Wagner College Forum for Undergraduate Research

Fall 2003
Volume II, Number 1

Wagner College Press
Staten Island, New York City

EDITOR'S INTRODUCTION

In response to many requests, an additional section containing the abstracts of papers and posters presented at the 57th Eastern Colleges Science Conference has been added to this issue. The conference was held in Ithaca, NY on April 11-12, 2003. It is the largest undergraduate research conference in the United States. Wagner College has, in recent years, been a strong contributor to this annual event and in 2000 hosted ECSC. Congratulations to the students and faculty for their excellent work and the fine job they did representing Wagner College.

The Wagner Forum for Undergraduate Research, now in its second year, 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 of these two sections are limited to papers and abstracts dealing with scientific investigations (experimental and theoretical). The third section is reserved for speculative papers based on the scholarly review and critical examination of previous works.

This issue contains a variety of fascinating topics including aircraft icing, crystal growth, the triangular theory of romantic relationships, arsenic poisoning in Bangladesh, garlic and wound healing, MRI contrast agents and the development and maturation of van Gogh's artwork. The interested reader will be challenged with questions such as:

- Does the fat content label effect a person's consumption of a particular food?
- Is Pluto a Planet?
- Does the MMR vaccination contribute to or cause autism?
- Who are the Disney characters many people grow up admiring and how do they represent the people of the world?

Read on and enjoy!

Gregory Falabella and Richard Brower, Editors

Section I: Eastern Colleges Science Conference

Abstracts

Section II: The Sciences

Full Length Papers

Section III: The Social Sciences

Full Length Papers

Section IV: Critical Essays

Full Length Papers

Section I: Eastern Colleges Science Conference

Redefining Love: The Interrelations Between Love, Attachment Styles and the Triangular Theory Of Romantic Relationships[1]

Jaime T. Carreno[2] (Psychology)

Three popular theories of love were brought together, in an attempt to better understand this concept. The interrelations between triangular love type, love styles, and adult attachment styles were of primary interest. One hundred college students were surveyed. Relationships were found within love styles and within triangular love theory components. Relationships were also found between love styles and the triangular theory and between age and levels of commitment in relationships. Lastly a relationship was found between attachment styles and triangular love type. The interrelations of these three major love theories seem to suggest an underlining essence of love. We seem to be on the path to a more encompassing definition of love. Finally, a new definition of love is proposed.

Deep Aquifer Water as Alternate Drinking Water Source in Arsenic Affected Area of Bangladesh

Margaret Fiasconaro (Chemistry), Sarah Alauddin (Chemistry)
and Dr. Mohammad Alauddin (Chemistry)

Most serious arsenic contamination from natural sources have been reported from Bangladesh, India, Taiwan, Chile, Argentina and inner Mongolia. Experts now believe the arsenic calamity in Bangladesh is the worst mass poisoning the world has ever witnessed. Bangladesh is a country of 148,400 square kilometers in an area with a population of about 120 million. About 97% of the total population depends on ground water as their principal source of drinking water. Abundant surface water is contaminated with microorganisms and people died of cholera, typhoid and diarrhea through consumption of this water. Aid organizations came forward and helped the local government in tapping the underground water at shallow depths of 40-100 ft which is free of microorganisms. The water was withdrawn by hand pump and metal tubes drilled into these aquifers. The vast population had access to safe drinking. However, in recent years (1993) the water has been found to be contaminated with arsenic at a level much higher than the World Health Organization's (WHO) permissible level of 10 g/l and

---

Bangladesh's own guideline value of 50g/l. Lately it was indicated by researchers and surveyors that aquifers at a depth of 300 ft or greater have arsenic at acceptable level by WHO standard. In our current project we have analyzed water samples from 29 such deep tube wells from two areas of Bangladesh. In addition to arsenic, water samples were analyzed for a number of trace elements and basic water quality parameters to check the water quality of these aquifers. Technique of graphite furnace atomic absorption spectrometry (GR-AAS) was applied and As, Ba, B, Fe, Mn, Pb, Cd, Co and Cr were determined at ultra trace level. We find the deep aquifer waters (depth of 600 ft or beyond) are quite safe for public consumption. Our findings and some inter-element correlation data will be presented in this paper.

Aircraft Icing: An Experimental Study[3]
Nicolas Rada (Physics) and Dr. Gregory J. Falabella (Physics)

Relatively small amounts of ice buildup on aircraft can alter the otherwise smooth flow of air and have disastrous consequences. This accumulation may occur due to precipitation or passage through a cloud containing super-cooled water droplets and is categorized as rime or glaze ice. The current research is an experimental investigation into how the presence of a glaze ice accretion dramatically reduces the lift force necessary for stable flight. A FLOTEK 1440 Wind Tunnel and a NACA 2415 airfoil is used to obtain the data. Preliminary results indicate that stall occurs at a significantly lower angle of attack and is sensitive to changes in Reynolds number as the transition from laminar to turbulent flow occurs.

Effect of Complexing Agent of TIO Hydrothermal Crystal Growth
Dawn Pothier (Chemistry) and Dr. Maria C. Gelabert (Chemistry)

Aqueous titanium chemistry was explored to gain understanding for how chelating agents affect hydrothermal crystal growth. By varying concentration, pH, and ligand, TiO_2 crystals were grown kept at 200 $^\circ$C for seven days. Observations (1000x) were made with a compound microscope. Needle-shaped crystals were observed when ethylene diamine tetraacetic acid (EDTA) was used and the pH was between 9 and 13; higher concentrations yielded larger crystals. Experiments with diethylenetriamine pentaacetic

---

[3] Received Best Platform Presentation in Physics, Astronomy and Engineering Award

acid (DTPA) and imino diacetic acid (IDA) did not yield sizable crystals with a determinable shape. Experiments enabling the slow decomposition of urea, and hence slow rise of pH, did not generally produce needle-shaped crystals. However, one sample did yield crystals that were slightly larger and longer than previously observed needles.

The Effect of Fat Content Label on Food Intake

Joanna Ferreri (Psychology) and Dr. Laurence J. Nolan (Psychology)

Food labels and beliefs about the nutritional content of foods have been found to affect food choice and meal size (Gatenby et al., 1995; Mela & Nolan, 1996; Miller et al., 1998). We tested whether a label indicating total calories and fat grams contained in a granola bar would affect the amount of subsequent macaroni and cheese consumption and food ratings (questionnaire). All participants received the same foods; one half were randomly assigned to receive granola labeled "no fat". All participants were asked to complete the Three-Factor Eating Questionnaire prior to the meal so that the role dietary restraint could also be tested (2 X 2 design).

Ion Chromatography Analysis of Deep Aquifer Water from Arsenic Affected Areas of Bangladesh[4]

Sarah Alauddin (Chemistry), Margaret Fiasconaro (Chemistry)
and Dr. Mohammad Alauddin (Chemistry)

Bangladesh is in the grip of worst mass poisoning the world has ever witnessed. The poisoning is taking place from drinking arsenic laced groundwater. About 97% of a total population of 120 million depend on groundwater for their primary source of drinking water. Although the permissible level of arsenic is 50μg/l by Bangladesh standard and only 10μg/l by World Health Organization (WHO), the level of arsenic in seriously affected areas in Bangladesh ranges from 500 to almost 4000 μg/l. Arsenic is a carcinogenic agent. There is an urgent need for finding alternate sources of water. Recently it was reported that deep tube well waters (aquifers at depths of 300 ft or more) may still provide arsenic safe drinking water for millions. We analyzed 29 deep tube well waters from two regions of Bangladesh. We investigated the water quality of these aquifers by advanced techniques of graphite furnace atomic absorption spectroscopy and

---

[4] Received Best Platform Presentation in Chemistry Award

ion-chromatography. In addition to arsenic and other toxic trace elements we also investigated the levels of F^-, Cl^-, Br^-, NO_3, NO_2, PO_4^{3-} and SO_4^{2-}. While the deep aquifer water is "arsenic safe" it may contain other toxic agents or high F^-. Objective of the current project was to investigate the level of fluoride and other ions in deep tube well waters. We found that the deep tube well water is good quality water, and this water may be an excellent alternative to arsenic contaminated shallow tube well water for the time being.

Transcardial Perfusion of Zebrafish Brain

Matthew W. Gray (Biology), Adam James (Biology),
Prof. Linda Raths (Biology) and Dr. Zoltan L. Fulop (Biology)

Correct ultra-structural investigation of the central nervous system requires vascular perfusion of the brain with fixative solution. This technique, preceded by cleaning the vasculature from the blood by an isotonic solution, is widely practiced to fix the brain of mammals. The aim of this study was to employ similar procedures to fix the adult zebrafish brain. We developed a *perfusion station* equipped with a micromanipulator-stage that allows the precision insertion of a glass micropipette into the cardiac ventricle of the zebrafish and infusion of the solutions into the brain vasculature through the ventral aorta. This procedure resulted in perfect fixation of the brain verifiable by successive morphological investigation. This study was supported by a research grant from Drs. Eva and George Megerle.

Hydrothermal Crystal Growth of Zinc Oxide
Via Coordination Chemistry

Dana M. Romano (Chemistry) and Dr. Maria C. Gelabert (Chemistry)

The chemistry of aqueous zinc solutions was explored to see the effect on size and morphology of zinc oxide crystals. Multidentate ligands such as ethylene diamine tetra acetic acid (EDTA), diethylene triamine pentaacetic acid (DTPA) and imino diacetic acid (IDA) were investigated separately in the growth of ZnO crystals. In this study, complexing agent, Zn molality and pH were varied in the precipitation of ZnO from basic aqueous solutions. Autoclaves were used for synthesis at $200^{\circ}C$. Optical microscopy on the resulting products revealed crystals with a needle habit for all ligands, with needle lengths up to 3mm. The overall variation in size and morphology may be explained to some degree by considering the coordinating nature of the ligands.

Pluto: Captured Comet or Legitimate Planet

Michelle Bingham (English) and Dr. Gregory J. Falabella (Physics)

Prompted by the recent controversy over Pluto's classification as a planet, a study was conducted to determine whether or not a large Kuiper Belt comet could have strayed too close to Neptune and had its orbit forever changed to that of present day Pluto. The resulting three-body problem was set up and simulated numerically using Interactive Physics^{TM}. Results show that the situation is indeed plausible, but only under certain circumstances, which explains why other comets did not experience a similar fate.

Validation of the Folk Remedy Garlic (Allium Sativum) in Wound Healing[5]

Katherine LaChance (Psychology), Christopher Hart (Chemistry)
and Dr. Ellen Perry (Biology)

Garlic (Allium sativum), a well-documented antibacterial spice, was investigated for its anti-microbial properties in wound healing. Environmental bacterial sources were plated on agar containing 0-50% of a 125g/l preparation of fresh, crushed garlic either soaked (24 hours), infused (20 minutes) or boiled (10 minutes) in distilled water, then incubated at either ambient or body temperature. A dose-responsive efficacy of garlic to inhibit microbial growth was observed. The anti-microbial efficiency of garlic decreased with heating (LD50=1% in soaked preparation, 5% in infused preparation and 10% in boiled preparation at ambient temperature). Microbes were identified to demonstrate the dose at which inhibition of growth occurred. The data validates the folk-medicinal wound healing properties of garlic through anti-microbial action.

The Relationship Between Teachers' Physical Attractiveness and Student Ratings of Their Effectiveness

Kerri Doran[6] (Psychology)

It is postulated that to be beautiful is to accrue various interpersonal advantages and foster positive expectations. This study explored the relationship between teachers' physical attractiveness and students' ratings of their effectiveness. Fifty-eight second

---

[5] Received Best Platform Presentation in Ecology and Botany Award
[6] Research performed under the direction of Dr. Amy Eshleman (Psychology)

graders from a public elementary school participated in this study, which measured their ratings of two target teachers after a poem was read to them. The study supported the hypothesis that the students rated the physically attractive teacher higher on four of six measures of overall fondness of and effectiveness. A follow-up study was conducted using third, fifth, and seventh grade students.

An Experimental Study of Shoaling Behavior In ZebraFish (Danio Rerio)

Janette Lebron (Biology), Dr. Brian G. Palestis (Biology) and Dr. Zoltan Fulop (Biology)

Zebrafish shoaling was quantified by comparing time spent by test fish near a compartment containing a stimulus fish to time spent near an empty compartment. The two compartments were located at opposite ends of a narrow tank, and only visual cues were available. Test fish spent significantly more time near stimulus fish than near the empty compartment, in both same-sex ($p<0.05$) and opposite-sex pairings ($p<0.01$). Interestingly, in both males ($p<0.025$) and females ($p<0.05$), shoaling was significantly more frequent in same-sex than in opposite-sex pairings. However, our experiments took place in the afternoon, while zebrafish spawn after dawn. Eventually we plan to study the effects of alcohol exposure on the development of shoaling behavior in young zebra fish.

Physiological Responses to Guided Relaxation

Teresa Jackson (Biology), Carolyn Palinkas (Mathematics), Robert Liberto (Chemistry), ParamPreet Ghuman (Biology), Dr. Zohreh Shahvar (Mathematics) and Dr. Zoltan Fulop (Biology)

Subjects were exposed for 20 min to a structured relaxation tape (H. Benson. *Guided Relaxation*, Mind/Body Medical Institute, Boston, MA) or to an indifferent audiotape of a historical story (War Letters) while physiological parameters were continuously recorded by a computer assisted device (MP 30, BioPac Inc.) . All subjects then listened to their tapes for twenty minutes twice daily for 28 days after which similar recordings were repeated. Statistical analysis of skin temperature revealed significant differences between the experimental and control subjects at all time-points in both sessions. However, no significant differences were found between the same parameters of the experimental subjects listening first time to their tape or after a month long training. These data

suggest that the relaxation response can be elicited with a right tape indifferent from prior learning or practice.

Alcohol-Induced Malformations in Zebrafish Embryos: Zebrafish as a Model Animal to Study Fetal Alcohol Syndrome[7,8]

Jacqueline Whittenburg (Biology), Renée Sudol (Nursing),
Prof. Linda Raths (Biology) and Dr. Zoltan Fulop (Biology)

The goal of this study was to determine the lowest ethyl alcohol (ETOH) concentration that causes detectable detrimental effects in zebrafish embryos, and the most critical time of embryonic development that is sensitive to alcohol. Observation of these embryos revealed a number of different morphological changes. These were either teratological effects, such as small heads with distorted craniofacial features, curved spine and distended abdomens or physiological disturbances such as impaired movements, inability to maintain postures and inability to capture prey. This study establishes zebrafish as a model animal to study fetal alcohol syndrome.

---

[7] Received Outstanding Paper in Developmental Biology Award
[8] For a reprint of the entire paper see *Wagner College Forum For Undergraduate Research* Volume 1, Number 2, Spring 2003.

Section II: The Natural Sciences

Investigation of Iron (III)-based MRI Contrast Agents

Maryanne Gaul[1] (Chemistry)

I. Introduction

Magnetic resonance (MR) imaging is a medical procedure that allows for examination of a patient via a non invasive method (*1*). MR imaging of vascular structures is very important within the medical field for purposes of diagnosing diseased tissues. Many diseases can be detected by abnormalities in vascular structure, vascular density, or microvascular permeability. Conditions that result in hemorrhage such as ulcers or traumatic injuries can be detected by increased vascular density in the MR image. Other conditions like angiogenesis and tumors can also be diagnosed using MR images that show abnormal vascular growth and vascular permeability (*2*).

The dependence of image intensity on tissue relaxation times is inherent on the basic principles of pulse nuclear magnetic resonance (NMR) (*3*). An MR image is generated where the signal intensity is either a function of proton density, the spin-lattice relaxation rate (T_1), spin-spin relaxation rate (T_2) or a combination of these factors. A problem with the generated images is that it is difficult to differentiate between adjacent tissue types (and thus provide an accurate diagnosis). To overcome this problem contrast agents have been developed. Contrast agents work by changing the signal intensity of the local tissues allowing better differentiation of healthy and diseased tissue (*1*).

MR imaging contrast agents must be biocompatible pharmaceuticals in addition to being nuclear relaxation probes. Aside from standard pharmaceutical features such as water solubility and shelf stability, there are requirements relevant for metal complex-based agents. One is the efficiency with which the complex enhances the proton relaxation rates of water, also referred to as relaxivity (a measure of relaxation enhancement per unit concentration). This must be sufficient to significantly increase the relaxation rates of target tissue. The dose of the complex at which such alteration of tissue relaxation rates occurs must of course be nontoxic (*3*). Another requirement for true diagnostic value is that the complex should localize for a period of time in a target tissue or tissue compartment in preference to non–target regions. This requirement is qualified in that it is sufficient that only the relaxation rates of the target tissues be enhanced in preference to other tissues. This might be accomplished by means other than

---

[1] Research performed under the direction of Dr. Nicholas Richardson (Chemistry)

concentration differences if the complex has a higher relaxivity in the environment of one tissue (*3*).

Three more essential prerequisites are in vivo stability, excreatability and again lack of toxicity (*3*). Toxicity data are often dependent on the species of animal as well as the route of administration, including intravenous and intraperotineal injections. The acute and chronic toxicity of an intravenously administered metal complex is related in part to its stability in vivo and its tissue clearance behavior. As the transition metal and lanthanide ions are relatively toxic at doses required for NMR relaxation rate changes, the dissociation of the complex cannot occur to any significant degree. Additionally a diagnostic agent should be excreted within hours of administration (*3*).

Complexes of paramagnetic transition metal and lanthanide ions, which decrease the relaxation times of nearby nuclei, receive the most attention as potential contrast agents. Gadolinium(III), iron(III), and manganese(II) complexes have received the most attention because of their high magnetic moments and relaxation efficiency (*3*). Current MRI contrast agents in clinical use utilize gadolinium(III) as the paramagnet, which is effective due to the seven unpaired electrons it possesses. Iron(III) and manganese(II) only posses 5 unpaired electrons and the relaxivity of complexes using these as paramagnetic species are significantly lower compared to gadolinium. However, it has been shown that when contrast agents based upon these metal ions are bound to human serum albumin (HSA) they can have relaxivities that are equivalent to those reported for gadolinium complexes also bound to HSA. Although gadolinium works as an effective paramagnet, there are some serious drawbacks. The first is that gadolinium has no natural biochemistry, thus making it difficult to harness known biochemistry in the design of a target-specific contrast agent. Second, there are growing environmental concerns about the use of gadolinium as a contrast agent. If iron(III) could be employed as the paramagnet, with its rich natural biochemistry and limited concerns about environmental impact, it could be as effective as gadolinium-based contrast agent when bound to HSA (*1*).

Another problem associated with the currently used paramagnetic-based contrast agents approved for clinical use in the U.S. is that they are all extracellular and are rapidly cleared from the patient, making it difficult to observe any abnormalities present in the vascular structure. Development of a contrast agent that remains in the blood–pool for an extended period of time would significantly enhance the ability to detect diseased tissue.

Blood–pool contrast agents are compounds that remain in circulation for extended periods of time and do not diffuse into the extracellular fluid. These compounds are designed to enhance tissue in a manner proportional to their blood volumes (*2*). One method that has been examined to create blood–pool contrast agents is to attach the

contrast agent to a macromolecule (*5*). Macromolecular contrast media (MMCM) are compounds that are significantly larger (>20,000 Daltons) than conventional clinical contrast agents and demonstrate prolonged intravascular retention. As noted before the relaxivity of a contrast agent is a measure of its effectiveness, and one of the significant influences upon the relaxivity is the rotational tumbling rate (also called the molecular rotation rate) of a contrast agent (*2*). However, the measurement of the in vitro relaxivity of the contrast agent may not provide a direct correlation to the in vivo relaxivity (*4*). Changes in viscosity of a solution slow this tumbling and increase relaxivity. Another way the tumbling rate of a molecule may be changed is by attachment to a macromolecule (*4*). The development of MMCM and other blood–pool contrast agents is very important as these compounds can be designed to produce the preferential biological distribution that would allow for better diagnosis of diseased tissue (*2*).

Unfortunately there are some problems associated with the method of covalently attaching the contrast agent to a macromolecule to create an injectable MMCM. These problems include the deposition of the toxic metal ion, incomplete excretion of the contrast agent and immunogenicity at the sight of administration. These problems outweigh the potential benefits so an alternative approach is required (*1*). One strategy involves the administration of low-molecular weight compounds that form MMCM in vivo by reversibly binding to plasma proteins, in particular HSA (*2*). Non-covalent binding of a low molecular weight contrast agent to a large macromolecule such as HSA reduces the molecular rotation rate. The decrease in the molecular rotation rate causes increases nuclear relaxation, this increase in relaxivity due to the slow molecular rotational rate of the contrast agent attached to a macromolecule compared to that of a contrast agent alone in solution is termed proton relaxation enhancement effect (PRE) (*2*).

HSA is a transport protein that binds a multitude of compounds that vary in structure and charge. Albumin also remains predominantly in the vascular system and only 5% of native albumin is removed from the blood in one hour. Therefore the retention time of the contrast agent will be prolonged and the protein-contrast agent complex will exhibit characteristics like those of a blood pool agent (*2*).

