2007

Undergraduate Review, Vol. 3, 2006/2007

BSC
BRIDGEWATER STATE COLLEGE

The Undergraduate Review

A JOURNAL OF UNDERGRADUATE RESEARCH AND CREATIVE WORK

Drake, Gorman, DeGagne, Pallucio, Snow, Rubin, Carson, Davenport, Almeida, Rekowski, Large, Vezina, Whittle, Viana, Sherwood, Keith, Levesque, Terrill, Manning, Williams, Masten, Collins

Letter from the Editor

"Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all his sentences short, or that he avoid all detail and treat his subjects only in outline, but that every word tell."

William Strunk Jr., *Elements of Style*

Every word of this journal does, as Mr. Strunk prescribes they should, *tell*. They tell of the hours upon hours of research, writing, and revision--evident in the well-crafted, thoughtfully researched, and innovative texts that appear beyond this page. They tell of a serious student population, a population interested in reaching beyond the five-paragraph essay, a population devoted to achieving more than the minimum requirement.

They tell of talent: talent evident throughout the *entire* undergraduate student body at Bridgewater State College, evident in a wider array of represented disciplines in these pages. They tell of a dedicated faculty who encourage, support, and nurture; mentors who have a passion for enabling academic success.

And, they tell of the enormous effort it takes to produce this journal. As always, the staff of *The Undergraduate Review* would like to thank the Adrian Tinsley Program (ATP); Dr. Dana Mohler-Faria, President of Bridgewater State College; Dr. Nancy Kleniewski, Vice President for Academic Affairs; Dr. Ron Pitt, Associate Vice President for Academic Affairs; the Bridgewater Foundation; Dr. Lee Torda, Director of the Office of Undergraduate Research; Ms. Kathy Frederick; faculty advisors; Drs. Ann Brunjes and Peter Saccocia; and the faculty readers for their time and effort in ensuring that the student contributors are recognized for their hard work.

The Undergraduate Review serves as proof that mentorship is alive on the campus of Bridgewater State College. Many thanks to the student writers and their mentors; it is only through the continuation of this relationship that this journal will thrive. The experiences, disappointments, perseverance, and aspirations that the writing in this journal embodies come with a purpose: to invoke thought and, more importantly, to tell.

I am proud to present to you the third volume of *The Undergraduate Review*.

STACY NISTENDIRK
Managing Editor

Table of Contents

COURSEWORK

FIRST YEAR WORK

HONORS THESIS

SHEA SCHOLAR PROGRAM

Faculty Advisor's Note

It is my very great pleasure to present to you Volume III of *The Undergraduate Review.* Though this is our third year producing the journal, it is a year of firsts. We have, for the first time, featured work from a Shea Scholar, Bethany Masten. And we are proud to include voices from departments – the School of Business and the Department of Criminal Justice – not previously represented in the journal. We have broadened our reach to all areas of the college and continue to pursue our objective: a true review of the mentored research and creative work done by our undergraduate students across our academic community.

Putting together a journal like this takes a tremendous amount of effort and a lot of coordination between several of the college's moving parts. Without the commitment, intelligence, organization and persistence of Stacy Nistendirk, our managing editor, this document would simply not exist. Dr. Ron Pitt, who is, technically, our boss at ATP, gave us exactly what we needed: his belief that we would get the job done and his help when we asked for it. Dr. Dana Mohler-Faria continues to provide financial and moral support, not just to this journal but to the ongoing and expanding mission of undergraduate research at Bridgewater State College. Dr. Nancy Kleniewski gives us both encouragement and resources when we want them most. And the Bridgewater State College Foundation provides crucial and reliable financial backing to all our endeavors at ATP. Thanks must go to Kathy Frederick in the OUR, who keeps us sane, relatively cheerful, and focused. Our faculty reviewers – John Mulrooney, Laura McAlinden, Michelle Cox, Charlie Angell, Arthur Lizie, Anne Murtagh, Anne Doyle, Lee Torda, Shannon Donovan, Richard Wright, John Kucich, and Jeff Williams – performed the hard work of screening submissions and recommending revisions. Finally, I cannot give enough credit and thanks to Dr. Lee Torda, whose remarkable effort in the production of the first two volumes of this journal smoothed the way for this year's issue and ensured the ongoing success of *The Undergraduate Review*.

Of course, the student writers and researchers are the heart of this journal. Thank you for pushing yourself harder than you thought you could, for asking difficult and provocative questions, and for seeing your work through to the end. Welcome to a new community of readers, writers, and scholars.

Ann Brunjes

Co-Coordinator, Adrian Tinsley Program for Undergraduate Research
Faculty Advisor to *The Undergraduate Review*
Associate Professor of English

Adrian Tinsley Program Grants

The Undergraduate Review
Vol. III

2

Human Behavior: Self-Discrepancy Reduction

Derek Drake

Abstract

The need for an overarching theory or model is discussed with integrated ideas and reasoning of past philosophers and scholars. The proposed theory of self-regulation as a discrepancy-reducing feedback loop that encompasses all aspects of psychological study is described and elaborated on with past work from Carver and Scheier and Powers. The formation of an elaborate model that accounts for all behavior is recognized as daunting though not unattainable. It is suggested that all behavior can be viewed as discrepancy-reducing; this idea could serve as the foundation for the construction of a broader and more elaborate model.

Pragmatic Psychology

"Her [pragmatism's] only test of probable truth is what works best in the way of leading us, what fits every part of life best and combines with the collectivity of experience's demands, nothing being omitted." ~ William James, 1997, p. 111

The quote above came from an American philosopher almost a century ago. In the search for truth there are many roadblocks within psychology as the subject it studies is vast in complexity and substance. Within this complexity and substance there must be something that unites it all, a principle or law that is relevant to all aspects of behavior. As the philosophical study of symbolic logic lays the foundation for basic algebraic mathematics, the American philosophical movement of pragmatism may lay out the foundation for an approach to study psychology.

In the quote above James is not talking about psychology but personal beliefs that a person lives by. But as a personal belief may guide an individual concerning the goals, values, and attitudes they might have, psychology is absent of such a belief to guide experimentation and explanations. Mathematics depends on the valid logical structure of sound arguments and premises, such as 1 = 1 or put in symbolic logic "'q' is logically equivalent to 'q'", where symbols and postulates are interchangeable. I ask then, what does psychology depend on? Is there a premise that a psychological experiment and its outcome must abide by to be labeled sound, besides the power of a statistic? If there were an error in operation performed in mathematics the outcome would be wrong. If a human behavior did not fit a psychology paradigm that would have predicted differently, the said human behavior can be dismissed as an insignificant statistic or "outlier", but

the prediction wouldn't be wrong. What would be considered by other sciences as anomalies that need attention psychology can dismiss as a misfit or error. If only 9 out of 10 objects on earth obeyed the pull of gravity, physics would be a shambles and would not rest until gravity was explained in a way that applies to all things. Why can we not expect the same from psychology, since it is a science? To do that, to hold psychology on a par with other sciences, it needs a unifying principle that psychology can use as a premise for all experimentation and explanations. The trick is where to start and here I turn to pragmatists Charles Peirce and William James.

One issue (perhaps the most important) that stands out when approaching this problem is that psychology is dealing with a very abstract mechanism, the brain. The brain, in my opinion, is the one of most mysterious of materials on earth because it is not clear how or why it works. For instance, the normal human brain has areas where activity can be regularly seen for doing routine tasks and we have named them accordingly. For instance, the occipital lobe is where visual information is processed (Garret, 2003). However, there are cases of people with hydrocephalus, a condition where the ventricles of the brain expand due to the abnormal collection of neural fluid, who have hardly any brain matter at all yet these people function and behave just as well if not better than normal people. There are yet other cases where people born with little to no brain have developed brain mass as time progressed and lived a normal successful life (Dallas, 1991). A lobotomy will demonstrate that removing mass can affect the brain most negatively, which uncovers a paradox: some people can have little brain mass and be functional but others, who have seemingly excess brain mass, have a bit removed or damaged and may become handicapped forever. Also, the recent 2002 book *The Mind & the Brain: Neuroplasticity and the Power of Mental Force* by Schwartz and Begley discusses work that has shown with owl monkeys that the cortical activity can be rewired, or rezoned, through experience to process differently than how the cerebral cortex brain was originally designed to do. Through the implications that arise from these observations between brain neuroplasticity and non-debilitating hydrocephalus, it is my opinion that psychology and medicine, through no fault of their own, simply do not at this time have the tools or technology to examine the brain with the sophistication needed to understand why or how the brain physically works. While we can pick and marvel at pieces of the brain and how it physically reacts when it gets sensory input or causes or prevents particular actions we are far from being able to predict and explain exactly how the physical brain produces behavior and takes in information. I propose then we should, for the moment, be satisfied with knowing that the brain just works. I suggest merely accepting the brain as something that works because whatever we deduce now cannot account for all the observed anomalies that occur

between different brains nor do I think we have observed all the different anomalies that can exist between human brains. To borrow Peirce's words "the true conclusion will remain true if we had no impulse to accept it, and the false would remain false, though we could not resist the tendency to believe in it" (Peirce1, 1997, p. 10). To reiterate, the mechanics of why or how the brain physically works will exist regardless whether of we discover it or not. Any premature or false belief we have now about how the brain works, no matter how sound it appears or how willing we are to accept it will still be false. A clue to whether or not a theory of how the brain works is true is given by the introduced quote above: it will explain everything observed and omit nothing. To the best of my knowledge we do not have such a theory that is accepted by all psychologists yet. What then do we do with why and how a brain works physically? For the moment, as stated before, we leave it and I intend to comfort you in doing so by giving you Peirce's response to not knowing an abstract fact such as force:

The idea which the word force excites in our minds has no other function than to affect our actions, and these actions can have no reference to force otherwise than through its effects. Consequently, if we know what the effects of force are, we are acquainted with every fact which is implied in saying that a force exists, and there is nothing more to know (Peirce2, 1997, p. 41). Likewise, if we know what the effects of the brain are then we are acquainted with every fact which is implied in saying someone has a brain, and there is nothing more to know. For the moment this will have to do because we simply cannot yet fathom how the brain physically works. Now that we can leave the brain inside our heads for the moment we are now faced with the dilemma of coming up with what is the effect of the brain? This is the job of psychology though, in my opinion, psychology does not seem to be getting the job done.

Psychology versus Chemistry

Plotnik (2002) defines psychology as the systematic, scientific study of behaviors and mental processes. Within psychology there are many approaches and Plotnik listed the approaches that were used mostly at the time he published his text: the biological approach, the cognitive approach, the psychoanalytical approach, the humanistic approach, and the cross-cultural approach. There are texts devoted to each approach concerning how one should go about observing data and how to interpret it and in this lies a terrible problem. Now, not any one approach can explain all reasons for behavior though they do a great job explaining the little parts that can influence it. To return to the definition of psychology, it is a systematic and scientific study. There appears to be nothing systematic about psychology. With the many routes of reasoning about human behavior through the different approaches it seems there is no one systematic principle

or method. If an individual's behavior would vary from the norm each psychological approach would have a different reason as to why it occurred. Each explanation may have a ring of truth to it but none of them alone is correct. There are no problems with having sub-divisions within a science, but there must be some common ground, some related premise and psychology is absent of one. It then follows that psychology struggles to be a science, as science is defined as "the organized, systematic, enterprise that gathers knowledge about the world and condenses the knowledge into testable laws and principles" (Wilson, 1998, p.53).

It is important for a moment to delve into what science means and what it needs to be in order to understand what psychology is lacking and what needs to be corrected. Edward Wilson, the author of *Consilience: The Unity of Knowledge* (1998) distinguishes science from pseudoscience through the qualities of repeatability, economy, mensuration, heuristics, and consilience. Repeatability is the ability to reproduce and test a result as to confirm or discard it by means of analysis and experimentation. Economy is the ability to abstract information into a form that is simple and aesthetic while also yielding the greatest amount of information with the least amount of effort. Mensuration is the property of being properly measured, using universally accepted scales and being able to generalize about information without making it ambiguous. Heuristics is the property of stimulating new discovery. Consilience is the survival of explanations of different phenomena based on connections and proven consistency between them (Wilson, 1998). In my opinion, psychology holds little to none of these properties. Psychology cannot yet rely on any method that can reproduce the same result from every individual. Psychology does not have a form of information that is simple and aesthetic that yields a lot of information with little effort. Psychology does have some uniform scales for measuring some personality traits, such as the "Big 5". Psychology is forever finding new avenues to explore, but not entirely due to any true understanding as throughout the field there exists bewilderment, in my opinion. Consilience is absent from psychological explanation and theory as there is always some individual that is an exception to the rule, for which the theory or explanation does not account.

Like psychology, there are many sub-divisions of chemistry: organic chemistry and inorganic chemistry to name two. Yet the discipline of chemistry, as well as physics and biology, has acquired those things necessary as prescribed by Wilson. Chemistry has two fundamental premises, two that all chemistry experimentation must follow and these are the laws of conservation of mass and energy. The law of conservation of energy is that energy cannot be either created or destroyed, and the law of conservation of mass indicates that mass cannot be either created or destroyed (*Chemical Principles*, 2005). All chemists can agree with this point and if something is observed where this law is not preserved

then there is a problem with the controlled environment or the instruments involved. Case in point: there is no unexplained variance in chemical reactions; there should not be any variance at all. If there were then great attention would be brought to it until it was reasoned out as to why it occurred. In that lies the difference between chemistry and psychology; chemists have a premise by which all experiments must abide, psychology as of now does not have any such thing.

Of course chemists have it far easier than psychologists: chemists have the luxury of knowing a reaction will occur 100% of the time no matter when it is done if all the conditions are the same; the era and culture of the human subject varies as studies go through the years. Also, chemists don't need to get the element's permission to do experiments on them; humans are a bit more sensitive when we want to pick at their brains.

Variance and Statistics

In psychological experiments there is always an observed variance that either does not follow the norm or conflicts with the experimental hypothesis. Each approach in psychology has a way of accounting for this array of behaviors that occur. The psychobiologists will look toward neural connections and brain activity, psychoanalysts will explore the unconscious and the behaviorists will look towards the environment for cues of causation. As to why these variances occur, that's where the subdivisions of psychology turn into independent factions and not a part of a whole. The behaviorists could explain a particular behavior that would also be explained in a completely different way by a biological or psychoanalytical approach. They all can't be solely correct but they can each have a degree of truth. Other than ideology, there are experimental steps to account for variability in subjects such as selecting subjects through random sampling or having a control group with which to compare the experimental group. The best tool, though, for coping with or dismissing variability is statistics. When testing their theory, any observed variance that results that does not fall into the scheme of things get tossed into the "dismissed" or "error" pile of statistics, which can be very damaging to a science when taken too far. Statistics can be very important when discovering variables or outputs that would not have been noticed before without the statistics to show either significance or descriptive direction. But when experimentation is guided only by statistics and ends with it the point of the science is gone. Instead of testing a theory, the attempt is instead trying to show anything that can occur in nature with very little value to its meaning. As Powers puts it: "Significance in [psychological] experimental results had come to mean something other than 'importance.' It now means a little triumph over nature's noise level" (Powers, p. 6). "Nature's noise level" is the vast variability between individuals; their personality, history, experiences, attitudes, physiology and chemistry (note

that there is an approach for most of the reasons for variability). As psychology is now, it is dealing with all these noises individually with no clear intention to bring it all into harmony.

What psychology needs is an approach or theory that all experimentation in all approaches contributes to. The problem that exists today is that there are many concepts and models across the sub-disciplines that overlap. This is not a novel observation as a recent publication of Dr. Staats from the University of Hawaii explored the shocking similarities between works and conclusions of past psychological research. He writes in an article: "the great commonality was overlooked, and with it the possibility of establishing a consensual, parsimonious, more understandable, and heuristic body of unified knowledge" (Staats, 1999, p. 6). Also, there may be an over-dependence on the old theories. As a new approach is needed, how do we go about creating it?

Powers

Powers wrote *Behavior: The Control of Perception* and in it he addresses this issue that psychology is facing. In it he discusses three ways of producing a theory: Abstraction, Extrapolation and Modeling. Abstraction is when an observed phenomenon is generalized to explain a broader law of nature. He uses the example of observing a rabbit eating a carrot. The rabbit will be generalized as a rodent and the carrot will be generalized as nourishment. Now we have a theory or "law" that follows that all rodents accept nourishment. It starts as an observation but turns into a verbal abstraction that goes farther away from what was observed to claiming what occurs concerning all related things. Although this seems logical and even true there is a fatal flaw in going about making rules of nature this way. For instance, some generalizations that are clearly wrong are "all birds fly" or "all mammals grow hair." Such a method would fall short of accounting for the billions of variances in any behavior observed in humans as mentioned above. Any attempt at it would be so vague that it would be meaningless, like "humans do something." Extrapolation is the generalization of masses of data and is only valid for predicting behavior en masse. Our aptitude tests and standardized tests depend on the reliability of the past predicting the future. Although this is a start for a science it isn't an end, as Powers demonstrates with his analogy of Mars. Mars can be observed to follow a curve over a period of weeks but it is wrong to assume it will forever follow that curve, even if it might for a while. Mars will stop and appear to move backwards. Those with high SAT scores are predicted to do well in college but they very well may drop out and those with low SAT scores are predicted to do poorly in college but they may very well succeed with honors. As mentioned, extrapolations are great for predicting behavior en masse but individually, they are poor predictors of an outcome. Statistics, again, is a key source here to dispel the individual difference. Another quote from Powers says it: "Statistics has

become a mainstay for psychology, to the point where it is a substitute for thought, creativity, and evaluation" (Powers, 1973, p. 12). If an experiment shows a correlation or a minute percent of error then it is a success, even if the experiment is mindless drivel. When psychology uses these extrapolations such as IQ and standardized test scores and applies them to predicting an individual's performance it may be wrong.

