Wagner College Forum for Undergraduate Research

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EDITOR'S INTRODUCTION

Should you buy or lease? What factors influence the cross-species transmission of disease? Were corsets an unnecessary evil imposed on women throughout history or were they incredibly useful garments? How did the United States reconcile segregation with a modern judicial system designed to provide liberty and justice to everyone? Inquisitive young minds at Wagner College have investigated these and other questions. The interested reader will find much on the pages that follow.

The Wagner Forum for Undergraduate Research is an interdisciplinary journal which provides an arena where students can publish their research. Papers are reviewed with respect to their intellectual merit and scope of contribution to a given field. To enhance readability the journal is typically subdivided into three sections entitled *The Natural Sciences*, *The Social Sciences* and *Critical Essays*. The first two of these sections are limited to papers and abstracts dealing with scientific investigations (experimental, theoretical and empirical). The third section is reserved for speculative papers based on the scholarly review and critical examination of previous works.

Gregory J. Falabella, Ph.D.
Editor-in-Chief

Section I: The Natural Sciences

Full Length Paper

2 The Cellular Response of Adult Zebrafish as a Model for a *Listeria Monocytogenes* Central Nervous System Infection
William Rivera

Section II: The Social Sciences

Full Length Paper

28 No Boundaries? Understanding Risk of Human-Primate Disease Transmission
Jennifer Ida

Section III: Critical Essays

Full Length Papers

44 Double Vision: The Utilization of Metempsychosis and Dual Identity in *Aura*
Julia Zenker

53 Leasing: Past, Present and Future
Noreen Taylor

68 The Corset as a Construction of Femininity: Silhouettes in the Victorian Era
Kristen Haggerty

98 A Dynamic and Progressive View of Autism Across Life Stages as seen in *After Thomas*, *The Curious Incident of the Dog in the Night-Time*, and *Temple Grandin*
Ananda DiMartino

105 "For Richer, For Poorer?" — Gender, Money, and Marriage
Victoria Felix

111 The Legal Evolution of Jim Crow: Separate and Unequal
Tyler Seling

Section I:
The Natural Sciences

The Cellular Response of Adult Zebrafish as a Model for a *Listeria Monocytogenes* Central Nervous System Infection

William Rivera (Microbiology)[1]

Listeria monocytogenes, a pathogen of the central nervous system, was injected into the vitreous humor of the adult zebrafish eye to determine if the organism could cause a transneuronal infection. When injected into this tissue, this pathogen was able to invade the cells of the retina, move through the optic nerve, and ultimately gain passage into the optic tectum. The objective of the experiment was to accurately determine the presence of an infection of *L. monocytogenes* in adult zebrafish. This experiment also gave insight into the infection that was caused in the area. Approximately 20 adult zebrafish were injected in the eye with *L. monocytogenes*, and through imaging techniques, the time course of the infection was studied.

I. Introduction

Zebrafish

Zebrafish (*Danio rerio*) are a small fresh water fish native to Bangladesh that belong to the group Teleostei. In the past decade, they have become a widely used laboratory animal due to their inexpensive cost and availability in pet stores across the scientific community. The fish began being used in developmental biology due to their external fertilization and transparent chorion, and have since become popular in neuroscience and microbial pathogenesis (Corbo et al., 2011). At this time, several other groups are using zebrafish as a model organism to study microbial infection (Chaco et al., 2010).

Listeria monocytogenes

Listeria monocytogenes is a facultative, intracellular, gram-positive bacterium that may infect humans following the ingestion of contaminated food. It is a human pathogen because it has been known to cause meningitis and spontaneous abortions in infected humans (Levraud et al., 2009).

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[1] Research performed under the direction of Prof. Christopher Corbo in partial fulfillment of the Senior Program requirements.

L. monocytogenes is very common and has been found in plant, soil, surface water samples, sewage, in the milk from cows, and in the feces of humans and animals (Weis, 1975). Cases of human listeriosis (an infection brought about by *L. monocytogenes*) stem primarily from food contaminated with the organism especially if the host has a compromised immune system (Welshimer, 1971). A recent study showed that individuals with an underlying condition that leads to a suppression of their T-cell-mediated immunity are 150 times more likely to contract the organism when compared to the general population (Gellin et al., 1991). Other conditions that put one at risk for listeriosis include neoplastic diseases such as cancer, immunosuppression, pregnancy, extremes of age, diabetes mellitus, alcoholism, cardiovascular and renal collagen diseases, and hemodialysis failure (Nieman and Lorber, 1980). Infection with *L. monocytogenes* generally leads to initial prodromal symptoms (headache, vomiting, fever, and malaise) and eventually progresses to a central nervous system infection that is meningitic or encephalitic in nature (Dee and Lorber, 1986). *Listeria* is also able to cross the placental barrier and can cause a spontaneous abortion with women in their third trimester of pregnancy (Becroft et al., 1971). A study from 1985 found that despite the use of antibiotics, the mortality rate of neonatal listeriosis was 36% (Evans et al., 1985).

According to a study of human listeriosis in Britain from 1967 through 1985, there are two clinical forms of neonatal listeriosis: an early (1.5 days after birth) and late (14.3 days after birth) onset. In the early-onset form, the infant is infected in utero and the organism is disseminated throughout the body, with a concentration of lesions in the liver and placenta. In contrast, the late-onset form is believed to be acquired from the mother's genital tract and in most cases causes meningitis (McLauchlin, 1990). However, despite this apparent threat to newborns, *L. monocytogenes* is fairly common in the intestinal tract and antibodies against the organism are commonly found in humans (Seeliger, 1988). This is reinforced by a study of listeriosis in humans and animals in the Netherlands, where it was found that 5-10% of the general population could be carriers of the organism (Kampelmacher and van Noorle Jansen, 1980).

In order for *L. monocytogenes* to cause infection, it must first enter the host's cells. According to Racz et al. (1972), the organism is able to cross the host cell's protective barriers by inducing its own endocytosis. This process, known as *parasite-directed endocytosis*, allows the *L. monocytogenes* to enter the intestinal cells and macrophages of the host and spread throughout the body (McGee et al., 1988). The intracellular growth of *L. monocytogenes* was further studied by Mackaness (1962), who determined that its survival inside the host's cells depended on two factors: the virulence of the strain and the state of activation of the macrophage. Cowart et al. (1990)

determined that *L. monocytogenes* is able to attach to eukaryotic cells via the interaction of a bacterial surface sugar (α-D-galactose) with a galactose receptor on the host cell. They also found that virulent strains of the organism possessed an α-D-galactose residue on its surface, where as non-virulent strains lacked the sugar and were unable to interact. This means that virulent strains of the bacteria were able to attach to the host cells easier and therefore were able to cause infection. Once the organism is phagocytized by the cell, the organism uses listeriolysin O (an exotoxin) to escape from the phagosome and enter the cytoplasm (Portnoy et al., 1988).

The state of the macrophage is very important in the survival of *L. monocytogenes*. If the bacteria enters an activated macrophage, it will most likely be killed by the toxic-free radicals (O_2^-) created inside the immune cell (Kaufmann, 1988). However, if the organism is able to enter a non-activated macrophage, there is a good possibility that it will be able to survive and infect other host cells.

After the use of listeriolysin O to enter the cytoplasm, the organism uses the host cytoskeletal components to produce actin filaments required for the organism's motility (Portnoy et al., 2002). These actin filaments are arranged to form a "comet's tail," which the *Listeria* uses to propel itself towards the cell surface and create a pseudopod-like extension (Tilney and Portnoy, 1989). When this extension comes into contact with another macrophage, it will be phagocytized and the *Listeria* will be placed into the phagosome of the second immune cell (repeating the cycle). According to Tilney and Portnoy (1989), this mode of transmission is extremely important in the survivability of the organism because it allows it to transfer from "cell to cell without ever leaving the host's cytoplasm;" therefore avoiding interaction with the humoral immune system (complement system and its associated antibodies).

On the other hand, not many studies have been performed with adult zebrafish and its interaction with *L. monocytogenes*. The common notion, which was reinforced by Menudier et al. (1996), was that adult zebrafish were highly resistant to listeriosis and that a 50% more lethal dose would be required to induce an infection when compared with mice. Jean-Pierre Levraud et al. (2009) expanded this study by finding that zebrafish larvae were actually susceptible to an infection when *L. monocytogenes* was microinjected near the urogenital opening. Accordingly, the aim of this study was to determine the ability of *L. monocytogenes* to infect the zebrafish central nervous system and the cellular response to this infection.

L. monocytogenes has been known to cause meningitis and encephalitis in humans and animals. According to Greiffenberg et al., (1998), the *L. monocytogenes* is able to cross the blood brain barrier, but the mechanism is not exactly understood. There

are two routes by which the organism may gain entry into the central nervous system: either through the microvascular endothelial cells or via entry into the cells of the choroid plexus.

Microvascular endothelial cells form the barrier between the cells of the brain (neurons and glial cells) and the blood. These cells are linked together via tight junctions and prevent most molecules from passing. Greiffenberg et al., (1998) studied the interaction between the microvascular endothelial cells and the pathogen, and despite the *L. monocytogenes* being able to infect these cells, it could not kill them. They surmised that the pathogen merely used the host cell as a source of replication and actin tail formation. In another study performed by Schlüter et al., (1996), it was found that the *L. monocytogenes* readily infected the epithelial cells of the choroid plexus, the structure in the brain responsible for the formation of cerebral spinal fluid. The infection of the cerebrospinal fluid is extremely dangerous for humans because it often leads to cases of meningitis and encephalitis.

II. Objective

The objective of this experiment was to accurately determine the infection of *Listeria monocytogenes* in adult zebrafish. The emphasis was on determining if the pathogen could be transmitted from the retinal cells to the optic tectum. This required analyzing the response of the cells within the optic tectum.

III. Materials and Methods

The adult zebrafish were acquired from a local pet store (Animal Pantry, Staten Island, NY) and were maintained in a 10-gallon aquarium. The tank possessed proper filtration and a day/night lighting cycle at 27°C. The fish were fed flake food daily. Adulthood was determined following the measurements set in Corbo et al. (2011), which defined adults being 2.5-3.8 cm in length. As in the situation with the experiment conducted by Corbo et al. (2011), it can be assumed that the fish were sexually mature because similar size fish are routinely used to obtain eggs for embryonic projects in the same lab. All procedures conducted in this study are listed in and approved by the IACUC Protocol (#359, issued by the New York State for Basic Research).

Microorganisms

Listeria monocytogenes ATCC 19115 (serotype 4B) was obtained from the ATCC: The Global Bioresource Center.

Non-Biological Material

Chemicals and Biochemicals

Glycerol (Sigma Aldrich) was sterilized at 121 °C for 15 minutes. It was used to make freezer stocks for the preservation of the *L. monocytogenes*. Ethyl Alcohol (Electron Microscopy Sciences) was used to sterilize the injection site on the zebrafish prior to the use of tuberculin syringes to perform the injections. It was also used in increasing concentrations (50%, 70%, 95%, 100% ethanol) to dehydrate the zebrafish brain tissue. Spurr resin (Electron Microscopy Sciences) was composed of a four component resin mixed together according to the manufacturer's protocol. It was used to imbed brain tissue samples for study using light and transmission electron microscopy. Xylene (Sigma Aldrich) was used to remove debris from the slides prior to cover slipping. It also allows the DPX mounting media to be spread evenly along the slide. DPX mounting media (Electron Microscopy Sciences) was used to permanently cover slip the slides so that the specimens are preserved.

Buffers and Solutions

Phosphate Buffer Saline Solution (PBS) was initially composed of 0.2M sodium phosphate dibasic. 0.2M sodium phosphate monobasic was then added until the pH reached 7.2.This was then diluted to 0.1M, and 0.9g NaCl (Fisher Scientific) per 100ml of solution (0.9%) was added. The PBS was used to resuspend the *L. monocytogenes* for injection into the adult zebrafish. Karnovky's fixative solution (KY) was composed of 4% paraformaldehyde and 2.5% glutaraldehyde in PBS solution (both fixative components come from Electron Microscopy Sciences) and pH was altered to 7.2. Both aldehydes were used to fix proteins. Glutaraldehyde is the stronger of the two and required for electron microscopy tissue preservation. In particular, this was used so that the tissue could be revisited for electron microscopy in future work. Tricaine powder (3-amino benzoic acidethylester, Sigma Aldrich) was dissolved in distilled water to generate a stock solution of 0.4%. This was further diluted to a final working concentration of 0.04% in distilled water and was used as an anesthetic for the zebrafish. The fish were left to swim in the solution for several minutes until they were unconscious. This was tested using the *tail fin pinch response* (Corbo et al., 2011). Osmium tetroxide (Electron Microscopy Sciences) was used as the post fixation, specifically to fix lipid bilayers. This was followed by increasing concentrations of ethanol to dehydrate the brain tissue samples. The osmium tetroxide solution is normally stocked at 4% in distilled water and diluted down to 1% in PBS for a working solution. Propylene oxide (Electron Microscopy Sciences) is a transitional solvent that was used to remove the ethanol from

the brain tissue and infiltrate the resin prior to embedding. Toluidine blue powder (Electron Microscopy Sciences) was added to distilled water to prepare a 1% solution. Once this was created, 1% sodium borax tetra (Electron Microscopy Sciences) was added to prevent contamination of the staining solution. The toluidine blue was freshly filtered and then used to stain the 1 μm semi-thin sections.

Oxford Media

Oxford media was used because it is not only selective (has certain antibiotics that only allow for the growth of *Listeria*), but also differential in that there is a color change if the organism is present. The results from this test plate would be used to confirm the presence of the *Listeria*. Oxford media was prepared based upon instructions detailed in kit ordered from the manufacturer OXOID. According to the kit, the Listeria Selective Agar (Oxford Formulation Code: CM0856) is composed of 39.0 g/L Columbia Blood Agar Base, 1.0 g/L Aesculin, 0.5 g/L Ferric ammonium citrate, 15.0 g/L Lithium chloride, and is maintained at a pH of 7.0 and a temperature of 25°C. After autoclaving at 121°C for 20 minutes at 15 psi, the antibiotic cock-tail supplied by OXOID was resuspended in 95% ethanol, and added to the media when it reached 50°C just prior to pouring. Each vile of antibiotics provided from OXOID was for 500 mL of media. 0.5 L batches were made one at a time.

Brain Heart Infusion Media

Brain heart infusion base is a very nutrient rich medium. It was the suggested growth medium for *Listeria* by ATCC. To prepare, brain heart infusion base medium from the company Difco was used and resuspended according to the manufactures protocol. Briefly, 37g of powder was suspended in 1 L of distilled water. The media was brought to a rolling boil and then 5 ml aliquots were prepared, capped and autoclaved using the same conditions as above. According to the container provided by the company, the powder consists of 6.0 g/L brain heart (infusion from solids), 6.0 g/L peptic digest of animal tissue, 5.0 g/L sodium chloride, 3.0 g/L of dextrose, 14.5 g/L pancreatic digest of gelatin, 2.5 g/L of sodium diphosphate, and should be maintained at a pH around 7.4.

Techniques

Calibration of Spectrophotometer with L. monocytogenes

It was important to know the amount of bacteria that was being injected into the adult zebrafish eye. A spectrophotometer was used to determine the number of *L. monocytogenes* in one sample. The first step was to centrifuge an overnight culture of *L. monocytogenes* at 4000 rpm for 15 minutes. The pellet of the *L. monocytogenes* was

resuspended in 5 mL of PBS. The entire sample of LM+PBS was then transferred into a sterile tube and the spectrophotometer was blanked using PBS.

A tenfold dilution series was then started, where 1 mL of LM+ PBS was transferred into 9 mL of a new tube containing sterile PBS. Then, 1 mL of the initial was transferred into another 9 mL of sterile PBS. Between each reading with the spectrophotometer, the machine was calibrated using a blank tube. The attempt was designed to reproduce the same concentration of cells seen in an experiment performed by Stockinger et al. (2009), where mice were injected with $5x10^6$ CFU per mL *L. monocytogenes*. However, determination of the exact concentration of cells in the sample proved unsuccessful so an overnight culture of *L. monocytogenes*, pelleted and resuspended in PBS to inject was employed. Despite the inability to acquire substantial readings from the spectrophotometer, Table 1 does show that the initial readings were consistent in that the optical density decreased with each subsequent dilution.

Dilution	600 nm	Cell Counts
Undiluted	1.999	TNTC
10^{-1}	0.081	TNTC
10^{-2}	0.012	TNTC

Table 1**:** Each dilution's absorbance value and cell count.

Culture Conditions

For long term storage of *L. monocytogenes,* a 25% glycerol suspension was prepared and stored at -80 °C. To revive the culture, a scraping of the glycerol stock was resuspended in 5mL of brain heart infusion broth (BHI) and then cultivated overnight at 37°C prior to the day of injections. The cultures were not aerated or maintained in an anaerobic environment.

Immediately before injection, the organism was pelleted via centrifugation using a Thermo Scientific IEC C130R, for 15 minutes, at 20°C, and with 4000 rpm. The supernatant was then removed and the *L. monocytogenes* pellet was resuspended in 5 mL of PBS. The identity of the organism was then confirmed via the inoculation of an Oxford media. This test was used primarily to confirm that the *Listeria* cells were still viable (Figure 1). A tuberculin syringe was then filled with 100 μL of the culture (Figure 2).

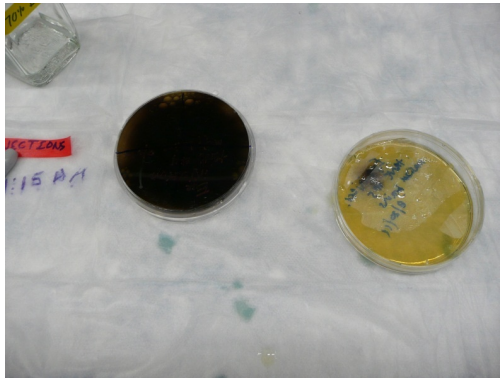

Figure 1: On left side of the image is an Oxford test plate that was positive for *Listeria monocytogenes*. On right side is an Oxford test plate that was negative for the organism.

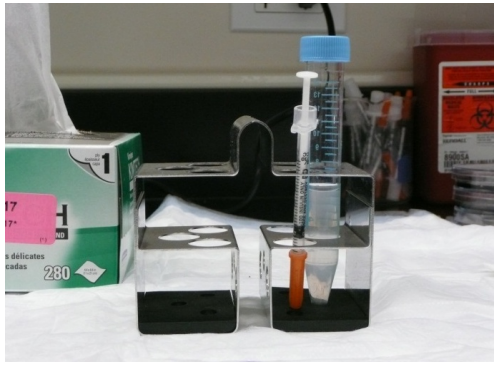

Figure 2: Tube containing resuspended pellet form of *Listeria monocytogenes* and syringe to be used in injections.

Injections with L. monocytogenes

A surgery station was prepared that consisted of sterile tuberculin syringes for injections, a stereo microscope, a platform to rest the fish, ethanol to clean injection site, forceps and scalpel for surgery, and a Bunsen burner to sterilize instruments (Figure 3). To start the injection process, a single adult zebrafish was transferred from a 30 gallon colony tank (that contained upwards of 50 fish and located in the Wagner College adult zebrafish colony room B3) into a medium sized beaker. Once the gill rate of the fish went back to normal, it was then transferred to a small beaker that contained the 0.04% tricaine and fish were anesthetized according to the methods described by Westerfield (2007).

Figure 3: Surgery station for the injection of zebrafish & extraction of infected brain tissue.

Once the fish was completely unconscious (zebrafish would be upside down and gill movement was very slow), which was confirmed by a pinch of the tail, forceps were used to extract the fish from the tricaine beaker and place it on to platform beneath stereomicroscope. The fish was then secured on to the platform with thumbtacks (Figure 4). It must be noted that the fish was not pierced with the thumbtacks; they were only used to stabilize its body so that the injections could be performed.

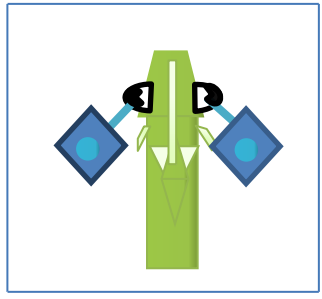

Figure 4: Diagram of how fish were pinned onto platform using two thumbtacks.

After a fish was injected in the eye with the LM+PBS, it was immediately placed into a small beaker and allowed to recover. On average, it would take about two minutes for the fish's gill rate to return to normal. In many cases, forceps were used to move the fish so that water would pass by its gills in an attempt to reduce the recovery time. Once the fish was swimming normally again, it was then put into a separate 2.5

gallon tank (Figure 5). A maximum of five fish were placed in a single 2.5 gallon tank and each was separated according to their injection site. For example, fish injected in the eye were not placed in a tank that contained fish injected in the gills.

Figure 5: Five 2.5-gallon tanks used to house normal and infected adult zebrafish.

Procedure for L. monocytogenes Infected Fish

Fish were maintained normally after injections. They had proper filtration, aeration and were fed daily. Any fish that showed immediate signs of sickness, which included a loss of muscle control or difficulty swimming, were placed back into the tricaine solution. An incision was then made by the dorsal-spinal area to euthanize the fish and forceps were used to puncture the region directly above medulla. The top of the skull was surgically removed with the forceps, which exposed the brain tissue. The entire fish was then placed into KY fixative for later processing.

Fixation of the Brain and Embedding of Tissue Samples

In using the same procedure as Corbo et al. (2011), after fish (with exposed brains) were placed in KY fixative solution at least overnight, their brains were then removed from the skull and maintained in KY fixative for at least an additional two days at room temperature. Brains were then post fixed in 1% osmium tetroxide, dehydrated through an increasing ethanol concentration series (50%, 70%, 95%, 100%), infiltrated with Spurr resin by using a 1:1 mixture of propylene oxide and Spurr resin for 1 hour, and pure Spurr overnight at 4°C. The following day, the brains were embedded into pure Spurr resin using BEEM capsules and cured at 60°C overnight, and then sectioned on OMU-2 ultramicrotome (Figure 6).

Figure 6: OMU-2 ultramicrotome used to section embedded tissue samples.

In order to make a cutting surface that is able to slice 1 μm semi-thin sections of tissue needed for light microscopy, a boated glass knife needs to be made. After scoring and breaking the glass using a LKB Knifemaker TYPE 7801-B (Figure 7) to produce a diagonal piece of glass (with a sharp and dull end), a piece of metallic tape is placed parallel to the base of the right triangle. Nail polish is then streaked along bottom of tape to prevent water from escaping (Figure 8). The knife is then placed into the OMU-2 ultramicrotome and filled with water. Once the sample is aligned with the sharp edge of the knife, 1 μm semi-thin sections are sliced and then put on to slides (Figure 9).

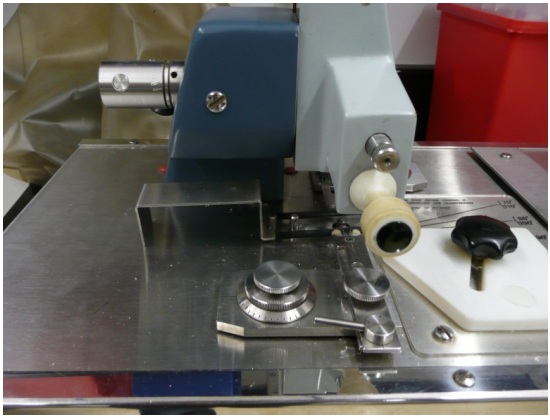

Figure 7: LKB Knifemaker TYPE 7801-B.

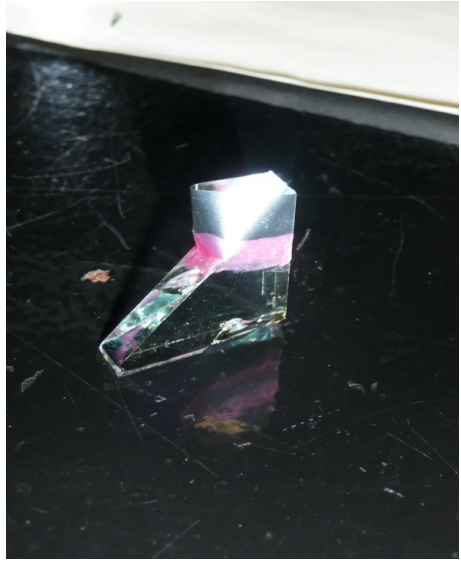

Figure 8: Picture of knife with a boat needed to slice 1µm semi-thin sections of tissue needed for light microscopy.

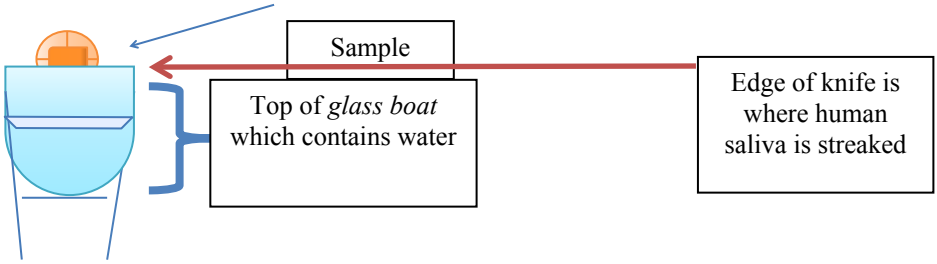

Figure 9: Diagram of glass knife needed to slice 1um semi-thin sections of tissue needed for light microscopy.

Staining with 1% Toluidine Blue

After 1 µm semi-thin sections were made with the OMU-2 ultramicrotome, slides were then stretched and sealed to the slide using a hot plate. Once all of the water was evaporated from the slide, the slides were covered with 1% toluidine blue and heated over a flame. Once vapor was detected, the slide was washed for 30 sec under running

water and allowed to dry overnight. Slides were then cover slipped under the fume hood using the solvent xylene to clear the slides and DPX mounting media.

Imaging

Slides were imaged using an Olympus BX-40 Light Microscope with Sony ExWave HAD Sony Analog Camera using a FlashBus image capture card and ImageJ capture software (Figure 10).