Serum albumins are some of the most extensively studied proteins. HSA is the most abundant protein in plasma and contributes significantly to the osmotic blood pressure (*2*). HSA synthesis occurs in the liver and is partly responsible for the maintenance of the blood pH and the transport of normally insoluble compounds in plasma such as fatty acids (*2*). HSA is a large protein that contains 585 residues and has a total molecular weight of 66,500 Daltons. The protein contains 17 disulfide linkages
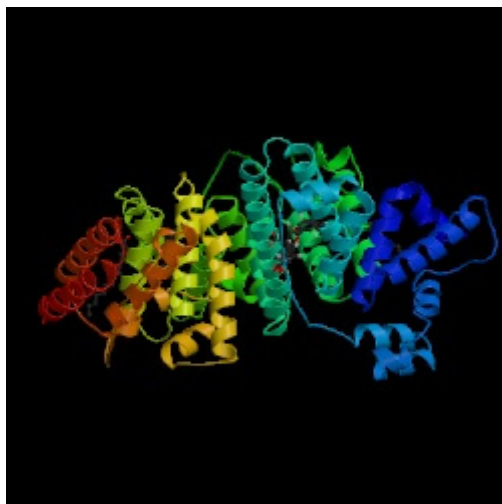
Figure I: Human serum albumin

with one free cysteine residue and one tryptophan residue (*2*). Human serum albumin is very flexible and allows for the binding of a multitude of substrates with varying structural features (*2*).

Iron Agents

The high spin d^5 iron(III) ion is an ideal candidate as a MRI contrast agent (*4*). Unfortunately iron(III) is toxic in its free form. Acute iron poisoning leads to increased respiration and pulse rates, as well as congestion of blood vessels. The greatest concern with iron(III) is the ability of the ion to participate in redox reactions and to catalyze the oxidation of organic substances (*4*). This suggests a need for iron(III) ion to be fully coordinated in vivo (*6*). In addition to decreasing toxicity, chelating ligands may be functionalized in order to provide tissue specificity. Unfortunately the complete coordination of iron(III) removes the possibility of inner–sphere water coordination and thus increases the distance between the metal center and the water protons, thereby reducing the effectiveness of the dipolar interaction with the protons (*6*). This leaves outer–sphere and second–sphere coordination as the only mechanism for relaxation (*4*). The main focus of our study was on the 3,5-disubstiuted sulfonamide catecholate derivative 3,5-bis(dimethylsulfonamide)catechol as the ligand. If a ligand can be synthesized that will bind to HSA, there should be a significant increase in the relaxivity of the iron(III) complex when it is measured in a plasma solution.

II. Procedure

The procedure can be broken down into three stages. The first stage is the synthesis of novel ligands, the second stage is synthesis of the iron(III) complex with the new ligands and the third stage is the evaluation of relaxivity and binding of the complex to HSA (5). To create a complex which will bind to HSA, ligands synthesized have characteristics of molecules that are already known to bind to HSA but also contain the requirements to coordinate to iron(III) (5).

This ligand was synthesized by equipping a 1000-ml round bottom flask with a Claisen adapter, reflux condenser, and an additional funnel. Dimethylamine (52 mL, 40% in water, 0.410 mol) was dissolved in 100ml diethyl ether and cooled to 0°C in an ice bath. 3,5-Bis(dichlorosulfonyl)catechol (10.0g, 0.0326 mol) dissolved in 100mL diethyl ether was added slowly. The reaction was allowed to come to room temperature and stir overnight. The ether was removed by rotary evaporation. Concentrated HCl (80 mL) was added to the resulting solid. The aqueous layer was washed with methylene chloride (6 x 150 mL). The methylene chloride was dried over sodium sulfate, filtered and removed by rotary evaporation. The product was recyrystallized using methylene chloride/hexanases (1.1g, 0.0034 mol, 10% yield).

For the synthesis of the iron(III) complex the iron(3,5-bis(dimethyl-sulfonamide)catechol)$_3$ was isolated as a trisodium salt. The ligand (3 mmol) was dissolved in water. Sodium hydroxide (0.0800 g, 2 mmol) and iron(III)-acac (0.3532 g, 1 mmol) were added and the solution was placed under reflux conditions. After 24 hours of heating, the solution was allowed to cool and the pH adjusted to 7. The solution was heated for another 24 hours and the pH again adjusted to 7. The solution was extracted with diethyl ether (6 x 150 mL). The pH was adjusted to 7, the solution was filtered, and the solvent was removed. The resulting red solid was dried under vacuum.

Once the contrast agent had been synthesized, the relaxivity was determined by use of a 20 MHz minispec. The spin-lattice relaxation time (T_1) was measured for a series of solutions of different concentrations, and then a plot was made of $1/T_1$ against concentration. The slope of the graph is relaxivity (5).

The iron-3,5 bis(dimethylsulfonamide)catechol (Fe-DiMeSAC) complex was first measured in vitro with aqueous solution. A 6 mmol solution was prepared (73.05 mg of complex in 10 mL of distilled H_2O), and then a series dilution performed to make the other concentrations. The samples of different concentration were then allowed to incubate in a dry bath at 37°C (to simulate body temperature) for a minimum of 10 minutes. After incubation samples were run individually in a Bruker 20 MHz minispec and T_1s were recorded. The inverse of T_1 was then plotted against concentration and the slope measured to give the relaxivity. These samples were then allowed to sit at room temperature for one week, and then measured again to confirm results.

Human plasma was then purchased from the Red Cross. A 6 mmol solution was prepared using iron(3,5-Bis(dimethylsulfonamide)catechol) and the plasma. A series dilution was then carried out. The same methods as those for the aqueous samples were followed; incubation at 37°C, T_1 of all concentrations measured, and then determination of relaxivity from these data.

III. Results

The spin lattice relaxation time for the aqueous solutions of varying concentrations increases at the concentration decreases, as predicted. The values are shown in Table 1:

Concentration (mM)	T_1 (ms)
5.25	94.01
4.5	110.5
4.0	122.0
3.0	162.1
1.5	307.2
0.75	558.9

Table 1

The inverse of T_1 was plotted against the concentration and the relaxivity was found to be 1.959 mM^{-1}s^{-1}. The plot of this slope is shown in Figure 2. The spin lattice relaxation times for the Fe(III) complex in human plasma were lower than those of the aqueous solutions, as seen in Table 2:

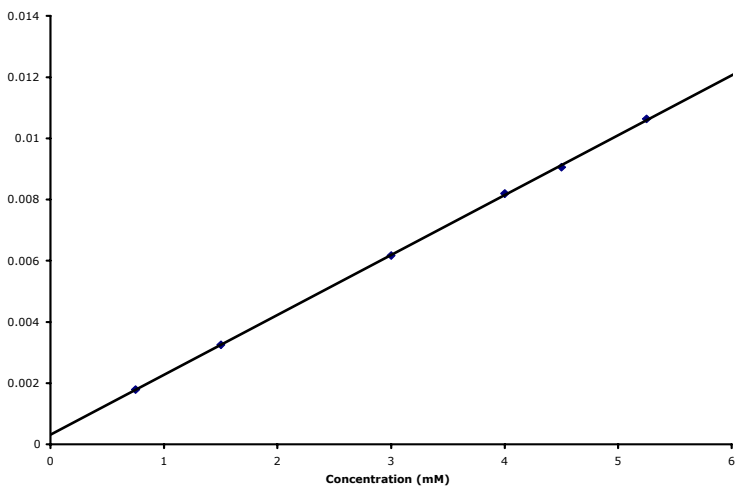| Concentration (mM)	T_1 (ms)
6.0	50.90
5.0	59.13
4.0	69.24
3.0	84.10
2.5	96.00
2.0	111.6
1.0	192.0
0.5	374.0

Table 2

Figure 2: Plot of 1/proton relaxation rate against concentration in water

The inverse of T_1 was plotted against the concentration and relaxivity in plasma was found to be 2.978 mM^{-1}s^{-1}. The graph of this data is shown in Figure 3.
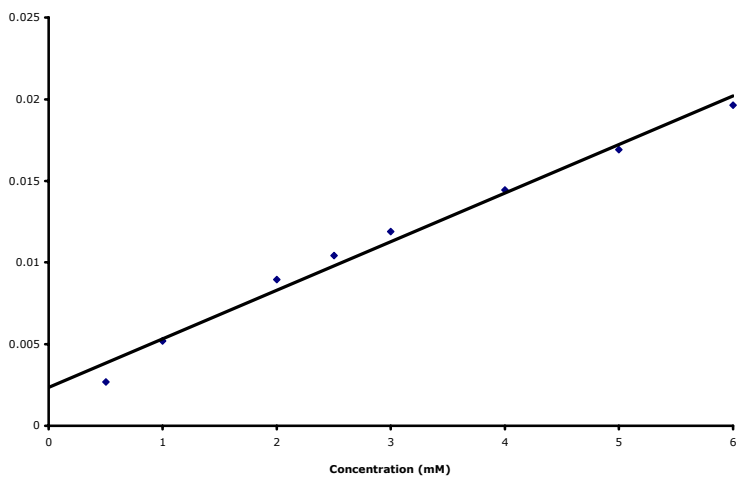
Figure 3: Plot of 1/proton relaxation rate against concentration in human plasma

IV. Discussion

The results of this study support nearly all of our hypotheses. The relaxivity (R_1) of 3,5-Bis(dimethylsulfonamide)catechol increased from 1.959 mM^{-1}s^{-1} to 2.978 mM^{-1}s^{-1}. This increase is probably due to the fact that human plasma is a 4.5% HSA solution. This also shows that this low molecular weight complex [3,5-Bis(dimethylsulfonamide) catechol] formed a macromolecular contrast media with HSA in vitro.

Table 3 shows some comparative data of other 3,5-disubstituted sulfonamide catecholate ligands, and a gadolinium based contrast agent. This data was collected by the Research Laboratories of Schering AG in Berlin, Germany. The relaxivity of iron-3,5-Bis(dimethylsulfonamide)catechol is within the same range as the other catechol derivatives but have greater relaxivites than typical six-coordinate, coordinatively saturated compounds. Although the relaxivity of the gadolinium based compound was much greater than the iron based compounds, this research and further research is being conducted to show that these iron based complexes can be just and effective, if not more of an effective contrast agent, along with being less toxic and dangerous.

Compound	R_1 (H$_2$O) (mmol^{-1}s^{-1})	R_1 (plasma) (mmol^{-1}s^{-1})
Fe-3,5-Bis(dimethylsulfonamide)catechol	2	3
Fe-3,5-Bis(diethylsulfonamide)catechol	1.9	4
Fe-3,5-bis[di(2-methoxyethyl)sulfonamide]catechol	2	3
Fe-3,5-Bis(morpholinesulfonamide)catechol	1.9	3.7
Gd-EOB-DTPA	5.3	8.7

Table 3

The next step in this research process is to determine exactly which site these ligands bind to on human serum albumin. As mentioned before HSA is a carrier for a multitude of molecular compounds within the body. Knowledge of approximate location of the primary sites provides an excellent starting point for docking experiments that can be used to find the best orientation of the contrast agent and determine residues involved in the binding interaction (*2*). Ideally, determination of the crystal structure of HSA with the bound contrast agent would provide the exact location of the binding sites, identify

the residues involved in the binding, and determine the change in the tertiary structure of the protein upon binding (*2*).

V. Conclusions

This research has demonstrated that iron–based contrast agents for MRI are viable alternatives to gadolinium-based agents in the design of MMCM. One intravenous and two oral contrast agents utilizing manganese and iron as paramagnets have already been approved for clinical use in many countries. The natural biochemistry of these metals makes a greater knowledge base on the distribution of the ions and their complexes in the body available for researchers to exploit and extend upon, allowing for development of targeted agents. The inherent low relaxivity of the non-gadolinium-based contrast agents may be enhanced by designing complexes that interact with serum proteins and other macromolecules. While it is not known if the relaxivities of non-gadolinium-based agents will ever surpass the highest of those of gadolinium-based agents, the opportunity for targeted, high-relaxivity agents is there *(4)*.

VI. Acknowledgements

VII. References

1. Richardson, N, P. *Development of Iron(III) Complexes That Bind to Human Serum Albumin.* The Petroleum Research Fund Grant Application, 2002.

2. Casper, J, J. *In Vivo and In Vitro Evaluation of Metal Chelates as Macromolecular Contrast Media for Magnetic Resonance Imaging.* University of Toledo, 2002.

3. Lauffer, R, B., *Paramagnetic Metal Complexes as Water Proton Relaxation Agents for NMR Imaging: Theory and Design.* Chem. Rev. 1987 87, 901-927.

4. Schwert, D,D.; Davis, J, A.; Richardson, N, P. *Non-Gadolinium-Based MRI Contrast Agents*; in *Topics in Current Chemistry,* W.Krause, Editor. 2002. Springer-Verlag: Berlin.

5. Richardson, N, P. *Development of Iron(III)-based Magnetic Resonance Imaging Contrast Agents That Bind to Plasma Proteins*. Cottrell College Science Awards application, 2000.

6. Davies, J,A.; Heffner, P,E.; Ji, G.; Keck, R.; Raduchel, B.; Richardson N.; Schwert, D. *Synthesis of 3,5-disubstituted sulfonamide catechol ligands and evaluation of their Fe(III) Complexes for Use as a Magnetic Resonance Imaging Contrast Agents.*(in preparation).

7.   Richardson, N.P.; Davies, J.A.; Raduchel, B.; *Iron(III)-based Contrast Agents for Magnetic Resonance Imaging.* Polyhedron 1999; 18(19): 2457

Pluto: Captured Comet or Legitimate Planet?[1]

Michelle Bingham (English) and Dr. Gregory J. Falabella (Physics)

I. Introduction

For as long as I can remember, I have been taught that Pluto is a planet. They told us Pluto was a planet in the third grade, so it must be true, right? Well what if they were wrong? What if Pluto wasn't really a planet at all, but rather a comet? This research gives credence to the theory that Pluto is a Kuiper Belt object whose trajectory was altered by Neptune's massive gravity.

Where did this crazy theory come from and more importantly is it credible? Well recently, the Hayden Planetarium in New York City helped to give conviction to this speculation. Instead of displaying Pluto as a planet, they simply lump it together with a group of icy bodies known as Kuiper Belt objects. To be specific, the Solar System exhibit is currently set up so that the onlookers see a display of each planet, except Pluto, which is covered by a metal plaque drilled over the original presentation. The plaque states, "Beyond the outer planets is the Kuiper Belt of comets, a disk of small icy worlds including Pluto." Was the Planetarium justified in undermining Pluto's status as a planet?

Pluto is clearly a misfit. It cannot be classified as a terrestrial or jovian planet and does not fall into the well-ordered framework of the solar system. Smaller than the Earth's moon, composed of 70-80% of rock, surrounded by layers of frozen water, methane and nitrogen and having an eccentric orbit tilted 17° from the ecliptic plane, Pluto has more in common with Kuiper Belt objects. As does its 2:3 orbital resonance with Neptune which is identical to that of other Kuiper Belt objects which tend to revolve around the sun twice for every two revolutions Neptune makes.

But astronomers have been aware of these peculiarities for many decades so why now all of the fuss? In 1992 the first object orbiting the sun beyond Pluto was discovered *(1)*. Since then hundreds of other bodies have been found and catalogued orbiting the Sun just beyond Neptune at distances of 40-60 astronomical units. Many astronomers now believe that Pluto is the largest of a family of chunks of rock and ice. Still, the majority of professional astronomers is reluctant to reclassify Pluto and defeated a motion placed before the International Astronomical Union in 1999. This reluctance to downgrade Pluto's status, however, may soon change. In 2001 an object approximately half the size of Pluto was discovered. Named Quaoar this is the largest object found in

---

[1] Presented at the 57th Eastern Colleges Science Conference in Ithaca, NY

the solar system since Pluto was discovered by Clyde Tombaugh in 1930*(2)*.
Furthermore, recent evidence suggests that some of these Kuiper Belt objects have
satellites similar to Pluto's moon Charon which interestingly has the exact same
composition as Pluto*(3)*.

II. Governing Equations and Solution Procedure

Is it possible, and moreover is it probable, that a large Kuiper Belt comet could
have strayed too close to Neptune sometime in the past and had its orbit forever changed
to that of Pluto or is this just another theory attempting to explain an oddball planet like
the speculation that Pluto was originally a satellite of Neptune ejected by some
catastrophe? In response we set out to model the scenario and substantiate our theory.
This amounts to using Newton's Law of Gravitation and Newton's Second Law of
Motion to determine the change in trajectory that would result if a Kuiper Belt object
came under the influence of Neptune's strong gravitational pull.

$$F = ma \qquad Newton's\, 2^{nd}\, Law\, of\, Motion$$

$$F = \frac{GMm}{r^2} \qquad Newton's\, law\, of\, Graviation$$

To do this we must model the Sun, Neptune and Pluto yielding a three body
problem that can be expressed mathematically

$$\ddot{\mathbf{r}}_1 = \frac{Gm_2}{\left|r_2 - r_1\right|^3}(\mathbf{r}_2 - \mathbf{r}_1) + \frac{Gm_3}{\left|r_3 - r_1\right|^3}(\mathbf{r}_3 - \mathbf{r}_1)$$

$$\ddot{\mathbf{r}}_2 = \frac{Gm_1}{\left|r_1 - r_2\right|^3}(\mathbf{r}_1 - \mathbf{r}_2) + \frac{Gm_3}{\left|r_3 - r_2\right|^3}(\mathbf{r}_3 - \mathbf{r}_2)$$

$$\ddot{\mathbf{r}}_3 = \frac{Gm_1}{\left|r_1 - r_3\right|^3}(\mathbf{r}_1 - \mathbf{r}_3) + \frac{Gm_2}{\left|r_2 - r_3\right|^3}(\mathbf{r}_2 - \mathbf{r}_3)$$

Although very intimidating, these equations illustrate that Pluto's displacement is
determined by its initial velocity, the force of Neptune and the force of the Sun.
Similarly, Neptune's trajectory is a result of its original momentum and the gravitational
pull of Pluto and the Sun. The above system consists of three coupled non-linear, partial
differential equations. It is difficult to solve and hence readily lends itself to a numerical

solution. As a result the software package Interactive Physics™ was utilized to model the scenario and the resulting mechanics.

At the start of each simulation the initial positions and velocities are given. The computer program then computes the acceleration due to gravitational fields present and determines the location of each body at some later time. The increment in time is kept small enough so that the acceleration can be assumed constant over each time interval with no loss of accuracy. As a result, the equations of motion shown below can be utilized. Through an iterative process entire trajectories are obtained.

$$\dot{\mathbf{r}} = \dot{\mathbf{r}}_0 + \ddot{\mathbf{r}}\Delta t$$

$$\mathbf{r} = \frac{1}{2}\ddot{\mathbf{r}}(\Delta t)^2 + \dot{\mathbf{r}}_0\Delta t + \dot{\mathbf{r}}_0$$

III. Results

Many different simulations were run with comets of varying eccentricities and semi-major axes. Most of the time these comets were ejected out of the solar system or into greater orbits after contact with Neptune's immense gravity. A few were slowed down and were sent into orbits that would have made a collision with another planet or the sun a near certainty. Two simulations transformed the comet's path into one similar to that of Pluto and one of them was extremely accurate.

It began with a comet orbiting the sun (figure 1) with an eccentricity of 0.913 and an aphelion of 63.3 Au (well beyond the orbit of Neptune). The comet came within 200,000 km of Neptune and then had its orbit altered (figure 2) to one almost identical to that of present day Pluto. As table 1 and figure 3 show the simulation is surprisingly accurate. It is only in error with regard to the amount of time Pluto spends inside the orbit of Neptune indicating that Neptune is the farthest planet for 30 out of every 248 years. In actuality Neptune is farther away from the Sun for 20 out of every 248 years as it was from 1979 to 1999.

IV. Conclusions

When the solar system formed it is likely that many small icy bodies filled the region between Neptune and the edge of the solar system. As our simulation indicates Kuiper Belt objects interacting with Neptune's gravity would most likely be kicked into greater orbits taking them outside the confines of the solar system or into the inner system and an

---

™ Interactive Physics is a trademark of MSC Software Corporation
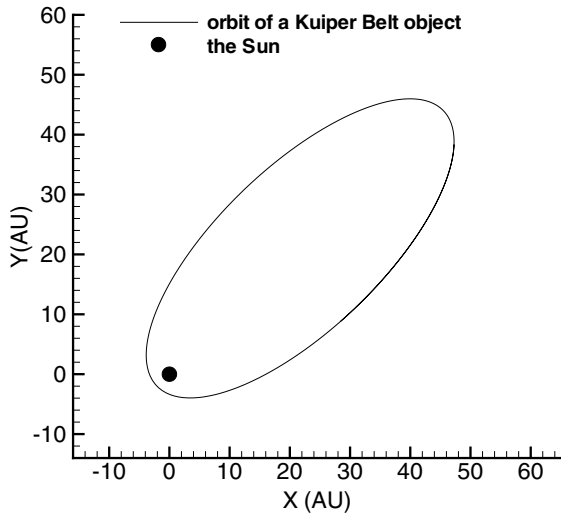
Figure 1: A typical Kuiper Belt comet
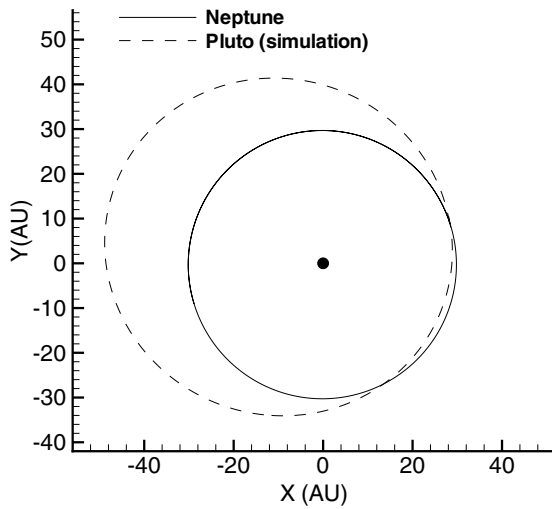
Figure 2: Comet after interacting with Neptune's gravity

Table 1: Pluto's Orbit

Orbital Data	Simulation	Textbook(4)	Percent Error
Aphelion	49.7 AU	49.3 AU	0.81
Perihelion	28.4 AU	29.7 AU	4.3
Orbital period	243.7 years	248.0 years	1.7
Eccentricity	0.272	0.249	9.2
Not the most distant planet	30 years	20 years	50.0

imminent demise. This would seem to explain the dearth of comets orbiting at 30-50AU. Interestingly it was, however, confirmed that it is possible under certain circumstances for the gas giant's gravity to have altered a comet's trajectory so that it would revolve around the sun in a path almost identical to that associated with the planet Pluto.