Model building is the third approach to forming theory and the one I wish to insist on for the psychology discipline. Powers also attempted the same in his book but it has seen little success. To echo his voice again "A model in the sense I intend is a description of subsystems within the system being studied, each having its own properties and all – interacting together according to their individual properties- being responsible for observed appearances" (Powers, p. 14). It is this approach that must be adopted by all facets of psychology to put together a system that explains all behaviors as we observe it. Powers began to suggest such a system as being a hierarchical control loop (Figure 2). It is now we turn to Carver and Scheier and recent works on the subject.

Control Loop

A hierarchical control loop is the system suggested by Powers that accounts for all observed human behavior. His idea was adopted and refined by Carver and Scheier, who came up with the self-regulative model.

Self-regulation is a term used by Carver and Scheier (1986; Scheier & Carver, 1988) to describe a motivational system that keeps an individual progressing toward a goal. As noted by Carver and Scheier, the idea has been around for a long time before they proposed it. The motivational system involves monitoring the discrepancy between a current state and an ideal state, and altering behavior to move the self closer to the desired goal. The implicit components of self-regulation, as explained by Carver and Scheier (1986), can be seen in their relationship to one another in Figure 1. The self-regulation feedback loop consists of six parts: Disturbance, Impact on environment, Input, Comparator, Reference Value, and Output. The disturbance and impact on environment constitute the context that a person is in at any moment. The input function is the process where a person monitors or checks on their present activities, qualities, or states within that context. This perception is then compared against salient reference values or standards in the comparator process. If there are any discrepancies between the individual's perception and their reference value when they are compared then action will be made to correct this, which would result in an output function exhibited as a change in behavior. This change in behavior may, in turn, change the impact on environment. This feedback system is a continuous process that repeatedly monitors how closely the

perceived outcomes of behavior match the reference value. The model's function is to minimize any discrepancies within the comparator (Carver & Scheier, 1986).

Carver and Scheier do not expect this model to replace current thought, but rather to work with many other ideas. (Carver and Scheier, 1998). There is an emphasis, though, on the necessity of goals in that "goal engagement is a necessity of life" (Carver & Scheier, 1998, p. 346). These goals are explained as being essential to the feedback loop process. What I find problematic with their discussion of the importance of goals is that these goals could just be viewed as specific reference values. Outside our basic needs such as thirst, hunger and sleep there are no specific goals that are necessary to live. That is to say, one does not need direction (such as a dream or career, aspiration, etc.) in their life to go on living. If one does exist though, it serves simply as another discrepancy in the forever reducing feedback loop. So what is necessary then, for life, or behavior in general, is a discrepancy to exist within the system of a thinking being.

I would suggest that there is no observable behavior that cannot be explained by this model. I challenge anyone to come up with an observed behavior that cannot be explained through self-regulation. To quote William James from his work *The Principle of Psychology* "A less obvious way of unifying the chaos [observable human behavior and suspected mental functions] is to seek common elements in the divers mental facts rather than a common agent behind them, and to explain them constructively by the various forms of arrangement of these elements as one explains houses by stones and bricks" (James, 1890, p. 1). I am proposing that parts of self-regulation, as shown in Figure 2, are the common elements in all observable and reportable behaviors and thoughts. Powers intended the hierarchical model to go as far as explaining how the brain controls the very hands used to type this paper. As it is not one nerve ending that controls the fluid motion of one hand it is many that influence the tendons and muscles that allow a person to manipulate their body to produce the desired effect. But, at the same time as a person uses the feedback loop to continuously stress and relax the tendons and the muscles of their hand to type they must also have a feedback loop monitoring their breathing, heart beat, and eye movements. Whatever the task is or need be a discrepancy feedback loop is a reasonable process that would describe its occurrence. As soon as the paper is done I need not type any more, thus the discrepancy would extinguished; ergo to fix it my hands would stop pushing keys. As this model does not need to be complicated to describe a single observable behavior it does need more complexity when cognitive functions and multiple actions are introduced to the equation. For instance, I'm a responsible adult, I was given a grant to write this paper, ergo I must write this paper so I must be sitting down at a computer to type the paper and be typing it to

complete the paper. It turns into a map of reasoning that guides behavior based on what we have for reference values.

What makes up reference values or determines what belongs where is a puzzle that needs to be and can be solved. The Powers model is a hierarchical model but it lacks the complexity that is needed in order to show basic human functions and to account for the multiple complex faculties that occur simultaneously. To allude to Maslow's hierarchy of needs, which consists of (from bottom up) physiological needs, safety needs, belongingness and love needs, esteem needs and self-actualization needs, it is recognized that this order is not fixed, as some starve themselves for some higher purpose like going on a hunger strike for some humane cause (Myers, (2004). Priorities can change between contexts. There are many contexts where priorities can change, such as that obedience is important around your parents but when your friends arrive the priorities shift to a desire for more rebellious action. And as priorities change there are multiple avenues where action can take place at the same time. A person can be writing a poem for an English class and as there are negative feedback loops that allow his body to control his hand movements something about the context of the poem can trigger a memory that evokes an emotion that the body then controls, changing the boy's facial expression to express the emotion while he continues to write it. There are reference values that are culturally induced, such as the dead should be mourned. There are outputs that require hormones and other chemical discharges, like adrenaline for the flight or fight response. There are also personality types that are more sensitive to particular stimuli, making an OCD patient more aware of the tidiness of their room. I propose then that a model be produced, loosely based on the self-regulation feedback control loop, that encompasses all behavior. This is not meant to be strictly for a particular approach within psychology; it is for all approaches in psychology as the model requires the input of all methods to make it work. It must also be considered that these reference values are able to change in position when viewed hierarchically, in that they depend on the condition or context a person is in, or the nature of the environment. For example, an adolescent may act in two very different ways depending on whether or not he is with his friends or with his folks. These changes in consistency were observed by James as he mentions in his work "the faculty [memory] does not exist absolutely, but works under conditions: and the quest of the conditions becomes the psychologist's most interesting task" (James, 1890, p. 3). I propose that the effect of how the environment influences the sequence and strengths of the comparators is the subject of said interesting task.

To help visualize this model we need to look at another science, biology. Biology itself is a science of many topics but these topics come together. As the chemists have their law of conservation

of energy, biologists have their first law of thermodynamics. The first law of thermodynamics states that energy can be transferred or transformed, but it cannot be created or destroyed (Campbell & Reece, 2002). With this law in mind the production of energy must be traceable since energy must come from somewhere since it cannot be created (Figure 3) and it must go somewhere since it cannot be destroyed. With the combined effort of many great minds and study a metabolic pathway chart was created that shows how metabolism occurs in the cell, let it be through photosynthesis or the Krebbs cycle (Campbell & Reece, 2002). The point is that such a chart would not be able to be if it were not for a collection of efforts from biologists who study plant cells as well as those who study animals and other organisms. Together the approaches of psychology might produce such a chart, not for metabolism, but for human behavior, including human cognition.

How Extension of the Model Needs to Start

If a model is to unify a science then the parts of the model must be accepted by the whole discipline of psychology. Going back to the self-regulation feedback loop, let's start examining the parts that cannot be denied: output, input, and environment. As all energy or mass must come from somewhere since it cannot be created, so must the mind depend on something to cause it to act and this is where environment starts to be defined. One can reason and accept that we all live in some context, though they may be different. These differences may be cultural and biological. Despite the similarities that may exist, there is a dichotomy between the environments of two people. For instance: if two men share the same room the two men do not have the same environment. Person A is in a room with Person B and Person B is in a room with Person A. Person A cannot see himself outside of his body so his experience of himself is not the same as Person B's experience of Person A. Also, Person B would not feel or be aware of the effects Person A's body is having on Person A. As Person A may be able to explain how tired he is to Person B, Person B cannot fully know how much stamina Person A has. This demonstrates that the environment does not only exist outside of our bodies but inside as well. Our hormones, chemical balances, stamina and so forth are part of our environment. This is not to separate or bind mind and body but it should be understood that people are aware of what is going on with their body and act accordingly. When our heart is beating too fast and we have shortness of breath we generally slow down and rest a bit. I am also going to propose that other things people can report, such as emotions and memories or creative ideas, are part of our environment. As emotions, memory, and creative images or ideas are popularly noted as cognitive functions it isn't far of a stretch to say that they can influence behavior. An emotion is felt, it can be described and understood by others, which can affect others and our own behavior therefore it is part of our environment. A memory can

be drawn out or played through, it can be used like a map to guide us back home or to a lost object, it can paint a picture of yesteryear to recall people and events and as these memories affect behavior can it not be reasonable to call it then part of our environment? A creative image or idea, like a memory, can spark ambition or entertain but influence behavior nevertheless, therefore is it not part of our environment if we define the environment as all that can influence behavior? A problem with psychology is that there are no entirely accepted premises but hopefully we can start now by agreeing what the environment is. The environment, for our model's purposes, is the context an individual is in. It encompasses all that can be felt and described: physical and metaphysical, internal and external. It also encompasses all that cannot be felt and described. As long as it can affect a person's behavior it is part of an individual's environment. This is the first thing that must be agreed upon by everyone in order to make the rest of the model make sense. This definition can apply to all methods of psychology, the psychoanalytical and biological, behavioral and cognitive. There is no reason to deny this definition of an environment as described. If the environment is not everything that can have an effect on behavior then what is it? Keep in mind the purpose of the model is to unify psychology and connect all approaches so that they can contribute towards and work with each other. Behaviorists use the environmental cues that guide behavior, psychoanalysts use the unconscious mind's desires and fears that guide behavior, biologists use the hormones and available anatomic bodily sensors that help guide behavior and cognitivists use the thoughts that help guide behavior. No aspect of psychology is omitted, an important and vital point.

From the environment (all that is physical, metaphysical, internal and external that can influence behavior) an individual takes in sensory input. This input in our model is what is perceived and sensed through our body and mind. Input is the sensory feed that reports what is going on with our outside world and internal body. It is a report of what is going on, from respiratory function to road conditions on the highway. A blind man will obviously not have any visual input as a deaf man would have no audio input, as there is none from their environment to collect from, but everything else that can be sensed or reported is. I cannot foresee any dispute over this claim, that this encompasses all that an individual perceives both consciously and unconsciously. Too often semantics get in the way of progress in that many terms in psychology have more than one meaning (Chalmers, 1996). When scientists argue over the meaning of "sensed" or "felt" a greater purpose is lost. The greater purpose is nt the meaning of the words but scientific study and the effect of the brain. Chemists all agree an element is a unique structure of protons and neutrons; hopefully psychologists can agree that input is all things that can be perceived and reported, both consciously and unconsciously, and the environment is what all input comes from.

Output is any observable behavior. Anything an individual or the individual's body is observed or reported to do is an output and this output has a direct effect and thus changes the environment, creating new input. This output can be a thought, memory, creative idea, movement, and speech or lack thereof as witnessed by another individual or self-reported. Output, plainly, is all observed and reported behavior and cognition. Everything we do or that our body does is done for a reason. So under the assumption that all of our behavior and cognition is a discrepancy reducing result of some comparator, the question arises, "what is the nature of these comparators?" The nature of the comparator is the big project.

The Big Project

Only a complete model that is supposed to apply all of the time and in all circumstances can really be tested by experiment. If one limits the scope of a model, failures of prediction or explanation can always be attributed to effects of what has been omitted. (Powers, 1973, p 78).

When something is omitted from a model or theory then it is bound to fall short of predicting all things. Even worse, the omitted aspects of the model may become viewed as unimportant or overlooked completely, which restricts what to do next (Powers, 1973). No one sub-discipline studies all aspects of the environment or every input a person has, nor should that be done differently. An experiment that takes every variable into consideration sounds terribly daunting. So how can this model possibly be made or used in a fashion that is useful? Going back to the metabolic pathway chart (Figure 3) it is going to be the progressive construction of many parts into a whole, looking at the many aspects and then relating them to this whole. When describing a single basic behavior the basic self-regulative model (Figure 1) could stand alone but when multiple behaviors occur at once and you look behind them as to why a particular comparator was used it falls short of explanation. To demonstrate how this may work, let's look at a topic that has had a lot of attention in research and theory: stress appraisal and coping.

Stress Coping and Appraisal

Cognitive appraisal is an evaluative process that determines why and to what extent a particular transaction or series of transactions between the person and the environment is stressful. Coping is the process through which the individual manages the demands of the person-environment relationship they have appraised as stressful and the emotions they generate (Lazarus & Folkman, 1984, p. 19).

In so many words, appraisal is the comparator that determines the discrepancy between the person and environment and coping is the output that is meant to deal with this discrepancy. The idea

that appraisal can be synonymous with a comparator goes back to the very problem with psychology mentioned before. As I describe the Lazarus and Folkman's appraisal theory I will use terms from the suggested model, to demonstrate how they can be seen as the same thing.

Lazarus and Folkman describe two types of appraisal, primary and secondary. There are three types of primary appraisal. Primary appraisal can be categorized as irrelevant, benign-positive, or stressful. Environmental input would be categorized as irrelevant if there were nothing to be lost or gained by it. Habituation to a reoccurring stimulus is such a case where the stimulus is categorized as irrelevant. This could be also that there is little to no discrepancy produced by the input. Benign-positive appraisals occur if an encounter is construed as something that will either preserve or enhance well being. This appraisal is characterized by pleasurable emotions. Guilt or anxiety can also characterize benign-positive appraisals as an individual may feel that good states must be paid for or will be followed by some misfortune. This characterization varies with personal factors and situational context (environment).

In the instance where people vary Lazarus suggests that there exist commitments and beliefs. These commitments are things that affect a person in a way that guides their behavior and how they perceive things. These commitments seem to take on a huge role and it is mentioned that these commitments can have varying depth to them. This seems like a good attempt to explain the variance in people who may appraise or cope with the same situation differently.

"By themselves, commitments and beliefs are not sufficient to explain appraisal. They work interdependently with situation factors to determine the extent to which harm/loss, threat, or challenge will be experienced." (Lazarus & Folkman, 1984, p. 81). This is a good attempt to recognize that the scope of predicting individual behavior considers many dimensions; however, exactly how to incorporate these dimensions is not described. Where this theory seems to echo off, the model I propose encompasses such dimensions. Also, to further demonstrate the problems in the science of psychology, the terms "commitments" and "beliefs" create further vocabulary and easy confusion talking about multiple things. In the interest of parsimony, Lazarus and Folkman might have used terms that link their ideas to other well-known and studied concepts or else it seems we are creating multiple words for the same thing. Such problems result in people confusing terms that are described in the same literature: "The distinction between coping and automatized response is not always clear" (Lazarus & Folkman, 1984, p. 131). I expect any two terms used in a discipline to be distinguishable.

Though the practice of using the cybernetic model of self-regulation to explain behavior has also been discussed in Matthews et al.'s *Emotional Intelligence: Science & Myth* (2002) as an explanation for occurring emotions, these authors suggest that emotions serve as reports on the functioning of the feedback system. If it is functioning well then there are positive emotions, if not, then negative emotions. As this is an attempt to link self-regulation to emotions, it raises a question: what system then is monitoring self-regulation and how does that work? Their approach raises more questions and it is my quest to reduce those questions. Instead of describing emotions as a monitor for the feedback loop, emotions themselves are a result of the feedback loop, as an output, since output is all observable behavior and it must serve to reduce some discrepancy. Then, terms such as primary appraisal are descriptive words whose purpose is to generalize the nature of the feedback loop and its outcome. An output can be a positive experience, benign-positive, or have a lack of emotion, irrelevant. Further on in the book it claims that "self control is said to be central to EI [Emotional Intelligence]… the term may refer to the overall operation of self-regulation" (Matthews et al., 2002, p. 361). To sum up appraisal and coping in terms of the discrepancy feedback loop I offer Figure 4. The appraisal is in place of the comparator, as it is doing essentially the same process, and coping is the output. While the similarities between appraisal and self-regulation are almost obvious, there are many mental processes that are not so obvious.

Describing the effect of the brain as a self-discrepancy reducer may lead to dead ends where it doesn't seem to make sense. For instance, how does imagination reduce a discrepancy? To explain the phenomenon of imagination as a discrepancy-reducing behavior let's start with the universal premises proposed thus far. The environment is the source of all things that influence behavior. If this is so then whatever we imagine is a product of things we already have in our environment. This can include experiences, images, knowledge of the world, etc. A blind man, then, cannot imagine a color if that blind man has never seen a color, much like a deaf man cannot imagine what a sound is if that deaf man has never heard a sound. If someone asked me what something was that I knew nothing of then I couldn't respond for the same reason a blind man could not imagine a color. I would have never seen it, I would have no idea how to relate it to something else, and there would be no context in which to put it. When a person imagines, then, they use everything that exists in their environment, including memories and knowledge. Problem solving involves such creativity where one needs to use what they know to create a solution. Imagination is a similar function where one creatively molds together what is in one's environment to produce something. In a sense, problem solving and imagining is the same thing. Take a child who is bored in their backyard. To solve their problem of being bored, either intellectually or physically, the child will play pretend. But this pretending will be built upon faculties and knowledge already accumulated through life. A child may imagine a monster, and granted a monster with tentacles and wings could not have been seen before but if the child had never seen tentacles or wings then this monster the child imagined could have neither. The monster is a concoction of ideas and experiences. Children can make up words, but only with the syntax and sounds they were brought up with. In a sense then, the imagination is not limitless. It is constricted to what has been experienced in an individual's environment and it is sparked when there is a discrepancy that the act of imagining can fix.