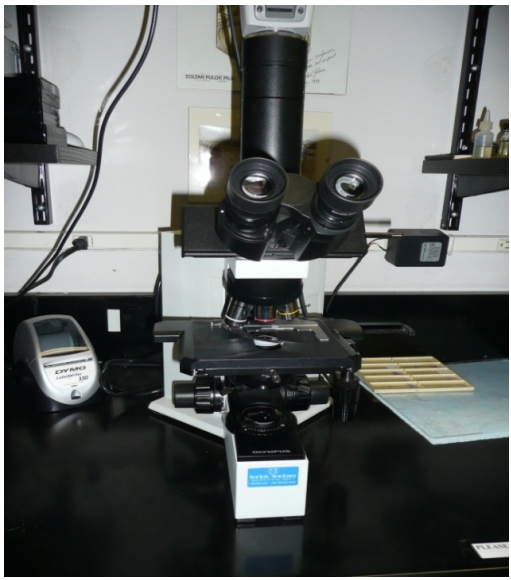

Figure 10: Olympus BX-40 Light Microscope with Sony ExWave HAD Sony Analog Camera using a FlashBus image capture card.

Fish found dead more than 12 hours later

If a fish was found dead, the brain tissue would be surgically removed and mashed with 50 µL of PBS in a sterile microcentrifuge tube. This brain tissue would be placed on to Oxford media to test for the presence of *L. monocytogenes* (Figure 1). This was done because dead brain tissue is not suitable to imaging and whether or not the fish was infected with *L. monocytogenes* needed to be ascertained. Using this technique, some data was collected on these fish, even if it was not imaging data.

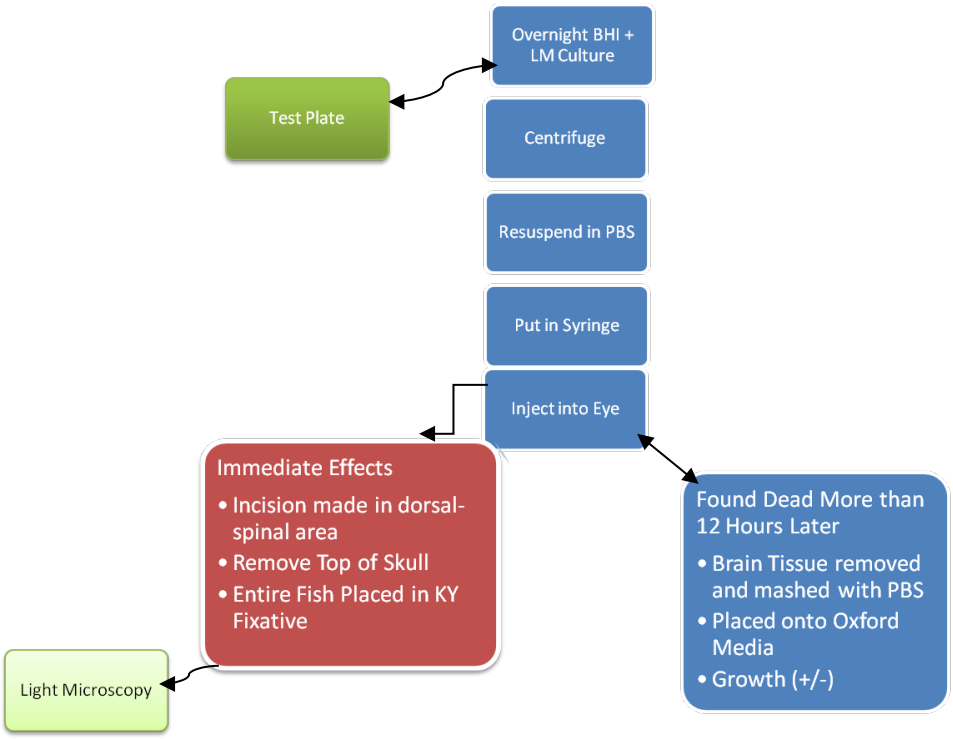

Figure 11: Flow Chart showing the steps of the experiment.

IV. Results

Determining the Routes of Infection

To gain insight into the routes *L. monocytogenes* used to enter the central nervous system, three fish were injected with approximately 1 µL of *L. monocytogenes* into the mouth, gills, and eye. Each injection site was tested with three fish. After 24 hours, two fish injected in the eye were found dead, and subsequent plating of brain tissue onto Oxford media revealed the presence of *L. monocytogenes.*

Injections into the Zebrafish Eye

Due to the rapid onset of infection in zebrafish that were injected in the eye, it was determined that a time course should be performed and fish that showed immediate effects from the organism would be fixed and their tissue used for light microscopy. A

total of 18 fish were then injected in the eye over two separate days (10 fish on 8-19-2011 and eight fish on 8-26-2011). It was found that of the 18 fish that were injected, eight were positive for *L. monocytogenes* either through testing with Oxford media or microscopic analysis (Table 2).

Of the 18 fish that were injected, seven fish died and five were intentionally sacrificed (Table 2). Of the seven fish that died, the brain tissue of four (Numbers 3, 5, 6-7) were positive for *L. monocytogenes*. All five fish that were sacrificed (Numbers 8-12) were positive for the presence of *Listeria* in the brain tissue as well.

Result of Injections with Adult Zebrafish in the Eye				
Number	**Time**	**Died**	**KY Fixative or Oxford**	**Presence of *L. monocytogenes***
1	2 Hours	Yes	KY Fixative	No
2	2 Hours	Yes	KY Fixative	-
3	4 Hours	Yes	KY Fixative	Yes
4	5 Hours	Yes	KY Fixative	No
5	12 Hours	Yes	Oxford	Yes
6	12 Hours	Yes	Oxford	Yes
7	12 Hours	Yes	KY Fixative	Yes
8	**7 Days**	**No**	**KY Fixative**	**Yes**
9	**7 Days**	**No**	**Oxford**	**Yes**
10	**7 Days**	**No**	**KY Fixative**	**-**
11	**7 Days**	**No**	**Oxford**	**Yes**
12	**7 Days**	**No**	**Oxford**	**Yes**

Table 2: The 12 fish that either died or were sacrificed after injections in the eye.

Results from Microscopic Analysis of Brain Tissue Samples

The following figures (13-17) show cells presumably infected with *L. monocytogenes* and were captured at a total magnification of 1000x. To differentiate between normal and infected cells the figure found in Portnoy et al., (2002) Mini-Review, which described the life cycle of *L. monocytogenes* using a series of electron micrographs (Figure 12), was referenced.

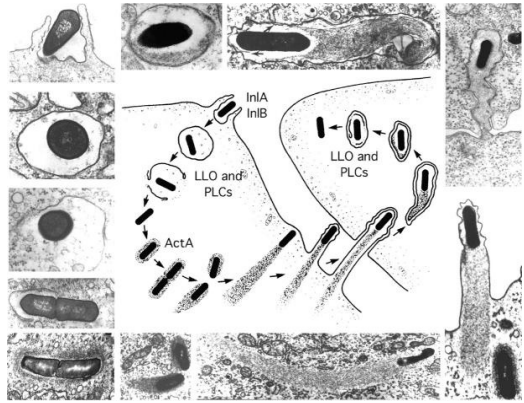

Figure 12: Cycle taken from Portnoy et al., (2002) Mini-Review, which states, "Stages in the intracellular life-cycle of *Listeria monocytogenes.* (Center) Cartoon depicting entry, escape from a vacuole, actin nucleation, actin-based motility, and cell-to-cell spread. (Outside) Representative electron micrographs from which the cartoon was derived. LLO, PLCs, and ActA are all described in the text. The cartoon and micrographs were adapted from Tilney and Portnoy (1989)."

In using Figure 12 as a reference, attempts were made to identify cells in the periventricular gray zone that were infected with *L. monocytogenes* . Due to *Listeria* being an intracellular pathogen, it causes degradation inside the cell because it utilizes the host's cytoplasmic and nuclear components. Therefore, it was assumed that cells infected with *L. monocytogenes* will have less nuclear material. This is detected by staining and is indicating the breakdown or digestion of the host cell components. For example, Figure 13 shows the presence of four infected cells (indicated with arrows) that have less material stained when compared with the normal cells (1). These infected cells (2-5) contain an irregular shaped nucleus that seems pushed to one side because of the presence of and degeneration caused by the *L. monocytogenes*.

The four infected cells also seem to be at different stages of the infection due to the varying sizes of their nucleus and cytoplasmic space. For example, the infected cell on the far left (3) seems to have less cytoplasm when compared with the cell on the bottom (4). Thus, it can be deemed that Cell 4 is at a later stage of the infection because more of its nucleus has been degraded by the pathogen. Another comparison can be made between Cells 2 and 3. Cell 2 does not possess the same circular stain seen in Cell 3, which might indicate that it is as an earlier stage of infection because more of its nucleus is present. The final stage of infection seems to be represented in Cell 5, where there are no intracellular

components present. This might be because the cell has been completely digested by the pathogen and only part of the membrane is left intact. In this section, the membrane seems intact, but in another plane of the cell, a region where the *L. monocytogenes* broke down the cell membrane to escape may have been found. As is seen in Table 3, a correlation might exist between the amount of material stained [inside the cell] and the stage of infection present. For example, Cell 1 has a majority of its mass stained, which indicates that it still has its normal (usually large) nucleus. However, Cell 2 only has about half of its mass stained and could be at an early stage of infection (Table 3).

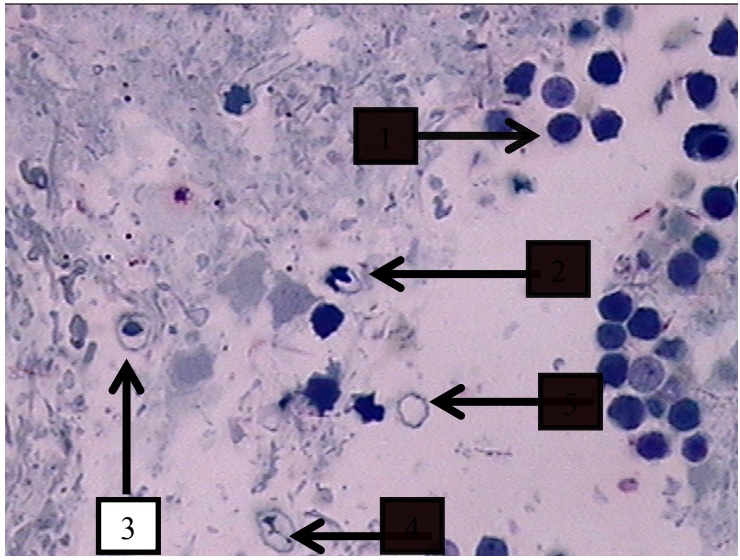

Figure 13: Micrograph indicates presence of *L. monocytogenes* in the brain tissue of fish fixed four hours after injection.

Analysis of Figure 13	
Cell Number	Stage of Infection
1	Normal cells
2	Early Stage
3	Mid-Stage
4	Late Stage
5	End Stage

Table 3: Table indicating the possible correlation between the amount of material stained [inside the cell] and the stage of infection present.

In Figure 14, the micrograph shows a single infected cell (A) that looks strikingly different from the neurons surrounding it. In contrast to these normal cells, which have a nucleus that makes up a large proportion of their cell mass, the infected cell seems to be missing half of its nucleus. Also, the stain inside the infected cell is asymmetrical, which might be an indication of the discontinuous level of degradation present due to the pathogen.

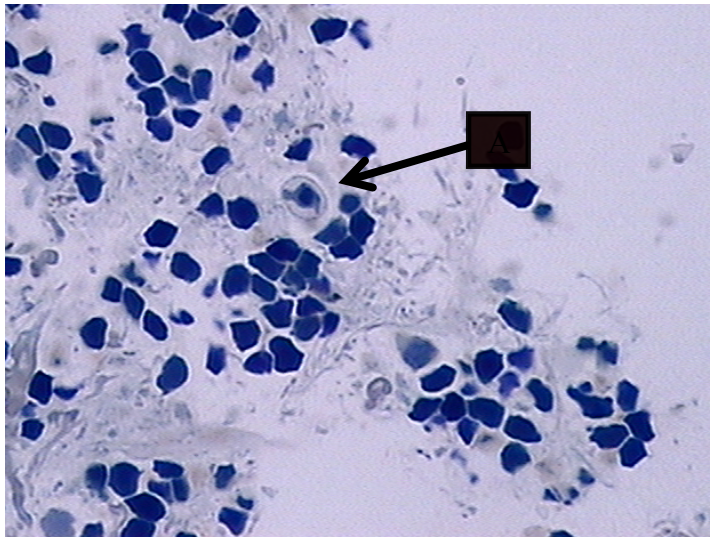

Figure 14: Micrograph indicates presence of *L. monocytogenes* in the brain tissue of fish fixed 12 hours after injection.

In Figure 15, two cells (B and C) are shown to be infected with the pathogen. Cell C seems to be at a later stage of infection because less of its material is stained. However, the cytoplasm of cells (B and C) is very similar in shape. The lower quadrant of the unstained portion in Cell C and the upper quadrant of the unstained region of Cell B both have a similar groove projecting into the stained region. If these cells (B and C) are infected, this projection into the stained region might consist of *Listeria* cells that are attempting to degrade the remaining nuclear material.

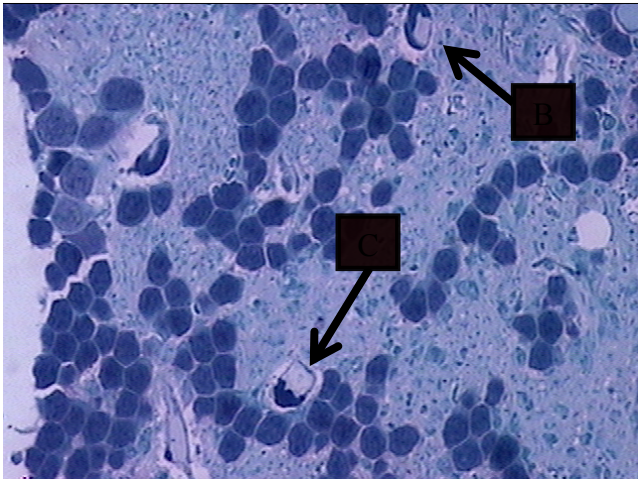

Figure 15: Micrograph indicates presence of *L. monocytogenes* in the brain tissue of fish fixed seven days after injection.

In Figure 16, three cells (D, E, and F) are shown to be infected with the pathogen. Unlike the images seen in Figures 13-15, the infected cells of Figure 16 seem to have no uniform remnant of the stain. For example, Cells B and C (Figure 15) both have a rectangular shaped cytoplasm (unstained region). In contrast, the cells (D, E, and F) have pieces of nuclear material (stained areas) spread throughout, indicating the discontinuous level of degradation throughout the intracellular space.

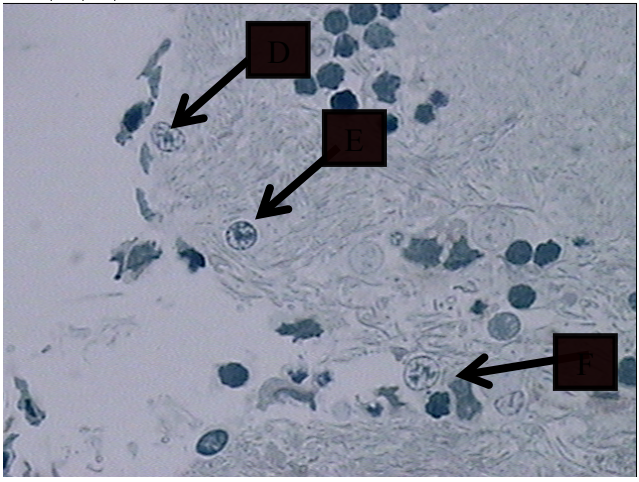

Figure 16: Micrograph indicates presence of *L. monocytogenes* in the brain tissue of fish fixed seven days after injection.

V. Discussion

Injections in the Eye

The objectives of this experiment were to accurately determine if *L. monocytogenes* could infect the visual cortex through inoculation into the eye, as well as the subsequent cellular response to the infection in adult zebrafish. The main goal of this study was to determine if the infection was possible in the zebrafish and to examine the pathology of the subsequent infected cells. In the experiment, the only injection site that showed conclusively positive for *L. monocytogenes* in the brain was through infection of the eye. Consequently, this suggests the organism was able to travel from the vitreous humor of the adult zebrafish eye (injection site), enter the cells of the retina, proceed through the optic nerve, and ultimately gain passage into the optic tectum. Of the 18 fish that were injected in the eye, eight were positive for *L. monocytogenes* either through testing with Oxford media or microscopic analysis (Table 2). Based upon this data, it can be concluded that the organism had a relatively high success rate at entering the optic tectum from the vitreous humor of the eye.

According to the results seen in Table 2, it can be inferred that the organism has the greatest incidence in the brain tissue when it was allowed to grow in its host for 12 hours or more. In Table 2, the 7 Days samples (Numbers 8-12) contained the highest frequency of *Listeria* cells inside the brain tissue. In contrast, no infected cells were found in the 2 Hour (Number 1) and 5 Hour (Number 4) samples. Based upon these results, it can be inferred that the *Listeria* required a certain amount of time to travel from the injection site into the optic tectum.

The results seen in Numbers 8-12 were also surprising in that all five fish did not die of an infection despite the high persistence of *Listeria* in their brain tissue. This could suggest that the brain infection was not enough to kill the organism. Although it was not tested, it may be interesting to see if any other vital systems were infected with *L. monocytogenes* when the organism is injected into the eye. For example, an infection of the cardiovascular system would be very detrimental to the organism as well allow for the pathogen to move to many other areas of the body. Future work may look at the ability of this organism to move throughout the system.

The presence of no *Listeria* cells in the 2 Hour (Number 1) and 5 Hour (Number 4) samples implies that these zebrafish did not die from an infection caused by the pathogen. In actuality, these fish might have died from the internal bleeding or puncture wound caused by the injection itself. Also, the growth seen in the 4 Hour (Number 3) sample might have been the result of a higher infective dose given to the zebrafish or the possible misidentification of a red blood cell. The surgery is a tedious procedure to

perform and there are a number of issues that can come about due to injections into the eye. Future work may use a pulled glass capillary tube for the injections as they will cause less damage to the tissue.

In addition, it was of interest to determine if there was any cellular based immune response. So far, the presence of any immunological cells or the activation of microglia (macrophages of the brain) has not been noticed. Further immunological assays would need to be performed in order to determine whether these cells are present. Future laboratory work will also utilize different techniques to determine the effect that this infection has on the ability of eliciting an immune response in the central nervous system.

Microscopic Analysis (Cells, Infection, Distribution)

In using the light microscope, cells of the periventricular gray zone (the region of cells located in the optic tectum bordering the lateral ventricle) were viewed because this is the cortical structure that processes visual input and this layer contains a very dense layer of cells. These neurons (circular cells) are very small and contain a large nucleus. In contrast, neurons infected with *L. monocytogenes* have less material stained, indicating the degradation or digestion of the cells' components. The breakdown seen inside the cell is most likely the result of *L. monocytogenes* using the host's cytoplasmic and nuclear components as a carbon source as well as the actin cytoskeletal components that *Listeria* uses for motility (Portnoy et al., 2002). Also, infected cells that contain less stained material might be at a later stage of infection, suggesting that the *L. monocytogenes* has utilized most of the cells' internal components to produce the actin filaments needed for its "comet tail."

Differentiating Between Normal Red Blood Cells and Infected Cells

During the microscopic analysis of the adult zebrafish brain tissue, another goal of ours was to be able to discern between red blood cells within capillaries and neurons infected with *L. monocytogenes*. However, this is a difficult task because zebrafish possess nucleated elliptical red blood cells. Therefore, the nucleus looks smaller when compared to the overall size of the cell and can be mistaken for an infected cell (whose inner components have been degraded). To be sure that the *L. monocytogenes* detected was in fish, the lab plans on acquiring a green fluorescent protein expressing strain of *L. monocytogenes*. With this, fluorescent detection would confirm the pathogen's presence.

Future Experiments with *L. monocytogenes*

It is hoped that this study is expanded by viewing our samples using the transmission electron microscope. This would not only provide greater detail, but also

allow the red blood cells and infected cells to be effortlessly differentiated. Future experiments will also seek a more comprehensive understanding of an infection in the visual system by obtaining retina samples from adult zebrafish.

Although it was not tested in this study, it may be interesting to see if any other vital systems were infected with *L. monocytogenes* when the organism is injected into the eye. In conjunction with this, different techniques will be utilized to determine the effect that this infection has on the ability of eliciting an immune response in the central nervous system. Also, pulled glass capillary tubes will be used in place of tuberculin syringes because they allow for ultra-fine needles that will not damage the zebrafish tissue.

Methodological Aspects

This was the first experiment performed in our lab where zebrafish were used as an experimental model for brain infections caused by a pathogen. It can be concluded that there is a presence of *L. monocytogenes* in the brain hours after inoculation into the eye of the fish. At this time, the procedure of inoculation was developed by our group and since this is the first round of the experiment, there may have been a small amount of error in the procedure. The death of some fish only hours after injection seemed to have occurred less as more injections were performed. The ability of the experimenter to inject may have improved over the course of the experimentation.

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Section II:
The Social Sciences

No Boundaries? Understanding Risk of Human-Primate Disease Transmission

Jennifer Ida (Anthropology)[1]

Cross-species transmission of disease between non-human primates and humans has increasingly become of great concern; however, we still lack essential background data on the process. It is hypothesized that close phylogenetic relationships, niche overlap, anthropogenic disturbance, and close contact with humans will increase the likelihood of transmission. This hypothesis is tested through an analysis of the literature. Specific cases of transmission were examined and the key factors of transmission were identified. Factors were then compared across cases. The research demonstrates that the degree of relatedness between humans and non-human primate species, as well as the extent of niche overlap and shared territory, often resulting from human encroachment on primate habitats, are salient factors in explaining frequency of transmission and predicting which species are most affected. The examined species will include baboons, redtail guenons, and chimpanzees. In addition, this research highlights possible routes of exposure, including fecal/oral and aerosol/inhalation transmission. The results then suggest directions for future research, including an examination of ways to mitigate risk.

I. Introduction

By examining cases reported in baboons, redtail guenons, and chimpanzees, we will identify the key factors of disease transmission between non-human primates and humans, i.e. close phylogenetic relationships, niche overlap, anthropogenic disturbance, and close contact with humans, and seek to understand modes of transmission. Transmission of pathogens between non-human primates and humans occurs frequently due to the close phylogenetic relationship between them. The more closely related primate hosts are to one another, the more likely they are to share similar pathogen communities and immunological responses. Because of primates' phylogenetic closeness to humans, the geographic location and spatial distribution of each host species can affect patterns of transmission. That is, host species with broader geographic ranges will be exposed to a greater diversity of pathogens and likely spread disease more frequently.

[1] Research performed under the direction of Dr. Celeste Gagnon as part of the independent study AN593: *Primate Behavior and Ecology*.

Niche overlap, anthropogenic disturbance, and close contact with humans dramatically increase the likelihood of transmission between non-human primates and humans. Degree of niche overlap between humans and non-human primates can have detrimental effects on primate populations. Increased population density often results in human establishments encroaching on animal territory, resulting in the exposure of animals to human pathogens as we will examine using the case of Sapolsky's baboons (Sapolsky and Else, 1987). The influence humans have in changing the environment of primates is an important factor to consider when analyzing cross-species disease transmission as practices such as logging and forest fragmentation have been observed to have lasting effects on habitats (Chapman et al., 2005). Not only do humans influence changes in the environment which, in turn, make animals more susceptible to disease, but they can also be directly responsible for exposing primates to diseases. Ecotourists, researchers, and guides are among those that can often be sources of exposure to disease (Woodford et al., 2002).

Understanding modes of infection is crucial in order to identify patterns of pathogen transmission and make pathogen-specific suggestions for prevention (Gillespie et al., 2008). The modes of transmission examined in this paper include aerosol/inhalation transmission, fecal/oral transmission, and other indirect routes such as reservoirs.

Disease transmission can have devastating effects on primate populations and cause serious conservation risks to many non-human primate populations that are already threatened or endangered (Chapman et al., 2005). By applying data retrieved from past and current research, preventative steps could be mapped out with potential for implementation.

II. Discussion

Phylogenetic Relationships

Close phylogenetic relationships between primates and humans arguably allow for the transmission of infectious disease across species lines with relative ease. The more closely related two primate species are to one another, the greater the chance there is for them to share similar levels of parasite richness (Nunn et al., 2003). Due to their close evolutionary relationships, primates often share similar immunological responses which directly influence the successful establishment of cross-species infection (Pedersen and Davies, 2009).

Davies and Pedersen (2009) used the human disease database (Taylor et al., 2001) and the Global Mammal Parasite Database (Nunn and Altizer, 2005) to measure pathogen

sharing between humans and primates. Using generalized linear modeling, they were able to determine the relationship between the evolutionary divergence of 117 primate species (according to the dated phlyogenetic tree of Bininda-Edmonds et al., 2007), and their pathogen communities. Their results suggested phylogenetic relatedness can be used to understand a third of the variation in pathogen communities. In other words, the more closely related primate hosts are to one another, the more likely they are to have similar pathogen communities.

Animals that are phylogenetically close to humans, such as gorillas, chimpanzees, and orangutans, are therefore susceptible to many of the infectious diseases of humans (Woodford et al., 2002). In fact, the list of communicable diseases that primates and humans share, as compiled by Woodford and colleagues (2002), is quite extensive. They include the following: the common cold, pneumonia, influenza, hepatitis, smallpox, chicken pox, bacterial meningitis, tuberculosis, measles, rubella, mumps, yellow fever, paralytic poliomyelitis, encephalomyocarditis, and Ebola fever. The following parasitic diseases are also included: malaria, schistosomiasis, giardiasis, filariasis, infection with *Strongyloides* spp., *Entamoeba* spp., *Oseophagostomum* spp., *Acanthocephala* spp., *Cyclospora* sp., *Giardia* sp., and *Sarcoptes* sp (Woodford et al., 2002).

It is important to keep in mind that not all organisms that are highly infectious in one species are also highly infectious in another, even closely related species (Reinquist and Whitney, 1987). Viral diseases can easily be transmitted from humans to primates or primates to humans, yet have dramatically distinctive effects. This is often seen in the transmission of *Herpes simiae,* also known as herpes b. Herpes b is usually latent in species of non-human primates such as macaques, yet if transmitted to humans can quickly result in serious illness and mortalities. Herpes b antibodies are present in close to 25% of macaques. Reinquist and Whitney suggest that all macaques should be considered carriers due to the level of difficulty in identifying carriers. The effects of the disease on the natural host, usually either rhesus or cyanomolgus macaques, are minimal with the most severe cases developing mild skin lesions. However, mortality rates are extremely high (90%) in humans with only 2 of the 20 reported cases surviving.