V. Acknowledgments

VI. References

1. Freeman J. Dyson, "Hidden Worlds: Hunting for Distant Comets and Rogue Planets," *Sky and Telescope*, *87*, 26-30 (January 1994).

2. Tony Reichhardt, "Discovery of giant asteroid gives Pluto a rocky outlook," *Nature 419*, 546 (10 Oct 2002).

3. Ron Cowen, "Nine planets or eight? Probing Pluto's place in the solar system," *Science News*, *159*, 360-361 (June 2001).

4. Eric Chaisson and Steve McMillan, *Astronomy Today*, 3rd edition, Prentice Hall, New Jersey (1999).
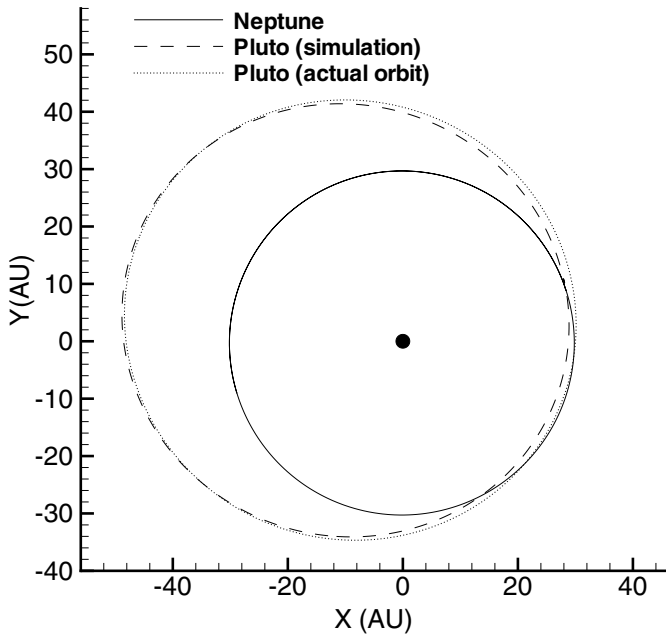
Figure 3: Comparison between the simulation's result and Pluto's actual orbit

Autism and the MMR Vaccination

Stephanie Capasso[1] (Nursing)

I. Introduction

The purpose of this study was to examine the relationship between the measles, mumps, and rubella vaccine (MMR) and the development of autism in children. It investigated the link between the MMR vaccine and bowel problems and autism as identified by Dr. Andrew Wakefield in 1998. Since the release of Wakefield's study many copycat studies and research has been conducted. The majority of research conducted since Wakefield's suggests that there is no link between autism and the MMR vaccination. The most well known study that opposes Wakefield's theory was conducted by Brent Taylor, who concluded that if there were a link between autism and the MMR vaccination then a greater number of children who had been vaccinated would have autism. On the other hand, researchers such as Brewitt and Sandler report that there is reason to believe that Wakefield's theory is valid. It is necessary to continue researching, especially on a larger scale to study the evidence of a link between the measles and autism and the prevalence of autism and its relationship to the MMR vaccination. The purpose of this study will be to determine if there is a link between autism and the measles, mumps, and rubella vaccine. The independent variable of this study was the MMR vaccination and the dependent variable of this study was autism.

II. Research Questions and Hypothesis

1) What is the relationship between the MMR vaccine and the development of autism in children?
2) Does the MMR vaccine have any relationship to bowel problems in children with autism?
3) Do the risks of not being vaccinated outweigh the possibility of a link with autism?
Hypothesis- The development of autism in children is unrelated to the MMR vaccine.

III. Review of Related Literature

Taylor, Miller, Lingam, and Andrews (2002) conducted a study to investigate whether the measles, mumps, and rubella (MMR) vaccination is associated with bowel problems and developmental regression in children with autism. The researchers used

---

[1] Research performed under the direction of Dr. Lauren E. O'Hare (Nursing)

Wakefield's theory of a link between the MMR vaccine and autism. The researchers looked for evidence of a new form of autism, where developmental regression is reported to follow shortly after MMR vaccination, typically accompanied by bowel symptoms. They found no correspondence between behavioral disturbances, including regression, shortly after MMR vaccination. They did speculate that "It is possible that the onset of MMR induced "regressive autism" with "autistic enterocolitis" may occur after a prolonged induction interval and, in addition, requires the presence of cofactors such as an infection, use of antibiotics, a history of atopy, a family history of autoimmune disease, or MMR or rubella immunization of mother shortly before or during pregnancy (p. 393-394)."

This article is relevant to the study because it showed that the proportion of children with developmental regression or bowel symptoms did not significantly change with the introduction of the MMR vaccine. No support for an MMR associated "new variant" form of autism with developmental regression and bowel problems was found.

The Exceptional Parent (2002) published an article that stemmed from Wakefield's study on the link between autism and the MMR vaccine. It then went on to discuss other studies worldwide that opposed Wakefield's view that there was a link, such as studies done by the American Academy of Pediatrics and the Centers for Disease Control and Prevention. It then reviewed Taylor's 1999 study that argued against a link between autism and the MMR vaccine. Taylor's most valid points were that the number of autism diagnosed cases has risen sharply since 1979, but there was no sharp increase after doctors started using the MMR vaccination and by age two vaccination coverage among children with autism was the same as vaccination coverage for children the same age who did not have autism. If the MMR vaccine and autism were linked, then a greater number of children who had been vaccinated would have autism. Also, the first signs of autistic behavior or the first diagnosis was no more likely to occur in time periods following the MMR vaccine than other time periods. The National Institute for Health (NIH) is funding research to help continue examining the possible link and their largest project to date studies 100,000 children from birth to age 20 to track their growth and development and genetic blueprints. Finally, this article provides evidence that there is no link between the MMR vaccine and autism. However, it does address ongoing studies to oppose these findings.

Heller, Heller, Pattison, and Heller (2001) discussed a professional's view of giving the MMR vaccine. The researcher's stated that only 45 percent of professionals completely agree with giving the second MMR dose. The authors then quote Wakefield and some of his opponents about the link between the vaccine and autism. Finally, the authors explain the devastating effects of not immunizing children at all and the benefits outweigh the risks.

In conclusion, the physicians addressed professional views about administering vaccines that may be controversial to some people. They stated that they were not hesitant to administer the vaccine because there was not sufficient evidence to support Wakefield's hypothesis.

Brewitt (2002) stated that there was a possible relationship between autism and the MMR vaccination, as Wakefield had suggested. She went on to define autism as a neuro-biological disorder linked to the measles. She stated the similarities as being: a strain of the measles virus that is found in 30 percent of autistic children's gastrointestinal tracts, immune system abnormalities, and areas of the brain affected by autism and the measles are similar. Finally, the author states that although much research is needed, "the evidence linking the onset of autism to children receiving the MMR vaccine, and the measles symptom profile to the autistic symptom profile are too strong to be ignored (p.70)."

Miller (2001) brought about new evidence that does not support Wakefield's theory. This evidence is based on studies conducted since 1999 that counter-act his theory. Researchers found that the MMR vaccine is highly effective and only rarely causes serious side effects and by giving the vaccine at separate intervals (as suggested by physicians) means that children are no longer protected against all three diseases as early as possible. Additionally, children would need six injections instead of two, and separate vaccines are not licensed in this country. In conclusion, considerable evidence is provided to support the use of the MMR vaccine. It provides significant evidence that supports immunizing because the risks of not immunizing can be life threatening.

Sandler (2002) discussed recent controversies regarding a link between the MMR vaccine and autism and a new phenotype of autism. "Autistic enterocolitis" is supported by Sandler because she reported that childhood disintegrative disorder has become more frequent, the mean age of first concern for autistic children exposed to the MMR vaccine is closer to the immunization age than children not exposed to the MMR vaccine, regression is more common in autistic children vaccinated with MMR, the age of symptom onset clusters around the immunization date of immunized children, and regressive autism is related with gastrointestinal symptoms. Lastly, Sandler addresses the possibility that a link exists between the MMR vaccine and autism. She points to the need for additional research, while pointing out existing statistics that support Wakefield's theory.

Kubetin (2001) addressed a study done at Boston University, which included 305 children diagnosed with autism between 1988 and 1999 (the year the MMR vaccine was first introduced in England). The study found that between 1988 and 1993, the risk of diagnosed autism increased fourfold. Additionally, they found that MMR vaccination rates remained constant during that period at 97 percent. Thus, the 572

percent increase in autism cases from 1980 to 1994 far exceeded the modest increase in MMR coverage. To conclude, the rate of diagnosed autism succeeded the rate of MMR vaccinations per year by four times. When the rate of autism increased dramatically between 1980 and 1994, the immunization rates remained stable, thus this was not the variable that caused the sharp rise in the diagnosis of autism.

Gorman (2002) reported that there is no difference in the autism rates of children who received the MMR vaccine and those who did not. The article described a study ongoing in Denmark where researchers are analyzing health records of every child born from 1991 through 1998. The study revealed that no link existed between autism and the MMR vaccine. The results were soundly based due to the fact that Denmark's medical system has generated the most complete health records of any country. Investigators were able to document those who were or were not vaccinated and the rate of autism as it developed. The research found that there was no difference in autism rates between vaccinated and unvaccinated children in Denmark. There was also no clustering of autism diagnoses in the weeks and months after vaccination. This was the largest, most complete study conducted on the subject.

IV. Methods

The target population for this study was children with autism. The criteria for sample selection was:
(a) Children with autism between two and eight years of age,
(b) Children whose medical records and vaccination records are available since birth,
(c) Patients still living.

Autistic children were randomly selected from two pediatricians' medical records. The physicians provided the listings of children in their care with autism who received the MMR vaccine and those who did not receive the MMR vaccine. After randomly selecting ten children with autism, the researcher reviewed the children's medical records to identify key similarities in events preceding the diagnosis of autism and the MMR vaccine in relation to their autism. The ex-post facto (or correlational) research method was utilized as the research design.

After review and approval from two local pediatricians, the study was conducted to determine if a relationship exists between the MMR vaccination and the development of autism in children. The researcher randomly selected ten autistic children and reviewed their immunization records to determine which children received the MMR vaccination at the appropriate times (fifteen months and a booster at four to five years old). The following information was used when collecting data:
 The information was organized according to two groups:
(1) Children who received the MMR vaccination at fifteen months and

(2) Children who did not receive the MMR vaccination at fifteen months.

        The second group was further classified according to whether the children did not receive the immunization because of parental opposition or because of other reasons such as immunodeficiency or long-term illness. This information was gathered by reading the physician's notes and verbal communication with the physician. Next, the medical records were reviewed to determine when the child was first diagnosed with autism and when the symptoms began to be present before the child received the vaccination.

        For the purpose of this study, the following terms will be operationally defined:

Autism is a neuro-biological disorder whereby children do not communicate or espond in the same manner as the general population. Autistic children have developmental delays that impair social interactions, verbal and non-verbal communications, ability to make eye contact, and speech (Brewitt, 2002).

The Wakefield Study is a study that was conducted by Dr. Andrew Wakefield in England that implicated the measles, mumps, and rubella (MMR) vaccine to autism. This study was widely published in 1998 and caused frenzy amongst parents, which lead to a worldwide ban of the MMR vaccine by some parents (Brewitt, 2002).

The Measles, Mumps, and Rubella (MMR) Vaccine is a suspension of killed viruses, administered for the prevention of the measles, mumps, and rubella viruses (Brewitt, 2002).

Bowel problems are noted as constipation, constipation and diarrhea, diarrhea, food allergy, and/or non-specific colitis (Anonymous, 2002).

The following tools will be utilized to collect data:

        This study used review of medical charts and physician interviews to investigate the relationship between exposures to the MMR vaccine in relation to the onset of autism. This study has strength and weaknesses of the data collected. First, the charts were read thoroughly and notes were recorded in regards to them. Notes were taken on the child's age, vaccination dates or absences, autistic development stage and related syndromes, available family history, and overall health. A chart review data sheet was created to organize information concerning child's age, diagnostic symptoms, vaccination age (if applicable), and other risk factors for autism. In addition, all notes and questions were clarified, as to accuracy of charted findings and thoroughness through informal physician interviews. Although the reviewing of medical charts was based on interpretation by the researcher, the information read was clarified, through interviews with the physician who took the notes and had insight into the precision of the notes. Also, there was only one physician's note and record for each child, which limited the data to the physician's

interpretation, observations, questions, and views. The chart review data sheet was utilized to organize the information found in the medical charts and the physicians' interview to create a clear picture of the autistic group that was being studied.

V. Results

The statistical testing method used in this study was a chi-square test. A chi-square test was the best method for testing this data because a chi-square test is a nonparametric procedure used to test hypotheses about the proportion of cases that fall into various categories. The two independent categories in this study were children with autism that received the MMR vaccination children with autism that did not receive the MMR vaccination. The results of the chi-square test indicate that there is a greater occurrence of autism occurring after vaccination than would have occurred by chance. The obtained value of 1.600 (x=1.600) is substantially larger than would be expected. If receiving the MMR vaccination has no correlation with the development of autism in children, then there should be no significant differences between the results autistic children that received the MMR vaccine and autistic children that have not received the MMR vaccine (Polit, Beck, and Hungler, 2001).

The researcher identified ten children with autism between the ages of two and eight years old. Of the ten children, seven received the MMR vaccination and three did not. The three children who did not receive the vaccination did not receive it due to immunodeficiency, parental opposition, and long-term illness (See data review sheet). Four out of seven of the children who received the MMR vaccination presented definite symptoms of autism before being vaccinated (See data review sheet). The results showed a strong possibility that the MMR vaccination is a contributor to autism. In the study, three children developed autism after receiving the MMR vaccine. Although other studies conducted state that no relationship exists between the development of autism and the MMR vaccination, there is need for more complete research. None of the research done thus far has studied large and varied groups of children. A large-scale study done on children from birth until adolescence would give accurate numbers about the relationship between autism and the MMR vaccination and could also give insight to possible contributors to autism. Until a large size study is conducted to determine the safeness of the vaccine, parents and physicians will hesitate to vaccinate children and may be causing more harm to the children by not vaccinating them.

VI. Limitations

Although there are numerous clinical studies that stand behind the theory that the MMR vaccination does not cause autism in children, there is still evidence that a possible relationship exists. This study was conducted with a limited sample size in one demographic region of the United States. Also the study was limited to two physician's observations and medical records. Finally, a study this small is limited in resources and time.

VII. References

(Anonymous, 2002). Autism and the MMR vaccine. The Exceptional Parent, 32, 2, p. 76-80.

Brewitt, B. (2002, January). Autism, MMR vaccine, HIV similarities and growth factor cell signaling. Townsend Letter for Doctors and Patients, (4), p.70-75.

Gorman, C. (2002, November 14). Do vaccines cause autism? Time Magazine, p. 37.

Heller, T., Heller, D., & Pattison, S. (2001, October 13). Vaccination against mumps, measles, and rubella: Is there a case for deepening the debate? British Medical Journal, 323, (7317), p.838-840.

Kubetin, S.K. (2001, September, 1). MMR vaccine is not behind sharp rise in autism cases. Family Practice News, 31, (17), p.2.

Miller, E. (2001, October). MMR vaccine- worries are not justified. Archives of Disease in Childhood, 85, (4). Full text article Retrieved November 21, 2002, from the Infotrac Health Reference Center.

Polit, D., Beck, C.T., and Hungler, B.P. (2001). Essentials of Nursing Research: Methods, Appraisal, and Utilization. New York, NY: Lippincott. Preboth, M. (2002, May 1). HTAC report on MMR vaccine and autism. American Family Physician, 65, (9), p. 1944.

Ricks, Delthia. (2002, November 7). Study finds no link between autism and vaccinations. The Staten Island Advance, p. A-6.

Sandler, A.D. (2002, April). Autism and MMR. Journal of Developmental & Behavioral Pediatrics, 23, (2), p. 122.

Taylor, B., Miller, E., Lingam, R., & Andrews, N. (2002) Measles, mumps, and rubella vaccination and bowel problems or developmental regression in children with autism: Population Study. British Medical Journal, 324,(7334), p. 393-396.

Appendix A: Chi-Square Test

FREQUENCIES

VACCINE

	Observed N	Expected N	Residual
1	7	5	2
2	3	5	-2
Total	10		

SYMPTOM

	Observed N	Expecter N	Residual
1	3	5	-2
2	7	5	2
Total	10		

TEST STATISTICS

	Vaccine	Symptom
Chi-Square	1.6	1.6
df	1	1
Asymp. Sig.	0.206	0.206

Section III: Social Sciences

The Effects of Conscious Sedation on Anxiety in Oral Surgery Patients

Dina Gramegna[1] (Nursing)

The increasing use of conscious sedation to perform surgical procedures in patients with anxiety and dental phobia is accredited to the increasing demand to conduct treatment in a time effective manner without subjecting patients to further anxiety. The purpose of this research was to examine the effects of conscious sedation on anxiety in oral surgery patients. This study is based on Fred Quarnstrom's theory which postulates that the lack of sedative anesthesia can be attributed to a patient's apprehension. This study consisted of twenty selected patients – ten who chose local anesthesia and ten who chose conscious sedation for oral surgical treatment. The age range in both the experimental and control groups were the same, twenty-one to thirty-one years of age. The subjects were English speaking patients with no known medical history. The findings of this study indicated that patients who selected conscious sedation were less anxious during both pre-operative and post-operative periods when compared to patients who opted for local anesthesia. Findings suggest that as anxiety levels decreased, pain management increased during the post-operative period for consciously sedated patients. Further studies need to examine the use of conscious sedation on anxious patients without outside influences such as cost.

I. Introduction

The growing use of conscious sedation to perform surgical procedures in patients with anxiety and dental phobias is attributed to the increasing demand to conduct treatment in a time efficient manner without subjecting patients to further anxiety. In the oral surgical field patients who are not sedated are visually, aurally and mentally aware of the procedures being performed. Conscious or intravenous sedation is used to alleviate anxiety without exposing the patient to the entire surgical procedure. Conscious, intravenous sedation has a rapid onset of action, because the patient has an intravenous access in place throughout the procedure, additional medication can be administered as needed to keep the analgesic effect. Intravenous medication concentrations can be titrated to achieve the level of sedation desired. The patient is placed in a relaxed sleep state but can be aroused when needed to aid the surgeon during the treatment. Patients, awake in

---

[1] Research performed under the direction of Dr. Lauren E. O'Hare (Nursing)

an amnesic state, remember only the insertion of a butterfly needle prior to surgery. Unlike general anesthesia, patients who are under conscious sedation can be asked to follow verbal commands and directions while undergoing surgery.

If minimizing a patient's anxiety through conscious sedation is an acceptable concept in healthcare, there should be substantial evidence to support this analgesic method with respect to oral surgery. Therefore, the purpose of this study is to experimentally determine whether or not conscious sedation reduces anxiety in patients undergoing oral surgery.

The independent variables were patients awaiting oral surgery and opting for either conscious sedation or local anesthesia and the dependent variable was anxiety levels.

Research Question(s) and Hypothesis

This research study answers the following research questions:
1. Does conscious sedation reduce anxiety levels?
2. Does the concept of being sedated create anxiety in patients awaiting oral surgery?
3. Is anxiety related to pain management?

It was hypothesized that the effects of conscious sedation aids in pain management and reduces anxiety in patients awaiting oral surgery.

Review of Literature

A common problem that oral and maxillofacial surgeons face is a patient's fear and anxiety regarding the pain and discomfort associated with their treatment (Desjardins, 2000). Management of the anxious patient is a major concern in oral health care because behavior can range from cooperative to unmanageable. Unmanageable behavior can present a hazard to the patient or hinder the procedure performance. Dental professionals are trained in sedative techniques that can alleviate patient anxiety and/or control disruptive behaviors in the course of dental treatment (Dougherty, Romer & Perlman, 2002).

The management of pain and anxiety is a major challenge for oral and maxillofacial surgeons. Zunuga (2000) found in oral surgery that control of patient anxiety assumes a significant role in overall patient management. He states the less anxious a patient is, the more easily and efficiently treatment can be performed. In a study conducted by Quarnstrom (1997) it was found that one can achieve better pain control through relaxation. His theory states that the lack of sedative anesthesia can be attributed to a patient's apprehension.

Pain and anxiety control involve the application of various physical, chemical and psychological modalities aimed at preventing and treating pre-operative, intra-

operative and post-operative patient anxiety and pain (Zuniga, 2000). Conscious, intravenous sedation is an important factor to manage a patient's pain and anxiety (Berkowitz, 1997). The goal of conscious sedation is to minimize anxiety, while making that patient comfortable and cooperative. Conscious, intravenous sedation minimally depresses consciousness while managing anxiety and pain. The ability to sedate and relax patients intra-operatively will allow procedures to be more comfortable and will cause a reduction in fear and anxiety.

Once patients are relaxed through sedation, adequate pain control is almost always possible. Minimizing anxiety will dramatically increase the quality of care received by patients undergoing surgery.

The theoretical framework for this study is Quarnstrom's concept that conscious sedation will reduce anxiety in patients undergoing oral surgical treatment.

II. Methods

Subjects were included in this study based on their decision to undergo an oral surgical procedure by either being consciously sedated and locally anesthetized, or by having surgery performed using only a local anesthetic. The patients opting for conscious sedation with a local anesthetic were classified into the experimental group while the patients receiving only a local anesthetic were classified into the control group.