If the idea of creating an overly complex model that fits everything seems too much wishful thinking then I'd say that is fair. I insist, however, that you take with you the idea that everything in psychology is connected and that humans are, or any animal with a brain is, a self-discrepancy-reducing animal. Through this approach all behavior and cognition is included. There will always be variances in observable behavior but all behavior will have the same goal, come forth to fulfill the same purpose: to fix a discrepancy. If you can accept that, look at behavior through that light, you would be intrigued to go back to all research that has been done in psychology and see if it cannot be viewed as describing in one way or another ourselves as discrepancy-reducing beings. Pavlov's salivating dogs illustrates a form of learned response, or in other words, a learned output. Is learning then in fact the creation of new discrepancies and intelligence the efficiency of reducing the discrepancy? As it is always easier to speculate than to prove, hopefully my reasoning as presented will convince you to humor the idea if not take it entirely to heart.

References

Atkins, P. & Jones L. (2005). Chemical Principles: The Quest for Insight 3rded. New York: W. H. Freeman and Company.

Campbell, N.A., & Reece, J.B. (2002). Biology 6thed. New York: Benjamin Cummings.

Chalmers, D.J. (1996). The Conscious Mind: In Search of a Fundamental Theory. New York: Oxford University Press.

Carver, C.S., Scheier, M.F. (1986). Self and the Control of Behavior. In L. Hartman, & K. Blankstein (Eds.), Perception of Self in Emotional Disorder and Psychotherapy (pp. 5 – 35). NY: Plenum Press.

Carver, C.S., Scheier, M.F. (1998). On the Self-Regulation of Behavior. US: Cambridge University Press.

Dallas, D. (Executive Producer). (1991). Is Your Brain Really Necessary?. UK: Yorkshire Television Production.

Garret, B. (2003). Brain and Behavior. Canada: Wadsworth

James, W. (1890). The Principles of Psychology Vol. 1. New York: Dover Publications, Inc.

James, W. (1997). What Pragmatism Means. In L. Menand (ed). Pragmatism: A Reader. New York: Vintage Books. (Reprint)

Lazarus, R.S., Folkman, S. (1984). Stress, Appraisal, and Coping. New York: Springer Publishing Company.

Matthews, G., Zeidner, M., & Roberts, . R.D. (2002). Emotional Intelligence: Science and Myth. Cambridge, MA: The MIT Press.

Meyers, D.G. (2004). Psychology 7th ed. NY: Worth Publishing.

Peirce, C1. (1997). The Fixation of Belief. In L. Menand (eds). Pragmatism: A Reader. New York: Vintage Books. (Reprint)

Peirce C2. (1997) How to Make our Ideas Clear. In L. Menand (ed). Pragmatism: A Reader. New York: Vintage Books. (Reprint)

Plotnik, R. (2002). Introduction to Psychology 6thed. US: Wadsworth

Powers, W.T. (1973). Behavior: The Control of Perception. Chicago: Aldine Publishing Company.

Scheier, M.F. & Carver, C.S. (1988). A Model of Behavioral Self-Regulation: Translating intention into action. In L. Berkowitz (Ed.), Advances in Experimental Social Psychology, 21, (pp. 303-346). New York: Academic Press.

Schwartz, J.M. & Begley, S. (2002). The Mind and The Brain: Neuroplasticity and the Power of Mental Force. New York: Regan Books.

Staats, A.W. (1999). Unifying Psychology Requires New Infrastructure, Theory, Method, and a Research Agenda. Review of General Psychology, 3, 3-13.

Wilson, E.D. (1998). Consilience: The Unity of Knowledge. New York: Alfred A. Knopf

Figure 1. Discrepancy reducing feedback loop (Carver and Scheier, 1986).
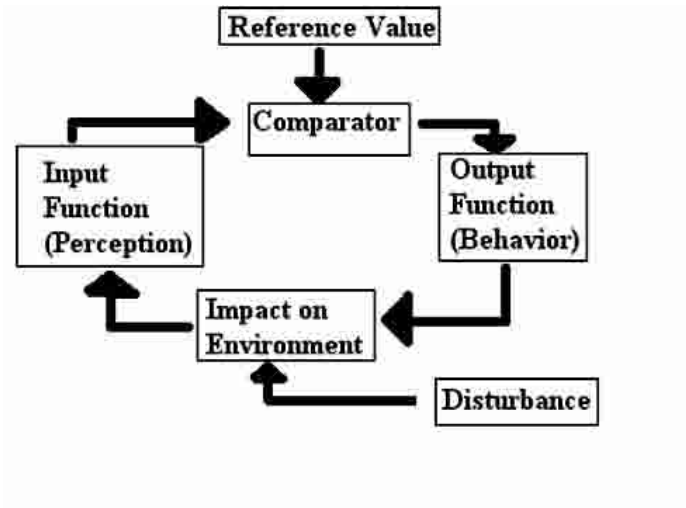
Figure 2. Hierarchical model of the discrepancy reducing feedback loop (Carver and Scheier, 1986).
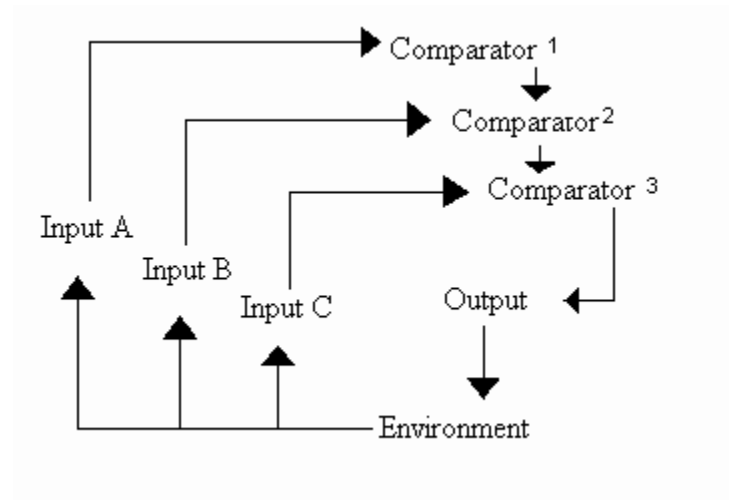
Figure 3. The metabolic pathway chart helps visualize how complex a model can be when connecting all the related parts and also that it embodies the theory of the first law of thermodynamics (Biology 6th ed., 2002).
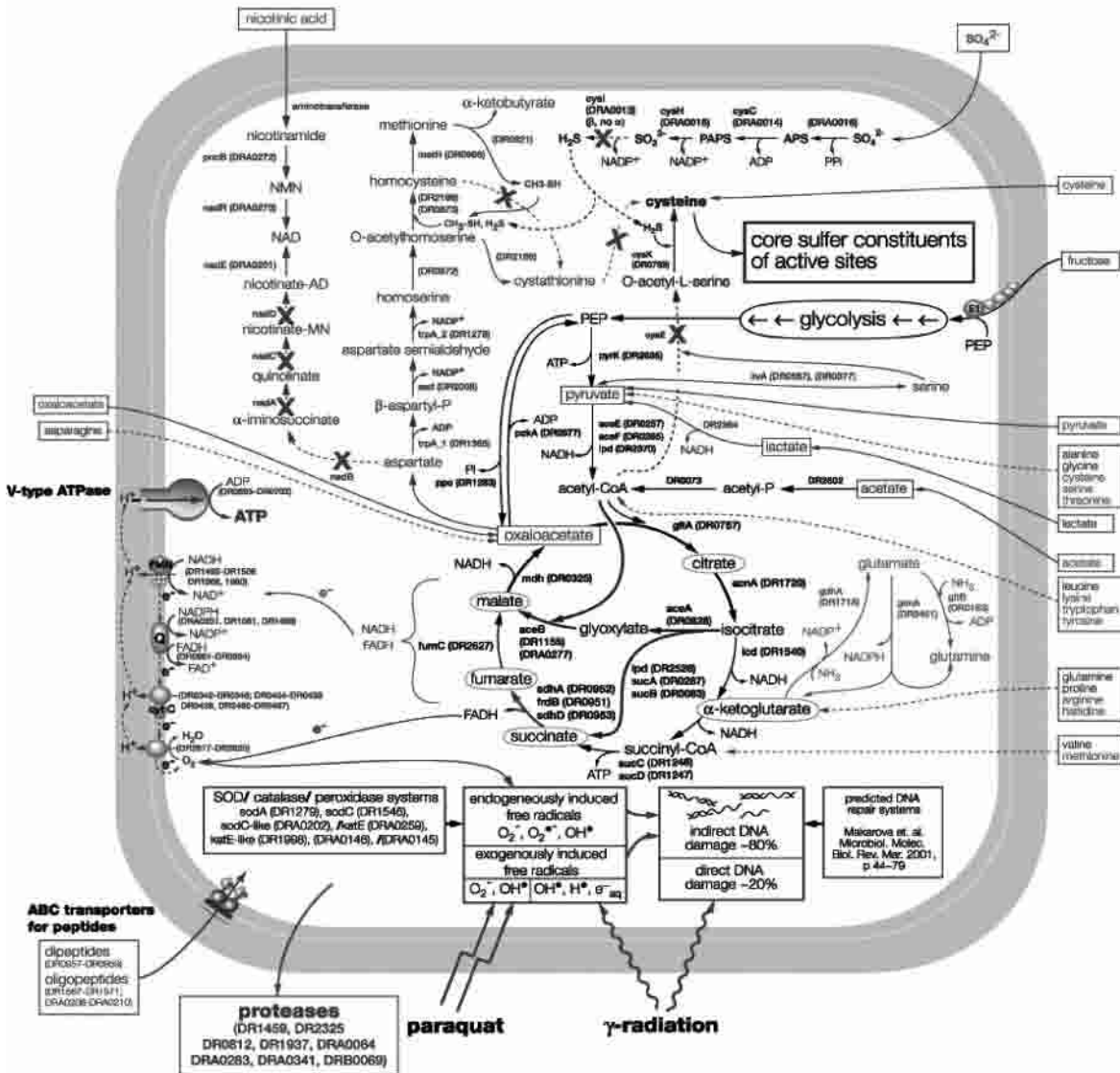
Figure 4. The function of appraisal and coping, as defined by Lazarus, can be illustrated as a form of discrepancy reduction as is shown by plugging into the discrepancy reducing feedback loop model.
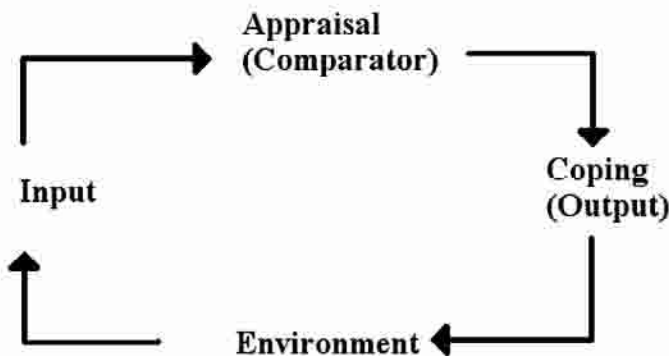
Maternal Transmission of Body Image in School-Aged Children

Carolyn Gorman

Carolyn is a senior majoring in Psychology. This piece of research began as a project funded by The Adrian Tinsley Program at Bridgewater State College this past summer under the mentorship of Dr. Teresa King. It was expanded in the fall and spring semesters as an Honors Thesis. Carolyn plans to attend graduate school to pursue a career and research in the many avenues of health psychology.

Abstract

This study examines transmission of body image attitudes from mothers to school aged children ages 6 - 8. Participants were 28 mother-child pairs from two area schools. Mothers completed assessments measuring their satisfaction with their appearance and their child's appearance. Children were interviewed individually where they chose actual and ideal figures and answered questions regarding feelings about their body. It was hypothesized that children's body image would be significantly associated with mother's body image. Results revealed that the children were fairly satisfied with their appearance. Children's body image was significantly associated with mother's satisfaction ratings of their child's appearance. Mother's body dissatisfaction was predicted by her BMI. These results should be interpreted with the awareness of limitations due to the small sample size. Future research will involve increasing participation and the investigation of body image investment.

Thoughts about our body can have a significant impact on our psychological health and overall happiness. Psychologists use the term "body image" to describe this concept. Body image is multidimensional as it involves countless aspects of human psychology (Cash & Fleming, 2001). Pruzinsky and Cash (2004) refer to it as "…a fundamental construct for understanding human functioning" and underline its role in an individual's quality of life. Our body esteem and various feelings and pathology may seem unrelated to the lay person but this relationship has been the subject of much research in the twentieth and twenty-first centuries. Paul Schilder has been credited with initiating recognition of the multidimensional nature of body image in his 1935 biopsychosocial approach (Pruzinsky & Cash, 2004). In the past fifty years alone, many discoveries and advances have been made in this field of study and body image is now examined in many contexts. Body image in children is a more recent focus and much more research is necessary.

Evaluation and investment are two main components to body image (Cash & Fleming, 2001). Evaluation refers to one's body satisfaction which is often measured by the degree of difference between a person's actual appearance and their ideal appearance (Thompson & Van Den Berg, 2004). Investment in terms of body image is the amount of importance placed on appearance

(Cash, 2004) and internalized appearance standards (Cash & Fleming, 2001). The development of attitudes that determine the evaluation, investment, and other aspects of body image had been attributed to cultural socialization, interpersonal experiences, physical characteristics, and personality attributes (Cash, 2004). A combination of these experiences and many others directs our quality of life by means of self-esteem, interpersonal confidence, and emotional stability (Cash & Fleming, 2001). All of these different aspects influencing body image result in variation from person to person. Some people (those who are not highly invested in appearance) can deal with body dissatisfaction quite well while others may be so concerned that their daily functioning is interrupted (Cash and Fleming, 2001). Such problems may turn into eating disorders, depression, body dysmorphic disorder, sexual dysfunction, and other disorders (Cash & Pruzinsky, 2002).

Research investigating young children and what influences their body image may provide insight toward the development of appropriate preventative measures and interventions. An important influence on children's body image is maternal body image attitudes. It has been noted that both parents contribute to body image development in their children, but more often it is the mother's attitudes and behaviors that make a significant difference (Kearney-Cooke, 2002). Researchers Smolak, Levine, and Schermer (1997) cited that mothers can influence their child by modeling negative body image and its associated behaviors and/or by communicating her dissatisfaction with her child's appearance. Their study found that while both boys and girls are significantly affected by parental influence, girls are affected more often and more so by mothers than fathers. They suggested that this is due to the fact that thinness has been made an important aspect of femininity in today's society and parents feel that they are doing the right thing by monitoring their daughter's weight. Researchers Lowes and Tiggemann (2003) conducted recently a study in Australia with girls and boys ages 5 to 8 and found that girls reported having more parental control over their eating habits and a greater awareness of dieting than boys. They also found that both girls and boys had a significant positive correlation between their own body dissatisfaction and that of their mothers – the effect of the fathers' dissatisfaction was not significant for either gender. This may be attributed to the common practice of mothers having more control over food preparation and clothing choices. Studies have shown that greater food restriction actually encourages unhealthy attitudes toward food and eating. They imply that parents may believe that they are keeping their children safer by monitoring what and how often their children eat, but are doing just the opposite (Lowes & Tiggemann, 2003). The actual appearance and size of a parent (mothers in particular) can also affect the standards the child will internalize. If that parent expresses dissatisfaction it is likely that the child will adopt similar attitudes (Pike & Rodin, 1991). Another perspective is that parents are not concerned enough about their children's health. According to a very recent study, parents are failing to recognize their children as overweight or at risk for overweight and therefore are unable to see the need for intervention even when their doctor has proposed it. The same study showed that of parents of children found to be overweight, only 26% were concerned about their child's weight (Eckstein, Mikhail, Ariza, Thomson, Millard, & Binns, 2006).

According to Smolak, Levine, & Schermer (1997) two pathways for maternal transmission of body image include modeling and direct communication. They found that both of these have been shown to have a significant effect on fourth and fifth grade children. Not only did the parents that are dissatisfied with their bodies model unhealthy attitudes, but they were also shown to make more direct comments about their child's weight than satisfied parents. The boys seemed to only have been effected by the direct verbal comments while girls were affected by vicarious influences (modeling) and comments. Parental concern about being fat led to daughters' developing concerns about their own weight. It should be noted that at least one study suggested that girls are not affected by their mothers' body image concerns (Byely et al, 1999). While most literature seems to disprove the latter it is obvious that more research is needed to better elucidate the factors that contribute to negative body image in children. However, family relations that were determined to be "conflictual" were also reported to have a significant effect in the development of negative body image in adolescent girls (no boys were included in this study) (Byely et al. 1999).

Body image development in children is now being researched more aggressively although most existing body image studies are centered on adolescents. The motivation to probe more deeply into preadolescent body image comes from research reporting that 31% to 46% of 9 year old girls fear becoming fat and engage in dieting and binge eating (Edlund, Halvarsson, and Sjoden, 1996) and 31% to 39% of young boys ages 8 to 12 are dieting to lose weight (McCabe, Ricciardelli, 2005). McCabe and Ricciardelli (2005) also found that not only thinness, but muscles are a concern for children as young as 5 years old, boys in particular. Research has shown that significant percentages of young children demonstrate symptoms of eating disturbance according to scores on the Children's Eating Attitude Test.

