the MRI in relation to Flusser's framing of the apparatus, or how he came to the conclusions above. The definition of apparatus, according to the Merriam-Webster dictionary, is “a: a set of materials or equipment designed for a particular use b: a group of anatomical or cytological parts functioning together c: an instrument or appliance designed for a specific operation.”²⁰ While these definitions are sufficient for a basic use of the word, Flusser goes much further into its conceptualization as applied to the camera. He looked at the word etymologically and found that “an

‘apparatus’ would be a thing that lies in wait or in readiness for something” and further that “The photographic apparatus lies in wait for photography; it sharpens its teeth in readiness.”²¹ This analogous connection between the camera and an animal struck me as rather important, the thought that an MRI could at once be both animal and machine, and I elaborate further on this analogy in a later section.

For now, the MRI is a camera that lies in wait for imaging, for the scanning of the human body. Much as a toaster lies in wait for toasting. This, however, is a poor definition. A cultural context is needed as the MRI is a device produced by a culture and is itself a cultural object; its form and the images it produces are a part of our “visual culture.”²² As a part of this culture it is reasonably safe to assume the MRI is a tool used to create images of the human body. Although, considering what a tool is and does, the MRI defined as a tool still does not quite suffice.

Tools are used to inform other objects, they enable work and act as extensions of human organs.²³ A good example is a saw. It extends the teeth, the fingernails, and the arms and hands. It informs a wooden log by changing its dimensions, unnaturalizing it into a culturally recognizable object. A table. A camera is not so simple, and Flusser distinguishes the camera, and by extension the MRI, from tools by drawing differences between industrial and post-industrial contexts. “The basic category of industrial society is work: Tools and machines work by tearing up objects from the natural world and informing them, i.e. changing the world.”²⁴ The shift from industrial to post-industrial society - that of the computer, the digital and the virtual - has provided us with the apparatus. An apparatus is different from a tool because its intention is not to change the world, “but to change the meaning of the world.”²⁵

This is the heart of the apparatus in my understanding. An MRI does not change the world in the same sense as a tool, although it certainly has its effect on physical structures due to its powerful magnet, but it does change the meaning of the body. This change is a very personal matter and is subsequently why I have not focused on the MRI images in the broader media context of television and advertising. These images, while products of the medical imaging apparatus, have moved beyond the medical imaging situation and only refer back to it. A personal change, or at least a shift in the understanding of one’s body, takes place upon seeing a scan of one’s own interior. Casey

Mullens, a health physicist at the University of Oklahoma Radiation Safety Office, has noted that, “even though the image is obviously not a living thing, when someone takes that image they capture something very important. That image is in effect, your representative. It is a small piece of you.”²⁶ The image, the small piece of you, that the medical imaging apparatus can bring to bear is not always a welcome one.

Flusser goes on to describe the camera as a scientific black box, one that is both programmed and a game of sorts. The camera is programmed to take photographs, to take hold, store, and actualize the many virtualites inside it. As a game it invites the user, or photographer - technician in the case of the MRI - to play. “Yet, photographers do not play with their plaything but against it. They creep into the camera in order to bring to light the tricks concealed within it.”²⁷ The MRI technician then plays with the scanner to actualize its virtualities. This idea is somewhat innocently expressed by a student at the College of Allied Health at the University of Oklahoma Health Science Center when expressing their feelings towards the cameras they work with. “It sounds weird but sometimes I see them as a coworker because I am only good at my job if the camera is good at its job too.”²⁸ While the idea of a coworker brings to mind teamwork and working with others; I would like to suggest that the interplay between the apparatus and user here asks the user to find out how to get the MRI, the coworker, to do its job well. This is why the technician has to ‘creep into’ the MRI, into the black box. K-space, the data space of the MRI, comes in as the dark interior of the black box and, according to Flusser, “It is precisely the obscurity of the box which motivates photographers to take photographs.”²⁹ The black box contains every possibility of the MRI program, every scan is held there waiting. A technician has to search out the possibilities of the MRI image, to explore the black box and play, in order to take a useful image. K-space, the interior data memory of the MRI, is the interiority of the black box. Virtualities are pulled from this dark space and made into realizations, the shadowy image on the screen. It is within the space of computer memory that MRI virtualities exist as both possibilities and transitional migrant data. The MRI is a conveyor, moving a body to data and on to image from only a possibility to a realization and sets the apparatus as a part of simulation.

The MRI is a part of simulation and it has been noted by Flusser that, “Apparatuses were invented to simulate specific thought processes.”³⁰ The camera simulates the eye, following as a tool, and to a larger degree the thought processes of visual memory. However, the MRI goes well beyond what we might consider vision. The MRI simulates ‘seeing’ with magnets, radio frequencies, and complex calculations, ignoring light altogether. Its gaze is one that penetrates the body and alters the game. Too, in k-space, the memory is fleeting, numerical, and only endures for the time it takes the apparatus to translate data into a visual representation or, I would like to pose, a simulacra. These ideas are expanded upon further in my discussion of medical imaging and the creation of simulacra. For now, the MRI itself is well defined as an apparatus.

At last a more specific understanding of the MRI as an apparatus is unfolded. This is the medical imaging apparatus. An MRI is a black box that holds possibilities, or virtualities in my understanding, and is programmed to make scans of the human body so long as a user is available to play, to step into it, and search for the virtuality, or possibility, they want to realize. As a part of simulation the apparatus can be considered to simulate vision, however otherworldly, and as a conveyor, moving numerical data from a scanned body into recognizable visual forms. It occurs to me that this is very much what Marshall McLuhan was describing when he wrote about media as translators, or - “That is what is meant when we say that we daily know more and more about man. We mean that we can translate more and more of ourselves into other forms of expression that exceed ourselves.”³¹ I believe this applies to both the apparatus, simulating organs and thought processes, and to the simulacra, an image of ourselves that can supersede us in many situations, such as that of medical imaging.

2.2.1 The Medical Imaging Situation

The medical imaging situation is a larger apparatus composed of the medical imaging apparatus, the doctor, the technician, and the patient. I will not further discuss the role of the apparatus in further detail except as a part of the separate examinations of the doctor, technician, and patient; the medical imaging apparatus is already well situated from the prior section.

My conceptualization of the position the medical imaging situation holds follows from Flusser's ideas concerning the wider functioning of the camera and its program. Flusser defines a program as "a combination game with clear and distinct elements."³² The program is what allows the user of the apparatus to both play and take photographs. He places it within a hierarchy of programs including the camera, operator, photographic industry, industrial complex, and so on. Flusser states that, "there can be no 'final' program of a 'final' apparatus since every program requires a metaprogram by which it is programmed. The hierarchy of programs is open at the top."³³ The medical imaging situation is very similar; it is itself a part of, and programmed by, a larger apparatus above it, the health system, and the health system is itself a part of larger apparatus with more above it. I find this idea important because it does not isolate the medical imaging situation, but sets it as a part of a larger system, a cog in the machine. Interestingly, the reverse is also applicable; the medical imaging situation is comprised of further smaller apparatuses from the MRI and doctor to the bodily functions of the patient and smaller still to cells, machine parts, and atoms. The statement made here is not *everything is connected* but *what is isolated and under scrutiny is not necessarily so*; there is always a larger image.

The medical imaging situation is idea that has grown out of my observation of medical scanning procedures and their spaces, stories of medical scanning that have been conveyed to me by others, and various writings covering both medical scanning and philosophy. It is a fairly easy situation to describe in some ways, too easy to reduce down, and in other ways it is rife with complexity, escaping description. The medical imaging situation is a narrative and one that both begins and ends with the patient, but has its echoes in the form of patient scans filed away in storage, left online, or written to a disc lost inside a box in the attic.

2.2.1.1 The Patient

The patient is, in simplest terms, a person that is in search of medical services, advice on how to ameliorate whatever ails them. They are a body that has, under certain circumstances, entered into the medical imaging situation. As a body it is pertinent to establish the position from which that body is being viewed, a point of view. Theories

abound about the body, its physicality, position in society, and its mediation. Many of these arguments take polarized positions that argue against yet another polarization and readily dispel differing points of view. It is the academic play of ideas where viewpoints challenge and equalize one another by forming counter-positions or theoretical discourse in an endless flux. Because of this I cannot say that I have embraced any single conceptualization of the body, as all have merit based on a respective point of view.

Consider the idea that suggests the body is not moving towards transparency, the thoughts of journalist and author Jose Van Djick. There is the posthuman conceptualization of the body, one that views the body as both transparent and infinitely modifiable, that eventually becomes one with information: the body of author, scientist, and futurist Ray Kurzweil. Something of a middle point is the idea of the body as topology, a squishy mesh that has no ending or beginning to itself: the body of new media philosopher Brian Massumi. Further there is the idea that the body is inside a complex of institutions that seek to control, regularize, and normalize it, such as those of philosopher Michele Foucault. The viewpoints go on, a laundry list of formalizations. The interesting development is that all have certain validity, a certain bearing on what it means to have and be a body. These ideas are the wonderful, intrinsic part of being a human in a world of multiplicity.