A sample size of twenty patients was used, ten in the experimental group and ten in the control group. Five in each group were males and the remaining five from each group were females. Subjects were within a ten year age range, between the ages of twenty-one and thirty-one. The patients selected did not have a past or present medical illness, were not taking any form of medication nor have any known allergies.

The study was conducted in an oral surgery practice in a suburban setting in New York City. All participants involved in the study were English speaking new patients, having no prior knowledge of the institution or of conscious sedation.

The medications used in conscious sedation were a combination of midazolam (Versed), diazepam (Valium), methohexital (Brevital), fentanyl, glycopyrrolate (Robinul), atropine, and dexamethasone along with the medications used to establish local anesthesia –either carbocaine or lidocaine.

The research design for this study was a cross-sectional design, involving the collection of data at two stages in time, pre-operative and post-operative. Pre-operative and post-operative data was collected in a structured questionnaire format. Patients received a pre-operative and post-operative questionnaire each containing ten statements to evaluate anxiety on a five-item Likert scale as follows:

5 = Strongly agree

4 = Agree

3 = No Opinion

2 = Disagree

1 = Strongly Disagree.

Pre-operative questionnaire statements:

1. I do not have a fear of needles, both intra-oral and intra-venous.
2. I am not afraid of visualizing my procedure.
3. I am not fearful of dental treatment or oral surgery.
4. I am comfortable with being able to hear the procedure.
5. I do not have a fear of being sedated.
6. I am not concerned with the after effects of the surgery.
7. I have not given much thought to coming in for surgery.
8. I am not concerned with being uncomfortable during surgery.
9. I feel the same now as I did prior to walking into the office.
10. I feel the same now as I did before taking this questionnaire.

Post-operative statements:

1. I did not experience any pain or discomfort during surgery.
2. I did not experience any pain or discomfort after surgery.
3. I am not as apprehensive as I was before the procedure.
4. I no longer have anxiety toward dental treatment or oral surgery.
5. I should have been less anxious prior to surgery.
6. There were other factors, aside from anxiety, that influenced me to choose either conscious sedation or local anesthesia.
7. If I were in need of oral surgery in the future, I would definitely feel less anxiety.
8. It is the increased knowledge prior to surgery, given to me by the oral surgeon, which decreased my anxiety.
9. My anxiety has been reduced due to my own method (local anesthesia or conscious sedation) of surgery.
10. If I were to have oral surgery again I would choose the same approach.

The experimental group was given an addressed stamped envelope and asked to mail in their questionnaires after a twenty-four hour recovery period so that the effects of the medication used in conscious sedation did not interfere with their answers.

After a review of initial medical history, the participants involved were asked if they were willing to participate in the study. Each participant signed a consent form to

allow the research findings to be released. The participants were made aware that this study was for the purpose of a nursing research class at Wagner College.

Each participant received a number from one to twenty. The questionnaires were also numbered one through twenty, allowing only the researcher to know which questionnaire corresponds to which participant. The pre-operative questionnaires were given to the patient after a review of the initial medical history, showing no past or present illness, no use of medications and no allergies. The purpose of the study was then explained to the patient. The patients were then asked how they will undergo surgical treatment. If they were to be sedated, they were placed in the experimental group and if they selected only local anesthesia they were placed in the control group. Those in the control group were asked to fill out both their pre and post operative questionnaires before leaving the institution. Those in the experimental group were asked to fill out the pre-operative questionnaire prior to surgery and mail in their post-operative questionnaire.

Once the questionnaires were returned, the scores from the questionnaires were summed. The scores of the control group were then tabulated and compared with those of the experimental group. The operational definition of variables showed low pre-operative scores reflecting severely anxious patients while high scores reflected patients who were less anxious just prior to surgery.

The post-operative questionnaire determined whether or not the participants were more anxious of being sedated or if conscious sedation played an active part in the reduction of anxiety.

III. Results

The summed scores from the Likert scale questionnaires administered pre and post-operatively are reflected below. The numerical data received from the questionnaires was evaluated to formulate a relationship between anxiety and those who received conscious sedation with a local anesthetic and those who received only a local anesthetic. A parametric paired t-test was used to determine the relationship between the experimental and control groups (during both pre-operative and post-operative periods) and the dependent variable, anxiety [See Tables 1 and 2].

Table 1: Paired Samples Statistics for the Control Group and Experimental Group
During Pre-Operative and Post-Operative Periods

Anxiety in:	Mean	Standard Deviation	Standard Error Mean
Control Group	2.0300	.05657	.04000
Experimental Group	3.0600	.36770	.26000

Table 2: Paired Samples T-Test for Control and Experimental Groups
During Pre-Operative and Post-Operative Periods

Overall Anxiety	Mean	Std. Deviation	Std. Error of Mean	t	Significance	ρ
Control-Experimental	1.0300	.31113	.02200	2.682	.0134	‹.05

The findings revealed that conscious sedation reduced anxiety levels during both pre-operative and post-operative periods in the experimental group. As anxiety levels decreased during the pre-operative period, there was a significant increase in pain management during the intra-operative and post-operative periods for the experimental group.

Mean scores and standard deviation were calculated for pre-operative and post-operative patients. The scores represent the mean levels of anxiety between both the control and experimental groups. The lower the mean score the higher the anxiety level. The reverse is also true, the higher the mean score the lower the anxiety level. [See Table 3]

Table 3: Group Mean for Levels of Anxiety

Anxiety	Pre-operative Standard Deviation	Post-operative Standard Deviation	Pre-operative Mean Values	Post-operative Mean Value
Control Group	0.946	0.058	1.99	2.07
Experimental Group	0.967	1.688	2.80	3.32

Although both groups were anxious prior to surgery, the control group (non-sedated patients) showed an increased level of anxiety over the experimental group (sedated patients). During the post-operative periods the experimental group demonstrated a lower level of anxiety over the control group.

IV. Discussion

According to the results of this study, there were no violations to hypothesis assumptions. It was found that conscious sedation decreased anxiety levels during pre-operative and post-operative periods for the experimental group. The concept of being sedated did not create an increase in anxiety in the experimental group. A reduction in

anxiety increases pain management during the post-operative period for the experimental group.

There were several limitations to this study, one being response set biases. Participants may choose an extreme response – such as strongly agree or strongly disagree – regardless of the amount of anxiety they are experiencing. To try and limit these biased responses the participants were kept in a nonjudgmental atmosphere, asked to answer the questions as honestly as possible, and were reassured that the responses supplied will be kept confidential.

Another limitation was the cost of sedation. Many patients cannot afford to be consciously sedated. Insurance companies view oral surgery as an ambulatory procedure and do not deem sedation necessary. Many medical insurance companies do not reimburse patients for conscious sedation. This imposed a limitation on the patient's free will to choose sedation as a method to reduce anxiety. Future studies should be conducted where the cost of conscious sedation will not play a factor in the patient's method of choice.

V. References

Berkowitz, C., (1997). Conscious sedation: a primer. *American Journal of Nursing,60(4),* (32).

Desjardins, P.**, (**2000). Patient pain and anxiety: The medical and psychologic challenges facing oral and maxillofacial surgery. *Journal of Oral and Maxillofacial Surgery, 58(10),* part 2.

Dougherty, N., Romer, M., & Perlman, S. (2002). The use of sedation for the dental patient with special needs. *Journal of Dental Medicine, 32(4),* (113-114).

Quarnstrom, F., (1997). Sedation of phobic dental patients with an emphasis on the use of oral triazolam. *Journal of Oral and Maxillofacial Surgery, 22(7),* (451).

Zuniga, J., (2002) Guidelines for anxiety control and pain management in oral and maxillofacial surgery**.** *Journal of Oral and Maxillofacial Surgery, 58(10),* (29).

Redefining Love: The Interrelations Between Love, Attachment Styles and the Triangular Theory of Romantic Relationships

Jaime T. Carreno[1] (Psychology)

Three popular theories of love were brought together, in an attempt to better understand this baffling concept. The interrelations between triangular love type, love styles, and adult attachment styles were of primary interest. One hundred college students were surveyed. Relationships were found within love styles and within triangular love theory components. Relationships were also found between love styles and the triangular theory and between age and levels of commitment in relationships. Lastly a relationship was found between attachment styles and triangular love type. The interrelations of these three major love theories suggests an underlining essence of love. This research is a step toward a more encompassing definition of love, which should take into account the way a person loves (love style), the way a person feels about receiving love (attachment style), and finally how a person comes to experience love (triangular love type) in a relationship.

I. Introduction

Love is like time. Everyone knows what it is until one is asked to define it. Researchers, who pride themselves in the creation of operational definitions of abstract concepts, have made a number of attempts at defining love. Although a number of latent and operational definitions have been presented, little has been done in having a universal definition stemming from a fusing of major love theories. Moreover attempts to use love as defined by the major love theories have many times overlooked the original concepts proposed by their creators. This research attempts to analyze the concepts of love styles, attachment styles, and triangular love type, while taking into account the theories set forth by the originators.

Love styles are an individual's personal theories of love. These theories are related to the ways in which individuals tend to behave in romantic relationships (Hendrick & Hendrick, 1986). These individual theories, originated from a proposed typology of love by Lee (1973), who identified three primary types of love styles: Eros,

---

[1] Research performed under the direction of Dr. Amy Eshleman (Psychology)

Ludus and Storge. Eros lovers become involved very quickly, they are seen as romantic and passionate. Ludus lovers are known as "game-players" who at times date more than one person. Storge lovers seek similarity between themselves and their partners, they often date friends. Lee then identified three secondary love styles: Pragma, Mania and Agape. Secondary love styles are composed of two primary styles yet are qualitatively different from their two derivatives. Each love style is distinctive. Pragmatic lovers (a compound of Storge and Ludus) know what they want in a relationship and have a "checklist" of conditions that must be met. Manic lovers (a compound of Eros and Ludus) obsess over their partners; they experience extreme highs and lows in their relationships, and are seen as possessive and dependent. Finally, Agapic lovers (a compound of Eros and Storge) do not think of themselves, instead they focus on their partners and what they can do for their partners (Hendrick & Hendrick, 1986). By definition a person's love style can only be one from this list of possible love styles, therefore it is a nominal level variable.

The second equally influential theory of love has its origins in a three volume collection by Bowlby (1969, 1973 & 1980), in which Bowlby sought to explain the attachment ties humans have to their caregivers. Bowlby's attachment theory grew out of observations of infants and their primary caregivers. Ainsworth, Blehar, Waters, and Wall (1978) took Bowlby's general theory and condensed it into three styles of types of attachment—secure, anxious/ambivalent, and avoidant. Hazan and Shaver (1987) applied Ainsworth et al.'s classifications to adult romantic relationships. Hazan and Shaver formed a three-item questionnaire to measure adult attachment styles, assigning one item for each attachment style. Each item was worded in such a way to apply the original concept of infant attachment styles to adult romantic relationships. Campos, Barrett, Lamb, Goldsmith, and Sternberg (1983) obtained the percentages corresponding to each attachment style in infants. Sixty-two percent of infants have secure attachment styles, 15% of infants have anxious/ambivalent attachment styles, and 23% of infants have avoidant attachment styles. Using these percentages as a baseline, Hazan and Shaver (1987) observed similar percentages in their measure of adult attachment styles. Adults who categorize themselves as secure composed 56% of the sample, 19% of adults classified themselves as anxious/ambivalent and 25% considered themselves avoidant. Secure attachment style is characterized by trust, lack of concern with being abandoned, and the view that one is worthy and well liked. Avoidant attachment style is characterized by a suppression of attachment needs, due to past refusals of attachment needs. Finally, anxious/ambivalent attachment is characterized by a concern that others will not reciprocate the individual's desire for intimacy.

The third theory examined was a highly influential theory by Sternberg (1986), who proposed that love was a collection of three components, intimacy, passion, and

commitment, which together form to make a triangle (See Figure 1). Each of these three components can vary in presence and intensity. Differing combinations of the three components of love create a different type of love. Intimacy alone produces a liking relationship. A friendship in which one feels closeness, bondedness and warmth, with the absence of sexual attraction or a decision to share one's life with the target person. Passion alone produces a relationship of infatuation. Infatuations tend to be instantaneous and are popularly referred to as "love at first sight". They tend to be characterized by psycho-physiological arousal, such as increased heart rate, increased hormonal secretion, and swelling of the genitals. Commitment alone produces an empty love. Empty love can be the result of a long term relationship in which two people have made the decision to stay together even though there is no mutual emotional involvement and the physical attraction has ended. Empty love can also be present at the beginning of a relationship, such as in an arranged marriage. Romantic love is composed of intimacy and passion. Romantic love is basically a close friendship with physical attraction. We can see examples of romantic love in a story such as Romeo and Juliet where there is not only a sexual attraction but also an emotional bond. Compassionate love consists of intimacy and commitment. Compassionate love is essentially a long-term friendship. This can happen in marriages in which physical attraction is absent. Fatuous love consists of passion and commitment. This is a love that exists through a commitment made because of passion. An example of this type of love is seen in Hollywood marriages in which a couple meets and marries in a short span of time—although the commitment and passion are present, the couple lacks sufficient time in acquiring an emotional bond. Consummate love is a love consisting of all three of the components of love. It is a love that is most withstanding and is what most couples strive to be. Non-love is the absence of all three components of the love triangle. Aron and Westbay (1996) distilled passion, intimacy, and commitment to a list of major features of each. Features of passion included gazing at each other, euphoria, sexual appeal, physical attraction, excitement, touching, laughing, and warm feelings. Features of intimacy included openness, honesty, support, understanding, patience, caring, and trust. Lastly features of commitment included devotion, protectiveness, loyalty, sacrifice, and longing for each other when separated. Here again we can see that by definition a person can not hold more than one position on the love triangle.

In recent years a small number of researchers have attempted to synthesize these theories, usually by ignoring the "labeling" nature of the theories. Fricker and Moore (2002) for example, attempted to correlate Hazan and Shaver's (1987) attachment styles with Hendrick and Hendrick's (1986) love styles. It was found that secure attachment styles were positively correlated with Eros love style (r=0.27; p=0.01) and anxious /ambivalent (0.01).

It is not difficult to see why some tend to classify both love styles and triangular love type as a ratio of level variables, since operational definitions of both theories are usually in the form of scales. However, upon inspecting the original theories (Lee, 1973, Hendrick & Hendrick, 1986, and Sternberg, 1986, respectively) it is obvious that both love styles and triangular love type are nominal variables. Therefore although level of each type of love style or levels of the three components of the triangular theory of love can be examined, by definition a participant can only be one love style or have one type of love from the triangular theory, which consists of the three separate components. Attachment styles do not usually experience the same misunderstanding since it seems to be understood that the differing attachment styles are also nominal. This may be a result of the Hendrick and Hendrick (1986) publishing a nominal form in which to measure the variable.

The present study seeks to identify the relationships between the aforementioned three major theories on love. We will examine the variables of love styles and triangular love type in the manner most consistent with the original theory. The hypothesized relationships are as follows:

I. There is a relationship between attachment styles and love style. More specifically the expected relationships are as follows: Participants who have a secure attachment style are also likely to have Storge, Pragma, and Eros love style. Participants who have an avoidant attachment style are also likely to have Ludus love style. Participants who have an anxious/ambivalent attachment style are also likely to have Agapic and Manic love style.

II. There is a relationship between love styles and type of triangular love. More specifically the expected relationships are as follows: Participants who have a Storge love style are also likely to have liking, consummate or companionate triangular love type. Participants who have a Pragma love style are also likely to have consummate triangular love type. Participants who have an Eros love style are also likely to have romantic triangular love type. Participants who have a Ludus love style are also likely to have non-love triangular love type. Participants who have an Agapic love style are also likely to have an empty triangular love type. Participants who have a mania love style are also likely to have infatuation or fatuous triangular love type.

III. There is a relationship between attachment styles and triangular love type. More specifically the expected relationships are as follows: Participants who have a secure attachment style are likely to have a triangular love type of liking, consummate, companionate and romantic. Participants who have an avoidant

attachment style are likely to have non-love triangular love type. Participants who are anxious/ambivalently attached are likely to have a triangular love type of empty, infatuation, or fatuous.

II. Method

Participants

The random sample of resident students at a small private liberal arts college was surveyed. From the original 1,286 questionnaires distributed to a random sample of resident students, 100 were completed and returned to the designated drop-off sites located on the campus.

Seventy-seven percent of the sample consisted of females. Thirty-six percent of the sample consisted of freshmen, 20% sophomores, 26% juniors, 17% seniors, and 1% graduate students. Ninety-two percent of the sample identified themselves as White, 3% of the sample identified themselves as Black, 1% of the sample identified themselves as Hispanic, 1% of the sample identified themselves as "other". Eleven percent of the sample classified their religion as "other". The ages of the sample ranged from 17-21, with the mean age of 19.12.

Materials

A questionnaire was constructed to gather the data of interest. The questionnaire began with seven demographic and background questions, addressing gender, school class status, race, religion, age, number of times in love, and whether or not the participant was in love at the time he/she completed the questionnaire. In order to determine each participant's love style, Hendrick and Hendrick's (1986) series of six love styles scales were included, one for each love style. Each scale had seven items, rated on a scale of 1 (strongly disagree) to 5 (strongly agree). Attachment styles were established by asking each participant to circle the one item in Hazan Shaver's (1987) three-item attachment scale which best described them. A final scale was used to determine the extent of each component of the triangular theory of love. The scale consisted of three sub-scales, one for each component of the theory (intimacy, passion, and commitment), which were adapted from Lemieux and Hale (1999). The intimacy and passion sub-scales each consisted of seven items, and the commitment sub-scale consisted of six items. All three sub-scales were measured on a ten-point agreement scale, where 1=strongly disagree and 10=strongly agree. Three items were reversely-scored. Finally participants were asked to identify which relationship was used in reference to the items

on the questionnaire (present relationship, past relationship or a relationship they would like to have in the future).

<p style="text-align:center">Procedure</p>

A questionnaire package was placed in randomly selected residential student mailboxes at Wagner College. In addition to the actual questionnaire each package contained a numbered return envelope and a ticket numbered the same as the envelope. Every participant was informed of the $50 raffle which would take place with the returned envelopes. Those students who wished to participate placed their envelopes in one of the designated drop-off locations around the campus.

The survey instructions informed participants that the study was designed to examine the romantic relationships of college students. They were assured of confidentiality and anonymity. Participation was completely voluntary. The participants were provided with contact information if they wished to ask questions or learn the results of the completed project.

III. Results

In order to analyze the three theories of love in the fashion most consistent with the original theory, each participant had to be ascribed to one attachment style, one love style and love triangular type. Attachment style for each participant was established by the one item circled in Hazan and Shaver's (1987) three-item attachment scale. Love style was established by the highest score in each of the six love style scales developed by Hendrick and Hendrick (1986). Ascribing each participant the love style that best corresponds to the participant's theories about love and behavior in relationships. Two were eliminated from the love analysis. Both had two scales with the same high score.

In order to classify each participant into a love style a simple equation was created, the J-Formula. The J-Formula is used to collapse a scale which measures multiple components of a theory into present or not present for each component. In order to establish the triangular love type of each participant, the J-Formula was used to determine the presence of intimacy, passion and commitment. The J-Formula is as follows:

$$(\text{Highest level on subscale} - \text{Mdn level on subscale}) \times N_{\text{items on subscale}} = J$$

If $J \geq$ the Participant's score, then that component is said to be present. The J-Formula takes into consideration the average level of each component of the love triangle (the median point of the scales), as well as the highest possible level (the highest point in the scales) and determines the average between these two points. If one consistently responds to each item in the scale above this level, then one can be said to have more than the average level of this component of the love triangle (the component is present).

Three hypotheses were tested and the following results obtained:

I. Hypothesis 1: Using a Chi-Squared test no relationship was found between participant's attachment style and love style.

II. Hypothesis 2: Using a Chi-Squared test no relationship was found between participant's love style and triangular love type.

III. Hypothesis 3: Using a Chi-Squared test relationships were found between attachment styles and triangular love type (p<0.01). The number of participants who were securely attached and who had romantic love and consummate love exceeded the number expected by chance, 21 to 19 and 21 to 15.1 respectively. The number of participants who were avoidantly attached and who had non-love exceeded the number that would occur by chance by almost three times (8 to 3.2). Finally, participants who were anxiously/ambivalently attached who also had an infatuated triangular love type exceeded the number that would occur by chance (3 to 2.2).

IV. Discussion

When the three theories were collapsed into the fashion most consistent with their original theories, a relationship between attachment style and type of love was found. Participants who were securely attached were more likely to also be in a romantic or consummate relationship. Participants who were avoidantly attached were likely to have non love. Finally, participants who were anxiously/ambivalently attached were likely to have infatuated love. These relationships seems consistent with the theoretical relationships between the variables, however, there seems to be a piece missing, namely love styles. If we recall the original definitions, we have an attachment style that primarily parallels our attachment style to our primary caregiver (mostly one's mother), However before we can have consummate love, or non love, we must develop theories about love and develop a series of behaviors that occur when one is in a relationship. By definition love theories and action in a relationship are love styles. When looking at the theoretical relationships in Figure 2, the relationships between attachment style and love type is expected but missing the center link (love style).

The question most should be asking is "why don't researchers use the concept in their original form and opt for using the concepts as ratio level variables?" This study found 17 correlations within and between the three love theories examined. Yet when the variables were examined according to their original concepts (i.e., nominal variables), only one interrelationship was found.