Geographic Location

Geographic range, the measure of the total area covered by a species, is considered to be a significant factor in predicting viral and protozoan species richness (Nunn et al., 2003). A parasite community can be easily increased by species that cover a wide geographic area. The wider the area, the more likely they are to share territory with other species and therefore share pathogens, resulting in the rapid growth of a parasite

community. This, therefore, means that a host species with a broader geographic range will also be exposed to a greater diversity of pathogens due to niche overlap.

The work of Pedersen and Davies (2009) particularly emphasizes this point. Their study focuses on measuring the phylogenetic risk of host shifts, that is, the likelihood of pathogens shifting between neighboring hosts that are also closely related. They found that there was a high correlation between phylogenetic risk and the number of geographically overlapping primates. They were also able to determine the centers of high phylogenetic risk of host shifts from wild primates to humans, known as hotspots. For example, although Amazonia was found to have a high frequency of host shifts between primates, it is not considered a hotspot for humans due to how distantly related New World primates are to humans. Therefore, areas where Old World primates reside (central Africa) seem to pose a higher phylogenetic risk. It is important to note that although Davies and Pederson use their data to suggest hotspots for transmission of pathogens from primates to humans, it can also be used to suggest the reverse.

Niche Overlap

Increased population density often results in human establishments encroaching on animal territory, resulting in the exposure of animals to human pathogens. In the case of Sapolsky's baboons, a troop of wild olive baboons in Narok District, southwest Kenya, the effects of human contact and disturbance went far beyond population declines (Sapolsky and Else, 1987). Close human contact due to niche overlap led to infection of the troops with bovine tuberculosis, resulting in permanent change to the troop's social behavior. Two troops were under study by Sapolsky and his colleagues. The first troop, Garbage Dump Troop, was observed scavenging for food in the garbage dump of the only nearby village as well as in a dump located behind the local slaughterhouse. The other troop, Forest Troop, was observed venturing out of their territory into the territory of Garbage Dump Troop in order to gain access to the refuse dumps. However, it was only the most aggressive adult males of Forest Troop that were up to this task.

Local villagers soon recognized signs of illness among the animals and reported them to the authors. Subjects were diagnosed with *M. bovis,* bovine tuberculosis. The Garbage Dump Troop suffered a population decline of approximately one-third of their population, while only adult males of Forest Troop were infected. Sapolsky and Else (1987) demonstrated that the outbreak of *M. bovis* infection arose from slaughtered, infected cows at the slaughterhouse. Baboons were seen gathering around the open killing area and feeding on animal waste and blood.

However, infection was not the most alarming effect. The deaths of the males from Forest Troop greatly changed the composition of their group (Sapolsky and Share, 2004). The deaths more than doubled the female to male ratio and by 1986, the troop was experiencing changed behavior. Because only less aggressive males survived, dominance interactions were no longer the same. What is even more astounding is that these behaviors still persisted nearly seven years later. The unusual behaviors that surfaced because of the deaths in 1983 were still in existence. This means that new males that were joining the group were adapting to the troop specific behaviors, an occurrence that was unseen in wild primates before this.

Anthropogenic Disturbance

The influence humans have in changing the environment of primates is an important factor to consider when analyzing cross-species disease transmission. Such practices as logging and forest fragmentation have lasting effects on habitats (Chapman et al., 2005). Studies, such as the one conducted in Kibale National Park, Uganda (Gillespie et al, 2005), have shown that anthropogenic disturbances such as these can alter primate-parasite interactions and lead to changes in gastrointestinal parasite infections. Redtail guenon populations in logged areas suffered from gastrointestinal infections that were greater in both richness and prevalence as compared to populations without human disturbance. The redtail guenons of the logged forest were infected with the following three parasite species: dicrocoeliid liver fluke, *Chilomastix mesnili*, and *Giardia lamblia*. In logged areas, infective-stage primate parasites were found at higher densities, suggesting a greater risk of infection for both human and nonhuman primates. Gillespie and colleagues (2005) identified what they considered to be accurate predictors of infection prevalence by observing the correlation between "forest-fragment attributes and infection patterns" (p. 141). They found that there was a direct relationship between tree-stump density, an indication of degradation, and the prevalence of parasitic nematodes (Chapman et al., 2005). They concluded that the degree and nature of anthropogenic disturbance affect the transmission of gastrointestinal parasites. One possible explanation is that the primate populations in disturbed areas no longer have access to needed nutrients. This added stress can lower the animals' immunity and cause them to be more susceptible to parasites. Another suggests that the redtail guenons' susceptibility to parasites may have increased due to restricted mobility created by limited habitat space.

In models used to determine the effects of anthropogenic change on host-parasite interactions, "changes at the multiregional scale" (Chapman et al., 2005, p. 141), which they define as "[processes] that act indirectly on an ecosystem-wide level to

modify disease transmission patterns" (Chapman et al., p. 138), take climate change into account as one key way host-parasite interactions are affected. Chapman and colleagues (2005) argue, "The larger the geographic scale over which host-parasite interactions change, the greater the number of populations that can potentially be affected. Climate is the factor that has the greatest potential to influence host-parasite interactions at this spatial scale" (p. 141). The emergence of certain diseases is often associated with particular seasons. For instance, hot, arid conditions have been noted to cause the eruption of epidemics, such as meningococcal meningitis. Chapman and colleagues (2005) refer to the work of Guernier, Hochberg, and Guegan (2004), through which they point out that the dispersion of human pathogens is directly related to climatic factors. They draw attention to the greater concentration of pathogens near the equator and suggest that these trends will continue to increase with global warming. They explain these patterns using the climatically-based energy hypothesis which suggests that species richness gradients depend on energy availability (Guernier et al., 2004). Guernier and colleagues (2004) conclude that precipitation, particularly degree of wetness, is responsible for pathogen distribution. Because pathogen richness and prevalence are directly related to an area's wetness, tropical areas tend to harbor a larger variety of species. Climatic changes such as those seen during rainy seasons facilitate transmission of water-borne diseases and can also provide new breeding grounds for vectors, therefore, increasing diseases such as those that are mosquito-borne (Chapman et al., 2005).

The influence of stress due to anthropogenic change can have detrimental effects on primates. The destruction and fragmentation of the primates' natural ecosystems are responsible for the increasing stress put on primates (Woodford et al., 2002). This leads to the facilitation of pathogen transmission and the development of various strains of diseases. Stress may also come from habituation, which often leads to further susceptibility to diseases due to immunological, gastro-intestinal, and cardiovascular changes (von Holst, 1988).

Close Contact

Not only do humans influence changes in the environment which, in turn, make animals more susceptible to disease, but they can also be directly responsible for exposing primates to diseases. As a result of increasing human population density, tourists, researchers, and guides are among those that can easily be sources of exposure (Woodford et al., 2002). Although a traveler may not be aware of their illness, they can bring new strains of a disease to an area. Also, stress due to travelling can leave tourists open to contraction of local intestinal infections, allowing them to pass on those diseases

to nonhuman primates during tours. Woodford and colleagues (2002) point out that even if a visitor was aware of his/her sickness, he/she would be reluctant to admit it after paying a substantial amount of money to gain admittance into the primates' habitat.

Researchers and those responsible for the management of habituated primates have an even greater chance at exposing the primates to disease. Researchers and managers often spend hours in close contact with the animals, creating opportunities for the rapid spread of disease across species lines. Wallis and Lee (1999) demonstrate the risk researchers pose at field sites. The necessity of habituation results in the primates becoming comfortable in close proximity to the human researchers, rather than retreating as humans approach. As a result of habituation at research facilities, primates have been observed approaching humans, even taking a seat beside researchers without hesitating to make direct physical contact. Although research presence has provided many positive results for primates, such as reducing poaching, it is important to keep in mind that there are also negative effects and attention needs to be put on reducing these effects, while maximizing the many positive effects (Kondgen et al., 2008).

Guides and guards might pose the greatest threat as they are in daily contact with both primates and tourists and their pathogens (Wallis and Lee, 1999; Woodford et al., 2002). Ironically, given their degree of contact, they often do not have the same access as tourists do to vaccinations or medical care, putting them at even greater risk of infecting primates or themselves.

Three communities of habituated chimpanzees in the Ivory Coast were negatively affected during a research project that took place over a period of seven years (Kondgen, 2008). The three chimpanzee communities suffered from five distinct respiratory illness outbreaks, with three of the five outbreaks leading to the following mortalities: six of thirty-two chimps died in the north group in 1999; eight of forty-four chimps dies in the south group in 2004; one of thirty-four chimps died in the south group in 2006. Although these numbers appear small, each death is significant in an endangered species such as the chimpanzees.

Fifty percent of the deceased individuals were examined and, of these, one hundred percent tested positive for human respiratory syncytial virus (HRSV) and human metapnuemovirus (HMPV), both of which are common causes of human respiratory disease. The authors conclude that humans, the only known reservoir for both viruses, are responsible for introducing the two viruses directly into wild populations.

This is not the first case of this type of transmission being reported. Two cases of zoo chimpanzees being infected with a febrile paralytic disease were noted prior to the eradication of polio in the United States. Cross-species infection was suggested because

of the closeness of contact with humans in zoo environments (Ruch, 1959). One of the chimpanzees exhibited signs of loss of appetite and weakness in her left leg. Although she was able to recover, the male chimpanzee, also exhibiting signs of weakness, became paralyzed in his left arm and developed lesions comparable to human poliomyelitis lesions. Poliomyelitis illness was reported in two children who had recently visited the zoo, suggesting transmission had occurred, though the origin of the disease was not identified. In the anthropogenic environment of zoos, there is concern about disease transmission due to high rates of human and animal contact. In spite of the efforts of zoos to significantly improve the quality of life for their animals, disease transmission remains a legitimate concern. Improvements are often made by increasing enrichment activities. Unfortunately, these enrichments often require close contact between the keeper and animal.

Although tourists, researchers, and guides are all at risk of infecting primates, preventive protocols could be implemented in the future to prevent transmission. However, this is not the case for unintentional contacts such as those with villagers, poachers, prospectors, miners, loggers, forest-product gathers, refugees, aid workers, bandits, and soldiers who may come in contact with wild primates (Woodford et al., 2002). Woodford and colleagues (2002) note that disease risk load is high among refugees because of over-crowding, exposure to the elements, poor sanitation practices, and malnutrition. Excrement left by the refugees lead to contamination of the surrounding environment and thus can lead to the decline in health and overall survival of nearby primate populations.

Hunting of wild primates, which involves tracking, capturing, handling, transporting, preparing, and consuming meat (Wolfe et al., 1998) requires exceptionally close contact between humans and wild primates, and in particular the bodily fluids of primates (Chapman et al., 2005). Hunting often occurs at high, unsustainable levels especially among many local communities which obtain their major food source from hunting primates. Chapman (2005) notes the following:

> "A single family of rubber tappers in a remote forest site of western Brazilian Amazonia killed more than 200 woolly monkeys, 100 spider monkeys, and 80 howlers during an 18 month period. In remote villages in Cameroon, more than 60% of the community reported having butchered nonhuman primates, 30% hunted primates, and 11% reported keeping primates as pets" (p. 139).

Routes of Exposure

Understanding modes of infection is crucial to understanding how pathogens are transmitted and the possible impacts transmission could have on a host species (Gillespie et al., 2008). Woodford and colleagues (2002) categorize infectious agents that could be transmitted from humans to primates according to their mode of transmission: aerosol/inhalation transmission, fecal/oral transmission, and indirect routes. Aerosol/inhalation transmission refers to diseases transmitted by coughing, sneezing, spitting, and nasal discharge (Woodford et al., 2002). Infectious aerosols can be projected several meters by these means. Diseases transmitted by aerosol/inhalation transmission include the common cold, influenza, poliomyelitis, mumps, measles and chicken pox as well as the bacilli of *Mycobacterium tuberculosis*. The risk of infection by aerosol/inhalation transmission is directly correlated with closeness of contact. Regular close contact with humans often leaves animals subject to the residuals of human behavior. The discarding of contaminated objects into the environment, a frequent practice of humans, could easily spread disease. Woodford and colleagues (2002) observed that because young apes are attracted to and may eat unclean, discarded handkerchiefs, they can pose a particular threat.

Fecal/oral transmission refers to diseases transmitted by contact with infected feces (Woodford et al., 2002). Introduction of pathogens can be caused by humans defecating or vomiting in the primates' habitat, especially if it is within visible sight of the animals. Fecal/oral transmission pertains to bacterial organisms, viruses, protozoa, and parasitic intestinal worms. Bacterial organisms that are transmitted by fecal/oral include *Campylobacter* spp., *Shigella* sp. and *Salmonella* sp. Hepatitis A and B and poliomylelitis are among some of the viruses. Protozoa transmitted by fecal/oral transmission include *Cryptosporidium* sp., *Cyclospora* sp., *Entamoeba* spp. and *Giardia* sp.

Non-primate natural reservoirs, such as biting insects and intermediate hosts, could also act as a means of transmission between humans and primates. Arthoprods such as lice, ticks and fleas can easily infest nonhuman primates (Reinquist and Whitney, 1987), which can then transmit the disease to humans though contact. Such diseases include malaria, filariasis, and a range of arboviruses. Transmission of one arbovirus, human malaria, by mosquitoes to young orangutans in close contact with humans has been documented (Kilbourn et al., 2003). Other arboviruses, including dengue fever and yellow fever, also have life cycles that involve a range of non-primate host species. Yellow fever uses the mosquito as its vector to transmit the disease to primates, its host reservoir (Reinquist and Whitney, 1987). This suggests that reservoirs can undermine the most hopeful eradication efforts (Wolfe et al., 1998).

Effects & Prevention

As noted through these examples, disease transmission can have devastating effects on primate populations, and cause serious conservation risks to many non-human primate populations that are already threatened or endangered (Chapman et al., 2005). Blood loss, tissue damage, and spontaneous abortion are among some of the most unfavorable outcomes, while malnutrition, difficulty escaping predators, and competing for resources are some of the less severe consequences (Gillespie et al., 2008). For example, contraction of the measles by macaque populations has been reported to lead to high mortality rates as well as spontaneous abortions of fetuses among females (Lowenstein, 1993; Renne et al., 1973). Group behavioral changes have also been reported as is the case with the baboon troop in southwest Kenya (Sapolsky and Share, 2004).

Given the information we have on the routes of pathogen transmission and the effects of human contact and anthropogenic environmental change, we have the resources necessary to begin taking preventative steps. Woodford and colleagues (2002) outline regulations that need to be followed in the case of gorillas in tourist heavy environments. For instance, recommendations include having researchers, guards, and guides tested annually for diseases such as TB and appropriately vaccinated. Tourists should be well-informed about regulations for visiting and the risk of disease for primates. Following the existing regulations would also reduce the risk of transmission. These include not permitting visitors to be within 5m or make contact with the animals, not exceeding the maximum number of individuals in each tour group, and strictly enforcing the regulation concerning the discard of materials in ape habitats, which as discussed above can pose a serious threat to the animals (Woodford et al., 2002).

Studies suggest that the best way to prevent future disease spread is by examining past and present relationships between host relatedness, geographic overlap, and pathogen community similarity (Pedersen and Davies, 2009). By examining these relationships, Pedersen and Davies (2009) demonstrate how they are able to quantify the risk of future host shifts that each species faces. They also examine how past host shifts between primates might have shaped pathogen communities by taking a closer look at host specificity. Their study identifies regions where non-human primates and human host shifts may occur in the future. They identify which lineages and within which geographic areas disease emergence may be most likely. Due to limited data concerning initial pathogen movement, it has proved challenging to create predictive models. However, such predictive models appear to be the most promising preventative method and certainly warrant future studies.

According to Wolfe and colleagues (1998), in order to predict pathogen emergence, we need close observation of primate populations, which will allow us to recognize behaviors associated with emergence. Such behaviors may include the consumption of specific plants or insects. This, for instance, may help us to identify the reservoir of Ebola virus. Although such monitoring increases risk, they still conclude that more systematic monitoring of primate populations through long-term studies will provide us with the most useful and pertinent information needed to control novel pathogens.

Wallis and Lee (1999) take a slightly different approach to prevention. They note that many programs focus on extracting humans from the equation, which they feel is not the most practical and efficient approach. They point out that many savannas have been maintained by humans for a considerable amount of time and that by changing this dynamic, we may be faced with unexpected ecological consequences. Instead, they suggest a solution that promotes the idea of protection from exploitation rather than from people in general. They suggest creating programs that would educate the local residents about conservation efforts and, in particular, the health aspects surrounding conservation by enticing the public with revenue-sharing programs and offering them the opportunity to participate in decision making. They do acknowledge that it is important to be cautious when educating local populations about topics such as disease transmission. Programs should make an effort to stress that the health of primates is not more important than the health of humans. They should also be careful as not to evoke fear or panic in local residents (Wallis and Lee, 1999). Such approaches can prove more complicated in practice, especially if the local culture is not thoroughly understood by those initiating such programs.

III. Conclusion and Future Research

Given the state of current research on transmission of pathogens between humans and primates, it is obvious that further studies are necessary in order to give us clearer insight into such areas as animal reservoirs and potential hotspots. These are topics in which data are limited and relatively recent, with the first study on predicting the likelihood of potential host shifts only having been conducted in 2009. Incorporating primates into studies that until now were focused on such animals as birds, pigs, and cows can provide us with information that would prove indispensable to the field. Development of more systematic means of monitoring is crucial to future advancement. Such systematic monitoring would enable us to distinguish the effects of host density and habitat characteristics on patterns of infections within primate populations (Gillespie et

al., 2008). Gaps in geographic sampling of parasites as well as phylogenetic uncertainty of infectious agents must also receive the much needed attention in order for them to be filled. Focus on generating epidemiological models that combine both data on parasite prevalence and data on parasite richness is another area that has yet to be covered, but could potentially provide vital information and possibly lead to the development of innovative questions. Of course, with gaps in background data such questions would be impossible to formulate. Lastly, we would like to emphasize, as many others such as Jones-Engel et al. (2001) have already pointed out, that future research in this field would have endless benefits in that not only would it work to prevent future epidemics in primates and work toward the conservation of many already endangered species, but it would also work directly to prevent future outbreaks of infectious disease that would threaten the health of human populations worldwide.

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Section III:
Critical Essays

Double Vision: The Utilization of Metempsychosis and Dual Identity in *Aura*

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The themes presented in Carlos Fuentes's novel, *Aura*, involve the reader in a spiraling story about human identity. The persistence of the theme of "the double" throughout the novel leaves the reader with a dizzied, uneasy feeling. The blurring of lines between different characters, epochs and identities forces the reader to question the reliability of the narrator. The genius of the novel lies within the usage of the second person narrative, which in effect forces the readers to question their own interpretation of the text. Fuentes's short and yet poignant novel addresses not only the idea of duality of consciousness, but also, as in many of his other works, entangles both the audience and Felipe in a labyrinth of mystery. By the time the riddle of the text is solved, it is too late for Felipe to escape the mental coup, that alters his identity.

The novel's title, "Aura", gives the reader an indication of the spirituality and a foreshadowing of the mysterious atmosphere of the novel, before even turning to the first page. The definition of the word gives way to the utter intangibility of an aura. Though an aura is pervasive and distinctive, an onlooker will never be able to physically grasp an aura. The elusive is a theme throughout the novel, as its main character is unable to grasp the gravity of the situation in which he finds himself. Also, while Felipe desires Aura, when he goes to reach for her, she vanishes like smoke. The visualization of an aura emanating from individuals obscures their image, making it unintelligible to the onlooker. As the novel nears the end, Felipe is able to see through that thick aura, much to his surprise, to see what it has been hiding.

Fuentes' utilization of second person narration was no accident. Cleverly, the author places the reader at the forefront of the novel, in the midst of this strange conglomeration of sensorial imagery. Fuentes's intentions become clear when one realizes that "a hypnotist often employs the second person as he addresses an individual who is being placed in a trance" (Gyurko 1361). The audience is unable to take any portion of the author's environmental descriptions lightly, as a reader is forced to visualize every image, smell every odor and feel every sensation. Fuentes leaves no sense

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forgotten when he paints the picture of the atmosphere of the novel. Naturally, as the reader follows the rarely used second person narrative, there is a more personal quality to the story. Most audiences are unaccustomed to being addressed by the author, but it's clear that Fuentes seeks to make the reader a participant in the novel's plot. Fuentes's tactic proves to be essential in getting the reader intimated with the happenings of the haunting novel. The mysterious nature of the story would be lost on the reader had phrases like, “you love her, you too have come back...”, not been incorporated by way of the second person narrative (Fuentes 145).

The unique quality of the second person narrative allows the reader to appreciate the sensorial imagery throughout the novel. Understanding the atmosphere in Aura is key to recognizing the foreshadowing and clues that Fuentes dangles in front of the reader. It is in Fuentes's vivid descriptions of the atmosphere that the reader begins to get a glimpse of what is to come. Fuentes's introduction to the double identity appears very early, but first he creates a “thick and drowsy” atmosphere that will distort the reader's and Felipe's senses for the greater part of the novel (Fuentes 11). The skin crawling sensations the reader experiences as he picks up “old grimy bottles” in the “damp and cold” house add to the reader's suspicions that dark forces are at work in Señora Consuelo's home Fuentes 39). The sound of the constantly yowling cats and the pungent smell of liver and onions heightens the reader's awareness of the haunting aura that permeates the house. The dingy Donceles 815 seems to breathe, as if alive, because of the humidity and plentitude of vermin.

As Felipe searches for the address given in the newspaper advertisement for a job practically written for him, he is struck by the “...conglomeration of old colonial mansions...converted into repair shops, jewelery shops, shoe stores, drugstores” (Fuentes 9). The reader gets the first taste of the multiple identities for which Fuentes' novels are famous when Felipe realizes that the house number had “...been changed, painted over, confused” (Fuentes 9). Little does Felipe know, the conversion of old to new will have significant meaning for him in the near future. It is no coincidence that Señora Consuelo and her beautiful niece are situated in the only part of town where antiquated mansions have been converted into new, prosperous shops. The town serves as a macrocosm for the reality that Felipe is about to step into. The once striking homes, like Consuelo, have withered at the hand of time, forcing them to reinvent themselves and maintain their youthful appearance.

The contrast of light and darkness plays an integral role in the shaping of *Aura's* eerie atmosphere.While most of the house remains in total darkness, some light streaks in from holes in the wall where the rats had chewed straight through to the outside world.

Felipe's room, the only room where his mind does not feel clouded, also has some sunlight streaming in from the windows. The inhabitants have been accustomed to feeling their way around the furniture and counting the steps to each passageway. As Felipe takes an account of the dining room, he notices that he is able to easily separate the room into two different elements: “the compact circle of light around the candelabra, illuminating the table...and the larger circle of darkness surrounding it” (Fuentes 43). Felipe's report of the darkness of the room serves as a symbol of the unknown, while the illuminated area, considerably smaller, represents what he knows to be true. As he continues to drink the “thick wine” occasionally shifting to ensure that Aura won't catch him in his hypnotized glances of uncontrollable adoration, Felipe's circle of illumination begins to shrink. He falls deeper and deeper into the darkness of the unknown at a rate directly proportional to the rate that he imbibes the herb-infused wine.

It isn't until the novel's final scene that Felipe becomes fully illuminated both literally and figuratively. St. Augustine's theory of illumination plays a particular role in the contrast between light and dark in *Aura*. St. Augustine, in his critique of traditional Cartesian paradigm, asserts that an individual's soul will be brought to, what he calls, the natural light of reason (Augustine 161). The “...ray of moonlight that shines in through a chink in the wall...” that illuminates Aura's eroded face surely is the critical point in Felipe's revelation (Fuentes 145). Montero, as a consequence of the light, became an informed character, with what was darkness before, now fully visible to him.

The dualistic infusion that Fuentes often incorporates into his novels are not limited to contrasts between light and dark; the idea of dual identity is the paramount theme of virtually all Fuentes's works. In *Aura*, Fuentes incorporates metempsychosis in order to account for the hallucinogenic feeling the protagonist, Montero, experiences when he feels his identity beginning to change. The transmigration of souls, also called metempsychosis, is a fundamental doctrine in many Eastern religions. Each religion has variations of the theory, but in general, the doctrine suggests that “the soul passes from one body to another, either human, animal or inanimate” (Columbia Electronic Encyclopedia 1). In Hinduism, the soul is thought to have entered the body of another after death, while Buddhism rejects this belief and modifies it to claim that there is an undifferentiated stream of being that prolongs existence for a pious soul (Columbia Electronic Encyclopedia 1)

The variation of the reincarnation theory is clearly tested in *Aura* through the characters of Aura and Felipe. Fuentes clarifies which type theory of transmigration he identifies with in the novel. At one point, Señora Consuelo, explaining to Felipe the nature of animals, remarks “they're always themselves, Señor Montero” (Fuentes 81).

Consuelo hints at the difference between the souls of animals and humans, claiming that humans share an identity with a concealed double self. Of course, Fuentes does not subscribe unquestioningly to the traditional theory of transmigration. He adapts *Aura* in order to incorporate a duality in the religious themes of the text. To that end, Fuentes's famous ambiguous texts leave his meanings open to interpretation.

The idea of an immortal soul reminds the reader of the Platonic tradition of soul rebirth or even Empedocles's tale of the double human in Plato's "Symposium". The theory of a latent, double identity has fascinated humans since the era of Ancient Greece. Felipe's transformation into General Llorente not only fascinates him, but also horrifies him. However, in Empedocles's account of love in the "Symposium", he describes a time when all humans existed with their double attached at the hip. In the novel, Felipe's duality is not quite as publicly visible as being attached at the hip, but rather the spirit of General Llorente seems to be attached to that of Felipe's. For those subscribing to Western thought, "never finding, nor conceiving it possible, that two things of the same kind should exist in the same place at the same time...conclude that anything that exists anywhere...is there itself alone" (Locke 681).The idea of two spirits inhabiting the same physical space is puzzling to a subscriber of the Western paradigm, but it is very clear in the novel that Fuentes seeks to experiment with Felipe's identity. As is true of many of Fuentes's literary characters, "identity is multiple and unstable, as are time and space" (Gyurko 1360).