Is it impossible to say that the body is not just any single one of these things; that the body, specifically the body of the patient, is a multiplicity that flows between points of view and escapes a definitive conceptualization? Treated as such the viewpoint takes on the nature of a multifaceted lens, a multitude of images each slightly different from one another due to variations in angle in each facet but able to be perceived as a whole. On each side of the lens is a subject of interest and an interested observer. From this point of view I will be creating a rather messy picture out of the patient body, full of contradictions, by briefly touching on several ideas that have helped form an idea of the patient and their body, one that is a part of the medical imaging situation.

Once facet of the patient body views it as residing a situation of power and control: the body of Michele Foucault. According to Foucault, “A body is docile that may be subjected, used, transformed, and improved.”³⁴ This patient body is embedded in the apparatus of the clinic, a structure of power. The clinic is also embedded in a larger

apparatus: a hierarchy of observation.³⁵ Marita Sturken and Lisa Cartwright state, in reference to Foucault's ideas, "the state actively manages, orders, and catalogues the properties of the body through social hygiene, public health, education, demography, census-taking, and regulating reproductive practices" and that, "modern power is not something that negates and represses so much as it is a force that produces."³⁶ The clinic then seeks to organize and regulate, transform and improve the body so that it may be produced. In other words, the clinic seeks to produce a model body based on predefined models, or norms, of health. This is a body that can only be known within larger entities of power, and as such is a product of those entities. It is then a product of the clinic, and a product of the medical imaging situation, a situation that requires the docility of the patient in order to function properly.

A second facet is the viewpoint of Van Djick, similar to that of Foucault, where the patient's body is within an apparatus of power that seeks to control it through the specific use of medical imaging technologies or the "mechanical-clinical gaze."³⁷ Her general stance though, is one against the ideal of transparency as it is applied the body, or 'transparent body.' Transparency in this case is linked to "notions of rationality and scientific progress; more recently, transparency has come to connote perfectibility, modifiability, and control over human physiology."³⁸ It rests on ideas that believe the body is ripe for mapping and all that is needed to understand it in full is to detail the map as perfectly as possible.

Her best argument deflating the ideal of transparency is to call attention to the subjectivity of the scan's interpretation, - "We can never assume a one-to-one relationship between image and pathology: looking at a scan, medical experts may identify signs of potential aberrations, but their interpretations are not necessarily univocal."³⁹ The scan is indeed a complex route of interpretation; the first interpretation is that of the apparatus's interpretation of the body from numerical data into an image and the second is the interpretation of the doctor. This second interpretation is discussed further later as a part of the doctor's hand in the medical imaging situation.

For now, the ideal of transparency, this myth, is a product of culture only capable of being grasped through an understanding of the apparatuses that make transparency possible. In this way the body itself is not transparent, but only becomes so through the

intervening possibilities of an imaging technology. Rather, the body is not transparent, but its representation can become so.

To illustrate the transparent body, a third facet, one can turn their thoughts to the ideas of posthumanism. This is the body of Ray Kurzweil, one that is infinitely modifiable and has the possibility to be discarded, eventually disappearing altogether into information; it is a part of what he calls the singularity.⁴⁰ Kurzweil's body is one that *wants* 'improvement' through the interventions of technology by choice, unlike the patient body that *needs* diagnosis, however voluntary. In this case though, Kurzweil's body is not so much a patient as a product of the ideas and ideals of scientific and medical progress.

The MRI plays its part, cited by Kurzweil as being a part of mapping the human brain in order to reverse engineer it and improve upon it. According to Kurzweil, "non-invasively scanning a living brain will ultimately become feasible as MRI and other scanning technologies continue to improve in resolution and speed."⁴¹ This statement places a lot of stock in continued growth and continued progress in science, and serves as the cornerstone of his ideas.

Building new bodies, building new brains, are ideas expressed by Kurzweil that rely on a progression of science and medicine to reveal more and more of the human body, effectively erasing it in the end.⁴² This is the transparent body that Van Djick discusses, one that fades from us, it's depths converted to images and three dimensional renderings, a map, a model, and a myth. It is a complex production of our culture that is both very real and in some ways very objectionable. It places the patient body as transparent.

A last facet is the body as a topological structure as expressed by Massumi. He states, - "A body lives in three dimensions only at the envelope of the skin. The "Euclidean" space of the body is a *membrane*."⁴³ Massumi's idea challenges the status of the body as a solid and he suggests that it is in fact porous, a sponge. He places the body almost as a shadowy presence in the world, both material and transparent, - "Biologically, it's all an act, a complex nutritive, excretive act: circus of the body. We do not live in Euclidean space. We live between dimensions."⁴⁴ It is reasonable to think that what Massumi is working toward is an open body, one that is free to move towards and away from transparency, into and away from information.

From this range of theoretical conceptualizations, a body can be formulated that places it as both transparent and receding into information, sitting as it does in a space of control that seeks to exert power over it in order to transform, modify, or improve upon it. The patient is transparent only through the intervention of the apparatus, leaving them as simultaneously transparent and solid. Yet, the body is only acting as a solid, playing at living in Euclidean space while existing as a something much more shadowy. In short, the patient lying on the bed of the MRI is a body that exists between its physical form and the representation on the screen. It reaches out in all directions at once only to find the skin holding it in place. It is both transparent and something that acts as a solid but is in itself permeable. The patient is a shadowy solid in constant flux that shifts between each successive point of view. Indeed, the body can be thought of as existing between dimensions.

2.2.1.2 The Technician

The role of the technician has already been somewhat outlined by my unraveling of the MRI as an apparatus. In reductive terms, the technician places and arranges the patient on the MRI bed for the scan with the later intent of diagnosis or interpretation. The technician enacts control over the patient's movements and actions. Although, power is not solely in the hands of the technician, more is going on. Flusser describes the power relationship between the apparatus and photographer, in this case technician, as a “hierarchical power game” and goes on to state, “Photographers have power over those who look at their photographs, they program their actions; and the camera has power over the photographers, it programs their acts.”⁴⁵ A technician then has power over the doctor, if not in the sense of a social hierarchy, through the images they forward. As well, the apparatus requires power over the technician; the apparatus draws them into a game of searching for and realizing the potentialities that exist within its depths.

It is interesting to discover what happens when the tables are turned, when a technician that works daily with the medical imaging apparatus finds themselves on the bed and under the gaze of the large cameras, the power structure now shifted. I had such an event recounted to me by Casey Mullens, a health physicist working in radiation safety at the University of Oklahoma Radiation Safety Office. Her primary specialization had

been with standard gamma scintillation cameras, mobile scintillation cameras, and PET/CT cameras, not MRI. When she needed a MRI scan of her shoulder she began to sympathize with their patients:

The experience really put my patient's feelings into perspective. There I was, lying in this huge machine that made all kinds of weird banging noises, and I had no idea what was going on. It's odd to go from being in command of the technology to being at the mercy of the technology. It makes you feel pretty helpless.⁴⁶

Her experience illustrates how fragile the position of power is within the medical imaging situation. It is not a situation where power is held specifically by any one entity, but rather power is in a state of flux that envelops and recedes from bodies depending on their placement within the situation.

The technician is simply a handler; one that works with and against the apparatus to create scans. Here again the apparatus is something of an animal, it lies in wait for the act of scanning and further waits for its handler to provide the specific directions needed to perform the act of scanning. According to Flusser, the technician does not work; “They create, process and store symbols.”⁴⁷ Combinations of symbols, the scan, constitutes information. Technicians oversee, handle, and direct a flow of information from the body, into the apparatus, and to the light of the screen. The scan the technician takes so much care to produce is “not an end but a means.”⁴⁸ Flusser’s statement best describes what exactly a technician does; they create the means by which the patient body is to be understood. To a different degree they are responsible for the movements of the simulacra, handling the apparatus and forwarding the simulacra to the waiting gaze of the doctor.

2.2.1.3 The Doctor

The Doctor, unlike the other players in the medical imaging situation, has a fairly simple to describe task at hand; they translate. The scan of the patient is forwarded to their waiting gaze, either by digital or physical means, and viewed. In ‘seeing’ the doctor is able to distinguish abnormalities, shadows, all without looking directly at the patient’s body. As Jose Van Djick has noted, “the mechanical-clinical gaze – the gaze directed

and mediated by imaging technologies – detaches a body from a person.”⁴⁹ The doctor is viewing a stand-in, a double, but one that has been made transparent.