What does this lack of relationship between the major original concepts of love mean? It means that there is a lack of unity between the definitions of love and

relationships. This study sought to unify the theories by providing a new clearer definition of love, there also giving a sort of formula for a successful relationship (i.e., one in which love exists between the two individuals). The task turned out to be more difficult than originally thought however this is not to say that the task should be abandoned. This is also not to say that the major love theories are not related and should be disregarded, quite the opposite. Actually it seems that although currently there are no appropriate ways to quantify love styles, or the triangular theory of love, there is a theoretical relationship between both of these theories and attachment styles, which will one day be able to be supported. The more encompassing definition of love will in the future look much like what follows. A person develops an attachment style presumably during childhood development, as one becomes older beliefs and theories about love or love style begin to develop, this yields a certain type of relationship (love triangle). In this fashion these three love theories are interrelated and when the theories are quantified in a more efficient fashion perhaps this will provide insight to social psychologists, and relationship councilors. It could finally help us to understand how and why people love each other and why some relationships work while others fail.

V. References

Aron, S. and Westbay, L. (1996). Dimensions of the prototype of love. *Journal of Personality and Social Psychology*, *70*, 535-551.

Feeney, J. and Noller, P. (1990). Attachment style as a predictor of adult romantic relationships. *Journal of Personality and Social Psychology*, *58*, 281-291.

Fricker, J. and Moore, S. (2002). Relationship satisfaction: The role of love styles and attachment styles. *Current Research in Social Psychology*, *7*, 182-204.

Hassebrauck, M. and Buhl, T. (1996). Three-dimensional love. *Journal of Social Psychology*, *136*,121-122.

Hazan, C. and Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology*, *52*, 511-524.

Hendrick, C. and Hendrick, S. (1986). A theory and method of love. *Journal of Personality and Social Psychology*, *50*, 392-402.

Hendrick, S. S., Hendrick, C. and Adler, N. L. (1988). Romantic relationships: love separation, and staying together. *Journal of Personality and Social Psychology, 54*, 980-988.

Lemieux, R. and Hale, J.L. (1999). Intimacy, passion, and commitment in young romantic relationships: Successfully measuring the triangular theory of love. *Psychological Reports*, *85*, 497-503.

McCutcheon, L.E. (2002). Are parasocial relationship styles reflected in love styles? *Current Research in Social Psychology*, *7*, 82-93.

Sternberg, R. J. (1986). A triangular theory of love. *Psychological Review*, *93*, 119-135.

```
                        INTIMACY
                         Liking



              Romantic              Companionate

                      Consummate




      PASSION                            COMMITMENT
     Infatuated          Fatuous            Empty
```
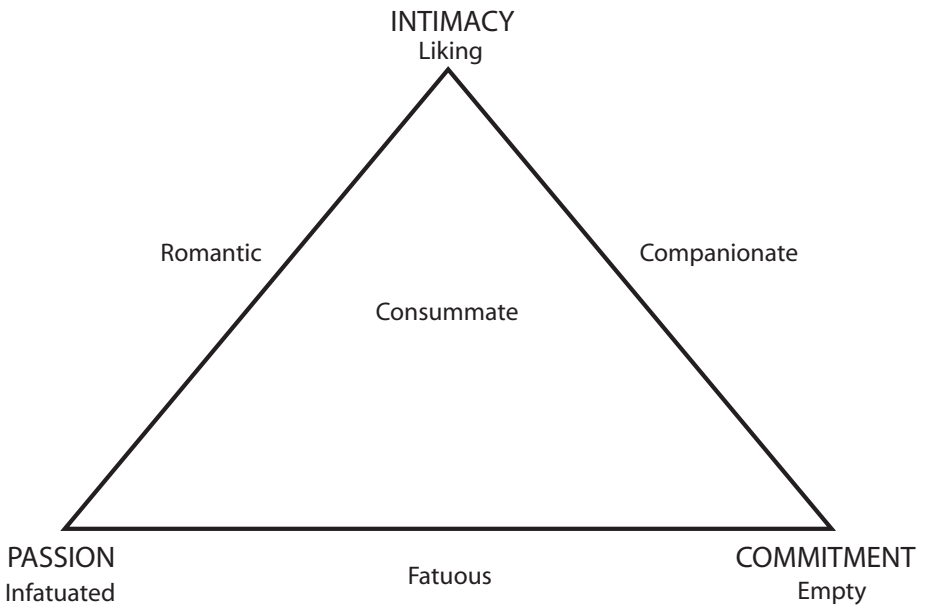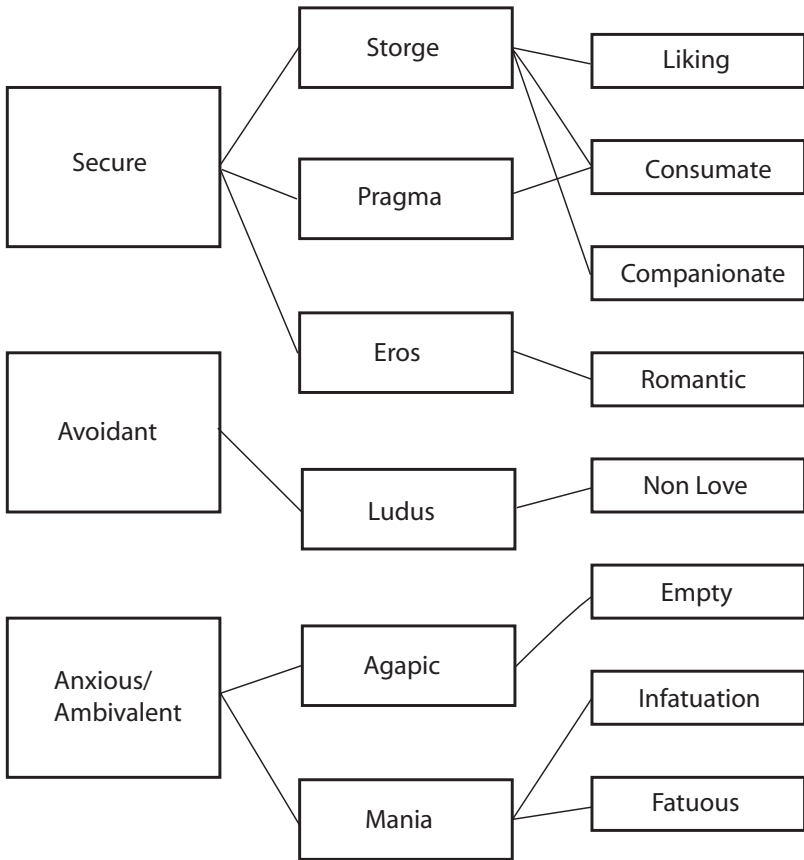
Figure 1: The love triangle

Figure 2: Theoretical relationships between attachment style, love style and triangular love type

Memory: Effects of One's Gender on Memory Retention

Nicole Gaeta[1] (Psychology)

Due to increased interest and previous studies on the effects of gender roles on cognitive abilities, a study was conducted to determine whether or not these effects played a significant role in memory differences within genders. Forty-one Wagner College psychology students, who were asked to participate in the study, were randomly given one of 2 different stories, one of which appealed to male prototypical interests, and one to female prototypical interests. The students were then asked to immediately rewrite the story that they were given, verbatim, to the best of their ability. Each essay recalled by the students was given 3 separate scores, one for overall level of accuracy, one for number of words recalled, and one for number of major details each person remembered. These scores were then calculated to determine 3 overall means for the males in each of these categories and 3 means in each area for the females. After comparing the means, there were not many differences in the means of all 3 categories. There were, however, substantial differences between the numbers of details remembered by females for the female story versus the male story. There was also an evident difference between numbers of words recalled by females in general as opposed to males.

I. Introduction

Many people wonder why they often forget certain things so easily and quickly. Even more disconcerting is why they can remember every detail about one thing and not even one detail about something else. The process of forgetting can be defined by two basic theories: *interference*, when some other information gets in the way of one's present thinking, causing one to forget something, and *decay*, which explains how the passage of time may cause one to forget something simply because it has slipped away from the memory trace. Memories that are not completely lost, however, are often not truthful due to another phenomenon known as memory distortion. This idea has fascinated many people through its explanation of how one's mind can actually distort a memory and make that person believe that something truly happened the way he/she remembers it. One psychologist, Schacter, described the basic memory distortions as the "seven sins of memory" (Sternberg 2003). His "seven sins" included *transience*, the rapid fading process of memory, *absent-mindedness*, forgetting what one had just done or

---

[1] Research performed under the direction of Dr. Richard Brower (Psychology)

was about to do, *blocking*, when one knows something but is having trouble retrieving it, *misattribution*, forgetting where one heard or learned certain information, *suggestibility*, when one thinks they remember something because someone mentions to them that they had, *bias*, having a prior idea of what one should be feeling based on past experiences, and *persistence*, where one remembers one thing that sticks out because it differed from a line of many other things (Sternberg 2003).

Though there is hardly any argument that these causes of memory loss exist, one might wonder why different ones occur at different times, to different people, about different things. It may be questionable whether or not one's gender would play a role in how much or how little, or even what type of information one remembers. Some may think that males are more likely to retain information that applies to prototypical male interests, like sports or tools, for example, whereas females would be more likely to remember things that are related to shopping or relationships. Previous research studies have been conducted by psychologists, including Maccoby and Jacklin, Hyde and Lynn, and Herlitz, Nilsson, & Backman, to determine whether or not sex differences affect cognitive abilities. While their ideas have been challenged by Hyde and Lynn, Maccoby and Jacklin believed, "women are superior to men in verbal ability, while men surpass women in spatial and mathematical ability" (Iodescu 2002). Herlitz, Nilsson, & Backman's recent study also concluded that women outperformed men on verbal tests, and specifically noted that women also consistently outperformed men on tasks involving episodic memory" (Iodescu 2002). Other studies, particularly that of Cross and Madson (1997), have supported the idea that male cognition differs from that of females, in respect to the different interests between the genders. Cross and Madson supported evidence that women focused more on information related to relationships, whereas men were more familiar with information related to social dominance (Gabriel & Gardner 1999).

With this growing interest between gender and cognitive abilities, the study described below was conducted to determine if a viable relationship actually does exist between memory retention and one's sex, based on cognitive differences between males and females. Using Frederic Bartlett's model for memory testing as a starting point, which studied the effects of culture based understandings on memory for particular material, 2 short fictional stories were created by the author to assess memory retention among genders (Sternberg 2003). Relative to the study discussed below, Bartlett believed that previously existing schemas or relevant knowledge affect a person's recall of presently learned information (Sternberg 2003). With this in mind, this study was conducted to determine whether or not different gender interests affect one's relevant knowledge, and, in turn, affect one's memory.

II. Method

Participants and Design

The participants of this study included 41 students, 15 males and 26 females, in the author's psychology classes. All participants were Wagner College students between the ages of 18 and 21. This was a correlational study seeking to determine whether or not there was a relationship between one's gender and how much of particular details one obtains. Students randomly received one of two stories, one that pertained to prototypical female interests and one to prototypical male interests.

Procedure

During class, students received one of the 2 stories as seen in Appendix 1 and 2, at random, so that some of them received the story that pertained to their gender, and some received the one that pertained to the opposite sex. To be sure that they paid close attention to what they were reading, all students were primed for the study by being told beforehand that they would be asked to rewrite the paragraph as soon as they were finished reading it. After all the students finished reading their designated story, which is described in detail below, they were handed out a piece of paper, and asked to rewrite the story verbatim to the best of their ability, as seen in Appendix 3. Essays were then analyzed to see if any differences existed between males and females in the number of words, names, numbers, facts, or any other details that they remembered. The essays were then studied within each gender to determine whether or not there was a significant difference between the students' memory retention of their prototypical female story versus the male story.

Each short story was created by the author to assess separate male and female interests. The stories, each containing an average of 425 words, contained a sufficient number of details. The female oriented story, Paragraph A, described a situation between 2 high school female friends who were preparing for their senior prom. It described, in detail, their task of prom dress shopping and included such information as follows: the names of the 2 girls, the names of their dates, the stores in which they shopped, the prices of the clothing, the styles of particular dresses, the present day and time, the date of the prom, the name of their high school, and the outcome of their adventure. The male-directed story, Paragraph B, described 2 male friends who were engaged in a video game competition and the bet that they made on one specific occasion. This story included the following details: the boys' names, their roommates' names, the monetary value of the bet, where the competition took place, the name of the football video game, the teams that they chose, the players in the games, the scores of the game, and specific plays that occurred during the game. Each story contained 23 major details.

Each essay written by the students was given a number score in 3 main categories: number of words, level of accuracy, and number of important details. The score for number of words remembered was rated in a ratio out of total number of words, 425, and a mean score was calculated for each group. The means obtained by females versus males were then compared to see if any differences existed as a result of either the students' genders or which story they received. A standard score out of a possible 10 was given to each student for his/her level of accuracy. This score was graded based on the student's sentence structure, formatting of the story, and accuracy of the details he/she remembered. For the last comparison, students were given 1 point for each major detail that they remembered from the 2 stories, out of a possible 23 details in each story. These numbers were then also compared to see if any significant differences existed here as well.

III. Results

Table 1 indicates that males did not display any substantial differences in accuracy scores or major details remembered between the female story, Paragraph A, and the male story, Paragraph B. The only evident difference between the males' memories of the 2 stories lies within the mean scores for number of words remembered. Males tended to recall an average of 144.80 words for the male-directed story, and only 114.20 for the female-oriented story. Though the number of words remembered by females from the female story, with a mean of 196.94, was substantially higher than the mean number retained from the male story, 145.3, even their lowest number of words was slightly higher than that of the highest score for the males. Females also showed a slight difference between accuracy scores from the female story, 8.38, and the male story, 6.30. The most substantial difference within the scores lies within the females' recollection of major details from the female story as opposed to the male story. For the story that was directed towards their own interests, females remembered an average of 15.38 out of a possible 23 details, and only 7.70 of the major details in the male story.

IV. Discussion

Though the students received higher mean scores for the story relating to their own gender, it was surprising to see that the males did not show any real substantial differences in accuracy or major details remembered for the male story as opposed to the female story. In general, the average total scores were lower for the males than the females. It was interesting to see how much more the females wrote about a story that they felt more comfortable with. In reading the essays, it seemed that the females

Table 1: Mean Scores for Students' Recollection

Story A= female story   Story B= male story

CATEGORY	MALES		FEMALES	
	Story A N=5	Story B N=10	Story A N=16	Story B N=10
# of Words/425	114.20	144.80	196.94	145.30
Accuracy Score/10	7.40	7.80	8.38	6.30
Major Details/23	10.80	11.10	15.38	7.70

rewrote the female story much more accurately, including the structure of the story itself. They tended to rewrite the story as if they were telling someone what happened. When the females had to rewrite the male story, it seemed that they were less accurate and attempted to fabricate some of the story to make it more interesting. Since females are stereotypically more talkative than males, it was also interesting to see that females wrote more of both stories, regardless of which one they had, than the males did. Even more interestingly, in reading the essays, it stood out that almost all of the females remembered the description of the dress that the girl in their story chose, and the males very often remembered the play that turned the game around in their story.

To determine a true level of differences between male and female memory retention, further studies may have all students read and rewrite both stories to factor out any other possibilities that may have affected how much or how little the students remembered. Some students may simply have a bad memory for small details, regardless of which story they are reading. It may also be a good idea to ask the students what they are interested in, to determine if the real differences actually lie in one's interests, as opposed to one's gender.

V. References

Gabriel, S. & Gardner, W.L. (1999). Are there "his" and "hers" types of interdependence? The implications of gender differences in collective versus relational interdependence for affect, behavior, and cognition. Journal of Personality and Social Psychology, 77(3), 642-655.

Ionescu, M. D. (2002). Sex differences in memory estimates, revisited. Psychological Reports, 91, 167-172.

Sternberg, R. J. (2003). Cognitive Psychology (3rd ed.). California: Wadsworth/Thompson Learning, Inc.

GPA and Study Habits: The Relationship between Study Habits and Grade Point Average in College Students

Jenny Ludvigsen[1] (Psychology)

Past research indicates that there is a relationship between study techniques and Grade Point Average (GPA). This study attempted to show that students with better study habits get better grades. There were forty-five participants in the study with fifteen people in each GPA interval. Participants answered a questionnaire that was broken down into 4 sub-scales measuring different methods of studying and general habits of lifestyle. The results showed significant differences in the Study Habits Inventory (SHI) of the three groups and supported the hypothesis that students with better study habits receive higher grades.

I. Introduction

The purpose of this study is to propose that there is a relationship between the way in which a college student studies (reads, takes notes, plans and organized their school work) and their Grade Point Average. What makes an A student different from a C student? Are the A students getting better grades because they are gifted and do not do things differently than C students? Or, are the A students doing something that the C students are not? What is different in the lives of students and how can one go from a C to an A?

A body of research has suggested that there may be a relationship between the way a student studies and their Grade Point Average (GPA). Jones, Slate and Kyle (1992) reported that high achieving college students have better study skills than low achieving students in areas of time management, study techniques, and attitudes toward learning. Di Vesta and Moreno (1993) found that students with high GPA practice self-awareness, purposeful planning, and self-adjustment activities more than students with low GPA (Hilawani & Sartawi, 1997). Researchers have consistently reported a positive relationship between study habits and academic success (Lammers, Onwuegbuzie & Slate, 2001).

Students may not be aware of the benefits or tolls of their techniques of studying or thinking a certain way, but it may be helpful for students with low grades to alter their

---

[1] Research performed under the direction of Dr. Richard Brower (Psychology)

study-habits in order to boost performance in school. Bliss and Muller (1993) found a strong correlation between scores on a study behavior inventory, a scale for measuring study skills, and semester GPA (Hilawani & Sartawi, 1997).

Stoynoff (1997) studied the factors associated with International student's academic achievement. He sampled 77 international students who enrolled as freshmen at a University in the Northwest. They all had a minimum GPA of 3.0 and a Test of English as a foreign Language (TOEFL) score of 500. During their first term they took the Learning and Study Strategies Inventory (LASSI) that asked them whether they received training in learning and study strategies. There was a strong correlation between the LASSI and cumulative GPA. The results show a relationship between motivation, study strategies and test taking techniques and international students' academic achievement. Stoynoff also found differences in high achievers and low achievers by interviewing the international students about their study-habits. He noticed that the students that read more did better on reading assignments, and that students with higher GPA sought social assistance, ie; study groups to review information.

John Lucas (1991) conducted a study at William Rainey Harper College to evaluate the effectiveness of a new academic probation intervention program. 278 students who were put on probation for having a GPA lower than 2.0 were required to participate in a success-oriented intervention program. They were surveyed over the phone before they started the intervention program and after the program. They learned effective study skills of reading for content and note taking techniques. Students improved their grades and 35% of the participants reported that poor study habits were the primary cause of their low GPA.

Lammers, Onwuegbuzie and Slate (2001) examined 366 undergraduate student's study skills as a function of age, gender, year in college, academic achievement, study time and employment status. The students completed a questionnaire in which demographic information was elicited and a validated 63 true-false item study-habits inventory was included. Results indicate that study habits were related positively to age, GPA, and the number of hours spent studying each week, and negatively related to the number of hours spent working each week.

This study attempted to evaluate the study habits of three GPA groups. It was expected that students in the high GPA group would show high scores on the Study Habits Inventory (SHI), and students in the low GPA group would show low scores on the SHI.

II. Method

Participants

Forty-five participants took part in this study. Participants were students at Wagner College enrolled in one of Dr.Brower's Psychology courses. Participants in the study were asked to partake in the study to fulfill the requirements of fellow classmates. Between the two classes that the test was administered to, 13 were men and 32 were women. The men and women each had a mean age of 20.1429 with a range from 18 to 21 years. All the participants share Psychology as a concentration.

Procedure

Participants were instructed to take the questions seriously and answer as honesty as possible. Personal information asked of each participant was GPA, major, year in school, age and gender. Clearly printed on the top of the survey were instructions from and expectations of the test giver. Participants answered a 38 question Study-Habits Inventory that was divided into 4 separate categories. The categories were titled:

A. Reading and note-taking techniques.
B. Habits of concentration
C. Distribution of time and social relationships in study.
D. General habits and attitudes of work.

The tests questions were direct and simple, requiring participants to circle whether they did something rarely or never, sometimes, or often or always. Before totaling up the scores for each individual survey, the completed surveys were divided into three equal groups of 15. The groups were sorted together by common GPA. Low GPA was below 3.0, middle GPA was between 3.0 and 3.5 and high GPA was above 3.5.

Points were totaled for each sub-scale separately for the three groups, designating 3 points, 2 points or 1 point each selected answer. The highest score that an individual could have obtained in total was 82. The maximum score for each individual in section A was 15. The maximum score for section B was 12. The maximum score for section C was 24 and the maximum score for section D was 31.

Materials

See Appendix A for a copy of the Study-Habits Inventory (SHI).

III. Results

Table 1 displays the points that each group obtained for each sub-scale. It is shown that the lower GPA group scored significantly lower than the high GPA group, within the sub-scales, and overall. Table 2 shows a frequency distribution of each GPA group. It is shown that the total scores of the entire survey varied between the individuals in the three GPA groups. The range of scores for the Low GPA group was 46 to 60. The range of scores for the middle GPA group was 57 to 69. The range of scores for the high GPA group was 70 to 81. The mean score for the low GPA group on the SHI was 57.8. The mean for the middle GPA group was 63.8 and the mean for the high GPA group was 76.

The Pearson Product Moment 2 tailed Correlation showed a significant relationship between the three GPA group's sub-scales at the .01 level (See Table 3 for Pearson correlation).

An ANOVA, in which GPA was the independent variable, was performed on the data for self-reported study habits. The analysis of this data yielded significant effects for each GPA interval, $F(2,42)=109.02$, $p<.001$. The sub-scales of the three groups were found to be significantly significant; A: $F(2,42)=110.26$, $p<.001$; B: $F(2,42)=63.32$, $p<.001$; C: $F(2,42)=44.97$, $p<.001$; D: $F(2,42)=29.21$, $p<.001$.