Felipe gets his first inclinations of mysterious activity between the two women in the house as he notices their mirrored gestures. During his first interview with Consuelo, regarding the translating position that has brought Felipe to the dilapidated home, Felipe notes that "the girl nods and at the same instant the old lady imitates her gesture" (Fuentes 25). This is only the first of many echoed gestures between the young and old hostesses. In several scenes, like the one in the dining room, Felipe witnesses a strange interplay between the Señora and her younger counterpart. Felipe incorrectly interprets this tension between the two women as Señora Consuelo's tyranny over Aura, "but at that moment the Señora becomes motionless, and at the same moment Aura puts her knife on her plate and also becomes motionless, and you remember that the Señora put down her knife only a fraction of a second earlier" (Fuentes 69). After several moments of silence, with Felipe swinging his head back and forth between the women, trying to understand their simultaneous hesitation, both the women excuse themselves from the table. It is this type of behavior that leads Felipe and the reader to question the accuracy of the narration;"perhaps you only imagined it" (Fuentes 59).

Felipe never questions the cause of his dream-like and hypnotized state, but Fuentes gives the reader hints of possible causes of this mental fogginess. At every meal, Felipe mentions that he imbibes the thick red liquid which he assumes to be wine. Through him, the reader feels as if they are under the influence of psychotropic drugs; everything seems to happen in slow motion. As Aura leaves the table, Felipe watches her "[get] up with a motion like those you associate with dreaming..." (Fuentes 71). Eventually, Felipe recognizes that he too has fallen into mechanical, hypnotized mentality; he identifies his "...sleep-walking movements with those of Aura and the old lady" (Fuentes 99). One must assume that the "pointed heart shaped leaves of the nightshade, the ash-colored down of the grape mullein with its clustered flowers; the bushy gatheridge with its white blossoms;and the bella donna" that are in full bloom outside the house, have made their way into the strange concoction that Montero recounts drinking each night. Fuentes points the reader to the source of Felipe's lethargy as he recounts that the herbs are used to "dilate pupils, alleviate pain, reduce pangs of childbirth, bring consolation, weaken the will, and induce voluptuous calm" (Fuentes 103).

The effects of the herbs on Felipe's mental states account the hallucinogenic experiences, but the reader's interest must then focus on determining the extent to which these hallucinogens have warped Felipe's reality. Fuentes gives the reader the chance to wonder whether the characters in the story are accurately described or even existent. The reader cannot be sure that Señora Consuelo or the youthful Aura are not a figment or construction of Felipe's mind. The story could be enjoyed as a neurotic hallucination or a tale of soul transmigration (Guerard 5). The only part of the story that the reader can be certain of is Felipe's account of reading the newspaper advertisement. As soon as Felipe walked through Señora Consuelo's threshold, the reader could rely on his perception of events. However, the audience can be fairly certain that Felipe was purposefully lured to the home by Consuelo's newspaper article that was crafted to address Montero directly. Felipe's remark that the newspaper ad "seems to be addressed to you and nobody else" is Fuentes's method of hinting to the audience that Felipe's accounts, while blurry, are generally accurate.

In literary history, many novels have dealt with the doppelganger effect; one such novel is that of Stephen Conrad's, called *The Secret Sharer*. The short story depicts a ship's captain struggling to deal with the his inner duality. The captain comes upon a naked man clinging to the side of his ship, claiming that he escaped from the near by ship, *Sephora.* The man, calling himself Leggatt, fled from the *Sephora* after killing an insolent man aboard the ship. Almost immediately, the anonymous captain and Leggatt

form what the captain calls a “mysterious communication” between the two (Conrad 65). The captain feels a strange affinity for this refugee. Leggatt is secretly harbored by the captain in his quarters, until he must be marooned on an island to avoid discovery. The narrator confides that he is new to the ship and “...somewhat a stranger to [himself]...” as well (Conrad 58). He constantly refers to the stranger as his double, almost as if he had suspected that there was a latent identity within him. He explains that seeing Leggatt was “as though [he] had been faced with [his] own reflection in the depths of a somber and immense mirror” (Conrad 67). In *Aura*, Montero describes a similar phenomena in which his body seemed to recognize that it was exactly where it was supposed to be. Felipe claims that he began “feeling a pleasure [he'd] never felt before, one that only now [he's] experiencing fully, setting it free...” (Fuentes 45). In hindsight, the audience now knows that this feeling was the soul of General Llorente manifesting itself in Felipe.

While both Fuentes's and Conrad's text confront the idea of identity duality, Conrad's protagonist greets his doppelganger as if he'd been expecting him. The captain's demeanor in accepting Leggatt makes the arrival of his duality seem like a non-event, while contrastingly, Montero's recognition of his duality spans the entire novel and his recognition is coerced with psychotropic herbs. Conrad seeks to prove that “...even the most rational man possesses a dual nature, that no man is above the threat of the irrational” (Rosenfield 319). Although the captain's double is given a literal personification unlike Felipe's inner duality, both the characters seek to hide or deny its existence to outsiders. One of the recurrent themes of the double in literature is “the need to keep a suppressed self alive, although society may insist on its annihilation” (Guerard 2). This theme is exhibited in both Fuentes's and Conrad's novels.

The suppression of the double identity is exhibited in Felipe's denial of it and in the captain's literal sheltering of Leggatt. After countless foreshadowing of the double, Felipe refuses to acknowledge his inner duality. It is only when the relationship between Aura and Consuelo is fully revealed that he is able to come to terms with his own duality. By then, it was too late for Felipe to deny General Llorente access to his body. The General's spirit had already metastasized. Though the captain admits to the reader that he recognizes his double in Laggatt, he must conceal him all the same. The captain believes that if one of the crewmen were to come upon the two men in his cabin “he would think he were seeing double or imagine himself come upon a scene of weird witchcraft...” (Conrad 70). The captain knows that if he were to publicly acknowledge his other half, his ship mates would “...[steal] glances at [him]” to check for signs of “lunacy or drunkenness” (Conrad 109). Both protagonists suppress their suspicions of double identity for fear of being rejected by others.

The denial of the alternate identity manifests itself not only in Felipe and the captain, but also in Consuelo, although the former are more genuine in their disbelief than the latter. Felipe's account of events are fuzzy due to the effects of the herbs that alter his consciousness, but his continued pursuance of Aura after he views the photographs of her, looking the same in the present as she did sixty years ago, suggests that Felipe began to get an inkling of the truth early on. Again, Felipe recognizes his own face, "...as if [he] were afraid that some invisible hand had ripped off the mask [he'd] been wearing for twenty seven years..." and superimposed it onto the picture of General Llorente, but he continues to refuse to concede his second identity (Fuentes 137). Yet, Felipe, only a few minutes later, finds himself caressing Consuelo's naked, withered body. Consuelo's denial of the mysterious yowling cats and plentiful garden only add to the mystery of the novel. Of course she does not genuinely deny Aura's representation as her counterpart, but she must outwardly deny it until Felipe is comfortable with his own duality.

The captain, though recognizing himself in Leggatt, does not admit that Leggatt does not exist outside of his own mind. In a sense, the captain is denying the existence of his duality by projecting his second identity onto an actual person. The fact that the crew men and servant never discover the stranger in the close quarters and lack of privacy allowed by the ship at sea, suggests that the captain is feigning Leggatt's existence in another body, outside his own. Unconsciously, the captain has welcomed a secret sharer into both his cabin and his mind. He is even surprised by his conscious's hinting at its duality when Legatt remarks, "it would never do for me to come alive again" (Conrad 103). The captain, exasperated by his inner consciousness's urging him to admit the truth of his double identity, dismisses the statement by retorting, "it was something a ghost might have said" (Conrad 104). By placing the culpability of the strange statement onto Leggatt, the captain is able to laugh off the reality of his bifurcated consciousness.The captain's denial of his inner Leggatt is mirrored by Felipe Montero's denial of his inner General Llorente.

Fuentes's struggle to create a Mexican identity through his literature gives the reader an indication of why most of his works portray the characters struggling with identity. The Malinche's first born, the very first mestizo, was the starting point of the dual identity with which many Latin Americans struggle. The mix of Spanish and indigenous blood does not create a sense of pride for many mestizos. The fact that the Spaniard, Hernán Cortés, "...disembarked at Veracruz to not bring peace, but genocide, subjugation and destruction of the Nahautl culture" has left many mestizos ashamed of at least half of their heritage (Boldy 291). Felipe's shame and denial of General Llorente's existence within him is a symbol of this identity shame exhibited by mestizos. Felipe's

denial of Llorente represents the Mexican resistance to foreign figures of authority, which as history suggests, ultimately leads to tyranny. History has proven that the presence of a foreign power within is like "...a monstrous Other that rapidly erodes and finally devours the original self" (Gyurko 1361). This scenario is clearly depicted within the novel through Felipe's transformation into General Llorente.

Fuentes even incorporates the stigma against the Malinche for betraying her culture by copulating with the ruthless Cortés. The Latin American sense of machismo and chauvinism is demonstrated by Señora Consuelo's willingness to allow a foreign presence in her soul in comparison to Montero's resistance. Consuelo is depicted as an evil sorceress and in Felipe's own words a "...perverse, insane old lady" (Fuentes 73). General Llorente, Consuelo's husband and Felipe's alter identity, was also a soldier who served the foreigner, Maximilian. The Malinche's weakness in loving a foreigner is mirrored in Consuelo's choice of husband. What is more, Consuelo was so obsessed with perpetuating her youth, that she has dedicated her life to creating a dual identity, namely Aura. From his memoirs, the General divulges that his barren wife resorted to tempting God with her rituals and even welcoming in this foreign identity. *Aura*, though very subtly, is both a search for Mexican identity and a criticism of feminine weakness.

Fuentes's novel opens with a promise to include the reader and Felipe in an exclusive journey toward knowledge; however, by the end of the reading, the themes of the text are even more elusive. Fuentes manipulates the language of the novel to appear as if the reader has preferential status through the usage of the "tú" form. The reader can't help but feel in control of the text and personally connected to the promised inside joke that will be revealed by its end. However Fuentes's method of drawing the reader and Felipe into the text is his tactic to entrap and beguile them. At the end of the novel, the truth is revealed and the joke is really on those who arrogantly thought that they were exceptional. By the time Felipe recognizes his duality, it has already taken him over. All the while, Fuentes craftily injects multiple social, identity and cultural parodies and criticisms into the text for the experienced reader.

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Leasing: Past, Present and Future

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One of the more important aspects of any economy is leasing. In 2008, leasing activity amounted to more than 640 billion dollars worldwide. Lease accounting has been an important topic in the United States since 1949, when the earliest lease accounting publication was issued. Over the past sixty-two years, numerous publications regarding lease accounting models have been released and amended. Currently, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) are working on a joint proposal to improve lease accounting. The proposal would eliminate lease classification, eliminate a company's ability to tailor a lease for its own benefit, and simplify financial reporting. This paper discusses past accounting models, present accounting models, and the future of lease accounting under GAAP and the IFRS.

An important aspect of leasing it is that is provides beneficial economic features. The leasing industry helps companies to manage their cash flow while enjoying the benefit of asset acquisition. However, much of the estimated 640 billion dollars of lease commitments fail to appear on the balance sheet of lessees (Ernst and Young, 2010). This gives a false impression of a company's financial position and liabilities. Due to this alarming amount of off-balance sheet lease obligations, the Financial Accounting Standards Board and the International Accounting Standards Board have come together in an effort to change and improve lease accounting models. These changes will have drastic impacts on almost every sector of the economy. The Boards propose to eliminate the distinction between operating and finance leases. This poses the thesis question, "Will the elimination of this distinction be beneficial or harmful for reporting entities and accounting as a whole?" This paper will discuss the history of lease accounting, our present accounting standards and the evolution of a new proposal.

There are three organizations that are responsible for the creation of accounting standards throughout the world. The Securities and Exchange Commission and the Financial Accounting Standards Board establish standards for accounting for the United

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States. The International Accounting Standards Board establishes accounting standards globally.

Since 1973, The Financial Accounting Standards Board has been the organization in the private sector that is responsible for creating accounting standards in the United States. The standards created by the FASB determine the way that financial statements are prepared for nongovernmental entities (FASB). Although the FASB can create the standards for preparing financial statements, they do not have the authority to establish them. The Securities and Exchange Commission has the ability to officially recognize these standards. Under the Securities and Exchange Act of 1934, the SEC was given the authority to establish financial accounting and reporting standards for publicly held companies. However, the SEC relies on the FASB to create accounting standards (FASB).

The FASB is part of an independent structure. This independence enables the FASB to create and improve standards of financial accounting and reporting that help nongovernmental entities to publish information that is useful for investors. Independence enables the FASB to objectively consider stakeholder views. This independent structure also includes the Financial Accounting Foundation, the Financial Accounting Standards Advisory Council, the Governmental Accounting Standards Board and the Governmental Accounting Standards and Advisory Council. The FASB is made up of seven members: Chairman Leslie F. Seidman, Daryl E. Buck, Russel G. Golden, Thomas J. Linsmeier, R. Harold Schroeder, Marc A. Siegel, and Lawrence W. Smith. Members serve five-year terms and are eligible for reappointment.

The International Accounting Standards Board is an independent standard-setting body of the International Financial Reporting Standards Foundation. The IFRS Foundation is an independent, private sector organization responsible for developing and enforcing globally accepted international financial reporting standards (IFRSs) through the IASB. The foundation takes into account the needs of emerging economies and small and medium sized business entities (SMEs). The foundation is also highly interested in bringing about convergence between national and international accounting standards.

The IASB is made up of fifteen members. Sir David Tweedie is the current chairman of the IASB. These members are responsible for creating and publishing standards. They are also responsible for approving interpretations created by the IFRS Interpretations Committee.

One of the largest regulatory changes in the history of accounting is the introduction of IFRS in most countries. Around 120 countries and reporting jurisdictions require or permit IFRS for companies. Approximately 90 countries have fully conformed

to IFRS in as required by the IASB. Several other countries such as Canada, Korea, Japan and Mexico will be transitioning to IFRS in the near future (IFRS Foundation, 2011). In 2007, the SEC eliminated U.S GAAP reconciliations for foreign private issuers. Foreign issuers were able to prepare their financial statements in accordance with International Financial Reporting Standards. This would apply to financial years ending after November 15, 2007 (SEC, 2007). This elimination is the first step in moving towards convergence.

Since 1949 there have been many statements published in regard to lease accounting . Lease accounting statements under GAAP first appeared in 1949, while international standards were not published until 1980 (FASB & IASB, 2007.). The following statements, research and memorandums were issued on lease accounting prior to FAS 13 and IAS 17.

In 1949, the Committee on Accounting Procedure of the American Institute of Accountants issued Accounting Research Bulletin No. 38, Disclosure of Long Term Leases in Financial Statements of Lessees. In 1953 this ARB was restated. The Committee was worried that companies using long term leases failed to show assets and liabilities on their balance sheet. The Committee required that long-term leases be included in the financial statements or notes.

In 1962, the AICPA issued Accounting Research Study No. 4, Reporting of Leases in Financial Statements. This ARS reexamined leasing. John H. Myers, the author of the study, determined that leasing had become more important since 1949. Myers believed that a lease conveyed a right-to use property as opposed to a mortgage-borrowing arrangement. Myers suggested that all leases be recognized on the balance sheet at the discounted present value of cash flows that were to be paid for by the property right.

In 1972, the APB issued Opinion No. 27. Opinion 27 was the first opinion to give specific criteria for determining if an in-substance sale/purchase had occurred. Also in 1972, the SEC issued ASR 132, Reporting of Leases in Financial Statements of Lessees. The SEC discussed how a lessee should record a lease in which the lessor has "no real economic substance other than to serve as a conduit by which debt financing can be obtained by the 'lessee'" (FASB & IASB, 2007).

In 1973, the APB issued Opinion 31, Disclosure of Lease Commitments by Lessees. This Opinion called for more extensive and uniform disclosure or rental commitments for non-capitalized leases. Opinion 31 required disclosure of the minimum rental commitments for each of the five succeeding fiscal years, each of the next three five-year periods and the remainder as a single amount. Opinion 31 required disclosures

for the basis for calculating rent payments, terms of renewal or purchase options and the nature and amounts of other guarantees and obligations. (FASB & IASB, 2007). In October 1973, the SEC issued ASR 147, Notice of Adoption of Amendments to Regulation S-X Requiring improved disclosure of Leases. The SEC criticized the APB for wanting less disclosure and at the same time called for more extensive and significant disclosure than ever before. The SEC required disclosure of the present value of financing leases and the impact on net income of capitalization of such leases (FASB & IASB, 2007). ASR 147 defined a financing lease as, "a lease which during the non-cancelable lease period either covers 75 percent or more of the economic life of the property or has terms which assure the lessor a full recovery of the fair market value of the property at the inception of the lease" (FASB & IASB, 2007).

In 1974, FASB issued a discussion memorandum (DM), An Analysis of Issues Related to Accounting for Leases. In this paper, the board discussed conceptual models related to lease capitalization. They identified five conceptual models that could be used to justify recognition of a lease arrangement in financial statements. The five models include the Purchase Model, the Legal Debt Model, the Property Rights (Asset) Model, the Liability Model, and the Executory Contract Model (FASB & IASB, 2007) . The Board created a list of criteria for both lessor and lessees that would determine if a lease should be capitalized. These criteria would apply to all five of the specific conceptual models. The criteria for lessees stated in the 1974 FASB DM is as follows:

a. Lessee builds up a material equity in the leased property.
b. Leased property is special purpose to the lessee.
c. Lease term is substantially equal to the estimated useful life of the property.
d. Lessee pays costs normally incident to ownership.
e. Lessee guarantees the lessor's debt with respect to the leased property.
f. Lessee treats the lease as a purchase for tax purposes.
g. Lease is between related parties.
h. Lease passes usual risks and rewards to lessee.
i. Lessee assumes an unconditional liability for lease rentals.
j. Lessor lacks independent economic substance.
k. Residual value at end of lease is expected to be nominal.
l. Lease agreement provides that the lessor will recover his investment plus a fair return.

m. Lessee has the option at any time to purchase the asset for the lessor's unrecovered investment.

n. Lease agreement is noncancelable for a *long term* (FASB & IASB, 2007, p.13).

The Board also discussed lessor accounting in their discussion memorandum. They considered revenue recognition for lessor, related party lease transactions, and uniformity between lessor and lessee accounting. They developed the following criteria to determine if a lessor should recognize a lease as a sale:

a. Lease transfers title to the property to the lessee by the end of its fixed non-cancelable term.

b. Lease term is substantially equal to the remaining economic life of the property.

c. Lease provides for a bargain purchase or a renewal option at bargain rates.

d. Lease passes ownership risks to lessee.

e. Lease is *full payout*.

f. Leased property is special purpose to the lessee.

g. Lease is treated as a sale for tax purposes.

h. Collection of the rentals called for by the lease is reasonably assured (FASB & IASB, 2007, p.14).

In October 1980, the International Accounting Standards Committee issues Exposure Draft No. 19, Accounting for Leases (E19). This draft was based on the extent to which risk and rewards incident to ownership of a leased asset lie with the lessor or the lessee. The Exposure Draft listed four criteria to classify a lease as a finance lease. The lease must transfer ownership to the lessee by the end of the lease term. The Lessee must have the option to purchase the asset at a price that is expected to be lower than the fair market value at the date that the option to buy becomes allowable. The lease term must be the major part of the life of the asset. Finally, the present value at the beginning of the lease of the minimum lease payments greater than or equal to the all of the fair value of the leased asset net of grants and tax credits to the lessor at the beginning of the lease (FASB & IASB, 2007).

Under GAAP, the current standard for lease accounting is Financial Accounting Standard 13. The Standard was published in 1976. The statement established the

standards for accounting for leases for both lessors and lessees. Statement 13 defines a lease as an agreement that transfers the right to use property, plant and equipment for a specified period of time. This does not include agreements which are contracts for services and do not transfer the right to use property, plant or equipment. However, agreements that transfer the right to use property and also include services for the maintenance or operation of the property can be classified as a lease. Lease agreements which concern exploration and exploitation of land for natural resources and licensing agreements for film, plays, manuscripts, copyrights and patents are not considered leases under statement 13 (FASB, 1976).

Statement 13 classifies leases into two distinct categories, operating leases and capital leases. According to FASB's FAS 13, a lease will be classified as a capital lease if it meets one of these four criteria:

a. The lease transfers ownership of the property to the lessee by the end of the lease term (as defined in paragraph 5(f)).

b. The lease contains a bargain purchase option (as defined in paragraph 5(d)).

c. The lease term (as defined in paragraph 5(f)) is equal to 75 percent or more of the estimated economic life of the leased property (as defined in paragraph 5(g)). However, if the beginning of the lease term falls within the last 25 percent of the total estimated economic life of the leased property, including earlier years of use, this criterion shall not be used for purposes of classifying the lease.

d. The present value at the beginning of the lease term of the minimum lease payments (as defined in paragraph 5(j)), excluding that portion of the payments representing executory costs such as insurance, maintenance, and taxes to be paid by the lessor, including any profit thereon, equals or exceeds 90 percent of the excess of the fair value of the leased property (as defined in paragraph 5(c)) to the lessor at the inception of the lease over any related investment tax credit retained by the lessor and expected to be realized by him. However, if the beginning of the lease term falls within the last 25 percent of the total estimated economic life of the leased property, including earlier years of use, this criterion shall not be used for purposes of classifying the lease. A lessor shall compute the present value of the minimum lease payments using the interest rate implicit in the lease (as defined in paragraph 5(k)). A lessee shall compute the present value of the minimum lease payments using his incremental borrowing rate (as defined

> in paragraph 5(1)), unless (i) it is practicable for him to learn the implicit rate computed by the lessor and (ii) the implicit rate computed by the lessor is less than the lessee's incremental borrowing rate. If both of those conditions are met, the lessee shall use the implicit rate (FASB, 1976, p. 8).

For a lease to be considered a capital lease, the lessee must be transferred ownership at the end of the lease term, the lessee must use the asset the majority of its useful life, the lease payments for the property should be equal to or exceed 90 percent of the fair market value of the asset at the beginning of the lease or the lease contains a bargain purchase option. A bargain purchase option allows the lessee to purchase the asset at the end of the lease term at a price that is lower than fair market value. However, the economic life and the fair value criteria do not apply if a lease term falls within the last 25 percent of the total economic life of the property. A lease may also be categorized as a sales-type lease if the lease agreement meets one of the four criteria of a capital lease and the two other criterions. Collecting of minimum lease payments must be reasonably predictable and the amount of unreimbursable costs yet to be incurred by the lessor should not be surrounded by important uncertainties. If the lease meets these two stipulations, then it may be considered a sales-type lease.

Both lessees and lessors account for lease agreements in a different manner. Capital leases and operating leases are treated differently in terms of accounting and reporting. Lessees will record a capital lease as both an asset and an obligation at an amount that is equal to the present value of the minimum lease payments at the beginning of the lease term. This will not include executory, insurance, maintenance or tax payments. If the present value amount exceeds the fair value of the asset at the beginning of the lease than the fair value will be used. Unless the asset is land, it will be amortized in a way that is consistent with the lessees' depreciation policy for owned assets. During the lease term, each minimum lease payment should be allocated between reducing the obligation and the interest expense. This will produce a constant periodic rate of interest on the remaining balance of the obligation. The asset recorded under the capital lease and its amortization should be recorded separately on the lessees' balance sheet or in the financial statement's footnotes. Termination of a capital lease should be accounted for by removing the asset and liability and recording a gain or a loss. A lessee will only need to account for an operating lease through a rent expense over the lease term as it becomes payable (FASB, 1976).

Accounting and reporting for lessors differs from that of lessees. Capital leases for lessors are diving into two types, sales-type leases and direct-financing leases. A sales-type lease is very similar to the sale of a product in exchange for a long term note.

The transaction includes a debit to a receivable and a credit to sales. There is also a debit to cost of goods sold and a credit to inventories for the cost of the product. The sales-type lease can also include interest implicit to the lease payments which is receivable to the lessor, unguaranteed residual value and initial direct costs (Lee, 2003). The distinction between a sales-type lease and a direct-financing lease is the presence or absence of a manufacturer's or dealer's profit or loss. To record a direct financing lease, the lessor must record a gross investment, unearned interest revenue and a net investment. The gross investment consists of the minimum lease payments plus the unguaranteed residual value accruing to the lessor at the end of the lease term. The unearned interest revenue is the difference between the gross investment and the fair market value of the property. The net investment is the difference between the gross investment and the unearned interest revenue (Kieso & Weygandt, 1986). To account for an operating lease, a lessor would include the lease property on the balance sheet and deduct the accumulated depreciation from the investment in the leased property. The depreciation method used would be consistent with the lessor's normal depreciation policy. Rent will be reported as income over the lease term and all initial direct costs will be deferred and allocated over the lease term. (Lee, 2003).

Under the International Accounting Standards, the most current publication on lease accounting is International Accounting Standard Number 17. The International Accounting Standards Board classifies leases into two categories, operating and finance. These two categories are determined by how much risk and reward belongs to the lessor or the lessee. A lease is categorized as an operating lease if it does not substantially transfer all risks and rewards incidental to ownership. On the other hand, if a lease substantially transfers all the risks and rewards incidental to ownership, it can be classified as a finance lease (IAS 17 p. 63-65).

Lessees will report lease payments under an operating lease as an expense. The expense will be on the straight-line basis unless another systematic basis is more suitable. The reporting standards are different for finance leases. Lessees will recognize finance leases as assets and liabilities on their balance sheets at the lesser of the fair market value of the leased property or the present value of the minimum lease payments. This will be determined at the beginning of the lease. The present value of the minimum lease payment will be calculated using the interest rate stated in the lease or the lessee's incremental borrowing rate. Initial direct costs will be added to the amount recognized as an asset (IAS 17 p. 66).

Lessors will recognize operating leases on their balance sheets according to the nature of the asset. Lease income will be recognized on a straight-line basis over the

lease term and the depreciation policy will be consistent with that of similar assets. Lessors will recognize assets finance leases on their balance sheet and present them as a receivable equal to the net investment of the lease. Manufacturer or dealer lessors will recognize selling profit or loss in the period in accordance with the policy followed by the entity for outright sales. Costs occurred in negotiating a lease will be recognized as an expense when a selling profit is recognized. This normally occurs at the end of a lease term (IAS 17 p.69).