Under the doctor’s eyes the simulacrum is most present. It precedes the patient to the doctor in the medical imaging situation, and will be what the body of the patient is measured against. The doctor, under the spell of the simulacrum, will peer into its shadowy depths and find *something*. It is what they are trained to do, to recognize the patterns, signs, and symbols of dis-ease and illness. The doctor will translate, interpret the body of the patient back to the patient. The patient is effectively doubled as both source of information and receiver of information. It is information flowing full circle. We are only known through the apparatuses that create us. Just as the world and the camera are, for Flusser, only preconditions for the image; the body and the medical imaging apparatus are only the preconditions for our simulacrum.⁵⁰ When brought to light the simulacrum supercedes us, making its way much faster through the world than a physical body ever could.

2.2.2 The Medical Oracular Entwinement: A Strange Translation

I have found in my scrutiny of the medical imaging situation a certain amount of similarity between it and the idea of the oracle. An oracle is a source of prophecy and advice. According to historian Hugh Lloyd-Jones, the oracles were most notably centers of worship for the pagan gods of the Greeks and Romans from before 5th century B.C. and up until the establishment of Christianity.⁵¹ The oracle, in this instance the Oracle of Apollo at Delphi, was comprised of four main bodies: the pilgrim, the Pythia, the god Apollo, and the Apollonian priests. The pilgrim is anyone, whole community or individual, that traveled to consult with the oracle for advice on problems both practical and prophetic, from domestic issues to colonization and the future outcomes of war.⁵² The Pythia of the Delphic Oracle, in Lloyd-Jones writing on the subject, was the medium through which Apollo spoke; she was “chosen from the local community” and had to be “over fifty years of age.”⁵³ The god Apollo was the source of the prophecy, the voice that spoke through the medium of the Pythia. The Apollonian priests concerned themselves with the running of the oracle and the temple to Apollo; they also acted as a mediator between the Pythia and the pilgrim.

In relation to the medical imaging situation the following parallels can be drawn. The pilgrim is similar to the patient, seeking advice from a center that is knowledgeable and that has the potential to contain answers. The Pythia is closely related to the medical imaging apparatus, a medium or translator from one source and on to another that makes sense of it, translates it: the priest. The Apollonian priest is in the position of the doctor, taking what the Pythia proclaimed and translating it yet again for the patient, or pilgrim. The god Apollo presents a strange problem. The patient in the medical imaging situation is doubled so that the doctor is effectively translating the body of the patient, the scan, back to the patient. This is missing in the oracle, but makes the medical imaging situation all the more interesting.

The medical imaging apparatus has as its subject the human body; it channels it into information and on to visual representation that eventually is translated back to that body. Likewise the Pythia have as their subject the god Apollo; channeling messages from other-worldly sources in the form of words spoken or shouted while in an auto suggestive trance that are then translated to the pilgrim.⁵⁴ The source of information and the entity that it is being translated back to in the medical imaging situation is one and the same. The body then, at least in relation to the oracle, is both source and receiver, both god and pilgrim. It follows that the patient body is then a god that has no understanding of itself other than through a means of mediation. This is essentially what I meant by the patient body being a multiplicity and existing as both transparent and solid, as a shadowy figure that lies somewhere between definition. It is no longer a question of what the body is or is not, but a question of whether or not it is real. Reality is at stake.

2.3 Medical Imaging and the Creation of Simulacra

I have used the word simulacra several times prior to this section and I believe that now is the time to explain its bearing in this text. It is, in my opinion, an important notion concerning medical imaging - that what is produced from its situation is a simulacrum. But, what does it mean? Is it a model, a map, a representation of something? Could it exist in an ill-defined state of flux that moves between reality and the virtual, both physical and vaporous?

My understanding of the concept follows from the ideas expressed by philosopher Jean Baudrillard. My best estimation of the simulacrum is a copy without an original. However, a copy without an original presents a bit of a problem at this juncture. The patient's body holds ground as an original and the scan as a copy, but by what criteria is an original assessed? Is there such a thing as an original when our bodies are concerned? My present use of simulacrum may present itself as a qualification of Baudrillard's idea. The simulacrum, the copy without an original, is born through the human capacity to simulate, technologically or otherwise. The precedence of our simulacrum, as will be shown, erases our need to emit information. Rather, our information is invested within the simulacrum, the scan.

2.3.1 Simulacra: Baudrillard and the Medical Imaging Situation

A foremost concept comes to mind when I think of the medical imaging situation: models. It is the model that is organized to produce an individual from the clinic. It is also a model that is produced from the body of a scanned patient, a model that precedes it to the waiting and interpreting gaze of the doctor. Models are much of what the world is based from. Buildings, organizations, consumer products, even the natural world, follow from models composed to illustrate and make sense of them. Models are something that I have specifically used to grasp and grapple with Baudrillard's notion of the simulacra.

The simulacrum is a twisted concept that obliterates truth, opposes a formulation of the real, and, in my estimation, presents us with the anxiety of the virtual. It marks an overturn in our conception of reality that poses an absence of referents.⁵⁵ It seems to me that Baudrillard's ideas rest on the thought that we can only come to understand what is real, if a real exists, through our simulation and virtualization of that real and in doing so we become the simulation. "YOU are the model" and "YOU are information" are two statements from Baudrillard that capture our simulation well.⁵⁶ It is a similar situation to the oracular system I outlined earlier, where a god cannot understand itself except through its own mediation and translation into something else. Only through a translation of this something else back to the god can it finally find understanding. But, this

does not necessarily mean it has become real if we follow from Baudrillard. We are already simulated, and a simulation of a simulation only complicates matters.

The MRI fits into this concept rather strangely. I have said that the medical imaging apparatus is responsible for the production of a simulacrum of the patient. I believe that, in part, I am correct. With the MRI the referent, the body, is supplanted by the scan primarily due to time and space. The doctor views the scan, not the patient, for potential signs of aberrations. However, the body of the patient does not in itself disappear, but rather its value as a primary source of information disappears. Baudrillard states that simulation, - “stems from the utopia of the principle of equivalence, *from the radical negation of the sign as value*, from the sign as the reversion and death sentence of every reference.”⁵⁷ The body then no longer holds value as a sign and its status as a reference is negated. So, the simulacrum posed extending from the medical imaging apparatus is possible, but hazy. This is because the scan that has succeeded the body is used as a reference for the body, for procedures and operations. An inversion has occurred where the body is no longer the reference point for the scan. The scan itself takes on the position of original, as the referent. In Baudrillard’s words, - “Today, it is the real that has become the alibi of the model, in a world controlled by the principle of simulation.”⁵⁸ It is in this remark that I see Flusser and Baudrillard converging in their ideas. Flusser’s work on the apparatus has a similar bend where “It is not the world out there that is real, nor the concept within the camera’s program – only the photograph is real.”⁵⁹ Although, Flusser’s discourse is still weighted in the representational value of symbols and their capacity to emit signs.⁶⁰ I draw a philosophical distinction between the MRI and the traditional camera Flusser discusses. The camera is aimed towards representation and the arrangement of symbols that comprise the real, the photograph, while the MRI supplants any notion of the real with a simulation. The distinction is subtle and shows Flusser and Baudrillard to be both mutually supportive and discrete.

To illustrate the concept of the simulacrum, no pun intended, I will be turning to a discussion of a short story in Ray Bradbury’s book *The Illustrated Man*. He poses a scenario that meshes well with the simulacrum and also has weight in my formulation of the MRI as something of an animal.

2.3.2 Bradbury's Nursery: The Eating and Replacing of Humans

In 1951, just about the time when Edward Purcell and Felix Bloch won the Nobel Prize in Physics for their experiments with NMR, Ray Bradbury compiled a book of short stories titled *The Illustrated Man*. While I was reading the book, for pleasure, I had no inkling that it might contain a connection to my research. It was a fortuitous accident. The book is far from a medical, theoretical, or philosophical text about anatomy or imaging technologies, but has bearing on these subjects. It is science fiction, as opposed to science truth, should such a thing exist without doubt.

The story that arrested my attention was *The Veldt*, a narrative that details and describes the nuclear family of the future as they try to come to grips with a new kind of technology, essentially a holographic simulator that includes stimulation for all the senses. To better place this story, it is important to understand what changes were taking place in the US at the time it was written. The television, a force taken for granted today, was making its way into the living rooms of a large part of the U.S.'s population. According to Napierkowski, "Some people were afraid that watching too much television would lead to the total breakdown of the family unit."⁶¹ Bradbury, concerned with the intrusion of a new representational medium into the home, wrote *The Veldt*, a story detailing a worst case scenario where the demon of technology is to blame for the death of a family. The family from the story is not the far-flung family of the future, but the nuclear family of the 1950's. It is a story invested in the morals and values of the time it was written and, legitimately, poses the question: are representational mediums and their devices good for us?