IV. Discussion

The present findings serve to replicate, extend and support those reported in similar previous research. The significant differences in the SHI scores of the three GPA groups is evidence of the effects of study-habits on school grades. It is important for students to understand the relationship between the techniques they use to study and the effects that it has on the grades that they receive. Testbusters is a program that teaches effective study habits, study skills and test taking strategies, which has overall shown GPA improvements significantly (Beidel, Turner, Taylor & Jill, 1999). Cooper and Robinson (1987) found that the combination of skills acquisition and peer support contributed to improvements in student GPA and self-concept of ability. The results of this study and similar studies indicate that there may be a strong relationship between study habits and GPA, as expected.

On many occasions, I have heard of parents blaming their children for getting bad grades because they "do not apply themselves", but it can be argued that it is not the child's fault for the bad grades, but the fault of the study techniques that they use, and the duration of time spent studying. The aforementioned studies discussed the benefits of intervention programs and study help sessions to improve GPA, therefore it may be helpful to change a technique or habit of studying and note taking, and assess time management skills if a student's grades are not where the should be.

V. References

Beidel, D., Turner, S., Taylor, F. and Jill, C. (1999). Teaching study skills and test-taking strategies to elementary school students: The testbusters program. Behavior Modification, 23 (4), 630-646.

Cooper, S. and Robinson, D. (1987). The effects of a structured academic support group on GPA and self-concept of ability. Techniques, 3 (4), 260-264.

Hilawani & Sartawi (1997). Study skills and habits of female university students. College Student Journal, 31, (4), 537-544.

Lammers, W., Onwuegbuzie, A., and Slate, J. (2001). Academic success as a function of the gender, class, race, age, study habits, and employment of college students. Research in the Schools, 8 (2), 71-81.

Lucas, J. (1990). Evaluation of new probation intervention program at Harper College. Willian Rainey Harper College Journal of Planning and Research, 20 (4), 2-27.

Stoynoff, S. (1997). Factors associated with international student's academic achievement. Journal of Instructional Psychology, 24 (1), 56-68.

Table 1: Total sub-scale scores and GPA

Low GPA	Middle GPA	High GPA
A= 107/225	A= 150/225	A= 202/225
B= 93/180	B= 124/180	B= 167/180
C= 250/360	C= 299/360	C= 332/360
D= 360/465	D= 385/465	D= 421/465
Total= 810/1230	Total= 958/1230	Total= 1122/1230

Table 2a: Low GPA total scores on SHI (N=15, x=57.8)

Score	Frequency Distribution
46	1
49	1
50	1
51	2
52	2
53	1
54	1
55	1
57	2
60	4

Table 2b: Middle GPA scores on SHI (N=15, x=63.8)

Score	Frequency Distribution
57	1
58	2
59	1
61	1
64	2
65	2
66	1
67	2
68	1
69	2

Table 2c: High GPA total scores on SHI (N=15, x=76[*])

Score	Frequency Distribution
70	2
72	1
73	1
74	1
76	3
77	1
78	2
79	1
80	2
81	1

Table 3: Pearson Correlation of sub-scales

	A	B	C	D
A		.921	.876	.738
B	.921		.837	.699
C	.876	.837		.606
D	.738	.699	.606	

Section IV: Critical Essays

Van Gogh and Gauguin

Kimberly Kopko[1] (History)

From English wood cutters to Old Dutch Masters: Influences on the Early works of van Gogh, 1881-1886

When one hears the name "van Gogh" it often brings to mind colorful paintings of a French landscape, bright sunflowers, or a 'starry night,' all of which are images from the artist's later years. Rarely does one immediately reflect on Vincent van Gogh's early works. Only a select few of these works, characteristically dark in hue, are considered big van Gogh sellers on the art market, yet; it is these seeds of underacknowlaged works that matured into what are presently considered van Gogh masterpieces. The early works of van Gogh, completed between the years of 1881 and 1886, show experimentation with various styles and themes, which eventually merged to develop a personal style. While van Gogh drew inspiration from various artists and styles, English wood engravers, Millet and the Barbizon School, contemporary Hague School artists, and Old Dutch Tradition and its masters, were primary influences in his early works.

Vincent van Gogh (1853-1890) was exposed to the world of art at a young age by having three uncles who ran art galleries in Amsterdam, The Hague, and Rotterdam (Keys, 21). At the age of sixteen, van Gogh obtained an art dealing position with Goupils and Co. and this gave him first hand exposure to the popular works of the day. Over the course of his employment, Vincent collected several prints of his favorite images by Ruisdael and Rembrandt, seventeenth century Old Dutch Masters, for his personal apartment. Eventually, van Gogh was dismissed from Goupils and Co. for poor salesmanship and this, among other issues, created tensions within the van Gogh family. It was at this time that van Gogh undertook a heavy reading of literature, gaining particular insight from John Bunyan's *Pilgrim's Progress*. "Bunyan believed that those most worthy of God's grace were the lowly workmen and the poor, who were endowed with a natural spiritual advantage because of their humility, self-denial, and renunciation of the trappings of worldly wealth" (Keys, 22). This and several other writings encouraged van Gogh to follow in the footsteps of his father and study theology; he felt that "evangelical zeal could give his life purpose" (Keys, 23). In time, van Gogh was sent to be a preacher to a poor mining district in the Borinage region of Belgium, but unfortunately was released due to his overwhelming desire to live a poor, underprivileged

---

[1] Research performed under the direction of Dr. Laura A. Morowitz (Art)

lifestyle similar to the miners. Finally in December of 1881, Vincent moved to The
Hague to become an artist.

"It was during his years in The Hague that Vincent's art came to express his
deep-seated sense of moral purpose" (Keys, 23). In the months leading up to his move,
van Gogh received drawing and painting lessons from his cousin Anton Mauve, an
established painter at The Hague. This relationship grew strong as well as extended to
include other prized artists from The Hague School such as Josef Israëls, George Hendrik
Breitner and Herman Johannes van der Weele (Keys, 23). Unfortunately, this took a sour
turn when van Gogh chose to take the prostitute Clasina Hoornik (Sien) under his wing.
The Sien problem grew out of hand and van Gogh left both the prostitute and The Hague
and moved to Drenthe where he was exposed to the "unindustrialized" landscapes of the
Old Masters and working peasant life. After a short stay of three months, Vincent moved
in with his parents in Neunen. As predicted this produced tension among the family and
after a brief stay at The Academy, van Gogh moved to Paris to live with his close brother
Theo van Gogh.

One of the major influences on works that van Gogh created during his stay at
The Hague was English wood engravers. Vincent was an avid reader of the periodical
magazine *The Graphic*, "which had published wood engravings representing the poor and
downtrodden in the 1870s, images that Vincent specifically connected with Sien and
valued as another modern gospel" (Druick, 32). In 1875, *The Graphic* produced a series
of ten illustrations called "Heads of the People," which depicted individuals in various
occupations such as miner, drayman, and agricultural laborer. Van Gogh attempted a
similar work of this nature when he painted head studies of peasants in Nuenen in 1883,
but this group of studies was not completed until May 1885 (I. Tilborgh, Vellekoop, 84).

Even earlier than 1883, van Gogh attempted a study on heads, similar to the
illustrations in *The Graphic*, where he drew portraits of old fisherman. Fishermen
seemed like a suitable subject to represent the working class while van Gogh studied at
The Hague because the area was primarily known for its fishing industry. In reality, van
Gogh's fishermen were men from the Dutch Reformed Old People's Home that he
dressed up, nevertheless van Gogh's intention was to represent realistically men who had
lived a life of difficult work. "In summary, van Gogh's heads were inspired in form by a
specific example of English engraved illustration, while their subject, fishermen, was
related to contemporary Netherlandish artistic practice" (Soth, 67).

Another primary influence in van Gogh's early work, and even his later works,
was artists of the French Barbizon School, in particular the Realist Jean-François Millet.
Van Gogh was first introduced to Millet at an exhibition of Barbizon paintings held at the
Academy of Fine Arts in the Hague in 1882 (Keys, 24). In addition, van Gogh read an
extremely biased book by Alfred Sensier which gave him a heroic, Christian loving

image of the well known Realist (II. Tilborgh, Vellekoop, 10). What drew van Gogh to Millet was the connection to the Realist and van Gogh's father. Since van Gogh could not fulfill his father's mission of priesthood, he conveyed it through artwork in the style of Millet, paying homage to the hardworking peasants.

> The connection he [van Gogh] discerned between Christian beliefs and the art of these masters [the Realists] enabled him to transform his ideal of a Christian worker and minister in the footsteps of his father into that of an artist with a calling. A precondition was that the work of peasant painters like Millet and Jules Breton should not be interpreted as revolutionary, but rather as Christian and conservative in character (Tsukasa, 134).

In numerous letters to his brother Theo, van Gogh mentions Millet's ability to express real subjects while simultaneously expressing "quelque chose là-haute" ("something on high")(I. Tilborgh, Vellekoop, 12).

Millet, often referred to as "Father Millet", furnishes the majority of reproductions that van Gogh does in his early studies. Often he copied the works of Millet to aid in his figure and compositional studies (McQuillan, 107). Most notable of his reproductions is van Gogh's thirteen varying images on Millet's *Sower*. Vincent often referred to his early studies of Millet as "the seed for further sowing that might produce a harvest of saleable work, and in describing his relentless attempts to master drawing in terms of improving the quality of the seed" (Druick, 30). Van Gogh did several versions of Millet's *Sower* in order to track his progress in figural studies through the years. Moreover, the *Sower* held a spiritual meaning for van Gogh, "the sower presents Vincent's earlier ambition to be a Christian laborer and sower of God's world…following the example of 'Father Millet,' whose *Sower* embodies his 'evangelical tone'"(Keys, 31).

However, there is one primary difference in van Gogh's studies of the *Sower* that set him apart from the well known Realist. His peasants are typically more individualized figures. This is because van Gogh used live models, dissimilar to the traditional way of learning figural drawing through models and figure casts. This individuality creates a reference to Rembrandt and the Old Dutch Masters of the Netherlands, who also characteristically used live models for their paintings.

Furthermore, when van Gogh relocated to Nuenen, he remained true to peasant depictions but drew and painted loom weavers, the distinctive peasant occupation in Nuenen. "The weaver, like the sower, came to symbolize artistic aspirations, maintained in the face of adverse social, economic, and spiritual conditions; Vincent identified with these workers in his desire to equate art-making with wage-earning craft" (Druick, 34). Initially these works focused on the task at hand, making reference back to Millet's laboring peasant. This can be seen in the paintings *Woman Winding Yarn,* 1885 and

Weaver Arranging Threads, 1884, where the light focuses on the task rather than the worker's face. Similar to his peasant drawings from Drenthe and his time at The Hague, van Gogh begins to focus on the worker's faces, integrating, once again, a sense of individualism reminiscent of artists like Rembrandt. This is articulated in van Gogh's drawing *Weaver Facing Right,* 1884, where the weaver's face carries the most detail and immediately draws the attention of the viewer over the task being performed by his nimble fingers. Nonetheless, Millet's influence on van Gogh's early works is apparent in almost all his images. The Realist dedication to the hard working peasant is a theme van Gogh remained true to until his death in 1890.

During his three year study at The Hague, which carried deep roots in seventeenth century Dutch genre painting, Vincent was exposed to works by "Old Masters" as well as contemporary Dutch artists such as Josef Israëls, Breitner and van der Weele, all of whom had a deep influence on van Gogh, both personally and artistically. "The Hague School represented the most advanced artistic position of the day in Holland…Rejecting historical subjects executed in a dry academic manner, these painters turned instead to landscape and peasant themes inspired both by the Barbizon School in France and by Dutch artists of the seventeenth century" (Murray, 412). The Hague artists added a contemporary flare to old Dutch traditions such as landscape painting, still lifes and seascapes.

In addition to subject matter, The Hague artists and ultimately van Gogh, adopted elements such as low horizons and one point linear perspective in their works, an element which originated in seventeenth century Dutch painting. "The recessional device of a tree-lined road, canal or towpath is found repeatedly in landscapes of The Hague School, and stems ultimately from Dutch landscapes of the seventeenth century such as *The Avenue, Middleharnis* by Hobbema" (Murray, 416). This use of perspective is obvious in van Gogh's *Avenue of Poplars with Figure,* 1884. Here, van Gogh creates a one point linear perspective but instead of having it merge at one vanishing point on the horizon, he places a house at the end, abruptly ending the line. In addition to line, color was an important element present in The Hague School. Characteristically their works were very dark in shade. This was a common criticism of both the school and the majority of van Gogh's early works. In van Gogh's early works, such as *Farm with Stack of Peat* (1883) and *Still Life with Birds Nest* (1885) the image is almost indistinguishable and there is a total absence of light. Not until van Gogh read Charles Blanc's "Grammaire des arts du dessin" did he become enlightened on ideas surrounding color theory. Eventually van Gogh grew to be at odds with The Hague School and moved to Drenthe where he focused primarily on seventeenth century Dutch genre painting.

Seventeenth century Dutch painting and its masters are the ultimate influence on the early works of Vincent van Gogh. Dutch roots are present in all of the other

influences that played a roll in van Gogh's development, the biggest example being The Hague School. Van Gogh held particular interest in Hals, Rembrandt and the landscapists Ruisdael and Hobbema. In Rembrandt's images, he admired the use of light within dark spaces, as well as the individuality of the subjects, and in Hals, van Gogh admired the quick, unfinished brushstrokes. In October of 1885, van Gogh made a journey to Amsterdam to visit the newly opened Rijksmuseum to view works by Hals and Rembrandt (Keys, 40). In a letter to Theo, Vincent expresses his fascination with the painting techniques that he saw at the museum: "What struck me most on seeing the old Dutch pictures again is that most of them *were painted quickly*, and that these great masters, such as Frans Hals, a Rembrandt, a Ruysdael and so many others –dashed off a thing from the first stroke and did not retouch it so very much" (Keys, 40). Van Gogh's love for abrupt and unfinished brushstrokes is something that he developed throughout his lifetime as an artist and it eventually became one of the most distinguishable factors in a van Gogh painting.

In addition to the great masters like Hals and Rembrandt, van Gogh admired the naturalism and the timelessness of the settings characteristically represented in Dutch genre painting. Especially living in Drenthe, van Gogh felt that he was experiencing the same landscape depicted in the Old Masters' works. Van Gogh describes this feeling in several letters to his brother Theo:

> …but if you come to the most remote back country of Drenthe, it will make quite a different impression on you, you will even feel just as if you lived in the time of van Goyen, Ruysdael, Michel, in short, in what perhaps one hardly feels even in the *present* Barbizon. That is an important thing, I think, for in such natural surroundings, things can be roused in a heart, things which would otherwise never have been awakened (qtd. in Keys, 37).

In addition to the timelessness of the landscapes, van Gogh admired the motifs expressed in Dutch genre painting. Still lifes were a prominent trait in Dutch genre painting and the clarity and use of light in these images were useful in the training of an early artist. This concept was strongly enforced by Mauve and is why van Gogh's first works pay tribute to the motif. Peasant and working themes were also characteristic of Dutch genre paintings. Dutch artists depicted worked fields, dirt roads with deep furrows, as well as tiny workers speckled throughout the image, all indications of habitation. This influenced Realists like Millet who played a major role in van Gogh's development as an artist. Van Gogh admired hard working peasants and a great deal of his early works depict peasants hunched over, tending to the fields. Moreover, furrows can be depicted in van Gogh's *Avenue of Poplars with Figure*, previously mentioned, indicating an inhabited Dutch setting.

Vincent also did several works of windmills and seascapes, both characteristic genre subjects of seventeenth century Holland. While van Gogh did few studies of windmills in The Hague and Nuenen, he did adopt the theme once traveling to Paris and viewing all the windmills of Monmartre. This windmill motif can be observed in *Le Moulin de la Galette* (1886) and *Monmartre: Quarry, the Mill* (1886).

While studying at The Hague, van Gogh was exposed to a prominent fishing community, which offered several opportunities to paint seascapes. One of van Gogh's most well known seascapes is *View of the Sea at Schiveningen*. When viewing this image in comparison with *Beached Boat with Horses* (1882) by Hague artist Anton Mauve and a seventeenth century work such as *Ships on a Stormy Sea* (1610) by Jan Porcellis, one can see the influences each era had on van Gogh. All three depict sea scenes but at different times in the ship's voyage: Porcellis' being the adventure on the sea during a storm, van Gogh's image depicting the return after a storm and Mauve's painting conveying the safety of being securely on land. The color scheme is similar between all the works, consisting of a dull palette of greens, blues and tans. The lines are all extremely naturalistic with Porcellis' holding the highest degree of detail and van Gogh's being the most rough. All three make use of perspective but the seventeenth century image has the lowest horizon, with van Gogh and Mauve's being relatively centered. Moreover, all the images show the violent thrashing of the waves by painting white peaks where they crash against land and the ships.

While there are generally similarities between the images, one can notice the subtle changes through time. The old Dutch image holds far more clarity than in van Gogh's image where the brush strokes are very visible, reflecting influence from the French schools. Mauve's image has almost a Realist stylistic sense to it, with the workers and their horses struggling to pull the boat ashore.

Another comparison that shows the influences of various epochs and styles in van Gogh's early works is van Gogh's *Potato Eaters* (1885), Israël's *The Frugal Meal* (1876), and Rembrandt's *Pilgrims at Emmaus* (1648*)*. Van Gogh was first inspired by Rembrandt's image in 1875 when he viewed it in Paris. He wrote to Theo:

> And so what Rembrandt has alone or almost alone among painters, that tenderness of gaze which we see, whether it's in the "Men of Emmaus" or in the "Jewish Bride" or in some such strange angelic figure as the picture you have had the good fortune to see, that heartbroken tenderness, that glimpse of a superhuman infinitude that seems so natural there –in many places you come upon it in Shakespeare too (Keys, 43).

Vincent also shows admiration for numerous images by Israëls, which depicted "pious religious associates in peasant subjects" (Keys, 44). In all the images, the figures were eating food with their labor-ridden hands that they themselves worked hard to earn.

In all the images, the table occupies a little carved out niche in the space of the room. The light is focusing primarily on the table, drawing the viewers' focus. The exception is in Rembrandt's image where there is a holy light emanating from a Christ figure at the center of the image. Van Gogh's image shows the influence of Rembrandt by having one light source in the center, which reflects off of all the figures' faces. All three show pious devotion, Rembrandt's taking that theme the farthest and actually depicting a scene with Christ. The *Frugal Meal* and *The Potato Eaters* clearly depicts peasant lifestyles with simple furniture, little food and simple, worn clothes. Rembrandt's image also depicts rustic life by having a simple wooden table and chairs. Christ is situated at this modest table, putting him on the same level as the peasants. This implies that Christ loves and shows mercy to all, including the lowly peasant class.

Fundamentally, all the images are naturalistic with van Gogh's being, as usual, the most deviant from the naturalistic mold. The lines are extremely blended in Rembrandt's image and in Israël's image, there is only slight variation on that theme. He shows the French influence by having quicker, more abrupt strokes. Van Gogh's brush strokes are clearly visible, showing the differentiation from Rembrandt. All three make use of extremely dark hues. It seems as if the canvas was first painted black and then the lighter colors added. Both van Gogh and Israëls pay homage to Rembrandt and other Dutch masters and one can see the influence Dutch works such as *Pilgrims at Emmaus* had on the artists of The Hague School.

While there were many influences on the early works of Vincent van Gogh, old Dutch genre painting and its masters were the backbone. The Hague school was based on seventeenth century Dutch painting, as well as ideas of the difficult, hardworking peasant lifestyle captured by French Barbizon artists such as Millet. Many styles and elements that van Gogh studied, especially at the Hague, were carried throughout all his works, including his later ones. Van Gogh had a love for pious hard working men and women, and painting fulfilled this theological passion. Themes of this nature are represented in works ranging from English wood carvers to French artists as well as Dutch artists of various centuries, all of whom played a role in influencing the early works of the famed Vincent van Gogh.

Works Cited/ Bibliography

Druick, Douglas. Van Gogh and Gauguin: Studio of the South. Chicago: Thames & Hudson, 2001.

Fuchs, R.H. Dutch Painting. New York: Oxford University Press, 1978.

Gowing, Lawrence. Paintings in the Louvre. New York: Stewart, Tabori & Chang. 1987.

Keys, George and Lauren Soth. Van Gogh Face to Face: "The Dutch Roots of Vincent van Gogh" and "Fantasy and Reality in The Hague Drawings". Michigan: The Detroit Institute of Arts, 2000.

McQuillan, Melissa. Van Gogh. New York: Thames & Hudson, 1989.

Murray, Ann. "Strange and Subtle Perspective: Van Gogh, The Hague School and the Dutch Landscape Tradition." Art History 3.4 Dec. 1980: 410-424.

Rozniatowski, David, Rev. "Art in the Age of Van Gogh: Dutch paintings from the Rijksmuseum, Amsterdam. Winnipeg Art Gallery." Border Crossings 18.3 Aug. 1999: 60-62.

Tilborgh, Louis van and Marij Vellekoop. Vincent van Gogh Paintings Vol. I: Dutch Period 1881-1885, Van Gogh Museum. Great Britain: Lund Humphries Publishers Ltd., 1999.

Tilborgh, Louis van and Marije Vellekoop, ed. Van Gogh and Millet. Netherlands: Waanders/Zwolle, 1989.

Tsukasa, Kōdera ed. The Mythology of Vincent van Gogh. Japan: Asahi National Broadcasting Co, Ltd., 1992.