The Financial Accounting Standards Board and the International Accounting Standards Board have jointly developed a draft standard on leasing and are proposing amendments to FASB Accounting Standards Codification and an International Financial Reporting Standard (IFRS). Leasing is one of the more important aspects of financing. Due to its importance, it is key that lease accounting provides financial statement users with accurate and complete information in regard to an entity's leasing activities. The present accounting models for leases require leases to be classified as either capital or operating leases. This model has been criticized heavily for not providing financial statement users with valid information because leasing transactions are not portrayed validly. The FASB and IASB have come together to develop a new approach to lease accounting that would accurately recognize the assets and liabilities that are due to lease obligations (FASB ED Topic 180 p. 5).

The exposure draft proposes that a right-of-use should be applied to all leases. This applies to both the lessor and the lessee. The lease accounting changes would apply to any entity that enters into a lease. There is an exception for biological and intangible assets, leases to explore for natural resources and some investment properties. This does however apply to leases of right-of-use assets in a sublease.

Lessees would need to recognize an asset representing its right to use the leased asset for the lease term and a liability representing lease payments. A lessor would recognize an asset representing its right to receive lease payments. Depending upon the risks or benefits surrounding the asset the lessor has two options. The lessor could recognize a lease liability while also recognizing the underlying asset or derecognize the rights of the underlying asset that it transfers to the lessee and continue to recognize a residual asset representing its rights to the underlying asset at the end of the lease term. Assets and liabilities recognized by lessees and lessors would be measured on a basis that assumes the longest possible lease term will occur and takes into account any options to extend or terminate the lease. This basis would also use an expected outcome technique that will reflect lease payments. This basis would also be updated when changes occur in the assets or liabilities since the previous reporting period. These requirements only

apply to leases that are long term. Leases 12 months or less would apply simplified requirements.

Lessees with a significant amount of assets held under operating leases would be substantially affected by the proposal. The proposal would require lessees to recognize the assets and liabilities arising from these assets. The proposal wouldn't only affect capital leases in the sense that the measurement of the assets and liabilities arising from leases. Lessor accounting would differ dramatically from existing GAAP and IFRS. Depending upon the risk and benefits associated with the lease, the lessor would need to apply a performance obligation approach or a derecognition approach. If a lessor retains exposure to significant risks or benefits associated with the underlying asset, the lessor would continue to recognize the underlying asset and also recognize a right to receive lease payments and lease liability. If the lessor does not retain exposure to significant risks or benefits, the lease would be accounted for in a way that is similar to current accounting for capital leases (FASB ED Topic 840 (P.7-8)).

The proposed changes to lease accounting have been brought on by a recent focus on off-balance sheet liabilities and past accounting scandals. The proposal would eliminate operating leases and effectively off balance sheet liabilities. The news rule for lease accounting would make leases much more complex. Leases will need to be re-evaluated every period.

Eliminating operating leases and creating a lease obligation for all leases will have an effect on the balance sheet. This will increase assets and liabilities on the balance sheet. Under the new proposal, the interest expense will be recognized on the obligation and depreciation on the asset. This will increase earnings before tax, interest, depreciation and amortization, depreciation expense, and interest income (Hepp & Gupta, Oct. 2010).

The proposal also raises concerns about leverage ratios that are vital to measuring a firm's performance or rations that figure out debt covenants. Companies will need to watch how the standard will affect agreements that are based on these ratios. Companies also need to be aware that the standard will cause income to go down and expenses to go up.

Bill Bosco, an accounting policy consultant for the Equipment Leasing and Finance Association, fears that the proposal will discourage companies from leasing property and equipment. This will cause earnings to go down at the beginning of the lease and eventually taper off. Booked lease obligations must reflect certain terms and conditions such as contingent rent or renewal provisions. This can lead to greater expenses of the life of the lease. These changes will result in a difference in income for

financial reporting and tax filing. This will lead to changes in deferred tax assets. Companies need to be careful when negotiating leases. They will try to push for short-term leases and more flexible renewal terms. However, this can lead to higher rent (Whitehouse, 2010).

The FASB/IASB lease proposal will also be retrospective. Companies must apply the new standards to all prior periods that will be represented in a set of financial statements. Therefore, companies need to start evaluating their current lease obligations.

The new standard is going to require companies to monitor their lease agreements more. They need to determine how changes will affect the accounting. This will cause more work for a company over the life of the lease. The elements of the proposal would impose greater costs on and require greater efforts from reporting entities and their auditors. Jeff Nickel, a partner with Deloitte and Touche, believes the standard is going to have a huge impact on companies. Companies need to start evaluating their accounting systems and their technical capabilities (Whitehouse, 2010).

There is a great amount of criticism towards the proposed accounting changes for many reasons. Many believe that the new rules will cause a squeezing of the balance sheet, companies will be discouraged from leasing plant, property and equipment and new regulations are too complex, time consuming, and costly for reporting entities. This proposal will cause many problems because U.S. executives are not prepared for the changes. According to research by Deloitte and Touche, only 7% of individuals questioned believed their company was extremely or very prepared for lease accounting changes. The firm questions 284 individuals who either lease to or from an organization. The proposed changes required information that is more detailed to be included in financial reports. Mark Beddy, a real estate partner with Deloitte and Touche states that (Singh, 2011),

The evidence from the U.S. is consistent with the key issues which have concerned property owners and occupiers in the UK about the proposed new lease accounting regime. It highlights the considerable compliance burden which any new standard will impose, together with continued worries about the impact on financing, lease lengths and property strategy (Singh, 2011). More than 40% of individuals who responded to Deloitte and Touche believe that the new standards will make it difficult to obtain financing in the future (Singh, 2011).

Although many feel that the lease proposal will complicate lease accounting, others feel that the existing lease accounting standards under GAAP and IFRS can significantly use some improvement. The proposal by the FASB and the IFRS to eliminate the distinction between operating and finance leases is a way of improving the

present standards. The proposed standards will simplify leases. There won't be a need to classify each lease as an operating lease or a finance lease. This will help take a burden off entities. This will also remove the temptation to misclassify a lease as an operating lease rather than a finance lease. Classifying a lease as an operating lease would allow reporting entities to keep assets and liabilities off of their balance sheets.

The proposal would view all leases as a right-to-use property and an asset for lessees and a liability for lessors due to rent payments. Lessees that currently classify leases as operating leases will have more assets and liabilities on their balance sheets under the new proposal. Lessors and lessees will have fewer opportunities to structure leases in a manner that enables lessees to keep lease related assets and liabilities off their balance sheets.

The FASB received many comments at the conclusion of the discussion on the proposal. Almost half of those who responded agree with the board's proposal. They believe that the distinction between capital and operating leases complicates lease accounting. Supporters of the proposal believe that the new model would put an end to structuring leases for self-benefit. The respondents who use financial statements were unanimously in favor of the proposal (Grossman & Grossman, 2010).

The lease accounting model proposed by the Financial Accounting Standards Board and the International Accounting Standards Board is a reaction to the recent scandals by the banks, Enron and others, to fix damaged accounting. Creating an accounting model that includes only one classification of a lease would simplify the rules. It would eliminate a company's ability to tailor a lease to their advantage. The proposal will have a major effect on a company's balance sheet. Liabilities will rise, debt to equity ratios will rise, and balance sheets will look bad. However, all lease liabilities will be reflected on the balance sheet. The financial positions of companies will change, but they will be more valid. The proposal will make financial information more comparable due to its unified nature. Finally, the proposed lease accounting model will bring the United States one step closer to IFRS convergence.

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Appendix A: Glossary

Lease: conveyance of land, buildings, equipment or other ASSETS from one person (lessor) to another (lessee) for a specific period of time for monetary or other consideration, usually in the form of rent.

Lessee: Person or entity that has the right to use property under the terms of a lease.

Lessor: Owner of property, the temporary use of which is transferred to another (lessee) under the terms of a lease.

Capitalized Lease: Lease recorded as an asset acquisition accompanied by a corresponding liability by the lessee.

Operating Lease: Type of lease, usually involving equipment, whereby the contract is written for considerably less than the life of the equipment and the lessor handles all maintenance and servicing.

Bargain purchase option: A provision allowing the lessee, at his option, to purchase the leased property for a price which is sufficiently lower than the expected fair value of the property at the date the option becomes exercisable that exercise of the option appears, at the inception of the lease, to be reasonably assured.

Fair value of the leased property: The price for which the property could be sold in an arm's-length transaction between unrelated parties.

Lease term: The fixed non-cancelable term of the lease plus (i) all periods, if any, covered by bargain renewal options (as defined in paragraph 5(e)), (ii) all periods, if any,

for which failure to renew the lease imposes a penalty on the lessee in an amount such that renewal appears, at the inception of the lease, to be reasonably assured, (iii) all periods, if any, covered by ordinary renewal options during which a guarantee by the lessee of the lessor's debt related to the leased property is expected to be in effect, (iv) all periods, if any, covered by ordinary renewal options preceding the date as of which a bargain purchase option is exercisable, and (v) all periods, if any, representing renewals or extensions of the lease at the lessor's option; however, in no case shall the lease term extend beyond the date a bargain purchase option becomes exercisable. A lease which is cancelable (i) only upon the occurrence of some remote contingency, (ii) only with the permission of the lessor, (iii) only if the lessee enters into a new lease with the same lessor, or (iv) only upon payment by the lessee of a penalty in an amount such that continuation of the lease appears, at inception, reasonably assured shall be considered "noncancelable" for purposes of this definition.

Estimated economic life of leased property: The estimated remaining period during which the property is expected to be economically usable by one or more users, with normal repairs and maintenance, for the purpose for which it was intended at the inception of the lease, without limitation by the lease term.

Minimum lease payments:

i. From the standpoint of the lessee: The payments that the lessee is obligated to make or can be required to make in connection with the leased property. However, a guarantee by the lessee of the lessor's debt and the lessee's obligation to pay (apart from the rental payments) executory costs such as insurance, maintenance, and taxes in connection with the leased property shall be excluded. If the lease contains a bargain purchase option, only the minimum rental payments over the lease term and the payment called for by the bargain purchase option shall be included in the minimum lease payments.

ii. From the standpoint of the lessor: The payments described in (i) above plus any guarantee of the residual value or of rental payments beyond the lease term by a third party unrelated to either the lessee or the lessor, provided the third party is financially capable of discharging the obligations that may arise from the guarantee.

The Corset as a Construction of Femininity: Silhouettes in the Victorian Era

Kristen Haggerty (History)[1]

In modern society, corsets are often viewed as an unnecessary evil imposed on women through history, a symbol of oppression and backwards thinking. The idea of corsetry has been distorted through the lens of modern culture, so many people's first impressions of corsets involve Scarlett O'Hara's seventeen inch waist. As an article of dress, and a tool to help understand the Victorian era, corsets can be incredibly useful. But unfortunately, as with many garments, "when their reign is over, they become objects of ridicule."[2] Recently, however, the scholarly attitude towards corsetry has been changing, and has begun to take on a less censorious tone.

By understanding the history of Victorian corsets, their link to industrialization, the physicality of wearing a corset, and the contemporary ideology in which corsets were espoused, the "sociocultural production of meaning"[3] is explored, and a more comprehensive argument can be formed. When viewed through this lens, corsetry as a patriarchal tool becomes a simple argument. Instead, light is shed on the complexity of corsetry, and the multifaceted ways it affected Victorian society. Corsets were not imposed upon women by a merciless patriarchy, but used to maintain a desirable and respectable physical figure which emulated the popular construction of femininity. Their existence was not merely good or bad, but, like most occurrences in life, a distinct, ever-changing, and hard to grasp balance of the two. But by weaving the multifaceted experiences of Victorian and modern women into a narrative of female experience, the misconceptions may give way to a clearer understanding of why corsets are still one of the most influential undergarments ever to grace the human form.

Victorian Corset History- Industrialization and the Changing Silhouette

Before the advent of the Industrial Revolution, many goods and services were

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[1] A senior honors thesis written under the direction of Dr. Alison Smith for HI-593: *Corsets and the Female Silhouette*.

[2] Norah Waugh, *Corsets and Crinolines* (New York: Theatre Arts Books, 1970), 7.

[3] Michael T. Murphy, "Jane Farrell-Beck and Colleen Gau, Uplift: The Bra in America; and Valerie Steele, The Corset: A Cultural History" *Winterthur Portfolio*, Vol. 38, No. 2/3 (Summer/Autumn 2003): 155.

produced by families for their own consumption, or using 'cottage industries'. The Industrial Revolution began in the late 1700s and continued to develop through the 19th century. This mechanization of culture changed many things about daily life, including the production and wearing of corsetry.

In that period of time, the Western world went through a rapid period of industrialization. The silhouette and corsetry of a woman from the time of the young Victoria to that of someone living during the end of her reign would have been different in a multitude of ways, from the appearance they gave of the figure to the method by which they were produced.

Tracing the origins of a change in silhouette is not an exact science, and seems to condense down to the fact that fashion is cyclical, and is influenced by the social and political events of the time as well as simply by a society's whims. Changes can occur on a small, quickly changing scale, which affects things like fashionable sleeve sizes and hem lengths. But they can also be traced in a wider, more unhurried way. By viewing nude artwork and portraits throughout the past several centuries, the change in the 'ideal' figure is evident, and occurs over a long period of time. In the 1500's, "the new, expanded Renaissance awareness of fleshly beauty seems to have been concentrated—as it was to be for centuries—on the female belly."[4] Large, rounded stomach were admired and emphasized, and women with otherwise slim bodies and protruding stomachs were a beauty ideal. But over the next 200 years, the focus of beauty begins to shift from the stomach to the breasts and hips, and "a marked fullness of breasts and corresponding fullness of backside had become the chief sexual charms of women, for which a slender waist provided the appropriate foil,"[5] and a protuberant belly was no longer the ideal. This change in erotic and ideal focus occurs slowly over centuries, and there is not much explanation for the change other than the shifting whims of fashion.

The most concise explanation for the faster 'fads' of fashion is that the industry consists, like many self-regulating phenomena, of a continuous cycle of rising and falling. Clothing's emphasis has always been on the silhouette it creates, and "the over-emphasis of line has given an… underlying rhythm to women's clothes…a long slender silhouette gradually begins to widen at the base, emphasis shifts from length to breadth, and when the greatest circumference possible has been reached, there is a collapse, a folding up, and a return to the long, straight line."[6] We can see the phenomena occurring

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[4] Anne Hollander, *Seeing Through Clothes*, (New York: University of California Press, 1978), 97.
[5] Hollander, 113.
[6] Waugh, 7.

in the period after the Civil War, when garishly large hoopskirts gave way to hobble skirts and bustles. This cycle in reverse can also be seen in the fashions of the 20th century, to use a modern example. During World War II, women's dresses were short and tight, with an emphasis on military tailoring and wide shoulders. But in 1947, Christian Dior introduced the New Look, a silhouette with a wasp waist and full skirts, with influence on exactly the opposite proportions of the previous decade.

This ever-changing silhouette can be seen when comparing a corset from the 1830's, at the beginning of the Victorian era, to one made in 1898, at its end. Viewing the two side by side, as in Fig. 1 and Fig. 2, the difference in the way they shaped the body is evident. The 1830's corset provides a gentle shaping but does not alter the body's natural silhouette significantly. It also places emphasis on a wide belly and hips, which it is made to flare widely over. The 1890's silhouette is much slimmer throughout, with an hourglass shape wherein the waist is pulled in significantly to emphasize the hips and breasts. The origin of both silhouettes is rooted in this cyclical theory of fashion.

In the Empire period directly before the Romantic era of the 1830s, corsets were nearly non-existent. The Empire silhouette of a high bust and long tubular skirt were seen as a Neo-classical take on traditional Greek garments.

But from 1810 through the 1820s, society shifted away from this radical style, representative to the next generation of an "overturned social order" and the "consequent loosening of morals and deportment"[7]. The waistline began to drop back to its natural position, corsets lengthened from just below the bust to the hip, and gussets replaced tabs at the bottom of the garment. Breasts were also newly shaped by gussets inset into the top of the corset instead of flattened by boning or pushed unnaturally high.[8]

The placement of corsetry on the body also changed. In the 17th and 18th centuries, it was common for corsetry to be on display on the body. Garments such as kirtles combined petticoats and stays into a singular item, worn on top of a shift and common for the working classes. But in the nineteenth century, "corsets definitively stayed underneath the dress."[9]

Corsets in the 1830s were known interchangeably as both corsets and stays. They were "almost always made of plain white cotton or linen, or at most, white satin. White was associated with chastity, and corsets formed part of an array of modest underwear."[10] These were made in two layers, and corded with cotton thread. The cords

[7] Waugh, 75.
[8] Valerie Steele, *Corsets: a Cultural History*, (New Haven: Yale University Press, 2001), 39.
[9] Steele, 39.

were positioned so as to give structure to the garment, and to gently shape the body. Cords over the stomach area held it flat, while diagonal cording at the ribs gave the waist a gentle curve. “The direction and placement... is intended to flatten the stomach but also to radiate out over, and thereby emphasize, the curve of the hips.”[11]A flat wooden busk ran down the front of the garment, in between the bust cups, as well as two smaller wooden slats or whalebones in the back[12]. These gave an extra stiffness to the figure, and helped women lace slightly tighter and hold an erect posture. The result was not much different than that of a modern woman wearing shape wear. The natural figure was slightly compressed and tightened by the stays, but not altered in any drastic way. Cording instead of steel or whalebone also created a more comfortable experience in the wearing of the stays.

From the 1830’s to the 1860’s, this silhouette began to change and become more and more of an exaggerated hourglass. The 1860’s was the peak of this style, and corsets were short and very wide at the hips and breasts, with a tiny waist in the middle. The contrast between the small waist and large hips creates nearly an “X” shape out of the torso. Then through the latter half of the 19th century, the silhouette began to slim down and become more fluid. Instead of an emphasis on just a slim waist, a corset created a ‘wasp waist’, with a tiny waist gently sloping to larger and fuller hips. It is this silhouette that is in fashion in 1898.

“During the 1890s, it was fashionable to be voluptuous at the bosom and hips, but small at the waist. Tight corsets aided this by displacing flesh from the waist to these areas.”[13] This corset gave a woman the desired silhouette, an hourglass figure with a wasp waist. In the 1880‘s the “spoon busk” was popular, which was “narrow at the top and widen[ed] out into a pear shape”[14], but at the beginning of the next decade this fell out of fashion in favor of a longer and less rounded shape to the stomach. This was achieved with the use of steel bones running vertically throughout the garment. Many late 19th century corsets had metal clasps at the front as well as back lacing so a lady could put the garment on by herself.

These silhouette changes can be interpreted by a cyclical method of fashion ideals, but there is more to the change than a simple cause and effect mentality. Silhouette changes are also caused by the mechanisms that allow them to happen. A

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[10] Steele, 39.
[11] Eleri Lynn, *Underwear: Fashion in detail* (London: V&A Publishing, 2010), 84.
[12] Waugh, 79.
[13] Lynn, 90.
[14] Waugh, 83.

woman in pre-history would not have been able to achieve an 1898 silhouette even if she desired it, because the tools to make it happen simply had not been invented yet. "Clothes of any period belong to, and form part of, the greater whole of the architectural and economic background against which they are worn; they must also adapt themselves to the texture and design of the materials produced at the time."[15]

The Victorian era was the age in which the Industrial Revolution flourished. At the beginning of the era, steam ships were just beginning to cross the Atlantic. By the end, telephones and motor cars were beginning to make their way into everyday life. As the uses of technology expanded, so did the ways in which women could alter their silhouettes and, "when a line became exaggerated, she [could] develop it to the utmost limit."[16] Each new invention during the Industrial Revolution trickled down to affect the mechanics of women's corsetry, and by default, the way in which silhouettes were altered. From the 18th to 20th centuries, "there was a significant convergence in styles of dress- particularly for middle class and elite males- over the course of the late eighteenth to early twentieth centuries, and there are strong reasons to think of this as a product of genuinely global processes."[17]

Industrialization during the 1830s was still an emerging phenomenon, and although the production of cloth had been mechanized, garment making was still a hand-sewn industry. Stays were relatively simple to make, cut in only three or four body pieces. Although commercial patterns would not be available for another twenty years, books such as The Workwoman's Guide (1838) and The Young Woman's Guide Containing Correct Rules for the Pursuit of Millinery, Dress, and Corset Making (1847) included instructions and rough diagrams for construction[18]. Most women sewed their own stays by hand, the home sewing machine not having been invented yet, although dressmakers could put together a pair for someone as well. Author of L'Art de faire les corsets (1828), Madame Burtel, declared that "It is not amusing to make a corset, as it can be to make a ball gown [or] a hat... but that doesn't matter, a young woman must be able to make everything she needs."[19] Dressmakers, or mantuamakers if called by the more traditional term, still abounded.

In the early decades of the 1800's, the production of cloth was increasingly mechanized, and homespun was virtually nonexistent by the early 19th century, but

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[15] Waugh, 7.
[16] Waugh, 7.
[17] Kenneth Pomeranz, "Social History and World History: From Daily Life to Patterns of Change*", Journal of World History*, (2007): 75.
[18] Steele, 39.
[19] Steele, 39.

creating ready-to-wear clothing was still decades in the future. “Garments least dependent on a close fit (like cloaks, petticoats, and chemises) entered factories in the 1860s and 1870s; blouses (known then as shirtwaists) and skirts did not follow until their more billowy silhouette came into vogue in the 1890s. Dresses would not be mass-produced until the 1910s.”[20]

The stays of the 1830s may appear simple, but industrial developments had actually greatly improved their functionality. In 1823, a device known as the Instant Release system was exhibited at the Paris Exposition Universelle. Invented by Josselin, the system was a precise juxtaposition of ropes and pulleys that allowed a woman to lace her own corset, as well as to unfasten it unassisted.[21]Although the system was not widely used, it was available to make an everyday task more streamlined. This simple device is a clear example of the Industrial Revolution’s influence on everyday life. Corsets, once expensive and made by tailors for upper class women of leisure, were now accessible to middle and working class women who may not have had servants available to help them with the task of lacing. As corsets became more prevalent and available, their hardware had to adapt to plebian use.

Another technological advancement appeared in the same decade, quietly revolutionizing women’s stays. Metal eyelets were introduced in the 1820s, allowing corsets to be laced more securely than before, when eyelets were created using buttonhole or whip stitching.[22]

Concerns over the health and safety of corsets have been documented for centuries, but in the early 19th century, attempts were made to actually create a more comfortable and healthier pair of stays (Fig. 3). In 1848, Madame Roxey A. Caplin showed her “hygienic corsets” in Paris, stating that her corset had been shown by those in the medical field to be superior.[23] Throughout the next century, countless options existed in corsetry for those who sought healthier garments, though most were no more effective than their ‘dangerous’ counterparts. One quack invention was the ‘electro-magnetic busk’ patented by Caplin. Other manifestations of health corsets were actually beneficial. An 1890’s woolen corset created by Dr. Gustav Jager used pleating at the bust to comfortably accommodate the breasts, cording instead of steel, and wide button straps to

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[20] Marla R. Miller, “The Last Mantuamaker: Craft Tradition and Commercial Change in Boston, 1760- 1845”, *The McNeil Center for Early American Studies* (2006): 421.
[21] Beatrice Fontanel, *Support and Seduction: A History of Corsets and Bras* (New York: Harry N. Abrams, Inc.1997), 49.
[22] Lynn, 122.
[23] Steele, 41.

support the frame.[24] Although corsets such as this, and its variations (including knit versions) truly were more comfortable, they never gained widespread popularity.

The art of corsetry continued to improve through the use of mechanization- "While there existed only two patents for corsets in 1828, sixty-four would be registered between 1828 and 1848."[25]

In the 1830s, it was necessary to have an assistant for lacing stays. But in 1848, a new method of lacing was developed in France, known as 'lazy lacing'. This method involved using two laces, or one that was very long, and creating two long loops at a woman's waist. Those loops could then be used by the wearer to pull the laces themselves, and then caught on small metal loop attached to the front of the corset, thus enabling a woman to produce a slimmer silhouette without assistance. "Lazy lacing was only made possible by developments in other areas of corset fastening, such as the introduction of the split steel busk and slot-and-stud fastenings, which entered commercial production towards the middle of the 19th century."[26]

In 1868 Edwin Izod invented the steam molding process. "Ideal" torso forms were cast in metal, over which finished corsets were place. The forms were then heated so that the corsets formed perfectly to the figure, thus creating a 'glove' fit for the garment.[27]

The Warner company invented stainless steel 'boning' towards the end of the era, thereby solving the problem of rusting and breaking stays. The many metal bones in corsetry were still subject to daily wear and tear, however, and in 1893 a patent was registered for corset shields, which would 'lessen liability of breakage of the ribs... and protect the body of the wearer'[28]. These shields were worn inside the corset on the sides of the waist, which dealt with the most pressure when the garment was pulled tight to the body.

In the mid 19th century, whalebone was used for boning, but by the 1890s the baleen whale had been hunted almost to extinction. Steel had thus largely replaced whalebone (and cording before it) as the preferred shaping method.

All of these developments affected the way that a corset acted on the body. At the beginning of the Victorian era, a woman could only alter her shape so much before the limits of cording and cloth were exceeded, and the homemade corset was constructed

[24] Lynn, 130.
[25] Fontanel, 52.
[26] Lynn, 119.
[27] Steele, 46.
[28] Lynn, 94.

to fit her figure instead of the other way around. But by the end of the era she could conceivably lace herself several inches smaller in her steel stays, which, because of 'glove fit' technology, gave her the perfect figure.

Mechanical innovations were not the only way that the Industrial Revolution shaped women's corsetry, however. The societal changes that came from industrialization also pervaded the art of creating, wearing, and selling women's undergarments.