Bradbury's answer, of course, is NO. In the story two young children and their parents live in a Happy Life Home, a prefabricated wonder of automation suited to take care of the family's every need. This is, in part, the problem and shows Bradbury to be in opposition to machines, to apparatuses. The family is pampered, the parents begin to feel useless in the home, and the children look to the house as "mother now and nurse-maid."⁶² Coupled with the general anxiety of the parents over their position in the home and their children's lives, a dark simulation keeps appearing in the nursery, the holographic display room, of the house. The nursery "caught the telepathic emanations of the children's minds and created life to fill their every desire."⁶³ The problematic simulation

is that of the African Veldt. Specifically the simulation features a particular scene of the African Veldt, lions eating the other creatures of the plain. The lions are so real and so horrifying to the parents, causing them to run from the nursery at one point, that they realize something is amiss. There is a quirk in their nursery or perhaps in their children. The parents called a psychologist to check on the nursery system. Two physical objects surface while the father and the psychologist are inside the nursery: a scarf from the mother and an old wallet from the father. Both show signs of wear and are blood stained.

The parents, beginning to realize that their family unit is dissolving, seek to correct their mistake by shutting down the house. The children become hysterical when they discover that the nursery has been shut off, - “The house was full of dead bodies, it seemed. It felt like a mechanical cemetery. So silent.”⁶⁴ This, perhaps foreshadowing what was to come, sets the tone for the rest of the story. The children, like children do when they can’t have something they want, throw fits, and incessantly beg for the nursery to be opened, keeping it up to the point where an adult finds it easier to capitulate than to try to reason. Here things become interesting. The children happily head off to the nursery when a scream is heard. The parents, readying for a vacation away from the house, run downstairs and into the nursery. They are trapped inside. The children, in an attempt to keep their precious nursery, lock the parents inside and wait as the lions devour them. A bit later a friend of their family, stopping by to take them to the airport, inquires about the parents whereabouts. The children reply, “Oh, they’ll be here directly.”⁶⁵ The story ends with the children sitting in the nursery, the family friend with them. He surveys the simulated veldt, spotting the recent carnage wrought on the parents by the lions in the distance, unable of knowing what truly happened.

Bradbury only suggests the promise of the parent’s reemergence. But, the ability of the nursery to actualize objects, as complex as lions, is proven in the story. Two items are found inside the nursery at different points in the narrative. The first is a wallet, belonging to the father, and the second is a scarf belonging to the mother. These two items are used to foreshadow the death of the parents, but can have a very different interpretation especially because Bradbury has left the story so open. The most common interpretation of the wallet and scarf, according to Naipierkowski, is that the children are simulating the deaths of their parents over and over again, and that the wallet and scarf

are left behind from the simulation, actualized.⁶⁶ These objects are free to move beyond the nursery as both items leave the space of the nursery when they are found.

An alternative interpretation leads to a very different outcome. The wallet is discussed as an “old” wallet of the fathers. These objects often find their way into the hands of children as hand-me-downs. The same view can be held for the scarf, children get into their parents things in order to play with them. Rather than view the wallet and scarf as actualized remnants of the parents simulated deaths, they could represent the deaths of the children and thereby put forward an even more frightening possibility. The children are simulations, but somehow actualized by the nursery apparatus, and they, as an extension of the nursery, want the parents gone. In this interpretation the nursery, the apparatus, takes center stage as the culprit, rather than the children.

The implications of this alternative interpretation are enormous. Not only is the apparatus responsible for the destruction of the family, it is also responsible for their simulation. The apparatus has replaced the family with a facsimile, a simulacrum. The production of this simulacrum is all the more important because it has erased all reference to an original. A model of the family is born through their destruction. The simulacrum here is a product of the violent intrusion of a pervasive medium. But, as Baudrillard suggests, “There is no longer a medium in the literal sense: it is now intangible, diffused, and diffracted in the real, and one can no longer even say that the medium is altered by it.”⁶⁷ The family then develops into a state of simulation with a lost referent located within a medium that never had any tangibility; they are a superimposition, a perfect model.

Representing the simulating apparatus in the story is the lion. It is the visual representation of the apparatus, or perhaps the simulated desires of the children, that kills and eats the family. In this the apparatus is very much like the animal I briefly mentioned in section 2.2. The apparatus, as I have already noted from Flusser, “lies in wait or in readiness” and, as an animal, “sharpens its teeth.”⁶⁸ The hunt, or search, this time is not only for a possibility to actualize, but also for the replacement of a cluster of possibilities. The animal apparatus here is seeking to wholly remove from the program of the real every possibility related to the family; virtualized. As Baudrillard suggests, “The virtual now is what takes place of the real; it is the final solution of the real in so far as it both

accomplishes the world in its definitive reality and marks its dissolution.⁶⁹ This is a very different scenario from that of the medical imaging situation, where a simulacrum exists in defiance to a referent, one that still holds to the real. The animal in the medical imaging apparatus has been tamed.

The MRI as animal is an idea I had prior to my reading of *The Veldt*. It was a general thought to anthropomorphize the MRI and similar medical imaging apparatuses. The MRI would then become a lumbering beast, magnetic claws capable of slicing the flesh from its prey, but strangely, leaving it unharmed. It was a comical idea of the MRI roaming the plains and drawing in animals only to scan them as a form of sustenance. Their waste? - It would simply be transparent simulacra of whatever it had scanned. It was not the violent act of replacement captured in the Bradbury story. However, my reading of the story, as well as Flusser's work, brought the idea to the front as a possibility of where I could take the MRI.

2.4 Peep Media and the Virtual

Peep media have come in many guises throughout history from the peep box of the traveling showman in the eighteenth century to the larger cosmorama arcades of the nineteenth century and the famed twentieth century Viewmaster. Some peep boxes came in varieties allowing for multiple viewing like the *Opticus Fortalitius* or Optical Fortress.⁷⁰ Errki Huhtamo, Associate professor of Media History and Theory at the University of California Los Angeles, Department of Design and Media Arts, defines peep media as a particular kind of viewing situation:

I use the concept of ‘peep media’ to refer to all media devices that interfere with their user via peeping – peering into a hole, a lens, a hood. This is understood as an individual activity – only the peeping person sees the sight (of course, there may be several peepholes available). This situation differs from gazing at a screen, which is available for several people’s gazes simultaneously.⁷¹

Peeping, then, is tied to a mediating apparatus that acts as a window to what is beyond, or inside, and is also marked as a singular viewing activity despite multiple peepholes. It is an intimate relationship between the peeper and what is being peeped at and, in present-day culture, carries a somewhat negative connotation. This negative

aspect of peeping, linked to voyeurism and surveillance, is inextricably tied to cultural power structures favoring the peeper. This is clearly demonstrated, and vividly distorted, by *A Room of One's Own*; the interactive peep box by Lynn Hershman Leeson.⁷²

In *A Room of One's Own* the viewer is invited to peep into the miniature of a woman's bedroom. The piece, as video documentation states, "was modeled after Edison's peep shows," and it is this peep aspect that interests me the most.⁷³ The peep device here is variable, you can pivot it left and right, giving you a wider view of the interior as you do so and thus emphasizing the controlling aspects of the gaze; surveillance. You are peeping into a private space, intruding. The looped video of a woman is there, inviting you to look because it is the only source of movement in the peep space. But, looking in this instance has consequences. However, every time you pivot the peep device toward the woman on the screen a voice repeatedly demands, "stop looking at me." If you avert your gaze the image is lost from sight and the normal loop begins again. If you gaze at her long enough you are confronted with retaliation, a handgun is pulled from a false book, aimed, and fired in the direction of the unseen viewer. You hear the sound of breaking glass and know that the bullet has penetrated the peep box, breaking its mediating hold, and entered the world beyond it. Leeson has successfully upended the peep box, negating its control. The viewer of peep media holds power over what is being peeped at primarily due to their position outside of the peep box. However, the situation is reversed in Hershman's work.

Peeping in medical imaging follows from a history of mediating devices; of which the microscope could be considered the most prominent. It narrows the view to a removal of the periphery, magnifies its subject, and creates a specialized instance of observation. Lisa Cartwright, assistant professor of English and visual and cultural studies at the University of Rochester, has stated of the microscope observation, - "Excised from the body, stained, blown up, resolved, pierced by a penetrating light, and perceived by a single squinting eye, the microscopic specimen is apparently stripped of its corporeality."⁷⁴ The microscope is an apparatus much like, and very different from, the MRI. The corporeality of the subject in both instances is at stake. Something is lost from us when we are perceived through the apparatus's mediating vision.