Findings like these are important because much of the research has been focused on the objectification of women in the media. However, it now appears that similar body ideals are also being applied to men. Boys scored significantly higher than girls on importance of muscle size and muscle increasing strategies. Boys also reported feeling more pressure from friends, parents

and media to increase muscles than girls. The changes that G.I. Joe has undergone in the past few decades are similar to those changes that have upset consumers about Barbie as a role model for young girls (Olivarida, 2002). Phares, Steinberg, and Thompson (2004) noted that findings showing that girls have more body dissatisfaction than boys may only be due to the fact that boys' body dissatisfaction is not captured by the same assessments that measure it in girls (2004).

Given all these recent findings there is still a "wide gap" between cultural expectations of men and women and the presentations of males and females in media (Grogan & Wainwright, 1996). Therefore, much of the findings in body image are more appropriately applied to females than males. Regardless, discoveries in both male and female body image have brought attention to a more urgent need to determine how early in development such concerns arise. While a health conscious and active childhood may set the foundation for a healthy and happy life, children are much too concerned about their bodies at young ages. For example, in a study of two groups of four girls (8 year olds and 13 year olds), both groups were interviewed in order to compare these two age groups' experiences of body dissatisfaction. Both groups expressed experiences that are a cause for concern but also seemed aware of what was acceptable and realistic. The 8 year olds described dieting as a means to thinness not health and expressed worries about being or becoming fat as did the 13 year olds (Grogan & Wainwright, 1996).

Understanding body image development is imperative to preventing negative body image and its damaging effects. There have been a number of studies on adolescents, females in particular, due to the belief that dissatisfaction comes with puberty and the natural changes that occur to the body during this time (Levine & Smolak, 2002). Recently there has been research which suggests that body image concerns begin much sooner. Preadolescent children, like the group of 8 year old girls, are already experiencing the body image concerns that older research had attributed to puberty and changes that come during adolescence (Sands, Tricker, Sherman, Armatas, & Maschette, 1996). In fact, children as young as 5 have been included in studies that have yielded significant body image concerns (McCabe & Ricciardelli, 2005). This is not surprising seeing how most children are entering kindergarten at this age and spending a good part of the day at school surrounded by peers and many types of media. Such an environment would provide a first look at social comparison and interactions like teasing and simply discussing aspects of appearance.

All of these findings that have addressed parental influence on children's body image have led to the present study. It will examine the relationship between mother's body image and their children's body image, both daughters and sons. Most studies have concluded that it is the maternal figure that has the greater effect in this area so we will not be examining paternal body image in this study. While there are many important factors in the development of body esteem the primary aim of this project is to determine whether or not mother's body image is significantly associated with their child's body image. Mother's satisfaction with their child's appearance was also examined. It was hypothesized that children of mothers with a more negative body image would have a more negative body image. It is important to investigate young boys and girls so that we might discover when and how these negative attitudes develop before more serious pathologies develop.

Methods
Participants
Participants were mother-child pairs from two area schools' first and second grade classes (n = 28). Children were from 6 to 8 years of age (M = 7.34) and mothers were from 20 to 50 years old (M = 38.5). The sample was 85.7% white, 7.1% Hispanic, and 7.1% other for mothers and 85.7% white, 10.7% black, and 3.6% Hispanic for the children. Of the 28 children there were 13 boys and 15 girls. Of the 209 families contacted to participate forty permission slips were returned. All 40 of those children were interviewed, but only 28 sets (mother-child pairs) of data were complete.

Measures
Figure Rating Scale
The FRS (Stunkard et al., 1983) was developed to measure body dissatisfaction in adults. It consists of 9 male or female figures that increase in weight and shape from very thin to obese. The subject is to pick the figures that represent their actual figure and their ideal figure. Dissatisfaction is measured by the discrepancy between the two figures chosen.
Body Esteem Scale

The BES (Franzoi & Shields, 1984) measures physical attractiveness, upper body strength, and physical condition for males and sexual attractiveness, weight concern, and physical condition for females. It is made up of 35 different body parts and functions that are rated on a Likert scale ranging from 1 ("have strong negative feelings") to 5 ("have strong positive feelings"). For the current study the BES sent home to parents was modified to 31 of the 35 original items and "height" was added.
Body Image Assessment for Children

The BIA-C (Veron-Guidry & Williamson, 1996) measures body dissatisfaction in children. The child chooses from 9 silhouettes (male for male children, female for female children) a figure that represents their actual size and one that represents their ideal

size. The discrepancy between the two choices is used to measure body dissatisfaction. In the current study the children were made aware of the fact that they could choose the same figure for both actual and ideal or two different ones to avoid suggesting that there must be a discrepancy. To measure mother's satisfaction with their child's appearance mothers also rate their perceptions of their child's actual and ideal size and shape on this scale.

Additional Assessments

In order to obtain a more comprehensive body image assessment (more than just body size) in these children a structured interview was conducted. The children chose an actual and ideal from the BIA-C figures. Next they were asked two open-ended questions, "Tell me what you like about the way you look" and "Is there anything that you don't like about the way you look?" To directly compare mother's body image assessment to child's body image assessment 16 of the original BES items were modified to accommodate the child's comprehension - for example, using "how big you are" instead of "body build." Teeth, hair, skin color, and clothing were also added to the list of items on the children's version. The children used a visual aid to demonstrate their feelings about the items. The FACES scale (Wong & Baker, 1988) was developed to measure pediatric pain. It consists of 5 cartoon-like faces with expressions representing "no hurt" to "hurts the worst." In the current study the same 5 faces were used to represent satisfaction with body parts or function on the BES on a 5-point scale ranging from "very happy" to "very unhappy." At the end of the interview they were allowed to ask the interviewer any questions that they had, thanked, and offered a sticker for their cooperation.

Procedure

Approval to conduct this study was obtained from the Bridgewater State College IRB. Permission to go into Burnell Campus School and Paul Cuffee Charter School (in Southeastern Massachusetts and Rhode Island) was obtained from the school principals and appropriate administration. Information packets were sent home to parents of all first and second grade students. One school requested that they be mailed home to parents while the rest were sent home with children from school. One school was predominantly Hispanic therefore all materials sent home to the parents were translated into Spanish by a hired translator. Materials sent home included a cover letter explaining the purpose of the study in plain language, an informed consent packet, a permission slip, three assessments, a demographics survey, and a checklist to aid the process. A reminder letter was also sent home with the children to increase participation.

All assessments (including those not sent home to parents) were modified slightly to ensure appropriateness for the current study, control for offensive language, and accommodate difficulties the children may have experienced in reading and comprehension levels. The female caretaker was instructed to fill out the enclosed assessments and questionnaires and return them anonymously by means of the prepaid envelopes provided. The children whose parents consented provided assent. They were informed what was going to happen in their interview and all assented verbally and by writing their name on an assent form. During allotted class times planned with teachers the children were interviewed for approximately 15 minutes where assessments were administered to them verbally in order to accommodate different reading levels.

Results

There was a positive correlation between the children's own body dissatisfaction and the dissatisfaction that the mothers displayed for their child's body image (r = .593, p < .05). Correlations were also conducted to examine the relationship between dissatisfaction and actual BMI (body mass index) for both mothers and children (r = .573, p < .05). Mother's dissatisfaction and mother's actual choice on the FRS significantly correlated with BMI (r = .587, p < .05). Children tended to choose the same figures on the BIA-C for their ideal figure and how they felt they actually looked (r = .593, p < .05).

Other correlations were conducted to examine the relationships between mother's dissatisfaction and child's dissatisfaction, mother's actual BMI and child's actual BMI, child's BMI and child's dissatisfaction, child's BMI and mother's dissatisfaction with child, and both mother and child's weight concern and weight concern scores. No significant relationships were found.

Discussion

The purpose of this study was to examine the transmission of body image attitudes from mother to child. Contrary to our hypothesis, mother's body image was not related to her child's body image. The small sample size should be taken into account when generalizing such results to a population considering findings that suggest otherwise in larger studies. However, mother's satisfaction with her child's appearance was significantly related to her child's body image as expected. This suggests that the transmission is not one of modeling but more direct. These results could imply that child's anxiety over body image brings the problem to the mother's attention or that mother's dissatisfaction raises awareness in the child and causes their anxiety; the direction of this relationship is unclear. Many studies suggest maternal transmission is expressed by way of direct comments or vicarious reinforcements (Smolak, Levine, & Schermer,1997). If a parent is dissatisfied with their child's appearance, this child is also likely to be dissatisfied with their own appearance. This finding is particularly interesting given the fact that the child's actual body size was not related to either the mother's ratings or

the child's ratings. This suggests that something else is at work here. One could speculate that mothers who are more invested in physical appearance are more apt to express dissatisfaction with their child's appearance. Unfortunately, investment in physical appearance was not measured. Further research is needed to better understand this relationship.

Mothers with higher BMI's reported higher dissatisfaction with their bodies. This supports the expectations of the current study. Actual BMI has been found to predict body dissatisfaction in many studies. Not only in adults, but for children obesity is a growing problem amongst all ages. With the stigma of overweight and concern or lack of concern by parents, body image disturbances may develop that actually do exist for them simply as a result of being objectively overweight (Eckstein et al., 2006). Such cases are not involved with perception or unreasonable investment because the subjects are objectively overweight. As previously mentioned, the stigma against overweight people greatly affects body image (Eckstein et al., 2006). The fact that mothers with higher BMI chose larger figures on the FRS implies that the assessment is valid and reliable. A significant relationship was also found between child's actual and ideal choices on the BIA-C. This is good news since it implies that the children are fairly satisfied with their appearance. Prevention programs could target this age group.

As mentioned, our small sample size makes it difficult to apply our results to the general population with confidence. The participation level of the parents may be due to the subject matter of the study. It has been noted that body image and its factors is not only at hot subject during current times but also a sensitive one. This is not necessarily something that could have been controlled for but more efforts and direct communication between the researchers and the parents may have elicited more participation. The length of the packets sent home may also have influenced the number of complete packets turned in. The informed consent involves technical vocabulary which is required by the local IRB guidelines. Placing it in the back of the more easily interpreted assessments and cover letters may be a way of getting the participants to read more of the material before deciding not to take part.

In addition to increasing participation, a suggestion for future research would be to look into mothers' body image orientation or investment (how important appearance is to the mother). It may not be so important how the mother feels about herself but how important appearance is to the mother. Elaborating on this and the findings of the current study could contribute to more ideas for preventative efforts.

References

Byley, L.et al. (2000). A prospective study of familial and social influences on girls' body image and dieting. International Journal of Eating Disorders, 28, 155-164.
. . . .
Cash, T.F., & Fleming, E.C. (2002). The impact of body image experiences Development of the body image quality of life inventory. International Journal of Eating Disorders, 31, 455-460.
. . . .
Cash, T.F., & Pruzinsky, T. (2002). Body Image. New York: Gilford.
. . . .
Eckstein, K.C.et al. (2006). Parents' perceptions of their child's weight and health. Pediatrics, 117, 681-690.
. . . .
Edlund, B., Halvarsson, K., & Sjoden, P. (1996). Eating behaviours, and attitudes to eating, dieting, and body image in 7-year old Swedish girls. European Eating Disorders Review, 4, 40-53.
. . . .
Grogan, S. & Wainwright, N. (1997). Growing up in the culture of slenderness: Girls' experiences of body dissatisfaction. Women's Studies International, 19, No. 6, 665-673.
. . . .
McCabe, M.P., & Ricciardelli, L.A. (2005). A longitudinal study of body image and strategies to lose weight and increase muscles among children. Applied Development Psychology, 26, 559-577.
. . . .
Sands, R., Tricker, J., Sherman, C., Armatas, C., & Maschette, W. (1996). Disordered eating patterns, body image, self-esteem, and physical activity in preadolescent children. International Journal of Eating Disorders, 21, 159166.
. . . .
Tiggemann, M., & Lowes, J. (2002). Predictors of maternal control over children's eating behaviour. Appetite, 39, 1-7.
. . . .
Tiggemann, M., & Lowes, J. (2003). Body dissatisfaction, dieting awareness and the impact of parental influence in young children. British Journal of Health Psychology, 8, 135-147.
. . . .
Smolak, L, Levine, M.P., & Schermer, F. (1999). Parental input and weight concerns among elementary school children. International Journal of Eating Disorders, 25, 263-271.

Unwired: Student Use of Technology in the Ubiquitous Computing World

Mike DeGagne

Mike DeGagne, from Chelmsford, is a senior from the School of Business pursuing a Marketing Concentration. Mike has had previous experience conducting marketing research for such companies as Dunkin Donuts, Kwik Trip and F1 Boston. This study was conceived after Mike expressed interest in the Adrian Tinsley Research Grant to Professor Robert Wolk. Together they created, designed and implemented a multi-faceted research study regarding student use of technology at Bridgewater State College. Mike plans to pursue a career in marketing research, entering into an MBA program at a private university in Boston and ultimately he hopes to become a college professor at a college or university very similar to Bridgewater State College.

Abstract:

This study examines how college students use technology in their everyday life on a campus with ubiquitous computing and communication. The primary areas of focus will include how effectively technology is being used in and out of the classroom, how the students use the technology in every facet of their lives, and how dependent these students have become on technology, all taken from the student's point of view. This study is particularly important because the campus being studied has a universal wireless network connection and a mandatory laptop program in effect for half of the current student body.

Keywords: technology, ubiquitous computing and communication, student use, student attitude, wireless, mandatory laptop requirement, online addictions, internet

Introduction

In 2003, the college where this study was conducted instituted a computer notebook program requiring all incoming freshman to purchase a laptop computer. The college's ultimate goal was for all undergraduate students to own their own laptop for use in any classroom or anywhere on campus while connected to a campus wide mandatory wireless computer network. The laptop initiative is currently half way to completion with 50% of the student body required to own a laptop. By the end of 2007, all students will possess a wireless laptop system.

The college where the research is being conducted is at a truly unique point in regard to its student body and campus. This campus is a part of a small faction of all college campuses that have a universal wireless connection throughout all areas. Furthermore, what makes this moment even more significant is that half of the current student body had a laptop purchase prerequisite in place as part of their admissions requirements. This factor creates a perfect sample to see the effects of ubiquitous technology on students with different computer devices. This sample will help highlight trends to see if students are more apt to use more diverse technological devices if they have access to certain computer devices (laptop computer, desktop computer, PDA etc). This study will also show the differences in technology use between students with or without laptop computers of their own. Finally, this study will assist in the enhancement of

the current understanding of how students are utilizing their technology both positively and negatively in the higher education environment. The information collected can be used by other medium- to large-sized universities as secondary research to aid in answering questions or issues pertaining to the use of wireless connection, laptop requirements and student use of technology in relation to their own unique campuses.

Literature Review

Currently, there is a wealth of information pertaining to the pros and cons of the adoption of laptop programs at colleges and universities throughout the United States and Canada, but information regarding the use and student opinions concerning computers and ubiquitous technology is sparse. A study conducted at Ohio State University pertaining to students' opinions of a laptop requirement on college campuses found a similar lack of information. "While some institutions have conducted in house evaluations, systematic research that describes student experience with laptop computers, particularly regarding their opinions about the value in academic and social context, is scarce" (Demb, Erickson, and Hawkins Wilding, 2004). This study focused on student opinions solely based on the quality of their experience with the school-issued laptop and did not examine its social and societal role.

A study published in the *Journal of College Student Development* found a similar lack of knowledge surrounding the effects and usage of ubiquitous technology on a college campus. The study, entitled "The Relationship Between Computer and Information Technology Use, Selected Learning and Personal Development Outcomes, and Other College Experiences", explains the current understanding: "Although research findings to date are generally promising, a substantial gap remains in our understanding of the effects of computer and information technology on student learning and other educational outcomes. For example, little evidence is available beyond student performance in individual classes to determine the effects of different forms of technology on various aspects of the college experience including the acquisition of a range of desired outcomes of college or the most efficacious design and use of these new technologies" (Kuh and Hu, 2001). This study also highlights the importance of student technology studies on individual college campuses. "Some evidence suggests that the effects of computing and information technology use may not be uniform for different types of institutions or students. Institutional affluence, student ability, socioeconomic status (SES), and accessibility and use of computing and information technology appear to be highly correlated" (Kuh and Hu, 2001). Another study, conducted at the University of Minnesota and the University of Wisconsin, examined what electronic devices students possess at several different college campuses. This study found that at least a third of the student body possesses

three or more electronic devices. This study found that "there is little variation in technology ownership by age, class year, grade point average, part time or full time status, on campus and off campus status..."(Kvavik and Caruso, 2005), but did find that male students are far more likely to own more informational electronic devices than female students. This study examined total time usage, student computer skill level, impact of skill level on preference for technology in course, need for training, and several other topics.

To begin a study of student use of technology, it is vital to define a typical student and what characteristics they possess. This definition was found in a study by Gardner and Eng (2005) entitled "What Students Want: Generation Y and the Changing Function of the Academic Library". This study explains that "the majority of college students are now part of a new generation born in or after 1982 and often labeled "Generation Y", but also sometimes referred to as the Net Generation, the Digital Generation, the Echo Boom Generation or the Millennials." (Gardner and Eng, 2005). This study expounds how Generation Y is vastly different than the generations of the past. The Millennials are thought to be unique because they are more ambitious and optimistic than Generation X, are the most ethnically diverse, and favor different values and learning styles than their predecessors. Furthermore, Millennial's stand out because they are the largest child generation in American history and are believed to be the most technologically savvy. Gardner and Eng (2005) state that Millennials share certain attributes regarding their use and expectations of technology and services. Millennials have great expectations, expect customization, are technological veterans and utilize new communication modes.