In the 18th century, many corsets were professionally tailored, expensive, and available only to the wealthy. Being able to wear a true corset, along with the fashionable outfits it naturally accompanied, was the mark of a higher class- the lower class wore jumps, a laced bodice "often made from stiffened or strong fabric, but with little or no boning…worn by working women for mobility."[29] But by the latter half of the 19th century, industrialization was booming. Mass-produced corsets, as well as other items of dress, were widely available at all levels of economic and social standing. The "democratization of fashion gave more women access to corsets. Beauty was now supposed to be every woman's 'duty' (if not her 'right') by means of artifice if not naturally."[30]

This meant that even those in the working class were expected and encouraged to indulge in well-made, factory produced underwear. In fact, one of the best selling corset products was Symington Corset Company's 'Pretty Housemaid', first produced in the 1880's (Fig. 4). It was advertised as 'the strongest, cheapest corset ever made', and was "affordable, attractive, [and] well-designed."[31] The corset had a minimal number of bones, and instead took most of its structure from familiar 1830's cording methods, creating the fashionable wasp waist but also allowing for the hard daily work of a maid. The item came in a variety of colors, and even included such decorative details as lace around the top and floss embroidery on the side stays. It was an ideal corset for those working women who wished to remain stylish on small amounts of income, and was a best seller at the time. One study showed that the percentage of working class French wives (in Paris and the provinces) who owned corsets rose from 33% between 1850 and 1874 to 44% between 1875 and 1909.[32]

Industrialization and mass production also increased the variety in corsetry, allowing it to be seen as a private fashion statement instead of simply a serviceable and

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[29] Lynn, 221.
[30] Steele, 36.
[31] Jill Salen, *Corsets, Historical Patterns and Techniques* (New York: Costume & Fashion Press, 2008), 59.
[32] Steele, 49.

sensible form of underwear. In the early part of the Victorian era, corsetry was noticeably lacking in variety. Corsets were uniformly white and plain, although detail could be found in cording patterns and embroidery on the outer layer. By the end of the era, a wider variety of colors and materials were acceptable, even though some combinations were still shocking to contemporary sensibilities. One such item, in the Victoria and Albert collection, is constructed from a shocking pink silk satin, with black lace and pink ribbon around the upper edge. In 1885, a Parisian magazine said of colored corsets, "Very elegant and extremely becoming. Evidently designed to be seen, and ... looked at!"[33] Colors advertised included black, white, pink, blue, red, or 'blush'. Fabric had expanded from simple jean or linen to satin weave cotton and coutil.[34]

> The mass production of corsets now allowed for the expansion of the genre. Catalogues offered a wide selection [for sale]: nuptial corsets, corsets made of white satin for the ball, lightly boned morning corsets, stayless corsets for night wear, nursing corsets with drawbridge gussets, traveling corsets with tabs that could be let out at night for sleeping, riding corsets with elastic at the hips; corsets for singing, for dancing, for bathing at the seaside (unboned), for riding the velocipede (made of jersey); cool and supple doeskin corsets for summer wear, pearl grey or chamois colored and trimmed with Nile or periwinkle satin; and net corsets of violet silk cord with a small sachet of perfume hanging in the center.[35]

The popularity of industrialization was an idea that was profited on by corset advertisers as well. Many corset advertisements pictured empty corsets being frolicked in by cherubs, or small vignettes about the life-changing effects of this corset or that. However, "some corset manufacturers proudly displayed images of smoke-belching factories on their trade cards and stationery, linking their products to notions of technical innovation and progress."[36]

Advertising also changed with the progression of technology. As photographic techniques improved, advertisements began to depict real women wearing corsets instead of line drawings or illustrations. It is interesting to note that these mass-produced corsets, when advertised, were not actually placed on a woman's body. Models were photographed in the correct poses, and then a picture of the corset was superimposed on their photograph. Any areas of their body that extended beyond the edge of the corset

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[33] Lynn, 126.
[34] Saundra Altman, "Fully Boned Victorian Corset, circa 1898", Past Patterns, (2000): 1.
[35] Fontanel, 58.
[36] Steele, 46.

were then darkened out, creating the ideal womanly figure without any need for immodest photography or pesky fittings with a model that may not be the ideal size.[37]

A common modern complaint is about the cheapness of material products today compared to several decades before, but this frustration is not recent. The expected duration of a corset in the late 1800's had greatly diminished from the beginning of the century. Many garments from the 1830's show evidence of home alterations, revealing that they were worn for long periods of time and possibly passed to relatives when they no longer fit the original owner. But an average corset in the 1890s was only intended to hold up for about one year. "The Symington Corset Company of Leicestershire guaranteed their corsets for twelve months."[38] Various inventions such as corset covers endeavored to extend the lives of these articles, but ultimately the lower quality of mass production and the amount of strain a corset experienced every day made them an impermanent feature in a woman's wardrobe.

The Industrial Revolution helped lead to the production of corsets that were both readily accessible to a wide segment of the population, and full of mechanizations that made significant alterations to the natural silhouette possible. Because of this, the amount of body modification to which the female torso was subjected during the Victorian period has been under contention by scholars for decades. The prevailing attitudes about this period of history have been generally negative, focusing more on the damaging physical and social implications of these garments rather than the industrialization that made them possible and the society that made them acceptable. However, recently more attention has been paid in costuming to the fullness of the experience surrounding corsetry, and the multi-faceted explanations for their embrace by society in the Victorian era.

Corsetry as a Means of Constructing Femininity

The field of costume history emerged as a legitimate scholarly pursuit around the 1970's, which is when the Women's Liberation movement was also blossoming. Thus many of the first academic works written about corsetry took a decidedly anti-corset tone. The main themes of these works seemed to be that corsetry was a tool of the patriarchy, used by men for centuries to oppress women. In summary, "corsets represented a fashionable and unhealthful instrument of patriarchy, imposed by men upon women in order to approximate bourgeois ideals of a physically disabled, chaste, yet eroticized feminine form."[39]

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[37] Altman, 1.
[38] Lynn, 94.
[39] Murphy, 155.

The corset, it was argued, was used to "police femininity"[40], because it not only restricted a woman's natural capacity for movement, it dictated that her natural shape was not ideal. And what was ideal changed frequently, causing women to distort their bodies in different ways throughout their lifetimes. Women "remain[ed] in fetters...in a strangling corset"[41], bound to their male sovereigns like horses in bridles.

Besides being seen as a way to control women themselves, corsets have also been interpreted as a way to elevate the status of the patriarchy. Fashion determined that women should wear corsets, and it was women who cared about fashion- they were frivolous, hence men could condemn women for wearing outfits that required corsetry, while at the same time expecting their use. This offered "masculine critics a safe platform to discuss dangerous sexual issues, while ingeniously providing a vehicle to shape and control female sexuality"[42] Thus doctors could advocate for 'health corsets' and preach about women needing to free themselves from the vanity of fashion, but could also expect to go home to wives or sweethearts who looked neat and 'properly shaped' in whatever corset was currently en vogue.

Along similar lines, many anti-corset advocates discuss the sadomasochistic nature of the garments. Corsets were described in a 2001 text as "construct[ing] middle-class women as psychologically submissive subjects"[43]. Traditional gender roles were reinforced or even increased, and the expected characteristics for each sex were clear. "Men were serious, women frivolous, men active, women inactive, men aggressive, women submissive."[44]

The Victorian era has traditionally been seen as a sexually repressive time period, and many scholars argue that corsetry was the perfect balance of punishment and sexuality for Victorian men and women alike. In a time when birth control was illegal, and pregnancy was an embarrassment but motherhood was idealized, "women were routinely objectified for the pleasure of the male spectator as a consumable object of desire."[45] This was accomplished through the use of clothing that both cloaked the body and emphasized its secondary sexual characteristics.

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[40] Leigh Summers, *Bound to Please: a History of the Victorian Corset*. (New York: Berg, 2001), back cover.
[41] Fontanel, 52.
[42] Summers, 3.
[43] Summers, back cover.
[44] Helene Roberts, "*The Exquisite Slave: the Role of Clothes in the Making of the Victorian Woman",* Signs, Vol. 2, (Spring 1977): 555.
[45] Summers, 186.

Victorian literature idealizes the submissive woman, and elevates her to the status of sainthood. A poem written by Coventry Patmore, about the joys of a perfect marriage, includes the stanza,

A rapture of submissive lifts,
Her life into celestial rest:
There's nothing left of what she was;
Back to the babe the woman dies.
And all the wisdome that she had
Is to love him for being wise[46]

This sentimental attitude towards the frailty of women does correlate with the popular clothing of the time, which tended to restrict movement in some ways. The attitude and clothing together have been interpreted to make the statement that "the clothing of the Victorian woman clearly projected the message of a willingness to conform to the submissive-masochistic pattern, but dress also helped mold female behavior to the role of the 'exquisite slave'"[47]

This masochistic leaning echoes with patriarchal sentiment as well. By asking women to be submissive, and dressing them as such, they become objectified. The idea of Victorian objectification of women is subtly different than our modern concept. Today, we think of a woman being objectified for her body, as a simple sex object. "Corsetry [had a] dual ability to create an acceptable fashion idea, ostensibly based on virginal reticence and refined debilitation, but with the added capability... to flagrantly sexualize the body."[48]

In the Victorian era, the clothes themselves often became the focus of objectification, and the woman as object was a perfect, submissive homemaker first, with sexuality only expressed in undertones and through clothing items. In fact, the sexualization of clothing was so rampant that it appears in quite a lot of Victorian literature. One such novel, The Well-Beloved (1892), records a scene in which the main character helps a young lady out of the rain and to her hotel. As he sits in the lobby, her wet clothes are sent down to dry by the fire, and, looking at them, he falls in love. This idealizing of a woman from her undergarments is wholly Victorian, and "the female body is articulated as a vessel for an (absent) unworldly object of desire, and her clothing as a vessel for the (absent) female body".[49] The corset (and its cousins, the shift and the

[46] Coventry Patmore, *The Angel in the House*, 4th ed. (London: Macmillan Publishing Co., 1866), 113.
[47] Roberts: 557.
[48] Summers, 122.

crinoline) became so entwined with the essence of femininity that they were an acceptable substitute for the female itself. In Victorian life and literature, "the female body and its clothes [became], not exactly exchangeable objects, but metaphors of sorts for one another."[50]Thus by becoming an accessory to the fetishizing of women, the corset was a symbol of women's oppression and struggle, a ball-and-chain that was keeping women from rising up from under the foot of the patriarchy. Through this lens, corsets were justly seen by modern historians as evil mechanisms, without merit to females themselves.

Corsets are also commonly viewed as painful garments, effective only when their wearer is uncomfortable. The history of their havoc-wreaking is summed up in a particularly vehement passage from a work of literature published in 1997- "After centuries of corsets that squeezed their breasts, bruised their waists, sheathed their bodies in armor, and made them all the more desirable, women finally jettisoned this instrument of torture."[51]

Most of these arguments against the corset have merit. The sexual dynamics of the Victorian times did call for a society in which women were expected to be quiet and angelic, and one cannot deny that the fashions of the time were restricting. But in recent years, a more balanced approach to the subject of corsetry has arisen- in 2001, Valerie Steele wrote that "corsetry was not one monolithic, unchanging experience that all unfortunate women experienced before being liberated by feminism. It was a situated practice that meant different things to different people at different times."[52]

Instead of simply discussing the militant feminist perspective on corsetry, scholars have begun to explore the "plurality and historicity of meanings and attitudes"[53] in relation to the garment. In imposing our modern viewpoint on a historical phenomenon, it is easy to add irrelevant meanings or disregard the ideas and surrounding culture of the time period itself. Concentrating on the "sociocultural production of meaning"[54], that is, the attitudes towards corsetry at the time it was used, as well as the attitudes of modern people who experience corsetry firsthand, creates a more balanced picture, one that looks at both the ways that corsets created a culture of gender inequality, but also how corsetry was empowering. Yes, corsetry had its issues, many of which were

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[49] Casey Finch, "*Hooked and Buttoned Together: Victorian Underwear and Representations of the Female Body*", *Victorian Studies* (Spring 1991): 338.
[50] Finch: 338.
[51] Fontanel, 7.
[52] Steele, 1.
[53] Murphy, 155.
[54] Murphy, 155.

valid, but it "also had many positive connotations- of social status, self discipline, artistry, respectability, beauty, youth, and erotic allure."[55]

In seeking a balanced view of corsetry, I donned an 1898 replica corset to experience the physicality of wearing one. As soon as the laces were closed, I did indeed feel like a feminine ideal- my waist was tiny and curved outward to a full bust and hips, and I was wrapped in ribbons and lace like a living present. But the feeling wasn't only about my silhouette. I stood erect (there was no other way to stand) and felt more confident in my posture and bearing, a respectable and attractive person. There was no doubt in my mind about the transformation that took place when I put on a corset. If I had to list my attributes while wearing one, femininity would have been written at the top. I did not feel uncomfortable, masochistic or pressured by patriarchy to fulfill an ideal.

The simplest way to refute the claims that women were sadomasochistic puppets can be found in the statement issued by Anne Hollander, one of the founders of the field of modern costume history: "People have always worn what they wanted to wear."[56] Stating that all women in the Victorian era were submissive and ready to accept pain to fulfill their feminine duty is to vastly underestimate the spirit of human nature. Today, in a room full of people, you will have some who dress to the height of fashion and damn the consequences, some who care enough to follow a few trends, and others who still wear their high school band t-shirts to work. Assuming that women were all equally enduring torture for centuries is a generalization, and a pretentious one at that. "It should not be assumed that all the women in the past were angry victims in their long skirts and tight stays, and felt forced into helplessness because of them."[57] Thinking this way robs all past generations of women of their free will, and reduces them to puppets on a political stage.

Similarly, the hosts of medical problems attributed to corsets run the gamut from punctured organs to general frailty. However, these accounts fail to take in the individuality of the wearers, and assume that all women are equally affected by wearing corsets. One doctor stated, frustrated, "Just about everything is now blamed on the corset, as though the individuals involved differed only with respect to how much or how little they used corsets; and as though differences in their constitutions, their physical strength, their lifestyles, their hereditary traits, their illnesses, their race, etc. were not equally capable of providing causes for the dissimilarities between them."[58]

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[55] Steele, 5.
[56] Anne Hollander, *Sex and Suits*, (New York: Knopf, 1994), 141.
[57] *Sex and suits*, 138.
[58] Fontanel, 62.

In looking at contemporary accounts of corsetry, it is also easy to find women espousing the idea. Corset maker Roxey A. Caplin wrote in her book Health and Beauty; or corsets and clothing constructed in accordance with the physiological laws of the human body (1854) that "the strong and perfect feel the benefit of using them; and to the weak and delicate or imperfect, they are absolutely indispensible...it is natural that ladies desire to retain as long as possible the charm of beauty and the appearance of youth"[59]

Corsetry was a way for women to feel respectable, presentable, and attractive. Clothing "reveal[ed] more clearly than speech express[ed], the inner life of heart and soul in a people, and also the tendencies of individual character,"stated Sarah Hale in her 1868 book Manners; or Happy Homes and Good Society All the Year Round. When worn properly, most corsets were minimally invasive, and it was thought that "tightness by its firm pressure on the body symbolized a firm control over the self."[60] Although it was not always comfortable, corsetry

> "demonstrated the primal and often sacred original purpose of dress, which is to represent, in terms of self-imposed and noticeable body applications, the imaginative projections and the practical sacrifices that divide self-aware human adults from careless infants and innocent beasts."[61]

In other words, corsets helped women feel like women- in control of themselves and their bodies, and marked them as free-willed human beings.

Wearing a corset also helped women identify themselves in a class-based society. Respectable women wore corsets- "to the middle class sensibility, the uncorseted woman reeked of license; an unlaced waist was regarded as a vessel of sin."[62] Corsets came to stand for modesty, the mark of an upstanding citizen, and the image of a well-put together woman. In the late 1870s, writer Eliza Hawei penned, "People who refuse to wear any corset at all look very slovenly."[63] And even though corsets were available at all economic and social levels, they were still used as a tool to distinguish the classes from each other. Les Domestiques, a cartoon from the 1870's pictures a corporeal maid in a corset and dressing gown holding up the dainty corset of her lady. The corsets are exactly the same except for the sizing, implying that although the maid may aspire to be like her lady, her lower class figure will never allow it (Fig. 5).

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[59] Steele, 41.
[60] Summers, 84.
[61] *Sex and Suits*, 9.
[62] Hooked and Buttoned Together, 339.
[63] Casey: 51.

Conversely, corsetry also helped women express their sexuality. Corsets were idealized and fetishized by men, but that does not mean that their erotic connotations were disregarded by women either. “Men were not responsible for forcing women to wear corsets,”[64] and living in a sexually repressed society did not mean that women did not want to express themselves in a sexual way. Cheeky cartoons from the period even played on the sexuality of women wearing corsets. A common theme in cartoons was the cheating wife- a cuckolded husband is untying his wife’s corset laces, and mutters a confused exclamation. “That’s odd! This morning I made a knot and tonight there is a bow!” (Fig. 6). The reader is supposed to realize that the woman has removed her corset during the day in a tryst, a seemingly raunchy thought process for such a traditionally stoic era.

One of the most commonly discussed phenomena in literature about corsetry is the idea of tight-lacing. Tight-lacing is the practice, understandably, of lacing one’s corsets or stays beyond the normal level of comfort required. Accounts of tight-lacing put some grown women’s waists as small as thirteen or fourteen inches- one famous tight lacer was the actress Polaire (Fig. 7).

Anecdotes of women who died from the process were common, although most were vague and poorly documented, seeming to be morality fables rather than factual accounts. In 1859 a Paris newspaper reported the following story:

A young woman, whose thin waist was admired by all her rivals, died two days after the ball. What had happened? Her family decided to find out the cause of her sudden death at such a young age and had an autopsy performed. The findings were rather surprising: the liver had been pierced by three of the girl’s ribs! This shows how one may die at the age of twenty-three, not of typhus or in childbirth but because of a corset.[65]

In 1848, The Family Herald declared that “Women ought to measure from 27 to 29 inches round the waist, but most females do not allow themselves to grow beyond 24; thousands are laced to 21, some to less than 20”[66] The first wife of Liddell Hart was required by him to tight lace- she wrote to him in a correspondence that “I don’t like these... corsets because I am uncomfortable and they make me feel sick.”[67] However, although the modern perception is that tight-lacing was a common occurrence, it was, in actuality, frowned upon.

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[64] Steele, 1.
[65] Fontanel, 54.
[66] Steele, 88.
[67] Steele, 108.

For example, many of the accounts of tight lacing that are currently archived are found in a magazine known as the Englishwoman's Domestic Magazine, published from 1867 to 1874. Many of these letters, when read, can be found to have an undertone of fetishism and sexual fantasy, from female and male writers alike. Such correspondence included phrases such as "well-applied restraint is in itself attractive", and "the tighter the better."[68]

> "Many of the tight lacing letters have a pronounced sadomasochistic tone. References to 'discipline', 'confinement', 'compulsion', 'suffering', 'torture', 'agony', 'submission', 'martyrs', and 'victims' abound- as do references to the 'delightful', 'delicious', 'exquisite', 'exciting', 'pleasurable', and 'superb' sensations experienced by tight lacers."[69]

These letters, combined with the general scorn shown towards tight lacers, help shed light on the fact that not only was Scarlett O'Hara's seventeen inch waist atypical, it may also have come from the sexual fantasies of a few young girls in a mid-century magazine.

The actual standard for waist measurement was much higher, and most would fit an average young woman's figure. In the Victoria and Albert Museum, "the majority...measure between 52-67 cm laced closed, and since most women wore their corsets laced fairly wide at the back we should add at least 5 cm."[70] Corsets were typically advertised in sizes from 18 to 30 inches, with larger sizes available for a higher price.[71] And many recorded waist measurement sizes are inaccurate, since as stated in The Dress Reform Problem, "Young girls, especially, derive intense satisfaction from proclaiming the diminutive size of their corset. Many purchase eighteen and nineteen inch stays, who must leave them open two, three, and four inches."[72] Just like modern 'vanity sizing', the measurements attached to the garment may not give a true indication as to the size of its wearer.

In the nineteenth century, doctors considered the normal size of a female waist to be between 27 and 29 inches. Museum corsets are generally found between 20 and 26 inches, so "it seems that many women laced two or three inches smaller than their natural waists, while some may have laced four, five, six inches smaller."[73]

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[68] Steele, 92.
[69] Steele, 92.
[70] Lynn, 73.
[71] Steele, 102.
[72] E. Ward & Co. *The Dress Reform Problem: A Chapter for Women*. (London and Bradford: Hamilton, Adams & Co.; John Dale & Co., 1886).

Author Siri Hustvedt was an extra on the set of the film Washington Square, and was dressed in mid-19th century clothing for eight days during shooting. She stated, "Wearing a corset is a little like finding oneself in a permanent embrace, a hug around the middle that goes on and on. This is pleasant and vaguely erotic- a squeeze that lasts."[74] According to Hustvedt, "The corset helped to create a notion of femininity, and the lines it produced have gone in and out of fashion ever since."[75]

Corsetry was used by many as an ally in their quest for femininity, and although problems with the garment did exist, there were definite psychological benefits to their use. Just like a modern training bra, corsetry "provided concrete (if private and symbolic) recognition of the transition between pre-adolescent years, puberty, and adulthood."[76] It was a way for women to mark themselves as women, to don something so significant and integral to their femininity.

This was reflected in the ads of that period as well. In modern times, a woman is inundated with media messages about staying thin and in shape, having perfect hair and teeth, exercising, dieting, and wearing beautiful clothing and makeup. In the Victorian era, these 'feminine ideals' were attained with the proper corsetry. Advertising played a large role in this construction- one popular theme was the 'before' and 'after' story. In one popular advertisement from the late 19th century, a woman looks sadly in the mirror at her disheveled figure, mourning how horrible her corset is. But then she purchases a Madame Warren corset, is admired by all, and ends the story with a happy marriage (Fig. 8).

Corsets allowed women to seek perfection, which allowed them to fit into society and to feel more confident about themselves. "The judicious use of corsetry enabled women to construct a femininity that reflected middle class ideals and expectations of female gender."[77]

Physical Experience of Corsetry as Research

First person documents are a useful and convenient tool for accessing the private and public lives of individuals in history. But reading documents and viewing images is just one facet of interpreting historic details. Corsets were not just written about- they were created, worn and physically experienced by women. I felt that in order to establish a well-rounded view of my subject, I needed to experience corsetry for myself. In that

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[73] Steele, 103.
[74] Siri Hustvedt, "Pulling Power", New Statesman (2006): 41.
[75] Hustvedt: 41.
[76] Summers, 77.
[77] Summers, 78.

way, I would be viewing history not only through the lens of those who wrote or spoke about it at the time period, and those who reinterpret that information in a modern context. I would actually be able to share at least a fraction of the physical experience of corsetry with Victorian women.

With this viewpoint in mind, I constructed, from start to finish, two Victorian corsets. The first was a pair of 1830's corded stays, and the second was a fully boned 1890's corset. I did not set out to create exact reproductions, but replicas, commonly defined as a copy closely resembling the original concerning its shape and appearance. I felt that in using modern sewing techniques and occasional substitutions, it would not compromise the integrity of the appearance, silhouette, or feel of the corsets.

I was not concerned with using period appropriate thread, buttons, or even material. The 1830's corset, which would have been jean or linen, was constructed using an old polyester tablecloth. Similarly, when some of the steel boning I purchased for the 1890's corset was too short, I substituted with modern zip ties. These are not substitutions that greatly affect the objects themselves: the white tablecloth has a similar weight and drape as linen, and the zip ties are encased with material, so they are not seen. However, these substitutions made creating corsets on a budget in a dormitory much simpler and more accessible.

The methods and materials I used in construction differed, sometimes greatly, from what would have been in use at the time. I used materials bought at a local crafts store or mined from my attic, and a home sewing machine propped on my dormitory desk. This method of construction looks nothing like what would have been used to create either corset.

In the first part of the 19th century, corsets were hand sewn, as the first commercial sewing machine would not appear until the 1850's. My 1830 corset would have been put together without the aid of a machine, probably by the woman who would end up wearing it. Commercial patterns were not yet available, so crude diagrams were offered in books such as The Work Woman's Guide- these were boxy and created to conserve fabric. A woman at home would have had to do quite detailed measurements and conversions to change a crudely drawn set of squares and triangles into a functional corset. However, she also would probably have had the aid of older female relatives or acquaintances to help her, a luxury that, as one of the only sewing-accomplished young women I know, I did not have.

Even with the aid of a machine, creating this corset was labor intensive. The amount of hours that must have been spent back-stitching hundreds of cording channels by hand is unimaginable. There is, however, a similarity between myself and the woman

who created this corset almost 200 years ago. The corset would have been sewn on breaks between other, more important activities such as chores and baking, or at night after children had been put to bed. Similarly, I balanced my schoolwork, job, and social life, and found the cracks in between to sew the corset. This was probably the most realistic time frame in which to construct the corset, because it certainly wouldn't have been put together in a few days like it would be if it was created in a modern costume shop.

The 1890's corset would have been created on the other end of the spectrum. By the end of the 19th century, corsets were being mass produced in factories. The corset I created on my home sewing machine is a replica of one sold by R & G corsets in 1898. In the Ladies Home Journal of March 1898, R & G stated "When the R & G Corset has been cut and stitched and boned, it is dampened. Then it is stretched on a steam-heated hollow iron form... The iron form is just right. It is modeled after a perfect human figure."[78] I had no such technology at my fingertips, so instead of molding my body to the perfect form, I was able to adjust the measurements of the corset to better fit my body. Like today's store-bought clothing, it must have been difficult to find a good fit in a factory-made corset. Sizing is still not standardized, and when the corset you are wearing is molded to 'the perfect body' but yours has human flaws, it must have led to some frustrations. I was able to circumvent those by taking in and letting out as necessary. It was interesting to note as I was making this corset, that those who would actually be wearing it in 1898 would not have had the experience of putting it together. Like a modern coat, it came ready-to-wear, and I would venture that little to no thought was wasted about the construction by the wearer.

I made both corsets using commercially available patterns, which were created from original garments. Unfortunately, my history with commercial patterns has been one fraught with problems, and these corsets were no exception. After carefully measuring myself and using the correct sizing as listed, the 1830s corset came out too small for my figure, and the 1898 corset was too large. I found ways around these difficulties, but they were still frustrating. My smaller-framed neighbor became the model for the early Victorian corset, which fit her well. I was able to size down the 1898 model before finishing, but not enough. Corsets are supposed to have a gap in the lacing, known as 'spring', of about 2 inches. In order to get full support from my corset, I needed to lace the back completely closed. A corset that fit me properly would have been about 2" or 3" smaller around in circumference. I was still able to experience the feeling, however, and ultimately the sizing issues did not ruin the experience.