Does this then mean that peep media, in the form of a peep display, can also create doubts as to the materiality of what is inside of it? I would like to pose that it can. Peep media are sometimes seen as a genesis, historical antecedent, or folded reverberation to the current modes of digital interaction and especially virtual reality. Arguing for a genesis to VR, however, is not within topic of this writing. It is present in all forms of peep media in a somewhat analog fashion as observed by Errki Huhtamo - “In addition to focusing the observer’s attention exclusively on the image, the box excludes the surroundings providing an experience of visual immersion, anticipating virtual reality.”⁷⁵ While this rings with placing peep media as a genesis for VR it also opens it up as an immersive media type that creates a tension between what is inside and what is outside. This tension, I would like to suggest, is indicative of the virtual, however physical, and possibly only a movement towards the virtual.

Several times Huhtamo discusses peep media as a virtual device - “Both peepshows and stereoscopes were media for ‘virtual voyaging’.”⁷⁶ ‘Virtual voyaging’ and armchair traveling were popular modes of distraction into the 1900’s that still exist today but have been incorporated into the television, motion picture, video game and internet mediums. All one needs to consider in order to find evidence of current armchair virtual voyaging is the Travel Channel. The popular cable channel exists as a gateway to the luxury of adventure, however unaffordable it may be to the viewer.

Oliver Grau takes on a similar position in his effort to relativize virtual reality from a historical standpoint - “Peep shows stand at the beginning of a line of development that complements the immersive spaces that envelop the full body, where the illusionistic effect results from bringing images up very close to the eyes of the observer.”⁷⁷ Although, for him the 360-degree image, the immersion of the viewer in a space of illusion, is of special importance and as such the panorama is a historical apotheosis. “The panorama installs the observer *in* the picture.”⁷⁸ This brings to the front an issue of scale that must be addressed. It has been stated that both the panorama and peep media aim at immersion, but the scales involved are so different that something more is needed to make this clear.

2.5 The Curious: An Inversion of Kant's Sublime

My understanding of Kant's philosophy comes through critical writing on the subject by philosopher Gilles Deleuze. I have not read Kant's philosophical texts and because of this my argument here may be less than reliable. However, I feel that what I have set out to do with his ideas is rather simple and Deleuze's assessment of Kant suffices nicely.

A person can make the generalized statements, "this is beautiful" or "this is sublime." These statements, according to Deleuze's writing on Kant, rest within us as judgments and he has mapped out just how we arrive at this kind of judgment.⁷⁹ I have found in Deleuze's critique of Kant an issue of scale that is tied to his conceptualization of the sublime. The Sublime is the enormous scale of nature and, possibly for the romantic Kant, the expansive natural vista. This is an instance where the human scale is dwarfed and subsequently imagination finds itself in suspension. Gilles Deleuze proposes:

The feeling of the sublime is experienced when faced with the formless or the deformed (immensity or power). It is as if the imagination were confronted with its own limit, forced to strain to its utmost, experiencing a violence which stretches it to the extremity of its power. Imagination undoubtedly has no limit as long as it is a matter of apprehending (the successive apprehension of parts). But, in so far as it has to reproduce the previous parts as it arrives at the succeeding ones, it does have a limit to its simultaneous *comprehension*.⁸⁰

The Sublime is a failure or breakdown in the imagination that Kant likens to pain, but one that rises to pleasure. Pleasure is come upon when the faculty of reason interjects and reminds the organism of the concept of infinity, which the human mind cannot grasp, but has a conceptual understanding of. This interjection is the "discordant-accord" of reason and imagination in the sublime, and is a sense that is an engendered part in each of us.⁸¹

Now, if we take scale to be the backbone of what is sublime, as Kant seems to, could an inverse also exist? I would like to pose that an inverse does exist, but only through the understanding of scale. Immensity gives rise to the application of the Sublime and therefore infinity. However, if we take the opposite of immensity and infinity we have the minuscule and the infinitesimal. If we place beauty, and it would seem that

the sublime is akin to beauty, along one pole of a threshold another pole is needed, an opposite pole.

This opposite pole could, for my purposes, be called the Curious. This places the Curious in an inverse relationship with the Sublime, but one that is understood through scale. The Sublime is, from the diagram, infinite nature while the Curious is infinitesimal nature. A relative scale exists between the two and as such the human scale is the comparative position from which judgments like “this is sublime” can be made. It is only in comparison from the human scale that judgments of this kind can be made. Here too is a reversal of Kant’s epistemology. Judgments here are proceeding from experience rather than being applied to it.⁸²

The threshold I am articulating is not of polar opposites except in the issue of scale or the understanding of scale. There is no line that an object crosses when it can suddenly be considered a negative of something on the other side of the line. This may be due to the relativity of scale. Our only accurate measurement of scale is the human scale or, ourselves. When Kant was viewing an immense natural vista he was, this is stretching but not entirely impossible, comparing the vista’s expanse to that of his own body and saying to himself, *what is before me is so much larger than myself that I cannot comprehend it*. What happens is a breakdown in the imagination where the faculty of reason interjects. Thus, we have the sublime. Confronted with the opposite situation, the curious, one could be thought to say, *what is before me is so much smaller in scale from myself that I cannot help but comprehend it*. In this instance we have the curious, not so much a breakdown of reason as a supersession of the role of the imagination.

This superceding of imagination is the result of the scale of objects, of models. According to Deleuze’s writing on Kant, “the imagination *schematizes*.⁸³ The imagination deals with the arrangement of concepts and ideas, plays with them. A small scale model, itself a schema in Kantian thought, can be viewed as an essential form, one that precedes something else; think of an architectural model that precedes a building. The schema, according to Deleuze, “does not consist in an image but in *spatio-temporal relations which embody or realize relations which are in fact conceptual*.⁸⁴ The small scale, the infinitesimal, is the realm of imagination because it is capable of schematizing, conceptualizing scales much smaller than the human scale. Imagination s reason in the small-

scale encounter. The faculty of reason is not disinterested, what is in the model space has to be schematized before reason can play its part. The difference, according to Deleuze, is a difference in question; the difference between “How are phenomena subject to the understanding?” and “How is the understanding *applied* to the phenomena which are its subject?”⁸⁵ This may be more clearly stated as “The imagination embodies the mediation, brings about the synthesis which relates phenomena to the understanding as the only faculty which legislates in the interest of knowledge.”⁸⁶ When confronted with a model space one has to first understand that space, recognize it, and from there the imagination schematizes, builds a conceptual model of the space; it simulates. Through simulation the Curious comes into being as an inversion of the Sublime.

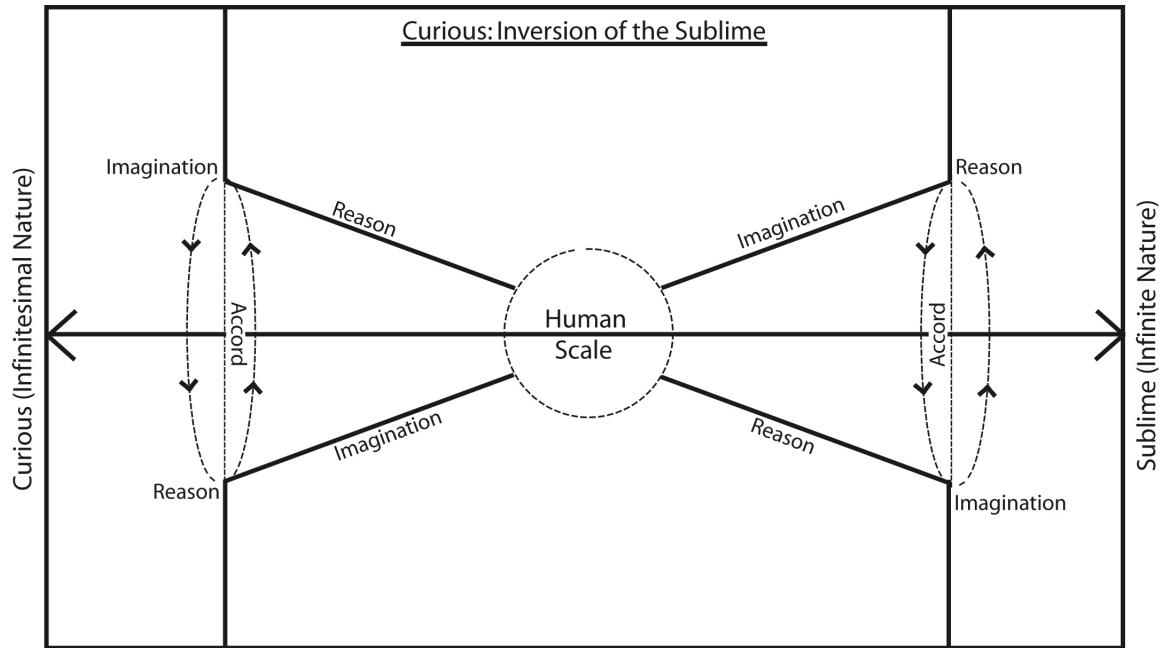


Fig. 1 – The Curious: Inversion of the Sublime

The differences between the Sublime and Curious can be thought of in this way: the sublime is a failure of apprehension, of focus, a feeling that there is too much while the curious is a hyper apprehension, a narrowed focus, the feeling of study and of puzzles.