Claire Raines discusses how Millennials are a different breed of humans in her scholarly article "Managing Millennials". Raines believes there are eight key trends of the '90s and '00s (that) have had a profound effect on their (Millennials) generational personality (Raines, 2002). These trends include the shift from the latchkey kids and both working parents to a sharp and intense focus on children and family; the emphasis for rigidly structured schedules for children; the presence of multiculturalism and the world being at their figure tips. Converse to the multicultural trend and that of past recent generations, the millennials are a generation deeply effected by terrorism. Millennials witnessed the bombing and devastation of the Murrah Federal building in Oklahoma City. They watched in horror as two Columbine High School Students killed and wounded their classmates, and as school shooting became a three-year trend. Their catalyzing generational event—the one that binds them as a generation, the catastrophic moment they all witnessed during their first, most formative years—is, of course, the terrorist attacks on September 11, 2001 (Raines, 2002). From these moments of terror emerged

another key generational trend: the rebirth of heroism and patriotism. Emerging from the rubble of these cataclysmic events was the resurrection of the American hero in the form of the policeman, fireman, and mayor that were long lost since the time before the Vietnam and Watergate era.

Millennials' View on Technology in Academia

With this basic understanding of some pertinent psychographics of the millennial college student, it is important to then examine what other researchers have uncovered regarding how millennial students view technology's role in the classroom. Kvavik and Caruso (2005) investigated this topic in the study "Convenience, Communications, and Control: How Students Use technology". This study spanned 13 colleges and universities and incorporated over 4000 participants. Of those over 4000 participants, 95 percent were included in the millennial generation. This study cultivated many topics of key interest that disunite popular belief. One was the erroneous demand for greater use of technology in teaching and learning in the classroom. In actuality, what researchers found was a moderate preference for technology and mixed feelings about technology in the classroom, even from the most skilled students. Additionally, this work uncovered a false confidence in the IT intelligence and learning abilities in the millennial generation. Students appear to be slower in developing adequate skills in using information technology in support of their academic activities, which limits technology's current value (Kvavik and Caruso, 2005). The attributes of today's students are more readily observable in nonacademic contexts than in the academic setting despite having enabling technologies readily accessible in both spheres. Although this study demonstrates ambiguous student perspectives, another study on web browsing, mobile computing and academic performance depicts a correlation between the presence of laptop computers in a classroom environment for varying periods of time and the quality of the final grade. Longer browsing sessions led to decreased academic performance and the prolonged inattention to the instructor and/or in class activities (Grace-Martin and Gay, 2005). In addition, it appeared that students were utilizing their computers during class for non-academic related activities, which also adversely affected their final grades. These non-academic uses are termed social computing and are believed to be one of the primary uses of the wireless laptops during class. A possible solution introduced would boost productivity by limiting network access in certain contexts or the use of specific purpose computing devices (Grace-Martin and Gay, 2005).

Millennials' Socio-economic Status, Gender and Use

The effects of certain demographics on the use of academic technology are another possible determinant of the positive or negative outcome of IT in higher education. Many past studies have explored these phenomena in detail with varying results, but the range in the data was not influential in every study. One such study, conducted by Kuh and Hu (2004), found that students who benefit most from using C&IT (computers and information technology) are those who use it more frequently and in more advanced ways. Women and students from lower SES (socio-economic status) backgrounds use C&IT less frequently and benefit less from its usage. The effect sizes associated with these differences are trivial.

Methodology

Commencement of the study was marked by the execution of a focus group consisting of 12 college students ranging in ages of 18 to 25. Each student received payment of 20 dollars for their time and input. Participant selection was based on several simple screener questions. Any student who could pass the simple screener was given the option to be a paid participant in the focus group. The screener served as an essential safeguarding tool used to protect the focus group's validity from any hidden bias that could adversely affect the experiment's outcome. The screener excluded any student who works or has worked for the college's Information Technology Department. The focus group was conducted in the college's focus group facilities and all proceedings were recorded both on video and audiotapes. Sixteen questions were drafted for discussion several days before the scheduled date and time of the focus group, but multiple probing questions arose during the session due to participant commentary. The focus group concluded after approximately 1 hour and 45 minutes. Tapes were then reviewed several times in order to locate key topics for survey questions.

The survey was constructed with 54 multiple-choice questions derived as a product of the data originating from the 12 student focus group. It was then decided that the survey would be administered both as an online version and as a hard copy version to ensure a proper sample. The hardcopy version would be executed to summer session students in a variety of fields of study. The electronic version would be created with the assistance of the college's IT Department and sent out once through the college's student email to all registered undergraduate and graduate students. The completed electronic surveys were stored in an online database until the sampling period concluded. Before the survey could be given to any student, it was first brought before the Institutional Review Board for approval. Having satisfied the IRB's commitment to student anonymity and safety, it was approved for usage. Following total survey data collected from the hard copy and electronic versions, each individual survey was entered into SPSS software.

Research Questions

The study conducted is directly concerned with use and opinion

of computers and technology by students on this wireless campus based on several main areas:

· Time spent on the computer
· Frequency of checking/receiving/deleting email
· Types of programs used in and outside of class
· File sharing
· IT services
· How common is the use of the blog
· The role of AIM, Facebook and MySpace
· Differences between laptop users and desktop users
· Devices most commonly used with computer
· Most common academic uses
· Online addictions
· Online dating
· Gender and age differences

Research Setting and Subjects

The college is a public liberal arts college located in Massachusetts. The student body is comprised of approximately 10,000 undergraduate and graduate students and consists of 95% in-state students with a female to male ratio of about 3:2 (Figures provided by Collegeboard.com). The college is considered one of the premier colleges in regards to campus technology. Most recently, the college was ranked in the top ten most unwired colleges in 2005 (Center for Digital Education, Intel Corporation, 2005).

Sampling Strategy

The survey was administered one of two ways: hard copy and electronically. The hard copy version was administered with the permission of summer session professors ten minutes before the regularly scheduled class period. The sampling strategy for the hard copy version was based on a few different factors. The first factor concerned the level and discipline of study. To ensure a proper sample of students, the researchers were very selective about which classes they administered the survey. Students in these classes were given the option of completing the survey and had the right of refusal any time before or during the survey. For the electronic version, an email was sent to all registered students requesting they complete the survey with the opportunity of winning a fifty dollar gift certificate.

Definitions

Aim: (**A**OL **I**nstant **M**essenger) America Online's Instant Messenger service which supports text chat, photo sharing, online gaming and PC to PC voice. An AIM list of Instant Messenger participants is called a "Buddy List." PCMag (2006)

Blog: (We**BLOG**): A Web site that contains dated entries in reverse chronological order (most recent first) about a particular topic. Functioning as an online newsletter, blogs can be written by one person or a group of contributors. Entries contain commentary and links to other Web sites, and images as well as a search facility may also be included. A blog with video clip entries instead of text is a "video Weblog". PCMag (2006)

Mp3 Player: digital music player that supports the MP3 format, which was the audio format that started a revolution in online music, downloads and distribution. All portable music players support MP3 along with one or more other audio formats. CD players, whether shelf units or portable, may also play back MP3 files. PCMag (2006)

Limitations

The limitations of this study concern the environment and timeframe in which the study was conducted. First, the students involved may not be representative of other colleges and universities. This can be attributed to such things as demographics, college policies, socio-economic status, proximity and other uncontrollable variables. Second, the data collection for the study was completed during summer sessions and this could signify an abnormal sample compared to the more traditional college terms. Finally, due to the period the survey was conducted, there is virtually no representation of the incoming freshman class. This void of new students is derived from the placement of new student orientation dates and their lack of any substantial knowledge regarding their new campus's technological environment.

Key Findings

Laptop Ownership

Of the 565 survey participants, an overwhelming 97.7% reported ownership of their own computer. Of the students who reported computer ownership, 48.1% owned a laptop, 18.1% owned a desktop, and 32.4% owned a combination of both a laptop and desktop. This means that 76.5% of those students who own a computer have at least a laptop computer and 32.4% have a secondary desktop computer.

Computer Types and Grade Point Averages

From the data collected there emerges no remarkable difference in grade point averages in relation to what type of computer the student owns. There is at most a 5.1% range between the types of computer owned inside the grade point averages with no real trend regarding the computer type throughout all of the data. This suggests that although laptop computers provide more functionality and freedom, these attributes do not translate into a higher grade point average.

There is, however, a strong correlation between owning a computer and quality of the student's grade point average. Of

the students who reported a grade point average of under a 2.0, less than 80% said that they owned a computer. All other grade point averages reported that at least 98.3% of respondents owned their own computer. This is a very important trend concerning the beneficial nature of computers in higher education, but it is vitally important to find true causation of this trend. These findings do not prove that academic success is directly attributed to computer ownership but could logically be attributed to the perceived value, tendency and more frequent utilization of students who perform at a higher level academically.

Laptop Presence in the Classroom

With a vast majority of the student population having access to a laptop computer for use in the classroom setting, this study is in an excellent position to examine how students are utilizing their wireless capabilities, if at all. The data shows that nearly half of students who own a laptop or a combination of a laptop and a desktop never bring their computer to class. Furthermore, only 6.3% of laptop owners and 8.7% of combination owners reported "always" bringing their laptop to class.

Figure 1: Laptops in Class
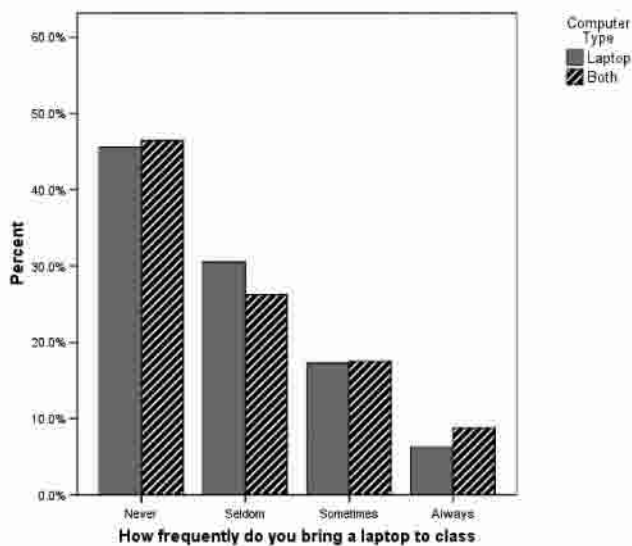
Student Use of Laptop Computer in Classroom

Note Taking: Further question of the laptop computers role in the academic environment arose with the results concerning in-class use. Of the students who expressed always bringing their laptop computer to class, 48.5% revealed always taking notes with the laptop and 27.3% said they sometimes take notes with their laptop in class. Equally as interesting are students who stated they sometimes bringing their laptops. Of these students only 2.4% reported always using their laptops to take notes, but these students articulated that 58.5% "sometimes" takes notes in class using their laptop.

Talking to Friends Online: Students were asked if they had ever have used their computer to talk to friends during class via an online communicator. Of the students who reported that they sometimes to always bring their laptop to class, 22.5% said they always talk to their friends online while in class and another 59.9% of these students said that they sometimes talked to their friends online during class.

In Class Email: Similar results were found regarding students who check and write email during class time with 35% of the students who sometimes to always bring their laptops to class reporting that they always checked and wrote email during class time. Another 62.3 % of students who sometimes to always bring their laptops to class reported sometimes checking and writing email during class time.

Other Class Work: Another question was posed regarding to whether or not students were performing work for other classes during class time with their laptops. Of the students who "sometimes" to always brought their laptop to class, 35.2% always completed other course work and 55.5% sometimes completed work for other classes.

Laptop Distraction: From the data collected from this study, it appears that the students who bring their laptops to class usually aren't using them for class-related activities which serves as a major distraction to the user, but does it stop there? One topic that the study hoped to explore was how distracting the presence of laptops in the classroom was, if at all, to surrounding students. The data from the study revealed that 47.8% of students found the presence of laptops in the classroom to be somewhat to very distracting. When this question is cross-tabulated with what gender the student is, another interesting trend occurs. It appears that females are more than twice as likely (17.6%) to report laptop computers in the classroom to be very distracting compared to males (8.9%).

Gambling and Other Online Addictions

Students were first asked if they believed that online addictions were common on their campus (see Table 1). Students could choose any one of five answers: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. 55.5% of the students surveyed agreed or strongly agreed that online addictions were common on their campus. Only 7.3 % of students disagreed to strongly disagreed with that statement, and the remaining 36.6% "neither agreed nor disagreed".

Table 1: Online Addictions

Online Addictions are common on your Campus	Frequency	Percent
Strongly Disagree	9	1.6
Disagree	32	5.7
Neither Agree Nor Disagree	204	36.1
Agree	207	36.6
Strongly Agree	107	18.9

Students were then asked to pick from a list of choices that they believed to be the most common and second most common online addiction (see Tables 2 and 3). For the most common online addiction, Facebook/MySpace topped with an astonishing 51.3%. AIM was chosen second on the list of most common addictions at 31.7%. The next question asked students what they believed to be the second most common online addiction. Similar to the first question Facebook/MySpace and AIM topped the list. AIM was the second most common online addiction with 37.2% of the overall amount followed by Facebook/MySpace with 30.1%. Music downloading appeared in the second most common online addiction question receiving 13.8%. The music-downloading variable represents the only other online addiction listed besides Facebook/MySpace and AIM to receive a double digit percentage.

Table 2 Online Addictions

Second Most Common Online Addcition	Frequency	Percent
other	18	3.2
online shopping	10	1.8
sports	6	1.1
downloading music	78	13.8
video games	30	5.3
gambling	19	3.4
Pornography	17	3
AIM	210	37.2
Facebook/MySpace	170	30.1

Table 3: Online Addictions

What are the most common online addictions?	Frequency	Percent
other	12	2.1
online shopping	2	0.4
sports	4	0.7
downloading music	26	4.6
video games	16	2.8
gambling	23	4.1
Pornography	6	1.1
AIM	179	31.7
Facebook/MySpace	290	51.3

A question regarding student use of online gambling asked each student if they had ever gambled online. 72.9% of students said that they have never gambled online, and another 19.8% admitted to gambling online but with no real money involved. Only 6.2% of the total sample disclosed gambling online for real money. Facebook/MySpace was chosen as the overall most common addiction. Several survey questions were included in our survey associated with these sites. The first question concerning Facebook/MySpace asked how often the student utilized Facebook/MySpace for academic reasons. 19.6% of students reported using Facebook/MySpace for academics somewhat frequently to very frequently.

Two other Facebook/MySpace questions were presented relevant to the social importance of these sites in regards to making and retaining friends in college and friends made during high school years. 41.9% of students agreed to strongly agreed that Facebook/MySpace is an important tool in making and retaining friends made during college. Similarly, 40% said that Facebook/MySpace was an important tool in retaining friendships previously made during high school.

A final Facebook/MySpace question was introduced asking the participant if they have ever used Facebook/MySpace to flirt with someone they were attracted to. 50.1% of students admitted to having used Facebook/MySpace to flirt with someone they were attracted to. A notable occurrence appeared when the answers to the Facebook/MySpace flirt question were cross tabulated by the venue the survey data was completed on (i.e. online version or paper version). 59.8% of students who completed the online version divulged using Facebook/MySpace to flirt with someone they were attracted to. Only 26.7% hard copy participants admitted to flirting on Facebook/MySpace. This gap between the two versions is understandable due to the number of surveys completed.

Figure 2: MySpace Flirting
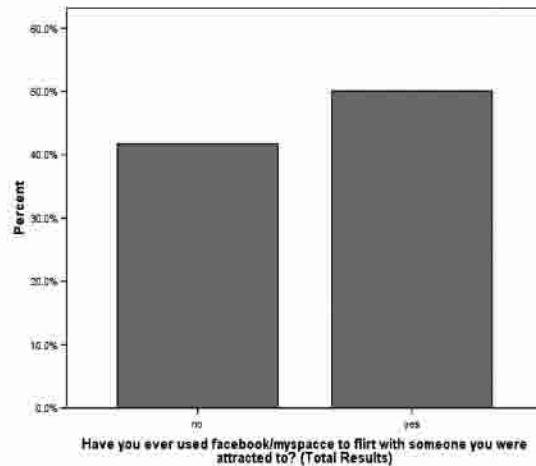
Figure 3: MySpace Flirting (Paper vs. Online Samples)
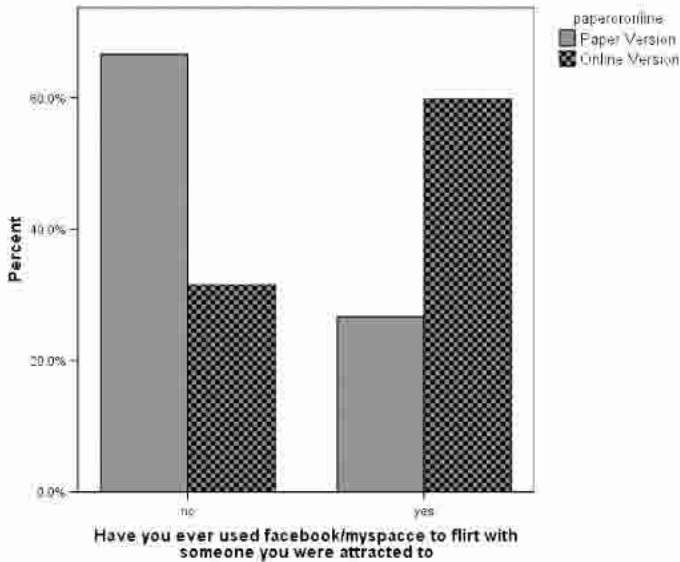
The breakdown of electronic to paper survey is as follows: 165 hardcopy surveys were completed coupled with the data from 400 electronic versions. There is a definite correlation between the people who completed the survey online on their own and their willingness to explore new technological dating media.