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[78] Altman, 1.

Once they were finally constructed, it was time to experience them for ourselves. I began by fitting the 1830's corset to my neighbor Sutton. The cording created a stiff surface that held in her stomach and allowed the corset to be pulled tight using the back laces. However, the material was pulled to a certain point and then would go no further, even though Sutton said she felt like it could be pulled more tightly. Without boning, especially on the outside of the lacing holes, there was nothing to aid the corset in being overly restrictive. It reduced Sutton's waist by 1", and could go no further. The spring at the back was almost exactly 2" (Figs. 9-11).

By contrast, my 1898 corset was laced completely closed. The steel framework of the corset aided in creating a garment that could forcibly become smaller and smaller. I could feel myself being caught off balance as the strings were pulled and the steel compressed my waist. Even though my waist was reduced by 2", I felt that the corset could have become even smaller. The only thing stopping that from happening was the fact that the corset itself was a few inches too big for my figure (Figs. 12-14).

Sutton's physical reaction to wearing the 1830's corset was almost underwhelming in its casualness. Several times she compared the garment to a sports bra, and stated that she felt snug and supported in it. She reported no discomfort, although she had to alter her breathing so that she breathed from her chest instead of her diaphragm. She also laughed that the busk in the front was probably the reason for inventing the chaise longue, because it was so difficult to sit down normally. When I asked her about how she would feel doing heavy labor in the corset, she stated that it would have to be loosened slightly, but that it would feel supportive and not restrictive. Once the garment came off, she said she could feel the difference in her body. All in all, the experience of wearing an 1830's corset didn't seem to be much more dramatic than that of a woman wearing Spanx to a formal event, except with the addition of a wooden busk.

My experience with the 1898 corset yielded more dramatic results. After the corset was cinched closed, I was at first disappointed that it was too large, because I had hoped to significantly reduce my waist, thus 'authenticating' the experience. I felt that, had the corset been smaller, my waist could have been reduced even more. However, I remembered a note in "Fashion in Detail" about waist sizes- the majority of the corsets in the V & A are from 52-67 cm laced closed (remembering, of course, that there is a 5 to 10 cm gap in the lacing when worn). Mine, laced closed, measured 65 cm. This means that if I wore a properly fitted corset, it would be closer to 55 cm laced closed. Both of these measurements fall in the most common sizing range, meaning that although I didn't reduce my waist in the extreme, I still achieved a figure that was an average size for the period.

I then remembered another mention of lacing. “Corsets: A Cultural History” reminded me that most women laced two or three inches smaller than normal, making my experience completely in line with an average 1890’s Victorian woman. Even I, who have done so much research on the subject, am still blindsided by the popular notion of tight lacing, when in fact most women had waists that, when corseted, were not significantly smaller than our own.

I mention earlier a woman who wore a corset for a historical film, and described it as being like a constant hug. Her description is accurate, and picturing it is the best way to visualize the feeling of wearing a tight corset. It was tight but oddly comforting- the support of doing hundreds of crunches without all the work. Although binding, it was not painful in the least- I felt like it could have been several inches smaller before I started to feel any discomfort. I didn’t worry about slouching, or my stomach sticking out- those things were impossible! Superficially, my body was feeling no ill effects from the corset.

However, my body, so used to breathing freely from my diaphragm and being able to pursue physical activity without fear of repercussion, was sometimes caught off guard by the corset. My breathing was altered significantly. I had to breathe from very high in my chest, and taking a deep breath took coordination, even to the point of having to place a hand on my sternum to compress it slightly so air could flow properly. I painted my nails while wearing the corset, and as I blew on them to dry, I began to feel light-headed and had to stop. My movement was restricted- bending down required an entire body’s focus, instead of just bending at the waist. I felt the effects of the corset after its removal- the feeling of a phantom hug for a few minutes after taking it off, and the lingering marks of steel boning on my stomach. Modern studies done on leggings have revealed that their compression on women’s bodies actually causes the muscles in their stomach and legs to relax, decreasing muscle tone. This was a common problem with corset wearers as well, and after wearing one for just a few hours it is easy to see why- when the corset does all the work for you, you can feel the rapid decrease in your muscle tone.

The most interesting thing I noted when the corsets were being worn was the sexualization of the one from the later period. While Sunny compared hers to the traditionally unsexy sports bra, I got compliments, a joking request for my number, and a suggestion that I wear the garment out to a bar. The reduction in my waist and the subsequent exaggeration of my hips sparked a conversation about the ‘ideal’ waist to hip ratio in women. Apparently it is .7- before the corset mine was a .73, and after it was reduced to a .68. I felt not only comfortable in my corset, but sexualized. And this led to a whole new set of questions- was this sexualization a recent development? Today corsets

are fetish wear and lingerie- when they are worn they are worn specifically to be sexy. The hourglass figure created by the 1898 corset is also highly coveted in today's society as the ultimate in Victoria's Secret model sexuality.

But to what extent was a corset sexualized in Victorian Society? We know from books of the period that underwear often stood as a substitute for a woman's nudity, but the true extent of corset sexualization is not something that can be found in literature. Just like the comments I received when walking around in a corset, sexualization could have been verbalized, or expressed in gestures or other non-written communication. The pervasiveness of the Victorian's sexualization of corsetry is impossible to determine without actually living in their society, especially since sexual desire was not widely discussed in public forums.

And this ambiguity extends beyond just sexuality. In donning a Victorian corset I experienced one tiny fraction of a Victorian woman's life. I was able to physically experience the 1898 corset, and hear the physical experience of someone wearing the 1830's corset. Yet I was still wearing the garment in a modern context, and most of the surrounding ideologies of corsetry remained inaccessible to me, hidden in the unwritten experiences of women who lived in a corset every day and could not, as no one can, express adequately all the factors that created their experience.

Constructing and wearing a Victorian corset helped to put me, however briefly in the physical shoes of corset-wearing women from the past. Yet in adding a physical element to my research, I created even more questions for myself, most of which are unanswerable. The fact remains that modern historians can interpret the experience of corsetry in a multitude of ways using primary sources, and I can make and don an accurate period corset to experience the physicality of corsets, but we will never be able to construct the environment in which Victorian women actually experienced corsetry every day. Therein lies the beauty of costume history- by perusing the subject from every possible angle, we can try to pin down the humanity of past cultures. But the terrible and fascinating complexity of human society means that even the significance of something as simple as undergarments will remain elusive to all but the Victorians themselves.

Conclusion

Though the field of costume history is recently emerging, scholars have already produced vast quantities of literature on the Victorian corset. The garment is an unfamiliar one to modern audiences, and the ideals it represented in its 19th century heyday can be interpreted in countless ways. Many factors contributed to making the Victorian corsetry the monolithic presence that it is in modern minds, including the

simple currents of fashion, the industrialization of the clothing industry, and the repressed sexual atmosphere that surrounded such a garment. The costume history field, with roots in the Women's Liberation movement, has been generally derogatory of the corset, proclaiming it a dangerous tool of the patriarchy in promoting the oppression of women. However, when corsetry is examined through a lens incorporating contemporary feelings of women who wore them, the social and cultural atmosphere surrounding the Victorian era, and the physicality of wearing corsets themselves, a much more balanced and complex picture emerges, of the corset as a means for women to assert their femininity in an era where being feminine meant being anything but assertive.

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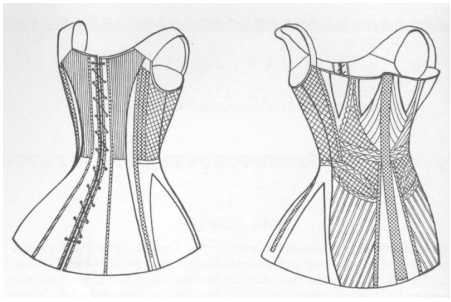

Fig 1: Late 1820’s/early 1830’s stays, white sateen. (Waugh, 82)

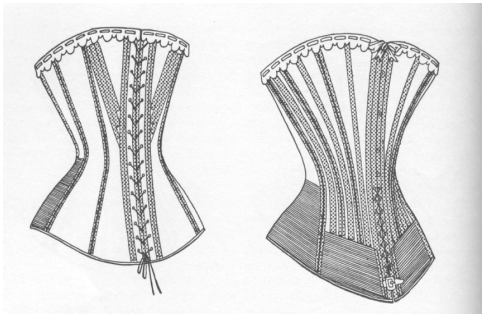

Fig. 2: Mid 1890’s corset, black coutil. (Waugh, 76)

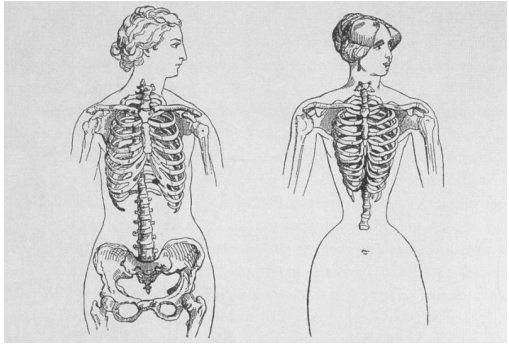

Fig. 3: Uncorseted and corseted illustration of a woman’s skeleton. From 1898 Tetoniana, Witkowsky. (Steele, 69)

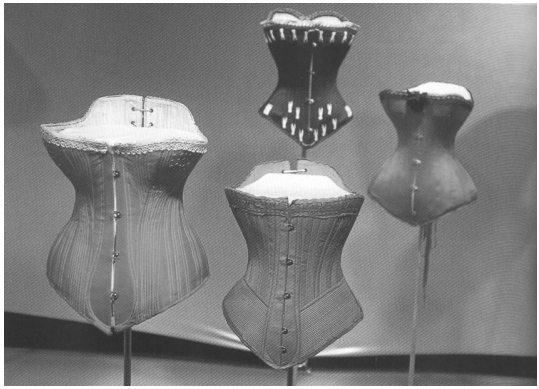

Fig. 4: A khaki Pretty Housemaid corset (center front), along with other corsets revealing the range of sizes and styles available. (Steele, 48)

A. Grévin, *Les Domestiques*, 1870s.

Fig. 5: “Les Domestiques”, an 1870’s cartoon by A. Grevin. (Steele, 48)

Fig. 6: 1840's cartoon by Gavarni depicting a cuckolded husband untying his wife's corset laces. (Steele, 45)

Fig 7: 1890 portrait of actress and tight lacer Polaire. (Fontanel, 55)

Fig. 8: Advertisement for Madame Warren Corsets. (Steele, 134)

Top left: “Oh! How horrible I look in this old corset.”

Bottom left: “What an improvement the Madam Warren Corset and how comfortable.”

Top right: “How delightful to be admired by everybody.”

Bottom right: The Happy Result!

Fig. 9: Sutton before corset.

Fig. 10: Front of 1830's corset, white polyester with gusset inserts at hip and chest, cording, and wooden front busk.

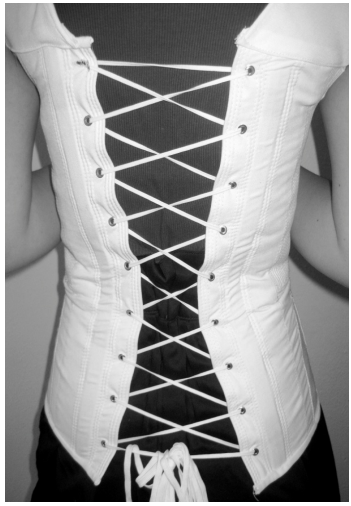

Fig. 11: Back of corset, with zip tie reinforcement, metal eyelets, stay laces.

Fig. 12: Myself before corset.

Fig 13: Front of 1898 corset, purple sateen with black lace edging, hook and loop closure, and steel boning.

Fig 14: Back of corset, with metal eyelets and corset lacing.

A Dynamic and Progressive View of Autism Across Life Stages as seen in *After Thomas*, *The Curious Incident of the Dog in the Night-Time*, and *Temple Grandin*

Ananda DiMartino[1]

General behaviors and characteristics that coincide with the disease autism can be defined, but a specific child, adolescent, or adult with autism cannot be placed strictly inside those generalities. Living with autism, a person is sensitive to certain stresses and situations that usually cause a tantrum, and has his or her own way of coping with these stimuli. The general behaviors and characteristics that coincide with autism, as author Grace Baron et. al. lists, are "…attachment to objects, repetitive isolated play and activity, lack of eye contact, and flat affect make it difficult for the child or adult with autism to form social relationships" (17). These definitions pertaining to autism make it particularly hard for outside people to understand how the person with autism is feeling, how they can be aided, and how they can interact with them. The different challenges, similarities, and differences between the spectrums of autism, in children, adolescents, and adults, can be observed in depth through the film *After Thomas*, the novel *The Curious Incident of the Dog in the Night-Time*, and the docudrama *Temple Grandin*. Not only the challenges and successes of each main character are explored, but also the challenges and successes of these characters' caregivers are portrayed, all playing a vital role in one another's lives.

The challenges for a young child with autism, Kyle, in the movie *After Thomas*, are demonstrated with his narrow vocabulary range as a result of insensitivity to concepts and feelings of other people; his rejection of change as a result of requiring a routine and familiarity; his solidarity as a result of not understanding other people's actions or emotions; his dislike of being touched, and the overstimulation of his senses. The film *After Thomas*, by Simon Shore, demonstrates that for a child with autism and his or her parents, in the childhood stage, living with autism is the hardest. One of the reasons that the childhood stage of autism is so difficult is because a child with autism may barely speak, or not speak at all, until they are around five, even with hands on guidance, attention, and teaching from caregivers. Living with autism, Kyle doesn't like being

[1] Written under the direction of Dr. Marilyn Kiss and Dr. Carolyn Oglio for the team taught ILC *Child Psychology: Children in Film and Literature*.

touched or interacting with others, so he comforts himself by rocking, as in his classroom when he sits alone and rocks; he is affected by certain stimuli which cause him stress, like the word "okay," or "school," and throws tantrums in response; he does not understand or respond to his caregivers, his father saying the museum is "closed," because he lacks language and rationalization skills; and, lastly, he doesn't understand concepts or emotions because he has nothing to relate to, which is where the dog, Thomas, comes in (*After Thomas*).

The biggest challenges for Kyle's parents are stress due to feelings of inadequacy, having no life, and identifying themselves simply as "objects" that give Kyle what he needs. Author Orsmond supports this when he states that, "Raising an adolescent or adult child with a developmental disability can be stressful and confers exceptional caregiving challenges on parents" (551). For Kyle's mother, stress and bad feelings stem mostly from a lack of acknowledgment and physical contact, or love, from Kyle, and the lack of any connection, even a conversation or being called "Mum". His mother, Nicola, spends all her time trying to push him, teach him, and challenge his autism. When Kyle's parents decide to get Thomas, they prepare him for the change, with no direct result, and eventually bring the dog home.

The first night the puppy, Thomas, is home with the family, Kyle already demonstrates the benefit of having a dog by going downstairs and talking to Thomas, saying, "Bedtime Thomas" (*After Thomas*). After this, every day Kyle's language skills develop substantially, which is seen from him repeating what his parents have said to him, not right away, to Thomas. This demonstrates how "Treatment to relieve symptoms of autism involves early education," along with repetition and a supporting medium, in this case Thomas the dog (Berger 332). Dogs are simple, without spoken emotion or social interaction pressures, so Kyle can relate to Thomas; thus, he teaches Thomas and learns through him as well, about the objects and people around them. The biggest success for Kyle and his parents is the development of Kyle's understanding of emotions and figuring out his own emotions. The most prominent and advanced example of this is in the end of the movie, when Kyle says that, "Thomas loves his Mum. And Kyle loves his Mum" (*After Thomas*). Finally, Kyle has overcome many of his initial challenges, and has progressed past the expectations of any of his caregivers.

Commonly, adolescents with autism, with the right responses and attention paid to each specific case, have progressed since childhood in their abilities and understanding of themselves and their disease. In the novel *The Curious Incident of the Dog in the Night-Time*, Christopher, a fifteen year old with autism, demonstrates that general behaviors and characteristics of autism continue throughout life, but he shows that there

is no limit to the number of new obstacles he can overcome. Living with autism as an adolescent, Christopher demonstrates the general behaviors and characteristics: specifically, he does not like being touched; he does not like looking at people's faces because he doesn't understand emotions or facial expressions, and he has certain stimuli that cause him stress, like the colors brown and yellow. When he feels unsafe or upset, like every child with autism, he has a coping method, which is covering his ears while groaning or listening to white noise, and rocking back and forth. This is a specific example of how "Children typically find ways to compensate: they learn effective strategies to work around their deficiencies" (Berger 330). Another one, in Christopher's case, would be having a special food box that only he can touch, and also, with a food that he likes, but if it is brown or yellow, he has food coloring to put on it so he can eat the food.

Christopher is developing mentally, attending school, and is extremely smart when it comes to science, math, puzzles, and word definitions; despite this, he still does not understand people, but in an educated way where he explains that this is because people lie, use metaphors, and have pictures of things in their heads that aren't real. New people and places are still a challenge for Christopher, along with communication in general. Christopher goes to a special needs school and talks to his advisor, Siobhan, every day; she answers his questions, helps him understand facial expressions, drawing them on a piece of paper for him to consult, and teaches him how to react in uncomfortable situations, by counting from 1 to 50, along with other things. Christopher is familiar with Siobhan, seeing her every day and knowing her, so he trusts her and listens to what she tells him, which shows how "Individually tailored programs can include behavior modification…" (Gavin, Meduri, and Lyness 2). One area of a challenge that both Christopher and his Father have is communication. Whenever Siobhan explains something, Christopher clarifies that, "When she tells me not to do something she tells me exactly what it is that I am not allowed to do. And I like this" (Haddon 29). Christopher's father, even when he thinks he does, does not explain things to Christopher specifically enough. This causes disagreements about Christopher minding his own business, not investigating who killed Wellington, the neighbor's dog, and about the mystery novel Christopher is writing.

Christopher's biggest success in overcoming aspects of his autism and things that challenged him are all bundled together into one big trip. Christopher decides he is going to live with his mother as soon as he decides he can't trust his dad because he lied about his Mom dying and lied about killing Wellington. This journey entails Christopher running away from home and overcoming things he doesn't like as a result of something

he doesn't like even more, which at this point is his father. For his trip he had to ask strangers for directions, hold onto his yellow train ticket, be around a lot of people in a crowded area, and use a public toilet. To accomplish all of these things, Christopher used the skills Siobhan had taught him and said how he sat in the train station, "And then I *Formulated a Plan*. And that made me feel better because there was something in my head that had an order and a pattern and I just had to follow the instructions one after the other," before he began traveling (Haddon 132). As a result, he was brave, got to London and found his mother, solved the mystery of who killed Wellington, and later got an A on his A Level Maths exam, accomplishing things he never would have imagined.

In the film *Temple Grandin*, Temple demonstrates the amazing success and growth of an adult with autism. She demonstrates the general behaviors and characteristics of a person with autism, but to a much less extreme and in a way that does not compromise her life out in the world. Temple is extremely interested, efficient and knowledgeable in the fields of science and math because she thinks in concrete, realistic pictures where she can see the moving and static geometry of any object. She is able to speak almost normally, meet new people, try new and unfamiliar things, and can have a conversation with someone. She still, like all people with autism, has a hard time understanding people's emotions and facial expressions in response to her or other things, like girls' goofy responses to boys, but she just ignores them. Stimuli that cause her stress often have to do with changes in her direct life or environment, like the sign on her room with her name on it falling off the door, and these over-stimulate her senses and her brain. She thinks in pictures and connects the pictures to understand objects or concepts, so when she cannot picture everything that is going on because there is too much, she is over stimulated and goes into a tantrum caused by stress and anxiety.

Temple's initial challenge was dealing with the change and newness of going to college, leaving her old school and Dr. Carlock, the science teacher she connected with. These were also challenges for her mother because Temple had a few tantrums, but giving Temple space calmed her down. Another struggle that Temple and her mother share is the lack of physical contact and affection on both their sides because Temple isn't comfortable with it as a normal part of her autism, but she still wonders about the feeling. Her largest success in the film overcomes this challenge and calms her in times of stress or a tantrum throughout the rest of her life. Structured after the cow-calming device on her Aunt and Uncle's ranch, used when cattle are being vaccinated, Temple designs her own hugging machine that works for her. It succeeds in calming her down and, as she explains, "I've always wanted to understand the gentleness that other people feel by being hugged by their mothers. And now I've made a machine that lets me do

that. It feels like a wire gets reconnected. Like something gets repaired" (*Temple Grandin*). The other thing that helps her is the image that Dr. Carlock suggested to her of thinking of a new challenge as "just another door," and all she has to do is open it.

With the use of her hugging/calming machine and the idea of each challenge as just a door that needed to be opened, Temple's successes were ongoing. Unlike many adults with autism, Temple graduates college with her BA in science, gives her graduation speech, writes a successful Masters Thesis and gets her Masters Degree, lives by herself in an apartment, understands kindness and love, has a car and job, and designs a cattle bed that is still widely used today, thanks to the pushing and support from her mother and Dr. Carlock. Through all of this, she understood her disease, used it to her advantage and embraced it, knowing that she could do things that many other people couldn't imagine. The most powerful way that Temple understands her disease is knowing that she is "Different but not less" (*Temple Grandin*). All of this leads to the culmination of the film and her greatest success of all when she is at the autism convention with her mother and begins telling people her story. Everyone is really impressed and intrigued by her so they ask her to tell them her life history and how she got to this point. This is a success for her mother also because here Temple publically acknowledges the efforts her mother made for her throughout her life and admits she wouldn't be the amazing person she is today without her mother's sacrifices. Her mother saw how much Temple had overcome because she wasn't bothered by the stimuli that used to stifle her. Once handed the microphone to go on stage in front of many people, Temple pictured a door, opened it, saw the many others she had walked through already, and told people her story.

The different challenges and successes of people with autism… a child, an adolescent, and an adult…are witnessed in depth through the film *After Thomas*, the novel *The Curious Incident of the Dog in the Night-Time*, and the docudrama *Temple Grandin*. While Kyle, Christopher, and Temple were all in different stages of life and their autism, there are still many similarities among them that are observed as a result of the definitions of general behaviors and characteristics in a person with autism. All three of them exhibited understanding of feelings and gaining physical contact through animals; they all displayed the necessity for a general routine or schedule; each had his/her own specific food rules and needs, and they each had a certain way of coping with stimuli that caused stress. Differences among the three of them were the actions they took to handle their stress individually. All three of the characters shared the challenge of being in a space with a lot of people, which proves true how in people with autism, "Their heads are large, and parts of the brain are unusually sensitive to noise, light, and

other sensations," so they are easily over stimulated. This over stimulation is a result of brain sensitivity, but also, for all three, the challenge of dealing with new people, things and changes (Berger 331).

Kyle, Christopher, and Temple all utilized the process of referencing other objects to understand reality. Kyle, as a child, accomplished this in a simple way, referencing "Thomas the Tank Engine" and then Thomas the dog to develop his language skills, parental acknowledgement, thoughts and feelings, and to form a friendship. For Christopher and Temple, the process of using or referencing other objects to understand reality is more complex, similar to each other, and both different from Kyle. In the novel, Christopher describes every detail of every thing he sees now and can tell you every detail of every thing he has seen in the past. The reason for this is the way he sees things, thinks of them, and processes them; he explains, "I see everything," and this is unique because, "Other people have pictures in their heads, too. But they are different because the pictures in my head are all pictures of things which really happened" (140, 78). Temple also sees everything and can explain every detail of things in the present or of something she saw in the past. Her way of seeing, thinking about and processing is similar to Christopher's; she states in the beginning of the movie *Temple Grandin* that, "My name is Temple Grandin. I'm not like other people. I think in pictures, and I connect them". Both Christopher and Temple relay a common way that both adolescents and adults with autism see, think about, process and remember things, also using these picture memories as references for concepts or reality.

In a child with autism who is growing into adolescence and adulthood, observed in Christopher and Temple's cases, the autism disease itself does not always limit academic achievement and excellence. Christopher's and Temple's special way of thinking and being able to recall pictures of everything they have seen actually enhances their abilities; both are very good at math and science. The fact that Christopher and Temple were so smart and functioning while being diagnosed with autism, leads to the possibility that they both had a different form of autism called Asperger syndrome. Berger supports the reason behind this possibility because "…those with Asperger syndrome, are called 'high-functioning,' which means that they are unusually intelligent in some specialized area and that there speech is close to normal. However, their social interaction is impaired" (331). Christopher and Temple both demonstrated strong abilities in the understanding of and the use of language, high capabilities in math and science, but still struggled with understanding different emotions, facial expressions, and social contexts.

The exploration of people with autism in childhood, adolescence, and adulthood brings to light that it is essential for a person seeking to understand and interact with an autistic person to explore beyond the defined and rigid list of general behaviors and characteristics that coincide with autism. Every person with autism is unique, with individual stresses, coping mechanisms, ways of thinking, and socializing. If we seek to understand and help someone with autism, it is important to know the background information on autism and then approach a situation or interaction with that person without any preconceived or concrete ideas. With patience, experimentation, repetition, and support, we can strive to understand and connect with a person with this misunderstood disease.

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“For Richer, For Poorer?” : Gender, Money, and Marriage

Victoria Felix (Psychology)[1]

"I, ___, take you, ___, for my lawful wife/husband, to have and to hold from this day forward, for better, for worse, for richer, for poorer, in sickness and health, until death do us part” (Catholic Wedding Vows, n.d.). As I watched my father pack up the trunk of the U-Haul truck, taking every last material item that belonged to him, including the package of napkins on our kitchen table, I began to question the seemingly arbitrary nature of these vows. My father’s absence immediately resulted in a number of questions. Who will dictate our family unit? Is mommy going to be allowed to make the family decisions now? How will our material lifestyle change? Can we still afford to live in our house? Interestingly, not a single question concerned the emotional trauma from losing our father in the household. His roles included establishing norms for acceptable behavior and providing material wealth; we did not know that a father could have any other role.