The peep box is ripe for the curious, an integral form that embodies it. The kind of immersion that the peep box entails is not the immersion of the panorama, which can be seen as a facsimile of the sublime, but of hyperfocused immersion. What I mean by this is

the immersion that one finds when doing detail work that requires the senses to focus in on a small area. Although, this is curiosity at its most narrowed from. The peep display rests somewhat closer to the other end of the pole.

3. Progression of Work: Past Works Leading to the Present

The progression of my current work can be traced to events from my past that have affected my outlook on the space of the hospital. Those events are detailed in section 1.2. In addition there are several artworks that I have completed along the way to this one that have each, in some way, contributed to the overall shaping of Transpose MR, be they successes or failures, finished works or experiments.

3.1 Sanitarium

Sanitarium is a work that took place in 2005 during my undergraduate work at the University of Oklahoma. It is a navigable work on DVD. When I say that it is navigable I mean that through use of the mouse a viewer can move between three different medical scenes. In this work, my first that specifically addressed the space of the hospital, I built physical models of medical spaces, lit them, and then photographed them digitally. These photos were then brought into a video program where I incorporated other digital images and video to more fully detail the spaces. They were then used as the primary space from which video content could be accessed.

My conceptualization of this piece came mostly from memories of trips to the hospital to see my mom when I was eight. Perhaps due to my exposure to them while I was young, the spaces of the hospital held fascination, rather than revulsion, for me. The piece was, largely, about making sense of the medical space, its twists and turns, large machines, and potential for waiting. Waiting is always a part of the hospital, regardless if you are there just to visit and offer support or are in a bed yourself.

Making sense of the hospital space meant building that space, a practice I continue to this day. Building a space somehow allows you to have command over it, you get to actualize the space in an order that you see fit rather than being subjected to that space. At this point in my development as an artist I had not yet considered philosophy as a possible venue or the genesis of my ideas, and as such the piece is fairly reactionary, brought to fruition more by emotion and instinct than anything else. It does, however, represent the introduction of several aspects of my work that can be seen in Transpose MR: a preoccupation with the hospital space, model building, and video compositing.

3.2 White Rooms



Fig. 2 – White Rooms

White Rooms can be seen as a second step in the formulation of *Transpose MR* and a refinement of *Sanitarium*. With this piece I sought to create a space much the same as I had with *Sanitarium*. I wanted, again, to build the spaces of the hospital but with a preoccupation towards the technology of those spaces, the MRI, CT, and Da Vinci robotic surgical suite. I saw in these technologies a flagrant removal of the doctor or technician hand from the patient, effectively alienating them. My concentration on these technologies was intended to bring to the surface the alienation that I saw was the result of technological mediation and intervention. I was beginning to think more about the space in philosophical terms of control, I had been exposed to Foucault, and with the ideas of digitality as outlined by digital media theorist Anna Munster.⁸⁷ Because of this I was beginning to think in terms of transparency and a dissolution of the patient, and a reinsertion of the proprioceptive subject back into the encounter with mediating digital technologies. Many of the basic concepts that have informed *Transpose MR* were in kernel form in this piece.

I constructed a large cabinet that stood as the base for an open maquette that contained physical models of an MRI, CT, and Da Vinci robotic surgical suite as well as control rooms for the prior two. These models were built using a combination of kit-bashing (building a model using existing pieces but not following the directions) and

scratch-building (building a model from raw stock). The piece was open at the sides and at about eye level for the average U.S. height, affording the observer a 360 degree view around it. The space was lit from above with white LED's and CCFT's, something I have carried over into *Transpose MR*. Also, the maquette had two small LCD screens displaying appropriated video of surgeries and surgeons, dividing the surgeons from the operation to illustrate the separation of the hand from the patient.

While I feel the piece was a success, it raised an abundance of questions as to my intentions toward building hospital spaces. What were my feelings towards the hospital space? Why build models? The maquette, in its reception, was seen by some as too illustrative and simply a rendering of the space. It was a presentation of the space as it exists, familiar. Then again, this is my own reading of other's reactions. However, I did feel that there was something more I could pull from the hospital in future work.

3.3 Untitled: A False Start

In *Untitled* it was my intent to build a large multi viewpoint peep box based on the optical fortress. The introduction of peeping to my work came out of further readings on medical imaging, specifically on the subject of the microscope, where, as has been noted by Lisa Cartwright, "The thrill of the spectacle of life was replaced by the intellectual stimulation of close inspection."⁸⁸ It was my intent to relate the space back to the apparatuses that imaged the body, creating a space that was itself under scrutiny that gave rise to the curious. I wanted to upend the space and make it the object to be observed, an idea that has been further developed in *Transpose MR*. It would become a primary concept in the building of my current work.

Once again I was determined to build the space of the hospital in model form, only in this case I wanted to model almost a full hospital. In the least I wanted to build a representative sampling: two larger waiting and reception areas, a large surgical suite, two medical imaging suites, a nurse station, several patient rooms, and a hallway system that connected it all. To construct the complicated peep box I modeled, in full and to scale, the entire interior and exterior in Autodesk Maya, a 3-D animation program. I then took the measurements from the 3-D model and built a layout in Adobe Illustrator capable of being converted to a file format that would allow me to laser cut the panels to

the exact specifications I needed. These panels, comprising the walls and ceiling of the model, were designed to fit within a wooden frame, essentially a large box, made of 1x2 poplar. The floor of the design was a combination of clear acrylic sheet and a rear projection material. It was my hope that this would allow me to project video or animation onto the floor of the space. It would provide a surface where I would be able to simulate the movements of the hospital, the walks down long corridors, the waiting, and the orchestrated movements of those that worked there, much as blood flows in the circulatory system.

The piece was a strong false start. Many of the procedures used in this project have been made better use of in *Transpose MR*. Problems began when I realized the piece was far too large. It would have required a huge amount of detail in building the model aspects of the space: miniature chairs, operating tables, fixtures, and other embellishments that were beyond my means, both monetarily and in model making, to create. The piece, after a messy showing of the work in progress, was abandoned. It rests in my mind as a gentle reminder to minimize my plans in such a way as to both fit my ideas and my wallet.

3.4 Transpose MR

Transpose MR is a work that seeks to upend the medical imaging situation. It took place on March 25th at the Center for Biotechnology and Interdisciplinary Studies on the Rensselaer Polytechnic Institutes Troy, NY campus. It seeks to simulate within a simulation, and to show the MRI as the animal that it is. The technicians and doctors that work with the MRI are only its handlers; they feed it and take care of it on a daily basis. It is a beast that survives on the informatic bodies of simulated organisms. We do not control it, it programs us, coerces us into a function of play that only serves to make it stronger. It is not a viscous animal, nor the beast from science fiction that inevitably gets free of the lab only to go on a killing spree. It is something else entirely.

3.4.1 Physical Description and Construction

I will begin with the two peep displays and then move on to the 3D animation. The two peep displays stand at just about 5'6" in order to accommodate a variety of individ-

ual heights. I chose this specifically to set it close to the average height of both males and females in the U.S., between 5' 9.4" and 5' 3.8" respectively.⁸⁹ Both peep displays are identical in their construction methods, although each exhibits individual differences due to construction difficulties, something I will get to later in this section. The interiors of the displays, and the models they contain, mark the strongest differences between the two.

One contains a model of an MRI in the setting of the veldt, an outdoor scene with tall grasses, rocky outcroppings, and a tree. This space is, in turn, encapsulated in a natural history museum display. A wall with a window separates the model from both physical viewers, looking into the peephole, and those that are virtual from the semi-transparent video display.

The second is a clinical scene, a MRI suite. It contains a model MRI, MRI bed, and a longer countertop along the back wall. The space takes on the appearance of a stage; an arch separates the clinical space and the space needed for the semitransparent display. Plastic faux tile flooring further separates the space.



Fig. 3 – Peep Display: Virtual (left) and Physical (right)

Physical construction of the peep displays began in Autodesk Maya, a 3D animation program. Building, in this instance, has gone from virtual to physical. Figure 3 shows the Maya model on the left and the physical model on the right for comparison. I modeled the displays using simple polygon rectangles designed to have the same dimensions as the materials I would use later in their construction, 0.75" x 1.5" select pine stock and 0.25" fiberboard. I worked as hard as possible to get close to a 1:1 ratio between the physical and virtual displays, as it would make things much easier in the construction. However, that is not always the case, as you will see. I then made drawings in Adobe Illustrator from the measurements in Maya for the fiberboard panels that would become the exterior casing and the interior walls, floor, and ceiling. These were cut using a Vytek laser cutting system. The files from illustrator are converted to a format specifically for CAD and then printed, or burned rather, in a fashion similar to an inkjet printer, but with another axis of motion. The panels were then painted white; some in the interior

were painted black, and attached to frames built from the aforementioned pine. Here a few minor problems came about.