Housewife to an Empowered War Hero:
The Feministic Transformation of the Disney Princesses

Kimberly Litto[1] (English)

For over fifty years, the animated films of Walt Disney have been a central part of the everyday lives of children. The classics and the new classics have become standard fare, especially in the culture of America. These films are so much a part of the lives of the children and also, at times, the adults of our country, questions should be asked as to just what is in these movies that our population is consuming so regularly. Who are the Disney characters many grow up admiring and how do they represent the people of the world?

One way to approach this question is through a feminist point of view. Common sense can tell us that the female representation of a cheerful, whistling, cooking and cleaning girl in *Snow White and the Seven Dwarfs* is not in accordance with the fundamentals of feminist thinkers. It is most likely provable that this is true for all of Disney's earliest films, but is it still true in the more recent animated movies by Disney? Is there any hope for feminists that their children will grow up admiring females that are able to stand for the liberated woman of today? The answer to this question is justifiably yes. By studying the various aspects of the Disney princesses from the first full length animated picture, *Snow White and the Seven Dwarfs* (1937), to a later film, *The Little Mermaid* (1989), and finally to a recent film, *Mulan* (1998), it is evident that the leading ladies of Disney have made a long, but progressive journey from a conventional housewife to the representation of a modernized woman.

One aspect in which this progression is evident is in the animation of the three characters: Snow White, Ariel, and Mulan. "Lips, red as the rose, hair, black as ebony, skin, white as snow". With this description the magic mirror is describing the "fairest one of all", Snow White." [2] It is through this description and by studying her flawless appearance that it becomes evident that she is meant to personify the perfection of beauty. There is not a blemish on her impeccable skin and although she is forced to wear rags, she never appears sloppy or unfinished. Her hair is always tidily fixed; even against a river and the strong winds that blow through the dark forest, she remains with a perfectly placed red bow and smooth curls.

---

[1] Research performed under the direction of Dr. Laura A. Morowitz (Art)

[2] Snow White and the Seven Dwarfs, film, prod. Walt Disney Productions, dir. David Hand, Perce Pearce, Larry Morey, William Cottrell, Wilfred Jackson, and Ben Sharpsteen, 100 min., Buena Vista Picture Distributions, 1937.

Another aspect of Snow White's animation is her stereotypically feminine body movement. With every motion, Snow White maneuvers her body with dainty elegance. Her thin arms seem to float about her lovely frame and she always touches with a delicate hand, with two fingers gracefully raised. When she laughs she slightly parts her deep red lips into an elegant smile as she girlishly tilts back her head and squints her long lashed eyelids flirtatiously. Snow White's excessive femininity is heightened by the overly sweet, high-pitched voice with which she speaks and sings. Interestingly, it is discussed by Elizabeth Bell that the Disney females are usually drawn by observing live models. In the early films, the models would have been professional ballerinas. [3] It is evident by the choice of model that Disney intended on producing a character who completely personified what at the time was perceived as "feminine."

The radiance and precision of Snow White's beauty, plus her overly feminine body movement, work together to create a particular type of portrayal. That portrayal is of a woman who completely encapsulates the qualities, which are quintessentially desired by a man, in a woman. As a result, Snow White becomes only an object of male desire. Furthermore, not only is she beautiful, but also the entire plot of the movie is based on that quality. If the evil queen was not madly jealous of Snow White's appearance, the latter would not have left the castle and encountered the dwarfs and their cottage. Because of this large focus on her beauty, spectators are encouraged further to see her as merely an object to be viewed. This notion is emphasized in a scene in which the dwarfs first encounter Snow White. As she lays on the beds, sleeping, the seven men surround her and stare in awe at her exquisiteness, as she sleeps. The fact that she is unaware of their gaze and therefore cannot return it works to underscore the objectification of her body and face. [4]

The Little Mermaid also shows evidence of objectification of the female body, and, here, it carries sexual implications. Throughout a large portion of the movie Ariel's clothing is scarce. Pauline Kael described the mermaid as "a teen-age tootsie in a flirty seashell bra." [5] Ariel's back, stomach, and part of her breasts are constantly exposed as

---

[3] Elizabeth Bell, "Somatexts at the Disney Shop: Constructing the Pentimentos of Women's Animated Bodies," in From Mouse to Mermaid: The Politics of Film, Gender, and Culture, ed. Elizabeth Bell, Lynda Haas, and Laura Sells (Bloomington and Indianapolis: Indiana University Press, 1995), 110.

[4] In her article "Visual Pleasure and Narrative Cinema" (*Screen* 16, no. 3, Autumn 1975: 6-18), Laura Mulvey discusses the sexist sexual imbalance present in concept of the gaze in the cinematic industry. She describes this sexist split between the active male, who possesses the power of vision over the passive female, who possesses only "to-be-looked-at-ness" (11).

[5] Quoted in Bell, 114.

she swims throughout the sea. Although it is obvious that her attire fits her environment, it is also evident that this is used to the advantage of her sexualized objectification. Bell notes the first appearance of Ariel when she is posed behind a broken mast of a ship and appears topless. Bell refers to this as a "striptease pose" that purposely increases the curiosity of the audience towards the question of Ariel's possible nudity. [6]

In addition, below Ariel's uncovered naval her fin dips into a low 'v' shape. Although Ariel is not human it appears as though if the 'v' was any lower on her body, her genitalia would be exposed, and therefore it seems to be an implication of what may exist behind her green-scaled fin. Moreover, the 'v' takes the form of an arrow pointing at the area between her legs, and furthermore, the shape echoes that of a triangle, producing an even further suggestion of female sexual organs. It is easily apparent that this type of depiction is not necessary in a children's movie and therefore is used instead for the objectification of Ariel's body. In addition, not unlike Snow White, her body is one of perfection based on the expectations of the society in which she was made. [7]

However, we can also see some progression from Snow White's appearance to that of Ariel. While, Snow White's exterior is constantly fixed and tidied, fitting the quintessential female role, Ariel's is the opposite. Her hair is long and flaming red in color and as she swims and even when she becomes human, it is continually flowing and moving in a freely unbounded manner. O'Brien refers to this characteristic of Ariel also: "she tosses her long red hair in defiant moves." [8] Trivial as her hair may seem, it works as a symbol of the fact that Ariel is not allowing herself to be oppressed. She is instead attempting to free herself of the constraints placed on her by her father and others. Thus, her hair can show the start of movement away from the prototypical repressed female representation to a more liberated state.

The physical animation of the Disney females makes a major shift with the drawing of Mulan. Firstly, as mentioned earlier, Snow White is given an appearance of perfectly exquisite beauty, on which the entire plot of the movie is based. In contrast, the percentage of the plot of the latter movie that deals with the subject of Mulan's beauty is extremely small, even almost played down in certain scenes. For example, early in the movie, Mulan is preparing to meet the matchmaker. After being worked on by hair dressers, make-up artists, and clothing stylists, she is walking through the town. She passes by a chess game played by two men, stops, thinks quickly, and then makes a

---

[6] Ibid., 114.

[7] In "The Happiest Films on Earth: A Textual and Contextual Analysis of Walt Disney's Cinderella and The Little Mermaid," in <u>From Mouse to Mermaid</u>, Pamela O'Brien states: "Visually Ariel resembles an animated Barbie Doll with thin waste and prominent bust" (173).

[8] Ibid., 172.

move, causing one of the men to be victorious. As a result, the spectators of the movie are encouraged to recognize Mulan's intellect, even during the scene, which celebrates her beauty. This is a large divergence from *Snow White,* which gives the audience no information about the title character, except her beauty. This quality is fitting to a feminist view because it implies that a woman's worth depends on more than her physical beauty. In addition, because the movie does not emphasize her physical appearance, Mulan is not turned into an object to be viewed. [9]

Moreover, *Mulan* presents a strong divergence from the sensual objectification of *The Little Mermaid*. Mulan*'s* story is one of a girl who poses as a male to join the army in order to save her father's life. As a result, for most of the movie, her body is covered in the armor of a Chinese soldier. However, in contrast to Ariel, prior to Mulan's "transformation" she is not given any overtly sexualized characteristics that have sexual implications. Her body is actually drawn with box-like angles: her knees and shoulders have sharp turns and her figure lacks any curves. Her breasts are almost ignored, with little emphasis on them. A single scene in the movie proves this characteristic of her animation. In the scene in which Mulan's sex is revealed, her captain sees her without her armor, wearing only a bandage. He recognizes the fact that she has breasts and then realizes she is a woman. Even in this moment, the presence of Mulan's breasts is only implied. The actual animation still fails to emphasize her chest for the audience. As a result, spectators cannot focus on the sexuality of her body. Feminists would be more content with Mulan's animation because it indicates the idea that a woman is not merely an element of sexual desire.

Another area in which there is proof of Disney's progress toward an updated heroine is in the dreams and goals to which the princesses are aspiring. Henke, Umble, and Smith discuss the idea that many Disney females have dreams for which they are striving. The details of these aspirations vary from movie to movie, as does the female involvement in realizing them. [10] It is in these aspects where the evidence of progress lies.

In *Snow White and the Seven Dwarfs,* the heroine expresses a single desire throughout the film. She reveals this wish very early in the movie as she sings to the wishing well: "I'm wishing for the one I love to find me today." [11] Snow White's only ambition in her story is to meet a prince, who will fall in madly in love with her, and bring her to his castle "far, far away." This characteristic carries sexist implications

---

[9] Mulvey, 11.

[10] Jill Birnie Henke, Nancy J. Smith, Diana Zimmerman Umble, "Construction of the Female Self: Feminist Readings of the Disney Heroine," <u>Women's Studies in Communication</u> 19 (1996): 229-247.

[11] <u>Snow White and the Seven Dwarfs</u>.

because it implies that women cannot find satisfaction by their own accord, but instead need men to bring them to happiness. Also, although Snow White's dream is fulfilled by the end of the movie, she has not had any part in making that dream come true. She basically sits around singing, whistling, and cleaning, as she waits for her love to come take her away. Not only is the content of her dream one with sexist overtones, but also the way in which it is accomplished. Snow White's lack of involvement in her own happiness implies that women should be passive and patient, while men make all their dreams come true.

Initially, in *The Little Mermaid*, it seems as though Ariel's ambitions and determination hold proof of a more independent female character. At the start of the movie Ariel is constantly expressing her thirst for something beyond her world under the sea. Despite her father's desire to keep her under his control, Ariel does all she can to learn about the human world for which she yearns. As Laura Sells explains Ariel is longing for change and independence:

> While singing, she caresses a book that she cannot read, expressing her longing for knowledge. Her desire for access is characterized by her hunger and fascination with a different world in which she believes she can have autonomy and independence. [12]

It is evident that Ariel's dreams are very heavily endowed with feminist values. However, as O'Brien discusses, Ariel loses all of these ambitions the moment she falls in love with Eric: "Where once she wanted to become human to explore her intellectual curiosity, she now wants to become human to be with her love." O'Brien notes that, although originally Ariel was on the path to a modern female, after meeting Eric she regresses back to a traditional representation. [13]

Henke, Umble, and Smith also discuss how Ariel originally seemed to be making her own dreams come true: "she explores, she asks questions, she makes choices, and she acts", but ultimately this, too, changes. [14] In the end, Ariel needs her father to change her to a human, in order to be with Eric: "it is still not her power, but her father's power which enables her dreams to come to fruition" (237). [15]

In the recent film, *Mulan*, the main character's dreams are quite complex. First, a very feminist quality of her ambitions is the fact that she lacks the fixation of the earlier Disney princesses on finding a husband. Instead, Mulan is yearning to make her father and her family proud. After ruining her meeting with the matchmaker, she is desperately wondering how she can please her family. Simultaneously, she is

---

[12] Laura Sells, "Where do the Mermaids Stand?", in <u>From Mouse to Mermaid</u>, 179.
[13] O'Brien, 171.
[14] Henke, Smith, and Umble, 236.
[15] Ibid., 237.

searching for herself. Mulan is struggling with the notion that she cannot truly be who she is in the society in which she lives. Her troubles and dreams are evident in the words of her song: "Now I see that if I were truly to be myself, I would break my family's heart…somehow I cannot hide who I am, though I've tried. When will my reflection show who I am inside?" [16]

It is arguable that Mulan's strong desire to please her father can be an insulting representation of women because Mulan is so focused on making the man in her life proud of her. However, it is in the fulfillment of her dreams, that Mulan becomes an advocate of female independence. By the end of the movie, Mulan has not changed herself to please her father or to fill society's expectations. Instead, she has been true to herself and followed her own heart. She succeeds, not by becoming the perfect wife, as would be expected, but by becoming a war heroine. As a result, it is her father who changes and realizes how proud he is of his daughter, the way that she is: "The greatest gift and honor is having you for a daughter." [17] Therefore, *Mulan* presents an image of a female who can be herself and prove that she is worthy of respect and recognition, even if she has not acted like the norm of her society.

Another area in which we can see the development of the more modern heroine in these three movies is in the females' quality of naivety, or lack thereof, in relation to their enemies. It is most obviously a problem for feminists when females are associated with naivety, because it implies the idea that women are not of high intelligence. Therefore, the presence of this quality in the Disney females is relevant to their feministic progress.

The villain vying against Snow White is her wicked stepmother. At a late point in the movie, the stepmother disguises herself as a decrepit old lady and visits the cottage of Snow White and the seven dwarfs. When she approaches Snow White, the audience is aware that the latter should refuse to interact with the old lady. However, the disguised stepmother offers the princess a shiny red apple, which is poisoned, unbeknownst to Snow White. The elderly woman tells Snow White that the apple is magical and one bite will make all her dreams come true. Despite the warning from the dwarfs to avoid all visitors, Snow White cannot resist the fruit and accepts a bite, causing her to fall into the sleeping death.

One misogynistic aspect of this scene is the direct echoing of the story of Adam and Eve. The creation story is very much underlined with sexist notions because it encourages the idea that woman is the single cause of the negative repercussions of existence, because of her surrender to temptation. By bringing us back to the Garden of Eden, *Snow White* instills this sexist idea a second time.

---

[16] <u>Mulan</u>, film, prod. Walt Disney Productions, dir. Barry Cook and Tony Bancroft, 100 min., Buena Vista Picture Distributions, 1998.
[17] Ibid.

Another sexist aspect of this scene is the fact that it is obviously extreme naivety that allows Snow White to trust such a bizarre stranger and, in doing so, to perform such an unintelligent act. This quality is emphasized by the fact that the spectators are conscious of the truth, while the helpless young maid is unaware. Furthermore, she actually believes the stranger's claim that the apple can make her dreams come true. Although this story contains magical situations, it seems quite gullible of Snow White to accept this idea. Therefore, this representation of woman is one of highly degrading quality because it depicts her as a person who makes dangerous decisions based on naïve and immature reasons.

The Little Mermaid presents some similar aspects of naivety found in Snow White and also evidence of progress away from that type of portrayal. In the plot of the former, Ariel makes a deal with the eccentric sea-witch, Ursula. If Ariel fails to complete her task of kissing Eric, her body and soul will belong to the sea-witch. It is apparent that Ariel acts with naivety in signing Ursula's contract. While the audience knows that, in doing so, she is placing her trust in a deceptive creature, Ariel remains unaware. Ursula has been banished from Triton's kingdom, yet Ariel makes a binding agreement with the exiled octopus, disregarding judgment and intellect. Thus, once again Disney depicts a heroine possessing naïve qualities.

However, there is a difference present between the circumstances of Snow White and Ariel. As mentioned earlier, Snow White's enemy is under a disguise. We are to assume that Snow White is not aware that the old woman is actually the evil queen. It is highly unacceptable that Snow White would not think to question whom this elderly woman is and why she is roaming about the forest bearing a magic apple. Therefore, her naivety is only heightened by the disguise of her nemesis. Ariel, however, knows that she is dealing with a sea-witch. Although it is naïve that she chooses to sign her life away to this creature, she knows she is taking a risk. Ariel is aware that she is doing something dangerous, while Snow White is innocently dreaming of her prince arriving after she has bitten into the magic apple.

Finally, in the later film, Mulan, the title character is practically void of naivety. After the Chinese army has defeated the Huns, the country is celebrating with an extravagant parade; yet, Mulan is aware that the Huns have returned and the entire country is in danger. As she attempts to inform the other members of the army, who are all male, she is shunned and disregarded. While Mulan is trying to formulate a plan of defense, the rest of China, including the emperor and the army, is celebrating with fireworks, costumes, songs, and cheers. As a result, they become the naïve characters and Mulan takes the role of the voice of reason. Therefore, it is evident in Mulan that Disney's depiction of its heroines has evolved into women of knowledge and intelligence.

Another aspect of the films where there is evidence of feminist progress is the way in which the females escape from danger. In *Snow White and the Seven Dwarfs*, the main character faces danger various times and each time she is saved by a male character. It is the queen's huntsman who first informs her of the queen's evil plot, giving her time to escape. It is the seven dwarfs who take her into their home from the woods and ultimately cause the queen's death. Finally, it is the prince who saves her from the sleeping death. Jack Zipes addresses this notion as he discusses the early Disney princesses: "The young women are helpless ornaments in need of protection, and when it comes to the action of the film, they are omitted." [18] This aspect of the movie helps create the sexist representation of Snow White, because it implies that she is incapable of surviving without the help of a man.

Again, *The Little Mermaid* has certain similar and dissimilar qualities to *Snow White*. There are some parts of the story in which Ariel is brought to safety by a male. After turning human, Ariel loses the ability to breath underwater. Her male friends, Sebastian and Flounder, bring her safely to the surface. Later, when Ursula stakes her claim on Ariel, Kind Triton sacrifices his own life to save that of his daughter. Also, it is Eric who fatally stabs Ursula, saving Ariel from the whirlpool in which she is trapped. O'Brien discusses this idea: "Once again Disney's heroine survives to find happiness thanks solely to the heroism and sacrifice of male characters." [19]

Therefore, it might seem as though in this movie Disney has not progressed from the "damsel in distress" ideas resonating through *Snow White*, but further evidence in the film proves contrary. Early in the movie an explosion occurs on Eric's ship and he is thrown unconscious into the ocean. Ariel swims to his rescue and carries him to shore. With this action Ariel portrays bold and brave qualities and as a result, *The Little Mermaid* shows evidence of the start of Disney's movement away from the sexist notion that woman is helpless without man. Perhaps it even suggests that at times man needs the assistance of woman.

While *The Little Mermaid* may hint at this notion, *Mulan* is strongly engaged in proving it. The plot of the movie is overloaded with instances in which Mulan assists various men in the face of danger and helps them survive. First, when her injured father is called to a war, in which he will undoubtedly perish, Mulan steals his armor and enrolls in the family name, saving her father's life. Then after joining the army, her troop is attacked by a massive group of Huns. While the rest of China's soldiers accept defeat and their own death, Mulan uses quick wit and constructs a strategy to save their lives and defeat the enemies. In the next moment, she saves her captain, her friends, and her

---

[18] Jack Zipes, "Breaking the Disney Spell," in <u>From Mouse to Mermaid</u>, 37.
[19] O'Brien, 173.

fellow soldiers from an avalanche. Then, as mentioned earlier, during a parade of celebration, Mulan becomes aware of the Huns' return and devises a plan to save the emperor and his people. Once again she saves her captain and ultimately defeats the evil, menacing foe, Shan-Yu. The magnificent heroism of Mulan is encapsulated in a single sentence from the emperor: "You have saved us all." [20] Interestingly, the various times that Mulan saves the different characters, she uses not brutal strength or violence, but instead her brilliant intelligence and cleverness. This seems perfectly suitable to feminists' guidelines of how a woman should be represented; that is as a person capable of high intellect and ability.

One might argue that these aspects of the movie do not serve as proof that Mulan was created in an image of feminism because she has posed as a male in order to succeed. However, in the climactic scenes of the film, Mulan's gender has already been revealed. Furthermore, she receives recognition for all her acts after this revelation has occurred. As all of China bows to their heroine, including the emperor and the soldiers, they are aware that she is a woman. Thus, Mulan represents a character that took the path necessary in order to succeed as a woman in her society.

Through the examination of these three movies, it has been argued that feminists need not worry as much about the female representation their children will idolize as they grow. Despite the original depictions of women in Disney films, *Mulan* has begun the start of a new era of Disney movies. With her brilliance, her strength, and her independence, she has paved the way for the future Disney princesses who can serve as models for the modern woman of today's society. In an article in *The Washington Post*, Elizabeth Chang, a mother of a preschool aged daughter, discusses how she attempted to keep her child away from the influence of Disney, until the release of *Mulan*.

Now I, who once downplayed Disney and refused to buy Ariel pajamas, am happy to have my daughter identify with a Disney movie character -- one who is brave, clever, capable, kind and respectful. A character who has a realistic figure…and wears clothing that manages to cover all sensitive body parts. A character more interested in fulfilling her own interests and abilities than in finding a man. [21]

In these words it is evident that Mulan will most likely serve as a role model for the children of today and of the future. Furthermore, apparently she possesses the qualities and attributes that any feminist, and perhaps any parent, would be proud to recognize in their own child.

---

[20] Mulan.
[21] Elizabeth Chang, "Disney's Character Flaws," The Washington Post, 4 Oct. 1998.

Works Cited

Bells, Elizabeth, and Lynda Haas, and Laura Sells, ed. <u>From Mouse to Mermaid The Politics of Film, Gender, and Culture</u>. Bloomington and Indianapolis: Indiana University Press, 1995.

Chang, Elizabeth. "Disney's Character Flaws." <u>The Washington Post</u> 4 Oct. 1998: F01.

Henke, Jill Birnie, and Nancy J. Smith, and Diana Zimmerman Umble. "Construction of The Female Self: Feminist Readings of the Disney Heroine." <u>Women's Studies in Communication</u> 19 (1996): 229-247.