Computer Labs

A new trend in IT in higher education institutions is a focus on universal wireless laptop computing and a downsizing of traditional open access computer labs located throughout the campus. Students were asked if they believed that computer labs were vital assets to the campus (see Table 4), and the response was an over whelming. 84.1% of the total sampled population said they agreed to strongly agreed with the statement "computer labs are a vital asset to the campus". Further break down of this figure shows that 84.4% of students who own laptops agreed to strongly agreed with this statement. 91.1% of students who own desktops agreed to strongly agreed with that statement and 82.8% of students who own both a laptop and a desktop agreed to strongly agreed. Only 3.4% of the total sample disagreed to strongly disagreed with the statement regarding computer labs.
Table 4: Computer Labs

Computer labs are a vital asset to a campus	Frequency	Percent
Strongly Disagree	4	0.7
Disagree	15	2.7
Neither Agree Nor Disagree	63	11.2
Agree	153	27.1
Strongly Agree	322	57

IT Satisfaction and Obstacles

Students were asked several questions regarding their satisfaction and the perceived benefits of owning and utilizing a computer in the educational environment. The first question that appeared pertaining to this area asked the student if they felt their computer has had a positive influence on their academic performance. 84.5% of the total sample agreed to strongly agreed that owning a computer has had a positive influence on their academic performance. When this data was further examined by what type of computer they owned and their opinion on positive academic success, all three segments (laptop, desktop, both) reported they agreed to strongly agreed within a difference of 4.5% points of each total. This shows that the type of computer owned does not necessarily affect a student's perceived academic value.

Another question was posed referring to their satisfaction of their campus internet connection. 74.9% reported being satisfied to very satisfied with their online connection, and only 15.6% reported being dissatisfied to very dissatisfied with the campus internet connection. The question was then cross tabulated by where the student lived (on campus, off campus apartment or off campus at family home). This produced an interesting tendency in the student opinion. Students who lived on campus showed the highest percentage of satisfaction with 81.8% satisfied to very satisfied with their campus internet connection. Students who lived in an off-campus apartment showed the least level of satisfaction with only 66.7% reporting being satisfied to very satisfied with their campus internet connection. This data appears to show that students who have the most access to the campus connection also have highest levels of satisfaction.

Which of the following is your largest problem regarding your use of technology	Frequency	
Insufficient technical assistance provided by college	24	4.2
Slow or insufficient network access	136	24.1
Viruses, spy ware, worms etc	174	30.8
Your own skill level regarding the use and concepts of computers	76	13.5
Age of computers and software	45	8
Lack of access to printing	102	18.1

In the survey, the students' largest problems related to using technology was also explored. Students were asked what general area they felt their largest problems regarding their use of technology fell. 30.8% reported viruses, spy ware and worms being their largest problem; 24.1% reported slow or insufficient internet access; 18.1% reported lack of access of printing and 13.5% reported their own skill level regarding technology was their largest problem (see table 5).
Table 5: Technology Problems

Device Ownership

Students were asked several questions about what types of devices they owned. These devices include an Ipod/Mp3 Player, Digital camera, PDA, and devices featuring GPS capabilities. The results of these questions are as follows: 59.8% of students reported owning an Ipod/Mp3 Player; 72% reported owning a digital camera, 13.3% own a PDA and 23% own devices with GPS capabilities. Notably, students who owned laptop computers were also about 20% more likely to own an Ipod/MP3 player than those students who own a desktop computer only.

Cell Phones and Ipod/Mp3 Player Dependence

Students were questioned on their use and dependence on 2 electronic devices: cell phones and Ipod/Mp3 players. These questions were designed to gauge the extent students depend on these devices in their daily lives. When asked the extent to which they agreed with the statement that they never go anywhere without their cell phone, 87.6% of students agreed to strongly agreed that they never go anywhere without their cell phones. Only 5.5% said that they disagreed to strongly disagreed with that statement. A similar question was posed asking if students agreed with this statement regarding cell phones: "I couldn't live without my cell phone." 58.9% of students agreed to strongly agreed that they could not live without their cell phone and only 19.7% disagreed to strongly disagreed with this statement. When these two cell phone questions were cross tabulated with genders, very unique trends in the results appeared. Women were almost twice as likely to answer that they strongly agree that they couldn't live without their cell phone. Women answered strongly agree 36.9% overall that they couldn't live without their cell phone while only 19.3% of males responded strongly agree. This shows that women have grown more dependent on cellular phones as a communication device.

A complementary set of questions were introduced in regard to Ipods/Mp3 Players. The first question requested students choose how much they agreed with the following statement: I never go anywhere without my Ipod/Mp3 player. Only 14.4% agreed to strongly agreed with this statement with the majority stating they disagreed to strongly disagreed with a total of 54.5% of the total response. Similar results were found when asked how much they agree with the following statement: I couldn't live without my Ipod/ Mp3 Player. Only 11.7% agreed to strongly agreed with that statement. Once again the majority of students disagreed to strongly disagreed with this statement receiving 61.9% of the total response.

Gender Differences

Certain questions were designed to view if the student population felt that gender affected technology use. A question asked the respondent if they believed that males were more technologically savvy than women. 20.8% of the respondents agreed or strongly agreed with that statement and conversely 47.8% disagreed to strongly disagreed with the idea that men were more technologically savvy than women. When these results were cross tabulated with the gender of the respondent, it became clear that men believe they are more technologically capable than women with 41.6% of male respondents agreeing or strongly agreed to the belief that males were more technologically savvy than women and only 16.7% disagreed to strong disagreed with this statement. On the other hand, only 13.4% of women agreed or strongly agreed that their gender was less technologically savvy than the other, while 59% of females disagreed to strongly disagreed with this statement.

A second question was asked regarding gender technology differences. This particular question pertained to the differences in technology use by gender. The question was phrased as follows: "Men utilize technology differently than women." This question was purposely posed in a vague and simplistic fashion in order to encompass the broad and personal definition of what technology circumscribes to each respondent. 53.2% of respondents agreed to strongly agreed with the idea that men utilize technology differently. Only 18% stated that they disagreed to strongly disagreed with the statement. Upon cross tabulation of the results by gender, it became clear that over 20% more males believed that men utilize technology differently than women. 70.4% of males agreed to strongly agreed with the statement while only 48.1% of females agreed to strongly agreed.

News: A question was added to the survey in regard to how students receive their news. Our data appears to show a difference in the way that men and women receive their news information. 37.4 % of men reported receiving their news through online sources, which was the most common response. The second most common male news source response was television with 33.3%. Female respondents instead chose television as their first choice with 49% followed by online news sources with 21.6%. This data may represent the male gender's willingness to explore less traditional settings to receive their news and information.

Online Sports Scores and Stats: A question was incorporated into the study pertaining to the frequency in which students checked and monitored sports scores and stats. In this area a gap between genders can clearly be seen. Males reported 55.5% check sports scores somewhat frequently to very frequently online, compared to 18.9% female respondents. Conversely, 58.1% of females said that they never check sports scores online contrasted to only 21.2% of men who reported never checking sport scores online.

Gambling: Similar to the results found related to online sport scores and statistics, online gambling seems to be mainly concerned

with males. When comparing the frequency of gambling by gender, one should focus on the male gender. 17.7% of males admitted to gambling for money online and another 25.2% said that they have gambled online with no money involved. Only 2.2% of female respondents gambled for money, and 18% of females professed online gambling with no money involved.

Conclusion

The results of this study signify an urgent need for improvement of information technology in higher education. In regards to education, students are utilizing technology for all of the wrong reasons. With only a fraction of students bringing their laptops to class and consistently using them for non-academic reasons, it begins to question the validity of the felt need for a laptop requirement in higher education institutions. In addition, new areas of addictions have appeared with unprecedented momentum. Three need-based recommendations can be derived from reviewing the data collected: the need for control, the need for proper and frequent academic use, and the need for better understanding of student use of technology with an emphasis on the role of multi-tasking.

From what can be inferred from the data, students are utilizing their computers and other technology, both inside and outside the classroom, for mainly non-academic purposes. This signifies a desperate need for administrative control and understanding of how their students are using technology in educational and social spheres. Further research is needed to explore what the current and most effective policies and procedures are to ensure proper academic and social use. It will be important to explore how willing and often faculty members utilize control options in their classroom environments, where already available.

This study highlights an alarmingly low level of student usage of laptop computers in the classroom. What makes this situation even more pertinent to IT is that this study was conducted on a campus with a laptop requirement in place with a universal wireless connection. This signifies the need for proper and frequent academic use which translates to the need for further research regarding faculty willingness to require or recommend laptop use in class and the students' willingness to utilize their laptops in a class environment.

The data collected demonstrates very powerful signs that the current understanding of student use of technology has become, in many ways, obsolete. If students are using technology for innumerable non-academic reasons, than one could assume that overall student grade point averages would suffer, but this has not been the case. In fact, IT has improved grade point averages significantly. So the question arises: how are students performing better academically while spending substantially less time (both

in and outside of class) on academics? This may be attributed to the Millennials' ability to multi-task in ways never before used by past generations due to constant exposure to technological forces.

In summary, research on information technology usage in institutions of higher education remains important for educators and researchers. Studies like this one serve as invaluable assets to college and university IT departments. IT departments can recognize trends highlighted by research to better serve the student body's information technology needs and distinguish patterns in usage and other areas. "The analysis of quantitative and qualitative data can be used to help develop a profile of a world-class undergraduate IT experience" (Kvavik and Caruso, 2005).

References

Carlson, Scott. (2001) "Researchers Conclude That Wireless Technology is a Double Edged Sword." The Chronicle of Higher Education : 1-5.
. . . .

Demb, Ada; Darlene Erickson and Shane Hawkins Wilding (2004) "The Laptop Alternative: Student Reactions and Strategic Implications." Elsevier 43. 383-401.
. . . .

Efaw, James, Scott Hampton, Silas Martinez and Scott Smith (2004)"Miracle or Menace: Teaching and Learning with Laptop Computers in the Classroom." Educause Quarterly 3 (2004).
. . . .

Furneaux, (2004) Craig "How Does Information Technology Impact the Methods, Potential and Purpose of Education." ETL Conference (2004).
. . . .

Gardner, Susan, Susan Eng (2005) "What Students Want: Generation Y and the Changing Function of the Academic Library." Libraries and the Academy 5.3 (2005): 405-420.
. . . .

Grace-Martin, Michael, Geri Gay (2006) "Web Browsing, Mobile Computing and Academic Performance." (). Retrieved 7 Jun. 2006 from http://ifets.ieee.org/periodical/vol_3_2001/grace_martin.html
. . . .

Havelka, Douglas (2003) "Students Beliefs and Attitudes Toward Information Technology."Information Systems Educators Journal 2434. (2003): 1-4.
. . . .

Kim, Kyung-Sun, Joi L Moore (2006) "Web-based Learning: factors Affecting Students' Satisfaction and Learning experience." First Monday 10 (2005). 5 Jul. 2006. <http://firstmonday.org/issue10_11/kim/index>.
. . . .

Kuh, George D, Shouping Hu (2001) "The relationships between computer and information technology use, selected learning and personal development and other college experiences ." Journal of College Student Development 42/3 (2001).
. . . .

Kvavik, Edward B, Judith B. Caruso (2005) "ECAR Study of Students and Information Technology, 2005: Convenience, Connection, Control and Learning." Educause 6 (2005). 5 Jul. 2006. <http://educause.edu>.
. . . .

McQueen, Tena f, Robert A. Fleck Jr. (2006) "Changing Patterns of Internet Usage and Challenges at Colleges and Universities." First Monday 9 (2004). 5 Jul. 2006. <http://firstmonday.org/issues/issue9_12/mcqueen/index.html>.
. . . .

Raines, Claire (2002) "Managing Millennials." Connecting Generations: The Sourcebook (2002). 5 Jul. 2006. <http://www.generationsatwork.com/articles/millenials.htm>.
. . . .

Rumbough, Timothy B. (2006)"Controversial Uses of the Internet by College Students." Educause. 5 Jul. 2006. http://www.educause.edu/ir/library/pdf/CSD1618.pdf.>.
. . . .

Sperling, Bert Most Unwired College Campuses. 2006. Online. 5 Jul 2006. <http://www.usnews.com/usnews/edu/elearning/lists/unwired_list.htm>.
. . . .

"Definitions." Provided by PCMag.com & Wikipedia. Vers. 2006. 5 Jul 2006. Keyword: Encyclopedia.

Hydromination of Alkynes, Enynes, and Dienes Using Titanium Catalysts

Taryn Palluccio

Taryn Palluccio, from Weymouth, is a senior majoring in chemistry. This project began as volunteer work last year and continued in the summer of 2006 as an Adrian Tinsley Program Summer Grant Project. She and her mentor, Dr. Stephen Waratuke, will continue this work in upcoming semesters and they will present this project at an American Chemical Society conference in Chicago in March 2007. Taryn plans to go on to graduate school.

Abstract

Hydroamination reactions involve the addition of an amine to an alkene or alkyne and are often performed in the presence of a catalyst. The nature of the catalyst can control the selectivity and efficiency of these reactions. A range of catalytic methods exist for achieving hydroaminations. These include late transition metals and even organic catalysts.a Early transition metals, including titanium and zirconium, are known to be very active compounds to catalyze organic reactions.b As compared with previously successful organometallic catalysts, titanium is less expensive, less toxic, and widely available.

Amines are of much importance due to the many uses of these compounds. They are present in vitamins, medicines, and proteins, and are utilized by the pharmaceutical, agricultural, and textile industries. Synthesis of certain amines can often be difficult, time consuming, and costly. A more efficient and reliable method for creating such compounds would benefit the scientific community.c Learning about the reaction mechanisms and catalytic cycle involved in hydroamination can open doors for new chemistry endeavors. The design of new ligands on the catalysts can further improve syntheses and add to the understanding that scientists have about this type of chemistry.

In recent years it has been increasingly significant to synthesize organic molecules, such as amines, in a stereo and regio- specific manner. This means that only one out of several possible products is selectively made. These products often have very different chemical reactivity and pharmacological properties. The winners of the 2005 Nobel Prize in chemistry were awarded for their efforts in this field.d

Results and Discussion

Catalytic Work

Two titanium aryl oxide catalysts have been synthesized according to literature procedures and used in hydroamination reactions. The aryl oxide type catalysts can be made in high yields by treating a toluene solution of the respective phenol with 0.5 equivalents of Ti(IV)Cl4. The mixture is allowed to stir for 24 hours followed by removal of the toluene solvent by vacuum. The catalysts are moisture sensitive and thus require the use of dry atmosphere techniques.

The structure and geometry of the catalyst are significant in determining its reactivity; the bulky aromatic ligands provide electronic stability for the titanium center and sterically, they create a pocket at the chlorine atoms which is the active sight for catalysis.

These pre-catalyst species are activated with 2 equivalents of n-butyl lithium. Both chloride ligands get replaced by butanes and reductive elimination forms an unstable titanacyclopropane intermediate. When the amine is added, the ring comes apart and forms a titanium bisamido species which converts to a 16 electron imido complex. This complex is thought to be essential for the hydroamination reaction (Scheme 1).
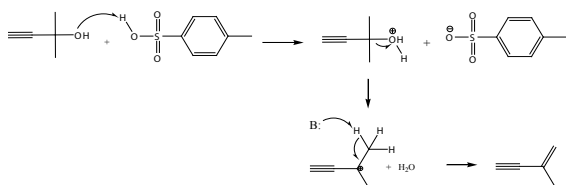
Scheme 1
Enyne Synthesis
2-methyl-1-buten-3-yne was synthesized according to the literature. The first step involves protonation of the hydroxyl group of 2-methyl 3-butyn-2-ol to make it a better leaving group. This is followed by an E1 reaction where H_2O leaves and a stable tertiary carbocation is formed; a base in solution abstracts a β-hydrogen atom and the lone pair of electrons moves down to form the alkene bond (Scheme 2). My findings were consistent with the literature.
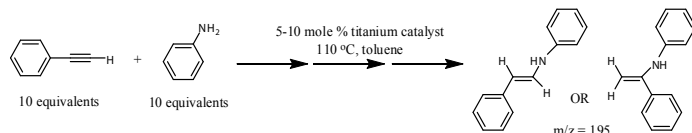
Scheme 2
The Hydroamination Reactions
My initial work focused on optimization of alkyne and enyne hydroamination reactions. Variations have been incorporated such as reaction temperature, reagent addition order, and catalyst selection. An example of the standard hydroamination is given below (Scheme 3). Based on the success of the hydroaminations of phenylacetylene and 1- ethynylcyclohexene with aniline, I extended my focus to 2-methyl-1-buten-3-yne as a potential hydroamination substrate, which was not successful. These reactions were monitored using gas chromatography. The product retention times occur at approximately 19 minutes and appear over time as the starting materials are consumed.
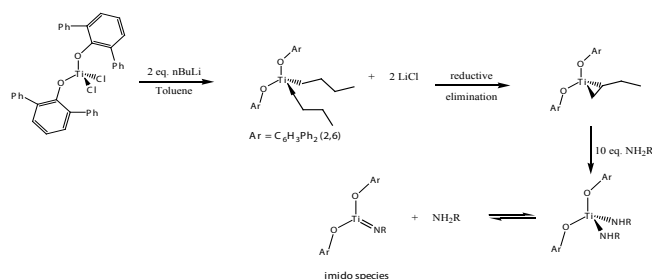
Scheme 3
Catalytic Reactions with 1, 3- cyclohexadiene

The dimerization of 1, 3- cyclohexadiene using $Ti(OC_6H_3Ph_2-2,6)_2$ as catalyst occurs quickly at room temperature (Scheme 4). This reaction was monitored by gas chromatography; samples were taken at reaction start, 1.5 hours, and 3 hours. The data shows complete consumption of the diene starting material and the presumed product peak after only 1.5 hours. The product peak has a retention time of approximately 14 minutes.
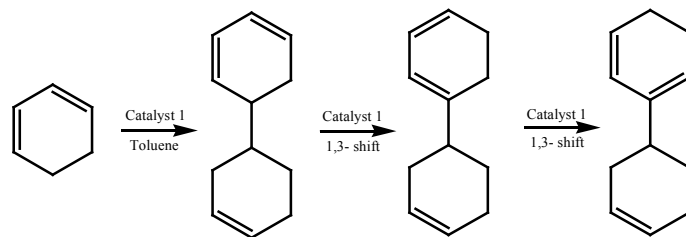
Scheme 4
A related effort in the laboratory is to probe the relationship between previously observed diene dimerization reactions and potential diene hydroamination reactions. I have begun to explore diene hydroaminations using aryl oxide titanium catalysts. I hope to better understand how subtle changes in the reaction conditions and catalyst might enable a change from no observable reaction to predominantly diene dimerization or to the novel titanium catalyzed diene hydroamination.