Space in Maya is Cartesian space, a mathematical *xyz* coordinate system. Two objects virtually abutting one another within the program meant that there was literally no space between them. The mathematical space of the Maya 3D program and real space, what we seem to inhabit, are not equivalent. As a result the panels fit the frames a bit too well. The application of paint had widened some of the panels slightly, more than enough to make them fit too snugly in some cases. On several occasions I had no other choice but to force the panels into position using a framing hammer and a block of wood, risking damage to both the frame and the panel.

I also found quickly that the “select” pine I had bought was fairly well warped and only looked straight due to the plastic wrap holding the slats together in bundles. Due to this the frame had several inconsistencies that made fitting the panels difficult.

The interiors of each box are lit with CCFT’s. One was 12” long and packaged as a computer case mod and the other, installed in the imaging suite display, is the backlight from a small, burnt out LCD screen. These were wired for power with 12 volt 1amp DC power supplies.

The semitransparent video displays use an optical trick called Pepper’s Ghost. It is a method from the mid-eighteen hundreds developed by Dr. John Henry Pepper and Henry Dircks that was used in theater to give audiences the impression of a ghost, an immaterial form on the stage.⁹⁰ This optical phenomenon has found fairly common use in art, entertainment, and industrial applications. In many instances it is a simple act of doubling, of reflecting. In others I would like to suggest that it creates a hybrid space, the ‘real’ and simulated in a kind of harmony.

A good example in entertainment that relates well to my own use of Pepper’s Ghost is the Musion Eyeliner system.⁹¹ The optical system is a large Pepper’s Ghost display that makes use of a projector and a foil, a reflective and semitransparent film, to give the appearance that an animated 3D character is in a real space. This Musion Eyeliner system is most notably used by the Gorillaz, a virtual band, while on tour.⁹² The band itself has real people producing the music, but they only show themselves in avatar form, a simulacrum with no referent. Their insertion into our space, from video documentation,

is essentially seamless. It calls to mind virtual reality but in a hybrid sense, physical spaces and virtual spaces overlapping. This has been the intent of my own use of Pepper's Ghost.



Fig. 4 – Pepper's Ghost Displays

The displays were made using 12"x12" beam-splitter mirrors, specifically as semi-transparent mirror rated at fifty percent transmission and fifty percent reflectance. The LCD screens were mounted in the ceiling in the front section of the displays with the mirror placed at approximately forty-five degrees away from the eyepiece. Video reaches the screens from the interior of the displays stand where a DVD player is set to loop. When the LCD screen displays a video the light it emits reflects from the mirror and towards the eyepiece. This light combines with the light from the rear of the display, the model area, and is perceived to overlay or, combine. Fig. 4 shows the effects of the Pepper's Ghost displays as they are situated within the peep boxes. The two images project from the same space but doubt is cast due to their transparency and lack of having binocular disparity. Although, their placement in a peep display largely nullifies this disparity. The eyepiece is designed to control and limit the range of the viewer's eyes, therefore binocular vision is limited.

The video for the two semitransparent displays was shot in the RPI Darrin Communications Center's black box studio. The displays need high contrast video in order to work correctly. White light reflects very well, combining with the model in the case, and the black of the image becomes mostly transparent. To shoot the video I needed controlled lighting and a black background. The DCC studio was perfect.

The first scene to be shot was the museum scene. Two lights with blue gels and diffusion were placed just in front, angled down and slightly away, of a black curtained wall. My actors came in dressed in their normal every day clothes, whatever they might wear to a museum. They were asked to traverse the space between the lights several times, sometimes stopping to take a look at the black curtain and other times just walking on. I wanted to create the look of the museum goer. Some people stop to ponder what they are viewing and others just keep on going.

The second scene was the clinical scene. Figure 4, right, shows the overlay of the clinical scene and the physical model. In this scene the actors were generally portraying the progression of an MRI scan with dramatic lighting. Two roles are played out in the scene, the patient and the technician. The scene is rather simple. One actor prepares the bed and then leads the patient to the MRI bed to be situated for scanning. Scanning is conveyed in audio form only, much as it is in the clinic. The scan lasts some minutes and, once over, the technician leads the patient off screen. It was my intent to show the length of the scan, sometimes up to forty-five minutes. It was almost my way of sharing the first experience I had with an MRI.

I am very satisfied with the results of both videos. They were both scaled well and almost perfectly align to complete the illusion that they are one with the space behind them. The results of the displays were a total surprise. I thought the video would need to be altered to fit the interior of the cases, but this turned out to be wrong. The videos were edited, burned to DVD, and fit the displays perfectly.



Fig. 5 – Speaker Installation

Audio is routed through the piece from the DVD player to a pair of computer speakers, modified to be free of their casings, that have been installed in the space between the inner and outer walls of the peep displays front facing. Figure 5 shows the speakers before and after installation. Between the walls of the case I stuffed polyfill, which I liberated from a pillow, giving the speakers a denser substrate to propagate sound waves through and hopefully accentuating the lower end frequencies of the audio.

The eye-piece, as seen in figure 4, is not a solid cylinder. It is composed of slices, a connection to the MRI, and uses four bolts to hold together. It is not the most elegant solution, but one I am satisfied with nonetheless. The bolts, as I have noticed, have served to keep viewers from placing their face directly against the eyepiece and therefore keep smudges from facial oils from appearing. This was a source of concern as the white paint readily accepts smudges from the hands, darkening the paint and possibly causing a viewer to think twice before peeping.

Now that I have described the construction of the cases I will turn to a description of the model making process.

3.4.1.1 Terrain Modeling, Kit-bashing, and Scratch-building



Fig. 6 – MRI on the Veldt Model

The natural history display model, the terrain model, was built using methods similar to those used in constructing landscapes for model railroads. This involves sculpting the basic shape of the terrain using expanded polystyrene block and sheet. The pieces are

then glued into position to rough out the terrain. Following this, I apply plaster and plaster cloth to the model to build the base on which you begin building grass, trees, small rocks, and deadfall to complete a ‘natural’ look. The short grass is a packaged material already dyed to specific colors that is glued to the base while the long grass was cut from cheap paint brushes. The tree was built from clippings from a real tree using wire and florists tape, ground dried leaves, and lichen. The deadfall was made using found twigs from trees and other woody plants, selected for aesthetics and conformity to the scale of the terrain.

In the construction of the model terrain I did some armchair traveling to Africa, finding video and photo references that gave me an idea as to the shape of the land, its colors and flora. There is no particular reference that I tried to model; I was more interested in creating my own impression of the landscape, a simulacrum in the sense that it has no exact reference.



Fig. 7 – Kit-bashing and Scratch-building

I have mentioned that my model making process is derived from a method called kit-bashing. In fact, there are two methods I employ, the other called scratch-building. Kit-bashing is taking a model kit, or several, and building your own model, regardless of

the directions. Scratch-building is, as the name implies, building a model from scratch using raw stock polystyrene, wood, metal, and various other materials. I use the two methods in conjunction to build my models. Before building I collect scale model kits of battleships, tanks, cars, and planes for detail pieces. These pieces give the model depth. I also collect various plastic parts in the form of container lids, parts from broken electronics and toys, white plastic pill bottles, and even plumbing parts on occasion. To be honest, anything made of plastic is game.

I begin building by collecting various materials that have the possibility to be a base for what I want to construct. For the two MRI's this meant collecting a range of materials that were circular in shape. The larger MRI has as its base a PVC plumbing part purchased at a hardware store while the smaller uses a combination of parts including a halved pill bottle, and the interior focus ring from a broken digital camera. The back of the smaller model is an orange juice container lid, the bottom of which has been sealed with a flat piece of polystyrene. This gives the lid the appearance of being solid.

Once these are found I build the base model, cutting or grinding the pieces when I have to, and gluing them together. When the basic shape is finished I begin to add detail pieces. From then on it is a process of selecting pieces that 'fit' the model both physically and aesthetically. The models are then finished after a coating of white paint is applied.

3.4.1.2 Animation



Fig. 8 Transpose MR Animation Still Frames

The animation in *Transpose MR* is a piece that combines the elements of both peep displays in an effort to link them together. I felt it necessary to show the movement of the MRI from the clinical setting and into the veldt because the two pieces alone do not accomplish this in a linear fashion. A viewer can move from one peep display to the other in any order they choose. It was important to me to show the MRI moving from the space of the clinic to the veldt in order to establish that the MRI was transposing back to its original habitat. This is because I believe the reversal suggests that the MRI is from the natural world, rather than an apparatus that has animal-like qualities. It would imply that the animal is being caged rather than set free.