<u>The Little Mermaid</u>. Dir. John Musker and Ron Clements. Prod. Walt Disney and Silver Screen Partners IV. Walt Disney Pictures. Buena Vista Picture Distributions, 1989.

<u>Mulan</u>. Dir. Barry Cook and Tony Bancroft. Prod. Walt Disney Productions. Walt Disney Pictures. Buena Vista Picture Distributions, 1998.

O'Brien, Patricia Colby. "The Happiest Films on Earth: A Textual and Contextual Analysis of Walt Disney's *Cinderella* and *The Little Mermaid*." <u>Women's Studies in Communication</u> 19 (1996): 169-183.

<u>Snow White and the Seven Dwarfs</u>. Dir. David Hand, Perce Pearce, Larry Morey, William Cottrell, Wilfred Jackson, and Ben Sharpsteen. Prod. Walt Disney Productions. Walt Disney Pictures. Buena Vista Picture Distributions, 1937.

Why Rules are Made to be Broken: The Establishment and Destruction of the Institution in *Harry Potter and the Sorcerer's Stone* and *Ender's Shadow*

Paula Casill[1] (Accounting)

It is not uncommon for the heroes of a literary piece to struggle and fight, even to the death, against the idea of the "institution." The destruction of an institution is the noblest cause that these heroes can further. It implies the dawn of a new age, the release of the enslaved, the renewal of justice for the masses, and a resurgence of knowledge, ideals, and values, all of which will inevitably lead towards a better and brighter tomorrow. Indeed, this concept is so common that the very term "institution" has developed strongly negative connotations. The institution in these pieces is traditionally portrayed as an overtly ridged, hopelessly archaic, blatantly biased, and yet omnipotent structure that must somehow be brought to its knees.

However, there are instances in literature in which the institution is not the enemy, but rather a necessity in the furtherance of the cause of good. In such cases, the institution is often used to train the hero in preparation for his quest against evil. Yet even in this role, the institution is not necessarily free from traditional deconstruction. Although the hero is not fighting against the institution in these stories, in order to prove victorious he must inevitably break free of the strict controls and rules that it has imposed on him, thus indicating that victory cannot be obtained within the institution's structure.

An examination of two works of literature, Harry Potter and the Sorcerer's Stone by J. K. Rowling, and Ender's Shadow by Orson Scott Card, gives us a clear example of this concept. In both of these stories, the author erects a powerful institution which serves three distinct purposes: to provide a training facility in which the elite learn to combat evil, to teach the hero (as well as the reader) about the rules and social norms of the elite culture he is entering, and finally, to provide the hero with a set of rules and controls that he can break in order to fulfill his quest.

Before one can compare the roles of the institution in these two pieces of literature, it is important to first define two generalized terms that are central to this argument. The first term is "hero." For this argument, "hero" is not defined in the grand

---

[1] Research performed under the direction of Dr. Susan Bernardo (English)

traditional sense, as the individual who leads the way towards ultimate victory, but rather as the individual whose relationship with the institution is the most unique and atypical, in other words, the person who gets to break the most rules. In <u>Harry Potter</u>, this distinction is not necessary, since both definitions are reconciled in the title character. However, in <u>Ender's Shadow</u> the difference is important. Ender Wiggin is the character who most closely resembles the traditional hero. However, it is the main character, Bean, who successfully supersedes the traditional confines of the institution, an therefore, for the purposes of this paper, plays the role of "hero."

The second term, "institution," can maintain a more traditional definition. For the sake of this comparison, the institution can be loosely defined as a highly structured, strictly controlled, and isolated environment designed to achieve a specific purpose or further a specific goal. This rather broad definition could include any number of traditional organizations from hospitals to government agencies; but conveniently, the institutions in both <u>Harry Potter</u> and <u>Ender's Shadow</u> are strikingly similar: they are both highly specialized schools designed to train children with exceptional gifts.

In <u>Harry Potter</u> the institution is Hogwarts, a school in which magical children learn to become witches and wizards. In <u>Ender's Shadow</u> the institution is Battle School, in which the best and brightest of Earth's children are sent to learn the art of combat in preparation for the upcoming war with the Buggers. There is a striking parallel between the structures of these schools which allows for an easy comparison of their uses within the two novels. It is therefore important to recognize the similarities between the schools in order to better understand the roles they play within their respective stories.

First, both of these schools are extremely elitist. Only the best, brightest, or most talented children on Earth are even considered for acceptance. Acceptance into Hogwarts is based solely on the child's level of magical talent. This means that having a magical family is not enough to ensure acceptance, and that the lack of magical family members does not mean automatic rejection. The characters of Hermione Granger and Neville Longbottom provide the perfect example of this. Hermione, when first meeting Harry, tells him "'Nobody in my family is magic at all, it was ever such a surprise when I got my [acceptance] letter'" (Rowling, 105). Neville, on the other hand, who was raised by his witch grandmother, admits that his family wasn't convinced that he would be accepted: "'they thought I might not be magic enough to come'" (125).

Battle School works in a similar fashion. Again, the school does not give preferential treatment to children from certain social classes or families. It accepts only children with the highest scores on their battery of exams. In fact, as Bean finds out once he reaches Battle School: "everyone had such high scores on all the tests … that the differences were almost trivial … most of the children clustered between 97 and 98 percent" (Card, 189).

Adding to the elitist attitude is the fact that in neither school do children apply for acceptance. Children do not find these schools, the schools find them. In fact, in both stories, the heroes knew nothing about the schools until after they were already singled out. Despite the fact that "his name's been down ever since he was born", Harry Potter had never heard of Hogwarts until he received his letter of acceptance (Rowling, 58). In Ender's Shadow, Sister Carlotta was on a constant quest to find potential Battle School students among the dregs of society. She found Bean and tested him without telling him why. It was not until he was already in the process of being tested that Bean was informed about what the tests were for. It was at this point that he learned about Battle School (Card, 50).

Another way in which these institutions are similar is that in both schools there is a heavy emphasis on splintering the students into smaller groups, which then constantly compete with each other. This internal structure of forced competition becomes central to the lives of the students, while at the same time, forcing them to strive towards excellence at all times.

At Hogwarts, children are immediately separated into one of four houses. Each house has its own dorm, its own colors, and its own symbol. The members of the house take classes together, eat at their own table, socialize among themselves, and make friends primarily with other members of their own house. They compete throughout the year for house points, and the house with the most points at the end of the year receives the coveted house cup (Rowling, 114). Points can be eared or lost for any exceptional or inappropriate behavior, but the majority of a house's points come from the game of Quddich, in which the winning team receives a minimum of 150 points (169). Each house has a team, and they compete against each other during the school year. For students at Hogwarts, the competition, and therefore the game, is central to their experiences at the school.

This emphasis on teams and competition is even more pronounced in Battle School. Once the students of Battle School reach a certain age they are divided into armies, each comprised of 40 soldiers and a commander. There are many more armies in Battle School than houses in Hogwarts. However, they have strikingly similar functions. Just as with the Hogwarts houses, each army has its own color combinations, its own animal symbol, and its own barracks. Members of each army exercise, train, learn, and socialize as a group. Students in these armies also compete for points on both an individual and army-wide basis. However, unlike Hogwarts, the only way to win points in Battle School is during a battle with another army. In this way Battle School takes the emphasis on competition to a higher level.

At Hogwarts, there are ways to earn and lose points outside of the main competition (Quidditch). As a result, students are encouraged to be on their best behavior

and to try hard at all times, not just on the playing field. At Battle School, on the other hand, the game is the only real form of competition. Higher grades no not affect the standings, and neither does misbehavior. The game is everything; it is the core of student life at Battle School. Normal education, grades, and even social behavior are secondary to this main focus.

The reason behind the elitism and the emphasis on competition in both of these institutions is the same. In both of their realities there exists a powerful evil force that must be overcome, and in neither case can the institutions take a neutral stance concerning this evil. Both schools are, in fact, training students specifically to combat it, and are therefore clearly on the side of good. The exclusivity of the schools ensures that they are training the students in their worlds that have the greatest potential, and the heavy emphasis on competition provides the incentive for this potential to be fully realized. Thus the first role of the institution within these stories is to provide an elite group of students with the training they will need to combat the evils that they will face in the future.

In the world of magic, of which Hogwarts is a part, there are some wizards who, in their search for power, turn to the Dark Side (Rowling, 54). These dark wizards are the evil against which Hogwarts trains its students to fight. Of course, education, not combat, is touted as the primary purpose of the school. Hogwarts is, first and foremost, an institution for the education of wizards. However, from their first year students are required to take classes in defense against the dark arts (70). Furthermore, it is clearly the attitude of the school that the worst thing a wizard can do is turn to the Dark Side. Students at Hogwarts are taught with the presumption that they will use their powers for good, and to that end the school "seeks to provide its students not only with knowledge but also with a moral education" (Nel, 28).

Therefore, although training students specifically to fight against dark wizards does not appear to be the primary purpose of the school, everything that the students learn about becoming a wizard is a key part of that training. It therefore makes sense that the competition between houses is extended beyond the Quidditch arena to include all areas of student life. The students must excel in all areas of wizardry in order to stand up to the forces of evil.

In Battle School, on the other hand, the goal of training students to combat evil is clearly stated to be the primary objective of the institution, as opposed to an unspoken underlying purpose. The evil that this institution is poised against is the Buggers, a hostile and dangerous alien race that had nearly wiped out humanity when it first came to conquer Earth generations before (Card, 50). Although they were defeated once, there is no question that the Buggers will come back again and that another war will ensue. Battle School was originally designed to find and train the best of Earth's young military

minds in preparation for this war. Thus the institution clearly positions itself to aid the heroes on the side of good (humanity) against the evil of an invading alien race.

Therefore, unlike Hogwarts, Battle School considers the game to be more important than a traditional education. Although what students learn in the purely academic part of the school is certainly helpful, it is not as important as the tactical training that they receive through the battles. Battle School is designed to train brilliant commanders, not scientists, technicians, or theorists. It is logical, therefore, for the school to place all of the competitive emphasis on the battle room as opposed to the classroom.

The parallels between the schools' structures and goals do not end there, however. There is another way in which the institutions in Harry Potter and Ender's Game are the same. Both of these schools are isolated and far removed from every other form of society. And it is important to note that this removal is not only from normal everyday society, but also from the elite social spheres which the children are training to enter.

Hogwarts is located in an unknown magical corner of England that is only accessible by the train that leaves King's Cross station form platform 9 ¾ (Rowling, 89). This platform, and therefore all access to Hogwarts, is the privileged information of the magical community, and no non-magical person (who wouldn't know the secret entrance to the platform) is able to travel to the school. However, even though people within the world of magic know the location of the school, or at least how to get there, there are no outside visitors during the school year. Students are able to communicate with their families through letters sent by owls, and it is possible to leave the school, as Dumbledore, the headmaster, does at the end of the book (267). However, the school is otherwise totally isolated from both outside worlds.

Battle School is also isolated from all other forms of society. The school is located on a space station, which removes it not only from society, but from Earth itself (Card, 50). The only way to get to the station is a shuttle flight, which is controlled by the International Fleet. Although the Fleet has access to the station, the only traveling done is the transportation of students. Visitors are unheard of. The isolation of battle School exceeds that of Hogwarts because almost all communication between students and their loved ones on Earth is cut off as well. Although the students are encouraged to write letters to their families, it is rare that these letters are actually sent home (139).

It is important to note that although both of these institutions are removed from the elite cultural spheres that the students are training to enter, they are still very much a part of those spheres. They operate by the same codes of conduct and the same unwritten norms as the groups that they represent. These codes are different from normal society's

codes. However, because in the real world these groups are intermingled with normal society on a day-to-day basis, discovering and learning these rules is a complex process.

Therefore removing the institutions from all other forms of society allows the unique groups that they represent to be studied in isolation. Furthermore, because, as institutions, they are highly structured and strictly controlled, many of the rules that are unwritten in their cultures are codified within the schools, which makes examination even easier. Thus the second role that the institution plays in these stories is to introduce both the hero and the reader to a larger cultural structure which would be nearly impossible to examine otherwise.

In each of these stories the institution forms a microcosm in which the larger social elite can be studied. In Harry Potter, Hogwarts represents the world of magic, while in Ender's Shadow, the school represents the International Fleet, the main military power on Earth. Neither of the social spheres actually exists for the modern-day reader, nor do they directly resemble any current social niches. The author must therefore introduce these cultures to their readers, explain how they work, and demonstrate how they differ from traditional social groups.

Both Rowling and Card use the hero's arrival in the institution to realize this goal. In both stories the main characters have no prior knowledge of or interaction with these new cultural niches before their acceptance into the schools. Furthermore, they are first introduced to these institutions at the same time as the reader. This is important, because it allows the author to teach the reader about these new cultures indirectly. As the hero inevitably learns the rules, both written and unwritten, of the school (and therefore the larger social structure), the reader is able to learn with him.

In Harry Potter, for instance, the reader learns along with Harry as he is educated in everything magical from the history of Voldemort, his arch nemesis, to wands and what they're made of, to the rules of Quidditch, to the way a wizard's duel works. Everything about this new world of magic must be explained to him, and the reader is therefore informed about things that members of the magical community are expected to know and understand.

Similarly, in Ender's Shadow, Bean arrives at Battle School knowing even less than the other launchies. He must learn how movement in space works, what the chain of command is, and even the military terms and ranks used on the station, such as calling the teams armies and their leaders commanders. Again, the reader's ignorance is reflected in the hero himself, and as the hero learns the reader is given the information as well.

It is important to note here that the heroes of these stories are not normal students, even as normality is defined within these institutions. As was mentioned earlier, both Hogwarts and Battle School admit only a highly specialized elite group of students. However, even among these elite, the heroes of these stories are exceptional

individuals. In Harry Potter, Harry had, as a mere baby, survived a direct encounter with the evil wizard Voldemort, indicating that he was destined to become a great wizard (Rowling, 50). In fact, his name was already legendary long before he arrived at Hogwarts. In Ender's Shadow, Bean scored much higher on every test of intelligence given to him than any other student in the history of the school (Card, 189). Considering the students to which he was being compared, this was no small feat.

Both of these boys have a potential that far exceeds what their schools are prepared to handle. However, those in charge of these institutions recognize that the greater good, namely success in the battle against evil, is much more important than the rules of the institution, and that "the most important achievements have little to do with rules" (McVeigh, 202). They are therefore willing to allow the bending, and even breaking of these rules under certain circumstances. In fact, knowing which rules to break and when becomes an important lesson for the heroes to learn. The final role of the institution in these stories, therefore, is to provide a structured set of rules and regulations which the hero can break in preparation for his confrontation with evil.

In fact, the normal rules of the schools begin to break almost immediately upon the heroes' arrivals. They are treated differently by the adults in their institutions from the very beginning, and when they do break the rules themselves, they find that their punishments are either non-traditional or even non-existent. In both of these stories "rules are important, but not ultimate … to break a rule … is both a reflection of real life and a part of growing and learning" (202).

For Harry Potter, the rule breaking begins as soon as he meets Hagrid, who uses magic on Harry's behalf even though he isn't permitted to (Rowling, 59). The rule breaking continues at Hogwarts during the sorting ceremony, where Harry interferes with the sorting hat's choice of which house to place him in (121). Harry's first act of direct disobedience takes place during his first flying class, when he disobeys a specific order against flying in order to recover Neville's rememberall from Malfoy (149). Interestingly enough, however, Harry was not punished for this blatant infraction of the rules, but rewarded by being placed on the house Quidditch team (151).

From this point onward, Harry breaks the rules of the school on a regular basis. He sneaks out of the dorms after hours, goes to forbidden sections of the library, and even handles an illegal dragon. And although he is occasionally caught and punished with the removal of house points, his punishments are never as severe as the situation warrants. In fact, the most serious punishment he faces, detention with Filch, turns into an adventure with Hagrid in the otherwise forbidden forest (249). For Harry, the punishment for breaking a rule is in fact the opportunity to break another rule.

For Bean, the rules are broken for the first time on the shuttle when Dimak informs the other students that Bean had scored higher than them on most of the tests

they'd taken (Card, 89). Normally student scores are kept strictly secret. Bean breaks the rules on his own for the first time later that day when he explores the station rather than going directly back to his dorm, and learns how to sneak through the ventilation system (113). Soon thereafter, Bean creates a secondary student ID and password, which the teachers know about but let him keep (123).

From that point on Bean begins to break the rules on a continual basis. He steals Nikoli's password, sneaks through the ventilation system spying on teachers, steals a teacher's ID and password, and eventually creates a fake teacher's ID to give himself unrestricted access to confidential information. The teachers are aware of most of these infractions. However, the result is not punishment, but the assignment of tasks usually given to teachers, such as the formation of an army for Ender to command (217).

The extent to which the normal rules of the institution are ignored for the heroes is extreme. However, it must be recognized that both the heroes and the institutions are in extreme positions. In both stories, the heroes are capable of feats that even the teachers cannot perform. Harry Potter is the only wizard who has come face to face with Voldemort and survived (Rowling, 55). His task is to face Voldemort again and protect the Sorcerer's Stone. Bean's intelligence is so high that even with only the tiniest bits of information he can piece together the big picture and make more intelligent decisions that the greatest military minds alive (Card, 211). His task, although he does not know it at first, is to aid Ender Wiggin in his preparation and training for the final war against the Buggers.

Therefore, when the heroes break the rules of their institutions it is because they need to. Both heroes are attempting to fulfill their destiny, to do their part in the battle against evil. In order to do that, they need special information, and in order to get that information they must remove themselves from the traditional role of student. This is reflected, in part, by their rapid advancement through the normal schooling system. Harry is they youngest Quidditch team player at Hogwarts in over 100 years (Rowling, 152). Bean is promoted through all of his regular classes at an alarming rate, is one of the youngest members of an army in Battle School history, and becomes the commander of his own army at the tender age of six (Card, 348).

However, even this special treatment is not enough to give the heroes what they need. To be successful in their quests, both boys require information that is simply not available to students within the institutional system. They therefore spend a lot of time and energy attempting to acquire this information, and in so doing, break the rules that were designed to keep the information private. For Harry this means sneaking around the school after hours and going places that he does not belong. For Bean it means tampering with the school's computer in order to access privileged confidential information.

It is important to note here that although the heroes have begun at this point to remove themselves from their roles within the institutions, they could not have done so without help from someone in a position of power. Both heroes were helped along in their quests by the most powerful men in their institutions. Much of Harry's investigation, and most especially his final journey to the trap door, was made possible because of a cloak of invisibility that was given to him anonymously (Rowling, 202). After his ordeal is over, Harry learns that the anonymous donor was in fact Dumbledore, the school's headmaster (299). The head of Battle School, Colonel Graff, is also aware of Bean's unauthorized activity, and allows it to continue through most of his time at battle school. Graff even uses him to further the school's (and Bean's) goal of preparing Ender for leadership as quickly as possible (Card, 215).

There is a definite connection between the heroes and the leaders of the institutions that lies outside of the usual student-teacher relationship. As the hero in each story begins to break down the rules of the institution, the man in charge of maintaining the institution allows, and even aids the process. It is therefore fair to argue that "the novels view official systems of power skeptically, placing greater faith in unofficial alliances" (Nel, 39). For although the hero is forced to rebel against the rules of the institution, he receives help from the people who should, logically, be trying to stop him.

The total deconstruction of the institution in the mind of the hero occurs late in each story as the hero recognizes that the institution's purpose has become obsolete. Both schools work towards training students to combat evil, but once the time comes for the actual confrontation, there is no longer any reason to maintain the training structure, and the institution therefore becomes meaningless. In Harry Potter, Harry realizes this just before he sets off to confront Voldemort. When his friends tell him he'll be expelled for leaving the dorms he responds "'There won't be any Hogwarts to get expelled from! … Losing points doesn't matter any more, can't you see? D'you think he'll leave you and your families alone if Gryffindor wins the house cup?'" (Rowling, 270). In Ender's Shadow, Bean comes to this realization after Ender is transferred out of Battle School. He makes a speech to the rest of the army commanders suggesting that they ignore the standings of the armies from that point on. He reminds them that "'we're not each other's enemies. The Buggers are the only enemy … that [score] board up there, that's the teachers' game, getting us to turn on each other'" (Card, 362). When each of the heroes realizes that the existence of the institution is no longer necessary for him to complete his task, the institution loses its power. The final role of the institution, its deconstruction, is thus completed.

In both Harry Potter and Ender's Shadow the institution plays three vital roles. First, it creates an environment in which an elite group of students, including the story's hero, can receive the training they need in order to defeat an evil force. Second, it

provides the hero, as well as the reader, with an isolated environment in which aspects of this new elite society, including its rules and regulations, may be observed and studied. Finally, it provides the hero with an organized structure against which he can rebel in pursuit of his ultimate quest.

Because the hero in each of these stories is uniquely gifted, there is no institution that can fully prepare him or provide him with the information he needs in order to play his role in the overall fight against evil. However, by circumventing the normal course of action for students – by breaking the rules and thus breaking down the institution – the hero is able to obtain the information he needs to complete his task. Thus although the institution is working on the side of good, its deconstruction becomes just as necessary at the end of the tale as was its establishment at the beginning.

Works Cited

Card, Orson Scott. <u>Ender's Shadow</u>. New York: Tom Doherty Associated, 1999.

McVeigh, Dan. "Is Harry Potter Christian?". <u>Renascence</u>. Spring 2002: 197-209.

Nel, Philip. <u>J. K. Rowling's Harry Potter Novels</u>. New York: Continuum, 2001.

Rowling, J. K. <u>Harry Potter and the Sorcerer's Stone</u>. New York: Scholastic, 1997.