Investigation into the hydroamination of 1, 3-cyclohexadiene with aniline reveals no formation of hydroamination products and barely any formation of dimerization products when aniline is added prior to the diene. We observe that these reactions do not compete and we are currently interested in the nature of the presumed inactive metallacycle species.

Conclusions
The hydroaminations of phenylacetylene and 1-ethynylcyclohexene and the dimerization of 1, 3-cyclohexadiene have been optimized. The hydroamination of 2-methyl-1-buten-3-yne was not as

successful. Due to its extreme volatility, 2-methyl-1-buten-3-yne must be purified and used immediately upon synthesis. I will investigate the use of other enyne substrates and introduce other amine compounds. Isolation of the pure amine and imine products is ongoing. Several techniques were explored but to no avail. Although the literature procedure was followed, I did not have success with the methodology and intend to re-visit this work. Mass spectroscopy will be available in the near future for product characterization.

A promising area of this research is incorporating ligand variations on titanium. I have successfully synthesized and utilized two titanium aryl oxide catalysts. I intend to investigate the use of a third titanium metallacycle species which can be activated without n-butyl lithium. This species, if successful, will eliminate any role that n-butyl lithium may have on the hydroamination reaction. Insight from this work will allow me to further explore the use of titanium catalysts to hydroaminate alkene and diene compounds.

Experimental

General Methods: All reactions were performed under an argon atmosphere using an MBraun dry box or a dual manifold vacuum/ inert gas line. Phenylacetylene, 1-ethynylcyclohexene, and 1, 3-cyclohexadiene were purchased from commercial sources and were flushed with argon and stored over molecular sieves prior to use. Aniline and toluene were distilled under argon and stored over molecular sieves before use. Titanium (IV) chloride was purchased as a 1.0 M solution in toluene and n-butyl lithium as a 1.6 M solution in hexanes. The titanium catalysts and 2-methyl-1-buten-3-yne were synthesized according to literature procedures. All hydroamination reactions were monitored by gas chromatography on a Hewlett-Packard 6890 Series gas chromatograph using mesitylene as an internal standard. ^{1}H NMR and ^{13}C NMR were recorded on a JEOL ECX 400 MHz spectrometer.

Synthesis of 2-methyl-1-buten-3-yne: Acetic anhydride (44.43 ml, 0.47 mol), p-toluenesulfonic acid monohydrate (3.2 g, 0.017 mol), and a stir bar were added to a 100 ml round bottom flask. The reaction mixture was stirred and cooled in an ice bath followed by slow addition of 3-methyl-1-butyn-2-ol (27.4 ml, 0.28 mol). The initial colorless mixture turns green; it is stirred for several hours and allowed to warm to room temperature. The volatile enyne is distilled from the reaction mixture and shaken with 15 ml of a cold NaOH solution. The organic layer is collected and dried over MgSO$_4$. Short path distillation was performed to afford the pure enyne (colorless oil, 16.1 %, 2.98 g, b.p. 32°C). ^{1}H NMR (400 MHz, CDCl$_3$): δ = 5.394 (1 H, d), 5.301 (1 H, d), 2.876 (1 H, s), 1.908 (3 H, s). ^{13}C NMR (CDCl$_3$): δ = 125.97, 123.55, 84.97, 76.2, 23.3.

Synthesis of Ti(OC$_6$H$_3$Ph$_2$-2,6)$_2$Cl$_2$: In the dry box, a 100 ml Schlenk flask was loaded with 2,6- diphenylphenol (2.5 g, 10.15 mmol), toluene (15 ml), and a stir bar. The flask was sealed, removed from the dry box, and attached to an argon line. TiCl$_4$ (5.075 ml, 5.075 mmol) was syringed into the flask, which turns the mixture a deep red color. The mixture was stirred under argon for 24 hours followed by evacuation of the toluene solvent. The product was a dark red crystalline solid obtained in a 98.6% yield (3.05 g).

Synthesis of Ti(OC$_6$HPh$_4$-2,3,5,6)$_2$Cl$_2$: In the dry box, a 100 ml Schlenk flask was loaded with 2,3,5,6- tetraphenylphenol (0.558 g, 1.4 mmol), toluene (10 ml), and a stir bar. The flask was sealed, removed from the dry box, and attached to an argon line. TiCl$_4$ (0.70 ml, 0.7 mmol) was syringed into the flask, which turns the mixture a deep red color. The mixture was stirred under argon for 24 hours followed by evacuation of the toluene solvent. The product was a red-orange solid obtained in a 104% yield (0.666 g). The excess yield is likely due to unreacted phenol starting material.

Procedure for the Dimerization Reaction of 1, 3-cyclohexadiene: In a 20 ml reaction vial Ti(OC$_6$H$_3$Ph$_2$-2,6)$_2$Cl$_2$ (0.15 g, 0.246 mmol) was dissolved in 5 ml toluene. 2.1 equivalents of n- butyl lithium (0.323 ml, 0.517 mmol) were added to activate the catalyst which turns the initial red solution to black. After waiting two minutes, 50 equivalents of 1, 3-cyclohexadiene (1.174 ml, 12.3 mmol) were added to the vial. The vial was capped and allowed to stir at room temperature in the dry box. Samples were taken at reaction start, 1.5 hours, and 3 hours. Reaction progress was monitored by gas chromatography.

General Procedure for Hydroamination Reactions: Either aryl oxide catalyst (1 mmol) is dissolved in toluene (10-15 ml) and activated with 2 equivalents of n-butyl lithium. A solution of the alkyne or enyne (10 mmol), aniline (10 mmol), and mesitylene (5 mmol) was added to the activated catalyst. The reaction mixtures were stirred in a 110°C oil bath for 24 hours. The reactions were sampled at reaction start and end time and injected into the GC for analysis.

Isolation Techniques: Most of the crude hydroamination reactions were followed up with reduction of the imine species by sodium cyanoborohydride to yield the amine product. This is a standard method from the literature, but still requires refinement of the techniques. TLC was performed on these mixtures with various solvent mixtures including hexanes, methylene chloride, and ethyl acetate. Analysis of TLC bands by GC showed components in the retention time range of the products. The remaining reactions were filtered through silica gel and distilled under reduced pressure in an attempt to isolate the imine species initially formed in the catalytic reactions.

Endnotes

a
a) T.E. Muller, M. Beller; Chem. Rev. 1998, 98, 675. b) F.J. Sardina, H. Rapoport; Chem. Rev. 1996, 96, 1825. c) H.U. Blaser; Chem. Rev. 1992, 92, 935. d) J. Louie, M.S. Driver, B.C. Hamann, J.F. Hartwig; J. Org. Chem. 1997, 62, 1268. e) L.S. Hegedus, B.M. in Trost, I. Fleming; Compr. Org. Synth. 1991, 4, 551. f) C.G. Harthung, A. Tillack, H. Trauthwein, M. Beller; J. Org. Chem. 2001, 66, 6339

. . . .

b
a) P.J. Walsh, A.M. Barranger, , R.G. Bergman; J. Am. Chem. Soc. 1992, 114, 1708. b) . b) Haak, E.; Bytsohkov, I.; S. Doye; Angew. Chemie. Int. Ed. 1999, 38, 22, 3389. c) C. Lorber, R. Choukroun, L. Vendier; Organomet. 2004, 23, 1845. d) J.S. Johnson; R.G. Bergman; J. Am. Chem. Soc. 2001, 123, 2923. e) C. Cao, Y. Shi, A.L. Odom; J.Am. Chem. Soc. 2003, 125, 2880. f) Y. Shi, C. Cao, A.L. Odom; Inorg. Chem. 2004, 43, 1, 275. g) Y. Li, Y. Shi, A.L. Odom; J. Am. Chem. Soc. 2004, 126, 1794

. . . .

c
a) S. A. Lawrence; Amines: Synthesis, Properties and Applications. Cambridge University Press, Cambridge, UK 2004, (0-521-78284-8). b) A. Ricci; Modern Amination Methods. Wiley-VCH, Weinheim, 2000, (3-527-29976-9)

. . . .

d
a) Chemical & Engineering News: Cover story – Olefin Metathesis, December 23, 2002, Vol. 80, Num. 51. b) K. C. Nicolaou, S. A. Snyder; Classics in Total Synthesis II, VHC, Weinheim, 2003. c) W.S. Knowles and M.J. Sabacky, Chem. Commun., 1445 (1968). d) Miyashita, A. Yasuda, H. Takaya, K. Toriumi, T. Ito, T. Souchi and R. Noyori, J.Am.Chem. Soc. 102, 7932 (1980). e) T. Katsuki and K.B. Sharpless, J. Am. Chem. Soc. 102, 5974 (1980).

Intimacy and Face-to-Face versus Computer Interaction

Emily Snow

Emily Snow, from East Bridgewater, is a senior majoring in psychology. This project began as an honors thesis in the spring of 2006, under Dr. Michael Murtagh's direction, and continued in the summer of 2006 as an Adrian Tinsley Program Summer Research Project, also under Dr. Murtagh's direction. Emily plans a career as a Licensed Mental Health Counselor.

Abstract

This study examined differences in intimacy (operationally defined as the degree of emotional intensity) between face-to-face interactions, computer interactions with emoticons, and computer interactions without emoticons. Subjects conversed with a confederate for 25 minutes either face-to-face, over AOL instant messenger while the confederate spoke in plain text only, or over AOL instant messenger while the confederate spoke with emoticons in addition to plain text; in both instant messenger conditions, the subject did not see the confederate. Findings were mixed, with some support for the main hypothesis, that there would be greater intensity in computer than in face-to-face interaction. The findings of this study and the need for future research are discussed.

Intimacy is a term which is often used, but difficult to define. One person's idea of the concept of "intimacy" may be quite different than that of another person. A recent study concluded that intimacy contained four main components: self-disclosure, love and affection, personal validation, and trust (Hook, Gerstein, Detterich & Gridley, 2003). In an earlier study subjects reported that positive feelings toward their partner, talking (especially about topics of an intimate nature) and sharing activities are associated with intimacy (Helgeson, Shaver & Dyer, 1987).

However, intimacy is not always viewed in the same way between the sexes. In one study, men directly associated sex and physical contact with intimacy, whereas women rarely mentioned sex and mentioned physical contact simply as a way of expressing other components of intimacy (Helgeson et al., 1987). In this study, it was found that for both men and women physical contact was rarely mentioned in same-sex intimate experiences, however, appreciation, happiness, talking, problem sharing and/or solving, experience sharing and activity sharing were all mentioned. Additionally, distant, non-intimate experiences were characterized with feeling awkward, feeling hurt, having arguments, a lack of communication, and disapproval.

While there are many factors which may influence the level of intimacy experienced in an interaction, such as self-disclosure, body language, and expressiveness, it is unclear how the type of interaction between the individuals, whether face-to-face or on a computer, may effect this experience.

The Internet

Online interactions have increased dramatically throughout the past few decades. The internet is now used in such diverse areas as education, psychological support, and social relationships.

Education

Both advantages and disadvantages exist in using the internet in education. In a chat room, students may reply at the same time as one another, and do not have to feel singled out by the teacher (Hudson & Bruckman, 2002). Students may edit their responses before sending them out, thus relieving some pressure to give a perfect answer in a perfectly synchronous manner (Ware, 2004). For students typing in a language other than their first language, or taking a course in a country other than their own, an online format also removes concerns about accents or unknown social customs (Ware, 2004). One disadvantage in using the internet in education is that students may not take online classrooms as seriously as traditionally classrooms (Hudson & Bruckman, 2002; Kirkpatrick, 2005). Interestingly, is has been found that the more graduate students experienced technology problems which impeded their learning, the higher they evaluated the course and the instructor (Tallent-Runnels, Lan, Fryer, Thomas, Cooper & Wang, 2005).

Psychological Support

In a study which looked at 136 web counseling sites, using similar search methods as would likely be used by someone seeking out a web counseling site, web counseling sites were found to be largely unsatisfactory (Heinlen, Welfel, Reynolds, Richmond & Rak, 2003). Some of the sites surveyed were free, some asked for fees, some were professionally made, some had errors in their layouts; but not one of the sites was in compliance with ethical standards for web counseling set out by the National Board for Certified Counselors (Heinlen et al., 2003).

Chat rooms and web sites can be used as a form of support. In a study on emotional support and honesty in chat rooms, it was found that 63% of first-year social psychology students surveyed had received emotional support in chat rooms (Whitty, 2002). An earlier study had found that several of the most common types of support given online were emotional, informational, and esteem; while tangible assistance was least often given (Braithwaite, Waldron & Finn, 1999).

Interestingly, while one study found no significant correlation between technical internet use (bulletin board use, created web pages, chat room use, and visitation of multi-user dungeons) or information exchange (accessing information online or emailing) on perceived social support, there was a correlation between leisure use (playing online games or instant messaging) and perceived social support (Swickert, Hittner, Harris & Herring, 2002).

Studies have found chatting on the internet to be emotionally beneficial (Green, Hilken, Friedman, Grossman, Gasiewski, Alder & Sabini, 2005; Shaw, Gant & Schouten, 2002). Depression and loneliness scores have been found to decrease with multiple chat sessions, while perceived social support and self-esteem increased (Shaw et al., 2002). It has also been found that after either Instant Messenger interaction or face-to-face interaction, participants were significantly happier, less tense, and less angry (Green et al., 2005). This increase in happiness was significant greater with Instant Messenger than face-to-face interactions, and this effect was stronger in women than in men. Interestingly, however, this study found that time spent on Instant Messenger was negatively correlated with life satisfaction.

Social Relationships

Perhaps one of the most common forms of internet use is that of using the internet to meet and communicate with people. The main forms of online social interaction on the internet of those surveyed were email, chat, and instant messaging (Baym, Zhang & Lin, 2004). In this study, most social interactions were reported to be face-to-face, with internet and phone interaction almost equal to each other. In regard to online activities, adolescents have reported spending the most time with Instant Messenger, using web sites (especially for downloading music) and email (Gross, 2004).

The internet can also be used as a way of meeting people. Chat rooms were listed in one study as the most popular method of meeting others over the internet, above web sites and email (McCown, Fischer, Page, & Homant, 2001). In this study, participants were found to have always had a telephone conversation with the other person before having a face-to-face meeting with someone they had met over the internet. Additionally, the relationships that were initially formed online were more casual than intimate or romantic. However, a more recent study found that the internet is becoming an increasingly popular way to find romantic or sexual partners (Hollander, 2002).

Internet interactions can be synchronous (an interaction with responses timed similarly to that of face-to-face conversation) or asynchronous (an interaction with delays between each response which are significantly longer than would occur in a face-to-face conversation). Instant messenger is an example of a commonly used form of synchronous interpersonal communication on the internet. Most students surveyed reported using instant messenger to talk to friends (Kindred & Roper 2004). The reasons given for their use of instant messenger included laziness, the ability to have privacy when others were in the room, ease of use, the ability to have other instant messenger conversations, watch the television or multi-task in other ways, or as a substitute

3 9

for interaction when a face-to-face meeting was not possible. Another study found that adolescents most often instant message people that they already know offline (Gross, 2004).

Findings are mixed on whether or not online interactions are viewed as equal to face-to-face interaction. Some studies found that internet interactions were viewed as being inferior overall to face-to-face interactions (Baym et. al., 2004; Green et al., 2005). One study found that while people viewed email as less effective than face-to-face or telephone interactions for both maintaining relationships and working, students found email to be as effective as telephone and face-to-face communication for completing schoolwork, and as more effective for exchanging information (Cummings, Butler & Kraut, 2002). Another study found that while students working on a project preferred to use face-to-face interaction on the whole, of the online interactions available, they preferred asynchronous interaction to synchronous for task completion, while synchronous conversation was best for brainstorming (Thomas & Macgregor, 2005). In terms of relationships, those from online conversations can feel just as real, intense, and rich as face-to-face relationships (Peris, Gimeno, Pinazo, Ortet, Carrero. Sanchiz, & Ibáñez, 2002). In this study, over 70% of those surveyed found platonic internet relationships to be just as important as face-to-face friendships, and over 55% of those surveyed found romantic internet relationships to be just as important as face-to-face romances.