The animation was completed using Autodesk Maya, Adobe Illustrator, Adobe Photoshop, Adobe After Effects, and Final Cut Pro. The animation process includes several steps that, for me, ran as follows: modeling, the addition of materials and textures, lighting, camera movement, rendering, compositing, and the addition of audio. I will not discuss every step in detail here, but instead will provide explanations of the steps I find most pertinent.

I began modeling by finding images of existing MRI suites, for the first half of the animation, and images of the veldt areas of Africa. These reference images are in no way reformed in any exactitude in the animation. They were simply a way to formulate the idea, the concept of what a scene should look like. A few exceptions exist in the equipment of the MRI suite. With these models I tried to be as exact as possible. A good example is the MRI. It is modeled after a common General Electric Signa 1.5 Tesla MRI.⁹³ It is the same model of MRI that I saw when I observed my mom's imaging procedure.

Here my 3D and physical modeling are very different. The physical models are much more freewheeling, carrying a science fiction aesthetic, while the 3D models are much closer to real life. It is a further example of Baudrillard's ideas. The 3D models more closely resemble 'the real thing' than the physical models do. In part, this is because it is, in some respects, much easier to produce a realistic model in Maya than in physical modeling. I also wanted the aesthetics of the physical models to be pushed a bit. They exist as a facsimile of a known form. During the show I had very few questions about what they were, the viewers seemed to know.

Once the modeling is complete materials and textures are applied. These give the models both color and attributes like specularity and reflectivity. I tended toward simpler materials and textures in this animation due to render times. The more complex these become the longer a single frame will take to fully render. The addition of materials and textures to the models generally coincides with the addition of lights to the scene. The two were adjusted in conjunction with one another.

The look I wanted from the MRI suite was of clinical austerity and I think I achieved that. The only embellishment that I think I added was the red blanket on the MRI. I normally do not go for the addition of blood and gore, but the blanket was something I could use to connect to the violence of Bradbury story. When the MRI transposes the blanket is left behind, it does not carry over into the other scene long.

The outdoor scene was quite different to put together than the clinical setting. Things like leaves and grass are difficult to model correctly and often push render times to minutes per frame. The outdoor scene posed the most problems in this respect. The grass made use of a part of the 3D program called Maya Fur. It is a quick way to produce grass quickly and with a multitude of attributes that can be custom set. However, this also caused my render times to rise very high. At times I was rendering out a single frame, video usually runs at 29.97 frames per second, every eight to twelve minutes. So testing the renders usually took quite a while, rendering only a run of perhaps thirty to sixty frames to see if any problems were occurring. They did. Maya Fur proved to be difficult to work with, causing me to fully re-render the last half of the scene. This proved to be due to a few settings that needed to be changed, menu sets that were buried within the program.

The outdoor scene, despite difficulties, turned out very well. The grass, once set correctly, worked well if not perfect. There are still a couple bugs to fix, like the small sections of grass that tend to move strangely and the way the grass moves in segments of wind rather than under one force.

The transposition of the MRI in the animation is carried out by matching the cameras of the two scenes and then rendering out overlapping sections. These sections are then composite together using After Effects. With the two scenes overlapping it was easy to cross fade between them, but the effect lacked depth. I rendered several layers of

the scene out to produce depth in the transition from one scene to another. These layers are most noticeable as the clinical equipment that is left for a short time, semi-opaque, in the outdoor scene. Similarly, in the clinical scene, the trees, one from the background and one in the foreground, fade into being early and call attention to what will be unfolding.

3.4.2 Relation to Historical and Theoretical Network

The MRI stalks us, lies in wait. It holds its magnetic claws at the ready, waiting for the perfect moment to make its slice. Or rather, it waits to take a slice, to devour and digest it, and turn it into something else. Much like any other animal it has both intake and output. Only this beast takes in information, digests it, and outputs our simulacrum. Flusser was so very close in his assessment of apparatuses and their similarity to animals. Drawing upon Flusser it is easy to see how the MRI can occupy *The Veldt*, and has for some time now. It is our very own savanna of the virtual. Bradbury's lions were only a stand in, what should have been an understudy to what truly belonged on the stage.

The MRI, much like any other domesticated animal, is bound to us. We take care of it, feed it regularly, and are required to do so. Otherwise its function stops and we are left in need. And we do need the MRI. Its claws transform us; we are caught in a beautiful nuclear magnetic intensity, a great conversion. We see ourselves unfold on the screen in magnetic detail. Others see us too. The simulacrum precedes us to the doctor, their gaze waiting only to assess the health of the simulacrum. Yet, only we reap the benefits. The simulacrum is left to be stored away, a remainder frozen in time. In some respects it is our accomplice in committing the perfect crime.⁹⁴ Through it we find the elimination of ourselves, but only in part and only for a moment. The MRI simulacrum is fleeting, purposeful.

As an animal the MRI can find itself in many settings and the natural history museum is no exception. These museums are fond of animals and often build their own, the remnant model that uses parts from one or more existing MRI to form a whole.⁹⁵ The display would seem much like home, grasses, trees, and possibly a boulder or two. But these would be fakes of course, false props echoing the real. Or, is the reversal the case?

In any event the picture is strange, something that itself simulates being simulated and seated within a simulated environment. Further, this display is itself simulated.

This is the heart of the two peep displays, a layering of simulation. The peep box has already been shown to be a virtual display type. Or, in the least, it lends itself to a facsimile of the virtual. Placed within the confines and limited viewing situation of the peep box; the model spaces disappear. They remain hidden until one moves to the peephole. A tension exists between what is outside and inside the display. This tension is partially due to scale and partly to simulation. The situation with the peephole is similar to that of medical imaging. An enclosed space, the depths of which are not fully known, is viewed in just the right way in order to see its ‘contents.’ This is not to say that the body is a box, but that the metaphor is a possibility. As Massumi has said, “This is one leaky ‘box.’”⁹⁶ The peep box does act as a stand-in for the body, a surrogate. However, inside this body is not the messiness of physiology, but the messiness of the culture of the medical imaging situation and all its players, the MRI and its scan. The scene is played out all too often, preceded by the wail of a siren and the flash of red and white lights. The MRI is rarely left to sleep, it plods on.

Curiosity plays its part as well. It draws the viewer into becoming a viewer. In a sense the peep box’s role is not to be a device for viewing, but something similar to the apparatus of Flusser. It controls our actions, beckoning with one un-closable eye. Aren’t the eyes the windows’ to the body? Its primary function is to turn the passerby into a viewer, to produce them. The Curious is felt as the draw the peep box has, and also as reasoning for the scale of the models. Small things pull you forward so you can get closer to their scale. The inversion of Kant’s sublime is a part of study and focus.

The semitransparent displays, sources of illusion, work towards simulation, but one that is doomed to repeat itself again and again. Indeed, the people in the videos are ghosts, resurrected through mediation. Their forms couple with the models behind them to form a hybrid reality or hybrid virtuality, both terms seem to work. All in all it is a confused space, but one that we live in every day.

4. Conclusions

Transpose MR has given me a lot to think about, both technically and conceptually. The responses of the viewers to the peep boxes are almost universally positive. Their reaction upon viewing is usually a verbal, “neat” and then they go along their way. It is not that this response is bad or even unwanted, but I am now wondering how I can pull more from a viewer with a similar display type. My thoughts now are leading me to consider a more dynamic approach to the content on the semitransparent displays, possibly coupling video and 3D animation on the screens.

There are several things I would have done differently. Most of these issues stem from things that I have no control of. The animation and the peep boxes were very far from one another in the Biotech center and at times it took some direction to get people into the lounge where the video was playing. In some instances this meant the viewer was walking back in a direction they had just come from, further from their destination. However, this only relates to the initial opening and showing of the work. I believe that the peep displays will do well in high traffic areas, ever so often pulling a passerby in to take a peek.

Similarly, the animation will be viewed several times by passersby in and out of the lounge at the biotech center. While the placement of the screen is not ideal, it would be wonderful if it was in a position to be flanked by the peep displays. It is not at all bad, the display is large and slick and the room is used almost constantly. Although for future showings I would prefer both the animation and peep displays to be in the same space.

There are always changes due to hindsight in a work. There are small tweaks that I would make to the construction of the cases and details that I would add to both the exterior and interior. It makes me want to believe that a work is never truly done, that it always resides in a state of becoming.

In this work I have tried to concentrate on the apparatus itself rather than the image, the simulacrum. This is because I believe that to get to the heart of medical imaging it is import to have an understanding of its devices. There are other artists’ work that concentrates on the image, on the representation and simulacrum. But it is hard to tell if they are focusing more on the aesthetics of the scan, a formal interest, or if the interest is deeper than that. I may at some point turn to the image that the MRI produces, or per-

haps its data, to see what resides there. For now, I will continue to focus on the apparatus that produces us.

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