It was through this (non) union, dictated under these vows, that I learned how to define sex, gender, and sexuality. Through watching the disintegration of my parents’ marriage, and in using evidence from Amadiume (1987), Austen (1996), and empirical research, I have formulated a definition of marriage as a union devoid of romance or love. It may seem as though these three worlds (Amadiume, Austen, and my family) are too different, too disconnected to be able to formulate a common definition of sexuality and relationships. It is important to note the historical connection that exists between these three worlds. Amadiume describes the Igbo culture in West Africa, while Austen describes the lives of white upper class families in England. Amadiume’s West Africa was primarily used by Austen’s England for enslaved human labor. These two cultures, connected through the political economy, helped to formulate the normative culture in the United States, including what we came to know about the importance of labor and how it should happen in society. This then places my family’s story within Amadiume and Austen’s shared history. Through connecting these histories, marriage can be conceptualized as an institution that teaches sex and gender roles through establishing norms for “acceptable” behavior, and can be defined through cultural materialism as an adaptation to secure resources.

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[1] Written under the direction of Dr. Jean Halley for honors seminar SO213: *Sexualities and the Social*.

Marriage can be viewed as an institution that develops and maintains normative gender roles. It was through my parents' marriage, and particularly my father's actions, that I was taught the acceptable and normative ways to be female within my family. Dictated by patriarchy and embodied by the mind/body split gender ideology, my father held all of the power in the household, and my mother's purpose was to serve his every whim. My father's familial roles were associated with the mind: working, financial responsibilities, and decision-making. My mother's familial roles were associated with the body: maternal roles, domestic duties, and sexual gratification for my father. My mother was treated as though she was my father's property. Their violent marriage firmly established a cycle of gender inequality, teaching my brother that he was entitled to power because he is a male, while teaching my sister and me that our purpose was to be servants to males. We learned that sex and gender were intertwined, and that the foundation for a female's sexuality should be based on pleasing a male's wants and needs.

My parents' marriage created a vehicle through which my father's sexist gender ideals could be expressed and maintained. Chen, Fiske, and Lee's (2009) research supports this argument, finding that male dominance can be maintained through marital relationships. Chen, Fiske, and Lee (2009) hypothesized that males who hold beliefs consistent with hostile sexism (hostility toward women who do not conform to traditional gender norms) will be more likely to use marriage as a way to maintain traditional gender norms. Results supported the hypothesis, finding a positive correlation between a male's hostile sexism ideologies and the degree to which unequal gender norms within a marriage were condoned. My father's behaviors in his marriage illustrated the results of this research.

Although the definitions of sex, gender, and marriage in Amadiume's (1987) description of the Igbo society differ from that of my family's culture, it is interesting to find a similarity in the way that marriage maintains their gender roles. In Igbo culture, male and female roles were given at birth and were carried out through marriage. At birth, a male baby's hair was buried under a kola-nut tree, symbolizing authority, wealth, and status. A female baby's hair was buried under a palm tree, symbolizing that her wealth would depend on the exchange of prosperous palm wine to her husband at her marriage. A male acquired authority, wealth, and status through the accumulation of land and wives. A female acquired wealth and security through being industrious and hard-working when maintaining her husband's land. The dictated gender roles were not possible without a marital union.

Furthermore, the flexibility of the Igbo gender system supports that gender roles are maintained through marriage. Amadiume (1987) describes that biological sex and gender roles are not intertwined within this culture, allowing females to embody male gender roles. If a male son does not exist to inherit land, a female daughter can go through a ritual to become a male daughter, inheriting male gender roles. This allows a biological female to take a male role and own land. The male daughter is then expected to marry female wives to carry out female gender roles, including upkeep of the land. The marital union still acts as the vehicle through which gender norms are maintained.

Jane Austen's (1996) *Mansfield Park* represents the epitome of gender roles being dictated by and defined through the prospect of marriage. Austen (1996) begins her novel by identifying the importance for women to marry men with large incomes and grandiose estates. Through juxtaposing Fanny's character with Maria and Julia Bertrum's characters, normative gender roles for women were expressed. Fanny, being from a lower social class than the Bertram daughters, was described as lacking a glowing complexion, lacking education and interest in music, and only owning two sashes (Austen, 1996, p. 30-32). The Bertram daughters, being described as "fully established belles," (Austen, 1996, p. 48) were beautiful, educated, well dressed, and possessed talents in music. These characteristics represented normative gender roles for women who wanted to successfully marry a wealthy man with an estate. It may be argued that women's gender roles were defined by teaching them ways to be marketable for marriage.

Through understanding the motive that underlies women's gender roles, the importance of wealth accumulation in normative male gender norms is also expressed. This society, similar to my parent's marriage, focused on male patriarchal ideologies. Sir Thomas Bertram represented the patriarch of the Bertram estate, and arguably was the character that represented the normative male role during this time period. He dictated the affairs at Mansfield Park, and when he needed to leave for Antigua, his son, Edmund, was given the responsibility of managing the estate. While he was in Antigua, his daughter Maria could not be married, and Edmund could not be ordained as a clergyman. Upon his return, the play that was being developed and rehearsed by the inhabitants at Mansfield was cancelled because he deemed it an improper affair. Sir Thomas Bertram represented a successful husband through his execution of these roles (Austen, 1996).

A common theme that has developed through evaluating marital gender roles is the purpose of the political economy in defining these roles. Across time periods, geographical spaces, and cultures, it can be argued that marriage is defined through cultural materialism as an adaptation to secure resources. When evaluating my parents' union, the gender roles that were created served the purpose of keeping my father in the

workplace and my mother in the home. The American ideology that deems the husband to be the "head of the household" and the "breadwinner" conveniently justified my father's dominance in the financial realm. My mother needed to rely on my father for income, asking him to write her a check every month to go grocery shopping. Marriage became my mother's only resource for income, and the adaptive function of this union became highlighted when resources depleted through my parents' divorce.

Prior to my parents' divorce, I never considered the role of money in my mother's decision to prolong her marriage. As a child, I would watch my father beat my mother and strangle my younger sister. I remember being so angry with my mother because she allowed my father to continue his abusive behaviors. I could not understand why we did not just run away. It was not until my father left our house that I learned why mother tolerated his actions. My father severed all economic ties to our family the moment he drove away in that U-Haul truck. Our new reality? Eviction notices on our front door because the mortgage was not being paid, an empty refrigerator, applying for food stamps, graciously accepting hand-me-down clothing, and losing medical insurance.

Kalmuss and Straus (1982) provide evidence to support my mother's actions. In order to assess the role of marital dependency on toleration of abuse, Kalmuss and Straus (1982) conducted interviews with wives. Findings illustrate that wives who tolerated severe abuse were economically dependent upon their husbands. Kalmuss and Straus (1982) discuss that a wife with a high dependency on her husband for resources may be left with few alternatives to the abusive marriage. My mother sacrificed her happiness and safety for thirteen years to protect us from the reality of poverty that my father purposely created. Marriage secured our financial lifestyle, and my mother adapted to a violent marriage to secure that lifestyle.

Unlike economical roles in my parent's marriage, husbands and wives within the Igbo culture played critical roles to secure that the political economy was functioning (Amadiume, 1987). As previously described, gender norms within a marriage defined that males acquired power through authority and status, while females gained power through up keeping her husband's land. In Igbo culture, the agricultural economy was not profitable; it was through the exchange of goods in the market economy that wealth was accumulated. It can be argued that Igbo marital culture sprang from the definition of their economy, with males controlling the production of profitable goods, while females were placed in control of subsistence crops.

The economic division of labor was enmeshed within the definition of normative gender roles, and was carried out through the marital union (Amadiume, 1987). The Igbo marriage ritual was characterized by the husband gaining access to his

wife's palm tree. This was significant because the palm tree produced marketable goods, and it was through rituals associated with palm oil and wine that a male gained power. Once married, the husband controlled the production and circulation of yam and palm-wine, while his wife was responsible for subsistence crops including cassava and cocoyam. A husband married many wives to increase his workforce on his land. Wives were expected to be industrious because they were given access to their husband's gardens and farmland. If a wife was exceptionally industrious, she could earn the title of female husband. This title would allow the female wife to take the gender norms of a husband. This allowed her to perform rituals and control yam production, and she could marry wives to fulfill land upkeep duties. Without the female husband title, it was through marriage that a woman could contribute to the economy. The ways in which the political economy functioned made it necessary for women to use marriage as an adaptation to secure resources.

While the Igbo political economy formulated marital gender norms that needed husbands and wives to work, the British political economy formulated marital gender norms that excluded women from this domain. Although the Igbo and British political economies were different, the accounts by Amadiume (1987) and Austen (1996) seem to parallel that women needed a husband in order to access resources. The evidence from Austen's (1996) *Mansfield Park* further supports that marriage was an institution that guaranteed resources, and that choosing companions was not based in finding love. This is made clear through the juxtaposition of Lady Bertram's marriage to Miss Frances' marriage. Lady Bertram is described as a fortunate woman who was able to marry herself into a wealthy class that came with a "handsome house and large income" (Austen, 1996, p. 23). Unfortunately for Miss Frances, she married a man without wealth or societal connections, leaving Miss Frances in desperation because she is now in a lower social class. This illuminates that the political economy, which was based on social hierarchy, was used to define a "successful" marriage.

This idea that women relied on marriage as a way to access wealth was commonly portrayed throughout Austen's (1996) novel. When Maria Bertram was introduced to Mr. Rushworth, she immediately began to analyze his potential as a husband. After deciding that his income was more than what her father's income could provide, and that she would be guaranteed to be a member of his estate, she decided that it would be her duty to marry him. Mary Crawford expresses similar reasoning when mocking Edmund for becoming a clergyman. She begs him to reconsider his profession, possibly becoming a lawyer, because she is interested in marrying him but does not want to live on the minimal wealth of a clergyman.

Through the definition of marriage that has been created by my parents' divorce and supported by evidence from Amadiume (1987) and Austen (1996), I have developed my own hopes, dreams, and fears about the potential role of marriage in my own life. I want to believe that this definition of marriage is an example of one of the possible ways in which marriage can be defined. I want to believe that marriage does not always need to dictate hierarchical gender roles, and that it does not need to be based on economical advantage. At my current place in time, I do not believe that marriage is an aspiration for my future. I have defined sexuality as a way to make myself vulnerable to this type of institution, and would not want to further continue the cycle of abuse that stems from marriage. On the contrary, I believe that the only way to maintain gender equality for myself would be to avoid marriage. I hope that one day I may meet someone who disproves every argument that I have found evidence to support, but until then, I do not believe that marriage would provide me with a lifestyle lacking subordination and violence.

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The Legal Evolution of Jim Crow: Separate and Unequal

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The United States of America is known for having one of the first modern and just legal systems in the world. After the American Revolution, the founding fathers sought to create a system to fight for "Liberty and Justice for all." However, this modern system included one of the worst blemishes in the history of the modern world: segregation. Laws studied as endorsing and facilitating legal segregation have come to be known as 'Jim Crow Laws.' The term Jim Crow originated from a song and dance called "Jim Crow" by Thomas D. Rice in 1832, who performed the role of a Negro in blackface.[2] Dozens of cases have passed in front of the court system regarding segregation of whites and blacks, though few have enough of an impact to be acknowledged as vital for understanding the evolution of segregation and Jim Crow laws. Landmark cases such as *Roberts v the City of Boston* (1848-49), *Plessy v Ferguson* (1896), and *Brown v The Board of Education* (1954) have guided the course of the legal system through the problem that was segregation; however, numerous smaller cases were instrumental in developing the modern legal and social system without it. The twelve cases highlighted, Van Camp v the Board of Education, State v McCann, Cory v Carter, Gong Lum v Rice, Buchanan v Warley, Shelley v Kraemer, Missouri ex rel. Gaines v Canada, Sipuel v Board of Regents, Mitchell v U.S., Henderson v U.S., Sweatt v Painter, McLaurin v Oklahoma State Regents for Higher Education, will serve to demonstrate the challenges to segregation on the grounds of validity and equal opportunity. These cases, which became a part of the battle against the 'Separate but Equal' standard, cover the various areas affected by segregation, the most notable being public education and public transportation.

The first major case in the long battle of segregation occurred in pre-Civil War era Boston, before the 13th or 14th amendments were passed in 1865 and 1868 respectively, giving slaves freedom and citizenship, and long before *Plessy v Ferguson*. The case known for initializing the phrase 'Separate but Equal' was the infamous case of *Roberts v the City of Boston.* Benjamin Roberts, a black printer, attempted to enroll his

[1] Written under the direction of Dr. Demetrios Lallas and Dr. Rita Reynolds for the team taught ILC *African American Cultural Voices*.

[2] Woodward, C. Vann and McFeely, William S. (2001), *The Strange Career of Jim Crow*. p. 7

five-year-old daughter at their neighborhood school, though it was a school for white children. State law at the time required students to attend the school nearest their residence, and families could recover damages if they were "unlawfully excluded from public schools."[3] Roberts attempted to sue the city; however, school officials contested that arrangements had been made for black students, as they sustained a racially segregated district. According to Horton and Moresi, Roberts' attorneys, abolitionist Charles Sumner and Robert Morris invoked:

> …'the great principle' embodied in the Constitution of Massachusetts, they asserted that all persons, regardless of race or color, stand as equals before the law. More specifically, they argued that racially segregated schools and equality of education are mutually exclusive, that segregation is unconstitutional because it infringes on the civil rights of individuals, and that it is socially and emotionally damaging to both black and white students.[4]

These arguments were denied by the State Supreme Court Chief Justice Lemuel Shaw because he felt that the argument of classical equality was pure theory and not viable when applied to the American environment.[5] He elaborated his opinion on the matter by stating racial intolerance "is not created by law, and probably cannot be changed by law."[6] This law, creating separate but equal[7] conditions for blacks and whites, became the underlying precedent to nearly all of the Jim Crow laws passed by states.

A second case that foreshadowed *Plessy* in Antebellum America was *Van Camp v the Board of Education* (1859). In the state of Ohio, the question of mixed blood residents drew attention to rights. A man who tried to enroll his children in public school under the assumption that they were white. They were denied acceptance to the school "…due to alleged African ancestry of very remote origin."[8] Under the court's opinion voiced by Justice William V. Peck, 'colored people' were defined as any people who were black, having African heritage or being of mixed lineage. His argument is interpreted by Bishop to mean that the tone of the person's skin didn't matter, because

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[3] Horton and Moresi, *Roberts, Plessy, and Brown: The Long, Hard Struggle Against Segregation,* 14.
[4] Ibid. 14
[5] Bishop, *Plessy V. Ferguson: A Reinterpretation*, 128.
[6] Ibid. 128
[7]Bernstein goes on to highlight in a footnote Charles Sumner's argument that the "separate school is not and could not be an equivalent" for integrated schools, for it "brand(s) a whole race with the stigma of inferiority and degradation" to identify the common use of the term 'separate but equal.'
[8] Bishop, *Plessy V. Ferguson: A Reinterpretation*, 128.

whites were unwilling to be associated with anyone who had a "perceptible mixture of African blood."[9] This case, in correlation to *Dred Scott v Sanford*, was the precedent in identifying the extent of what qualified for 'black' in America. Bishop further identifies it as a social definition, not a biological one that is used in the American legal tradition.

The 13th and 14th amendments were passed in the 1860s, prohibiting slavery and granting African Americans citizenship and equal protection under the law, respectively. It is after this point that the multitude of cases against segregation began to amass. In the 1870s, two cases were brought forth to challenge segregation in schools: *State v McCann* (1871) and *Cory v Carter* (1874). Both cases used "legal reasoning that racial classification was similar to classification based on sex or age."[10] In *State v McCann* the Ohio court confirmed that permitting racial segregation in schools wasn't a diminishment of the privileges or immunities a citizen of the state would benefit from, nor was it a denial of equal protection under the law.[11] The Indiana case of *Cory v Carter* was shadowed by a pre-Civil War state constitution which held that blacks were regarded as detached, disparate and substandard by the law.[12] The Civil War amendments (the 13th and 14th) gave blacks citizenship they had not previously held in Indiana; however, these amendments did not limit the power the states had been given through the 10th amendment (that powers not granted to the federal government nor prohibited to the states by the Constitution are reserved, respectively, to the states or the people[13]). As Bishop observes, "Segregated education, like slavery, was a purely domestic institution of a state to be protected by the federal Constitution as reserved rights for the states."[14]

One of the most infamous cases in the history of the United States, which legally permitted segregation around the country, was *Plessy v Ferguson*. Homer Plessy, a black man of mixed blood (mulatto) that appeared light in complexion[15], purchased a ticket from New Orleans to Covington Louisiana on June 7, 1892. Carefully selected to challenge Louisiana's Separate Car Act (1890), Plessy performed civil disobedience by entering the "whites only" car. Bishop states, "The entire case revolved around the constitutionality of a Louisiana statute."[16] A brief was filed, by Plessy's attorney Albion

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[9] Ibid. 128 (see footnote 17 in Bishop)
[10] Ibid. 129
[11] Bernstein, *Case Law in Plessy V. Ferguson*, 193.
[12] Bishop, *Plessy V. Ferguson: A Reinterpretation*, 129.
[13] United States Constitution, Bill of Rights, 10th amendment
[14] Bishop, *Plessy V. Ferguson: A Reinterpretation*, 129.
[15] Horton and Moresi, *Roberts, Plessy, and Brown: The Long, Hard Struggle Against Segregation,* 14.
[16] Bishop, *Plessy V. Ferguson: A Reinterpretation*, 127.

Tourgee, stating that Homer Plessy was seven-eighths white, having a singular great-grandparent who had been black. The brief argued that Plessy was therefore permitted all of the same civil liberties and protections under the law sustained by white people. A side argument made by Tourgee was that "the reputation of one who belonged to the dominant (white) race in a mixed community was property in a sense of inheritance being property."[17]

The court's decision mirrored that of the *Roberts v City of Boston* case, exacerbating perception among whites that the races were somehow essentially dissimilar, unalterable by law. The Court's opinion, written by Justice Henry Billings Brown, did acknowledge that the property argument permitted a white man's assignment to a black coach; however, he wrote that a black man did not enjoy the lawful status of a white man.[18] "If one race be inferior to the other socially, the Constitution of the United States cannot put them on the same plane," remarked the court.[19] This case set precedence in several of the following Jim Crow law cases that attested segregation was unconstitutional. This decision was upheld in the 1927 case of *Gong Lum v Rice*, which found racial segregation of public schools valid on the same grounds that had been used in *Plessy*[20], though neither case had directly covered equal standards for blacks as necessary criteria for segregation as it was later interpreted. Kauper points out that all of the following cases "in regard to segregation in education turned on the question of equality of treatment within the pattern of segregation."[21]

The next case worthy of mention was the first significant case to overrule segregation, though it pertained to a residential zoning law. *Buchanan v Warley* (1917) challenged a community decree that created separate residential neighborhoods for blacks and whites. This law was found unsound "under the due process clause of the 14th amendment as an arbitrary interference with property rights."[22] A coinciding case in 1948, *Shelley v Kraemer*[23], held that the execution by a state court of a deterrent agreement preventing the use of residential property by blacks was a denial of the equal protection of the laws, thereby confirming segregation in regards to housing unconstitutional.

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[17] Ibid.
[18] Ibid.
[19] Horton and Moresi, *Roberts, Plessy, and Brown: The Long, Hard Struggle Against Segregation,*16.
[20] Kauper, *Segregation in Public Education: The Decline of Plessy v. Ferguson*, 1145.
[21] Ibid. 1145-46
[22] Ibid. 1143-44
[23] Ibid.

Two cases in the battle against segregation at the collegiate level pertained to law students: *Missouri ex rel. Gaines v Canada* and *Sipuel v Board of Regents*, in 1938 and 1948 respectively. The claim in *Missouri ex rel. Gaines v Canada* was that the state's educational system worked to discriminate against him, stating the state of Missouri had bestowed a law school for white students at its state university while it did not meet its obligation to supply such a school for black students in state, and more so in refusing to pay their out-of-state tuition. The Court's opinion was that equal protection applied within the state's own borders[24], and that sending the student out of the state wasn't relevant because the state still failed to meet the equal standards. In *Sipuel*, the Supreme Court ruled that because Oklahoma refused to admit black students to the state university's law school, it violated equal protection under law, as there was no alternative law school available for black students.[25] These two cases further chipped away at segregation as they continued to challenge the necessary equality standards by which segregation had been built.

The equal facilities standard was further attacked in the 1941 case *Mitchell v U.S.* Mitchell was a United States Congressman from Chicago, who had bought a first-class ticket with sleeping accommodations from Chicago to Hot Springs, Arkansas. When the train crossed into Arkansas, the conductor awoke Congressman Mitchell and informed him that he was required by state law to move to the Jim Crow coach for the remainder of the trip. Mitchell pursued the railway in court and through the Interstate Commerce Act (ICC). The ICC sided with the railway, and when the case was brought to the U.S. Supreme Court, he won in a unanimous decision. However, the Court "did not rule that segregation was illegal; it determined merely that Rock Island's failure to offer exactly identical accommodations to both blacks and whites was illegal."[26] This marked a substantive change in railway policy, which went on to desegregate its first class accommodations to avoid the high costs of creating a second first class coach. In 1950, a coinciding case, *Henderson v U.S.*, the court again ruled in favor of the black traveler at the expense of the railroad because he had not been offered equal accommodations in the dining car. Osborn notes that:

> The United States Justice Department filed a brief in support of Henderson's position, asserting that separate but equal was a "constitutional anachronism" and that the court should overturn the 1896 decision that originally encouraged

[24] Ibid. 1146
[25] Ibid. 1146
[26] Osborn, *Curtains for Jim Crow: Law, Race, and the Texas Railroads*, 408.

> the South on its statutory course of segregation…The Court decided for Henderson but declined to overrule *Plessy*.[27]

This case set up the further attack on Jim Crow laws in railways, as well as foreshadowing *Brown v the Board of Education*. The willingness of the Court to continue to hear cases regarding segregation and the separate but equal standards continued to show the openness of the Court and the determination of black legal activists.

The two cases leading directly to *Brown v the Board of Education* pushed the Court to overrule *Plessy v Ferguson*, permanently invalidating the separate but equal standards. In both *Sweatt v Painter* (1950) and *McLaurin v Oklahoma State Regents for Higher Education* (1950) the court was able to determine that the black students involved underwent unlawful prejudice "within the framework of the segregation pattern established by the state since they did not in fact enjoy equality in the educational opportunities offered by the state."[28] In *Sweatt,* a black student tried to enter the University of Texas Law School while another institution was offered for black students within the state. The Court decided that the law school provided for blacks was not equal in terms of:

> …the reputation and prestige of the university law school, the position and influence of the alumni, the opportunity for interplay of ideas, [and the] exchange of views and association with students who would eventually constitute the larger part of the legal profession with whom the petitioner would be dealing…[29]

This criterion was scrutinized by the court in an attempt to avoid a ruling that would dismiss *Plessy.* In *McLaurin*, a black student had been accepted to graduate studies at the University, but the university authorities forced several limitations to keep him apart from other students. These limitations were found to be discriminatory and therefore a refutation of the equal protection of the laws.[30] These two cases seemingly set the ground for *Brown v the Board of Education*, creating a feeling within the Court that the challenges would continue to become more expansive and diverse.

The most successful and relevant case in the history of Jim Crow laws was the one to end segregation altogether by overruling the verdict given in *Plessy v Ferguson*:

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[27] Ibid 418
[28] Kauper, *Segregation in Public Education: The Decline of Plessy v. Ferguson*, 1138.
[29] Ibid. (1146)
[30] Ibid.

Brown v the Board of Education. The cases that were consolidated in *Brown* came from the District of Columbia and the South—Kansas, South Carolina, Virginia, and Delaware—all of which regarded lower levels of public education, from elementary to high school. These cases got back to the original concept of *Roberts v the City of Boston*, in that they were about what was best for the development of children. Kauper emphasizes that "These cases were heard and decided on the assumption that the separate educational facilities furnished Negro students were either equal to those furnished white students or were in the process of being equalized."[31] The Court based its hearing upon two primary questions:

1. What evidence was there that the Congress…contemplated or did not contemplate, understood or did not understand, that it would abolish segregation in public schools?
2. If neither Congress…nor the States…understood that compliance with it would require the immediate abolition of segregation in public schools, was it nevertheless the understanding of the framers of the Amendment: a. that future Congresses might…under section 5 of the Amendment, abolish such segregation, or b. that it would be within the judicial power, in light of future conditions, to construe the Amendment as abolishing such segregation of its own force?[32]

Though other important questions were asked, these two laid the groundwork for furthering the others. These questions guided the Court to a unanimous decision, which was delivered by Chief Justice Warren, who argued that racial segregation in public schools upheld by the states disadvantaged "the children of the minority group equal education opportunities and hence denied to them the equal protection of the laws as required by the 14th amendment."[33] This decision completely struck down *Plessy v Ferguson* and the separate but equal standard that had been so strictly applied for generations.

Though Kauper goes on to claim that "the decision in *Brown v the Board of Education* applies only to segregation in state supported schools,"[34] following cases brought by the National Association for the Advancement of Colored People (NAACP) against a conglomerate of railway corporations with the ICC. Osborn points out that the

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[31] Ibid.
[32] The questions for the Court can be found in footnote nine of Kauper's article, where he lists all five questions and their subsidiary contingencies.
[33] Kauper, *Segregation in Public Education: The Decline of Plessy v. Ferguson*, 1139.
[34] Ibid.

Court had further ruled that "any language in *Plessy v Ferguson* contrary to this finding is rejected."[35] This line thereby invalidates any precedent set in other cases on the legal application of segregation. After considering the case brought forth by the NAACP, it decided adjacently in favor of the NAACP, saying "that segregation violated the law… [and] completely rejected the separate but equal approach and ordered the railway companies to abandon all of their Jim Crow rules."[36] This case was the first to follow *Brown* in a pattern that dissolved segregation across the nation.

This history of American segregation has been a long, winding road from which equality and opportunity have risen. The evolution of the arguments for and against Jim Crow segregation – even those derived from science – were driven from legal, social, and cultural ideals. As rationales shifted, one constant emerged: a separate but equal standard was not viable through an equal protection under the law. As skin color grew less of an issue than blood purity, the context in which segregation was challenged changed from biological excuses to social concerns. The vast array of cases that spanned travel, neighborhood districting, and, most importantly, education, prove that social and cultural norms can be unacceptable. Racial intolerance may not have been created by the law, but it certainly should never be enforced by it. With the ruling in *Brown v the Board of Education*, a new era of legal integrity and social decency could commence.

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[35] Osborn, *Curtains for Jim Crow: Law, Race, and the Texas Railroads*, 420.
[36] Ibid.

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