Verbal and Nonverbal Cues in Intimacy
Verbal cues consist entirely of the words that are spoken or typed. This includes the information contained in those words, as well as the level of self-disclosure they contained. Higher levels of self-disclosure are associated with higher intimacy (Guerrero, Jones & Burgoon, 2000; Town & Harvey, 1981). Greater conversational fluency, with fewer pauses, has also been found to be associated with greater perceived intimacy (Burgoon & LePoire, 1999) and with greater conversational involvement, a concept associated with intimacy (Coker & Burgoon, 1987). Although not directly labeled as being associated with intimacy, back-channel responses (such as saying: "uh-huh"), have been positively correlated with rapport (Bernieri, Gillis, Davis & Grahe, 1996).

Nonverbal cues, such as tone of voice or body language, provide information beyond the actual words used in an interaction. Touching has been found to be associated with greater intimacy (Burgoon, 1991; Burgoon, Buller, Hale, & DeTurck, 1984; Guerrero et al., 2000). Eye contact, gazing, or looking at the face of a conversational partner has been found to be associated with greater intimacy (Breed, 1972; Burgoon et al., 1984; Burgoon & LePoire, 1999; Guerrero et al., 2000; Wada, 1990). Expressiveness, or animation, has been found to be correlated with greater rapport (Bernieri et al., 1996), and intimacy (Burgoon & LePoire, 1999).

In a study with opposite-sex dyads, gesturing with hands by the female was the nonverbal behavior most strongly correlated with self-reported rapport (Bernieri et al., 1996). Increased proximity has been found to be correlated with greater rapport (Bernieri et al., 1996), greater intimacy (Burgoon et al., 1984; Guerrero et al., 2000), and greater conversational involvement (Coker & Burgoon,1987).

There are other aspects of body language (a type of nonverbal cues) which relate to intimacy. Fewer posture shifts is correlated with greater rapport (Bernieri et al., 1996), forward lean is associated with higher intimacy (Breed, 1972; Burgoon et al., 1984; Burgoon & LePoire, 1999), and a more direct-facing orientation is associated with greater involvement (Coker & Burgoon, 1987) and intimacy (Burgoon & LePoire, 1999). A relaxed posture is also associated with higher intimacy (Burgoon & LePoire, 1999), mirroring (or similarity and coordination of behavior) has been found to be correlated with greater rapport (Bernieri et al., 1996), and body coordination has been shown to be associated with greater conversational involvement (Coker & Burgoon, 1987). Smiling has produced mixed results as it relates to intimacy. Although one study found that smiling was not related to rapport (Bernieri et al., 1996), smiling has been found in some studies to be related to greater intimacy (Burgoon et al., 1984; Guerrero et al., 2000) and to increased liking (Kleinke & Taylor, 1991).

The sex of the people communicating is also nonverbal information which may affect intimacy. One study found that interactions with female confederates were rated as more intimate than interactions with male confederates although the confederates did not vary in behavior (Burgoon et al., 1984). This finding is consistent with an earlier study which found that female confederates were rated as acting more interested than a male confederate acting in the same manner (Breed, 1972). Subjects made more eye contact with male confederates than female confederates, shifted body position more often with female confederates than male confederates, and interactions with a confederate of the same sex was viewed as more comfortable by both sexes (Breed, 1972). Pairs of males made less eye contact and had more confronting head orientation than pairs of females; and males smiled less in more intimate same-sex pairings, while females smiled more in more intimate same-sex pairings (Wada, 1990). An earlier study, however, found no significant differences in the intimacy-indicating behaviors between male and female participants when interacting with a female confederate (Town & Harvey, 1981).

The attractiveness of a conversational partner can effect the experience in ways related to intimacy as well, including the attribution of positive characteristics such as competence,

adjustment, and overall impression (Eagly, Ashmore, Makhijani & Longo, 1991; Langlois, Kalakanis, Rubenstein, Larson, Hallam, M., & Smoot, 2000). Additionally, attractive people are treated better than unattractive people (Langloi et al., 2000). Thus attractiveness may be related to experiences of intimacy. Indeed, attractiveness of another person had been cited as an extremely important factor in falling in love, clearly an intimate experience (Sangrador, & Yela, 2000).

Intimacy and the Internet

Differences in verbal and nonverbal cues between face-to-face and internet interactions, as well as individual characteristics, may effect the level of intimacy experienced in these interactions.

Verbal Cues

While all of the verbal cues discussed earlier are present in text-only online interactions, they may be negatively affected by this medium in relation to face-to-face interactions. For example, conversational fluency may be more difficult to maintain online. Chat rooms have been stated by participants to be limiting due to the additional effort needed to convey information (Becker & Stamp, 2005). It is slower to say the same thing in chat than in face-to-face conversations, partly because of the medium itself (typing taking longer than speaking and technical difficulties) and partly because of the need for extra clarification (presumably due to the lack of non-verbal information). Indeed, participants in a chat room became very frustrated with more than several seconds of lag time between their sending a message and the message being received (Roed, 2003).

Self-disclosure is an important part of intimacy that is available online; however, it has been found that nearly half of adolescents using the internet have pretended to be someone they are not online (Gross, 2004). Even when people online do not falsify information about themselves, they may use other forms of deception, such as withholding information, to change the impression that they give to others online (Becker & Stamp, 2005). Although the internet allows for deception, its potential anonymity may also make it easier for one to self-disclose, and reveal one's true self. Indeed, the true self has been found to be more accessible after an online interaction (Bargh, Yair, McKenna & Fitzsimmons, 2002).

Nonverbal Cues

While it would appear that virtually all nonverbal cues, such as tone of voice and facial expressions (which in face-to-face interactions often clarify the meaning behind the words used) are absent in online interactions, internet users have developed ways to attempt to compensate for this lack of nonverbal information. These include the use of emoticons (arrangements of typographic symbols to indicate nonverbal signals, often facial expressions,

such as :-) for a smile), avatars (graphic representations of oneself online) and social norms.

Emoticons are widely recognized (Walther & D'Addario, 2001) and used (Braithwaite et al., 1999; Kindred & Roper, 2004) by internet users. Emoticons are used to clarify ambiguous statements (Kindred & Roper, 2004), mitigate negative messages (Roed, 2003), and to flirt (Whitty, 2004). Interestingly, women have been found to use emoticons more often than men (Baron, 2004; Witmer & Katzman, 1997); however, use may be equal in mixed-gender groups (Wolf, 2000).

Another compensation for the lack of nonverbal information available online is the use of avatars. Avatars provide social cues which would be otherwise lacking in online interaction (Kolko, 1999). For example, the perceived sex of an avatar allows others to interact with the owner of this avatar as if their sex were certain. The vast majority of preadolescents in one study used avatars which were the same gender as they were (Calvert, Mahler, Zehnder, Jenkins, & Lee, 2003). However, avatars are not a true substitute for actually being able to see someone as the nonverbal information provided by an avatar may not be accurate or complete (Kolko, 1999).

While there are fewer visible social cues which can be followed to create norms online than in face-to-face interactions, groups on the internet often have their own rules and norms (Pankoke-Babatz & Jeffrey, 2002). These norms are often either explained to those new to these internet groups, or are learned by observing before participating.

Introversion, Shyness, Social Anxiety, and Age

The findings on introversion as it relates to online behavior are mixed. One study found that extroverts tend to self-disclose and be themselves more in face-to-face interaction than in online interaction, while introverts, as well as neurotics, tend to be themselves more online (Amichai-Hamburger, Wainapel & Fox, 2002). However, a more recent study found that introversion does not lead to more self-disclosure online, rather it leads to less (Peter, Valkenburg & Schouten, 2005).

Some people who experienced shyness in face-to-face interactions have been found to feel more comfortable in online interaction due to the anonymity, and the extra time allotted to respond (Becker & Stamp, 2005). Shyness is associated with increased intimacy in internet socializing (Birnie & Horvath, 2002) and shy people have been found to have a higher tendency to become addicted to the internet (Chak & Leung, 2004). In addition, high social phobia scores have been found to correlate with the use of the internet to regulate social fears; a relationship strengthened by high anxiety or depression scores (Shepherd & Edelmann, 2005).

Another potential human factor in internet experience is age. It has been found that found that younger students in the college population have better computer skills and socialize more over the internet; however it should be noted that younger students socialize more off the internet as well (Birnie & Horvath, 2002). Having less experience and skills in the use of the internet could lead to such experiences being less enjoyable for older individuals.

Face-to-Face versus Internet
It would appear that since face-to-face interactions contain more cues as to the meaning behind the words used than online interactions, that those in face-to-face interactions would gain a more accurate understanding of what their partner was attempting to communicate. It is unclear, however, if this would lead to greater or less intimacy. Ambiguous statements and comments may well lead to greater projections on the part of those in online interactions. These projections, in turn, may well lead to stronger, more intense feelings; thus, greater perceived intimacy.

In addition, a reduction or elimination of social boundaries of appropriateness in internet interactions may lead to higher levels of self-disclosure than would normally be present in more advanced face-to-face interactions, resulting in heightened intimacy (Ross, 2005). The use of deception, or even different online persona, may also indirectly heighten perceived intimacy, as there is not a way, within the interaction, to confirm or disconfirm a romanticized and overly intimate view of the individual one is interacting with online (Ross, 2005). However, as Ross points out, the internet can be used to avoid intimacy as well, by dodging or ignoring personal questions.

Research in this area has been limited and conflicting. The amount of time spent communicating in email, telephone or in face-to-face interactions has been found to be related to perceived closeness with another (Cummings et al., 2002). In addition, those surveyed in this study felt closer overall to those they communicated with face-to-face or on the telephone than those they communicated with over the internet. However, it has been found that the more often college students communicated with each other via instant messenger, the higher their perceived level of intimacy with the other person (Hu, Wood, Smith & Westbrook, 2004).

The Present Study
The present study investigates differences in intimacy for those engaging in interactions which provide different degrees of non-verbal information. Subjects will engage in one of three types of interactions, face-to-face (highest nonverbal cues), online without emoticons (lowest nonverbal cues), and online with emoticons (some nonverbal cues). The following five hypotheses are made:

1) Lower amounts of non-verbal information will result in greater intensity of emotions. Non-verbal information increases clarity in the communication, an absence of this information results in less clear information. When information is not clear, the recipient does more inference to try to understand and interpret the information, allowing for greater projection. These interpretations will likely be more extreme than the intent of the communication. Thus, emotional responses to the same information, with fewer nonverbal cues, will be more extreme.

2) Those who are shyer will have a higher level of positive feeling towards those they communicate with online versus face-to-face, and those who are shyer will feel more comfortable in online interactions than face-to-face.

3) Perceived attractiveness of the other will significantly correlate with enjoyment, positive feelings towards the other, and desire to spend additional time with the other. Additionally, self-reports of the ease with which their opinion of the other could change will be negatively correlated with perceived attractiveness.

4) Comfort with online communication will be positively correlated with enjoyment ratings of doing the task online.

5) There will be a negative correlation between age and comfort with communicating with others online.

Method

Participants
Participants consisted of 35 individuals (28 women and 6 men), taking summer courses in a southeastern Massachusetts state college. The ages of participants ranged from 18 to 47 years of age (M = 25.76, SD = 8.78). The ethnic makeup of the participants was 74% white, 9% Hispanic, 6% Asian, 3% African American, and 6% other. One participant provided no ethnographic information.

Materials
Subjects completed a short questionnaire following their interaction (online or face-to-face) with the confederate whom they thought was another subject. Items consisted of ratings on a seven-point Likert scale of their feelings about the confederate, the interaction, and themselves, as well as a number of demographic items (please see the Appendix for a copy of the survey).

AOL Instant Messenger was used as the sole method of communication and interaction in the computer groups in this study.

Procedure

Participants were told that the study was examining college students' attitudes about summer courses, and were asked to speak with a partner for 25 minutes about their views on summer courses. Each dyad consisted of one participant and a confederate (a female college student who turned 19 during the course of the study). Subjects were randomly assigned in a counterbalanced manner to one of three groups. In group one (face-to-face), the confederate spoke face-to-face with the participants. In group two (computer interaction with emoticons) the confederate spoke over the internet with the participant using AOL instant messenger, but the confederate used emoticons in addition to plain text messaged. In group three (computer interaction without emoticons) the confederate spoke in text-only messages without emoticons. The participants were not instructed to use or not use emoticons. The same confederate was used with each subject, and the confederate was instructed to mirror the participants' attitudes toward the topic. The confederate was given a list of positive and negative aspects of the topic to aid in this task.

After the session was complete, the participant was asked to complete the survey. In the face-to-face condition, this was done after the confederate left the room (supposedly to complete an identical survey). Once the survey was completed, the participants were partially debriefed, and offered the opportunity to have the full details of the study, as well as results, once the study was completed.

Results

In order to test the first and main hypothesis, that lower amounts of non-verbal information will result in greater intensity of emotions, two sets of analyses were conducted. The first consisted of three, one-factor between-subject ANOVAs, with the dependent measures being ratings of the following items: "How easily do you think your opinion of your partner in the study could be changed?," "How well do you feel that you now know your partner in this study?," "How well do you feel that your partner in this study now knows you?," respectively. (Please see Table 1.)

In the first one-factor between-subjects ANOVA, concerning the reported ease with which subjects felt that their opinion about the confederate could be changed, a significant difference between groups was found, $F (2, 32) = 4.26$, $p = .023$. This effect was probed using a Tukey HSD post-hoc test. Subjects in the face-to-face condition (M = 5.34, SD = 1.12) believed that their opinion of the confederate could be more easily changed than did those in the computer interaction without emoticons group (M = 4.09, SD = 1.22), $p = .02$. There was no significant difference between the face-to-face group and computer interaction

with emoticons (M = 4.46, SD = 1.04), $p = .13$, or between the computer interaction with emoticons group and the computer interaction without emoticons group ($p = .73$).

The second one-factor between-subjects ANOVA, concerning how well the subjects felt they knew their partner, revealed no significant main effect between groups, $F (2, 32) = 1.32$, $p = .28$. The third one-factor between-subjects ANOVA, concerning how well the subjects felt their partner knew them, also revealed no significant main effect between groups, $F (2, 32) = .63$, $p = .54$.

The second series of analyses conducted to examine hypothesis one consisted of five, one-factor between subjects ANOVAs, used the ratings on the items "How much did you enjoy interacting with your partner in this study?," "Please rate you overall feelings towards your partner in the study.," "How attractive did you find your partner in this study to be?," "How much would you like to spend time with your partner from this study in the future?," "How do you think your partner in the study would rate their overall feelings towards you?." As these analyses were to determine intensity, but not directionality, the use of actual scores could hide this effect (i.e., a rating of 1 and a rating of 7 would both be intense, but would average out to a non-intense score of 4). Thus, deviation scores were used. For each item, the absolute value of the difference between the mean score of that item from the individual subject's actual rating was used. (See Table 2)

None of these five, one-factor between-subjects ANOVAs revealed a significant effect. Specifically, how well the subjects enjoyed interacting with their partner, $F (2, 32) = .30$, $p = .74$; subject's feelings toward their partner, $F (2, 32) = 2.06$, $p = .15$; subjects' perceptions of the attractiveness of their partner $F (2, 29) = 1.08$, $p = .35$; subjects' desire or lack of desire to spend more time with their partner confederate, $F (2, 32) = .06$, $p = .94$; subjects' belief in their partner's opinion of them, $F (2, 32) = .24$, $p = .79$.

The second hypothesis, that those who are shyer would have a higher level of positive feeling towards those they communicate with online versus face-to-face and those who are shyer would feel more comfortable in online interactions than face-to-face, was unable to be tested due to a relative overall lack of variance in levels of reported shyness. However, a review of the raw data indicated there may have been an unusual distribution of shy subjects in the face-to-face condition. Thus, an unplanned one factor between subjects ANOVA for shyness between conditions was conducted. Results revealed no significant main effect between groups, $F (2, 32) = 2.38$, $p = .11$.

The third hypothesis, that perceived attractiveness of the other will significantly correlate with enjoyment, positive feelings towards the other, and desire to spend additional time with

the other, and that self-reports of the ease with which their opinion of the other might change will be negatively correlated with perceived attractiveness, was analyzed using four Pearson Product moment correlations. A significant positive correlation was found between the subjects' perceived attractiveness of their partner (M = 4.59, SD = 1.24), and both the subjects' enjoyment of their interaction with their partner (M = 6.23, SD = .94), r = .41, p = .02, and their desire to spend more time with their partner (M = 4.49, SD = 1.54) r = .66, p = .00. No significant correlations were found between the subjects' perceived attractiveness of their partner and either their overall feelings toward their partner (M = 6.37, SD = .73), r = .33, p = .07, nor the ease with which they felt their opinion of their partner could change (M = 4.69, SD = 1.23) r = .29, p = .10.

The fourth hypothesis, that comfort with online communication will be positively correlated with enjoyment ratings of doing the task online, was unable to be tested due to a relative overall lack of variance in levels of reported comfort in communicating online.

The fifth hypothesis, that a there will be a negative correlation between age and comfort with communicating with others online, was analyzed differently than initially planned. Although the fifth hypothesis initially called for a correlation, data revealed two clear-cut age groups of which all subjects who responded to the question regarding age were a part; 18-27 (N = 27) and 38-47 (N = 7). Thus, an Independent Groups t-test was conducted between these two groups, with comfort communicating online as the dependant variable. Results revealed no significant main effect of age t(32) = .75, p = .12. Thus, younger subjects (M = 5.85, SD = 1.43) were not significantly more comfortable communicating online than older subjects (M = 5.43, SD = .79).

Discussion

The purpose of this study was to examine differences in the level of intimacy experienced (operationally defined as intensity of emotions) in different types of interactions, specifically in face-to-face, computer with emoticons, and computer without emoticons. The primary hypothesis, that interactions with less non-verbal cues, would result in greater intimacy, received some support. In the predetermined primary analysis, the subjects rating of how easily they thought their feelings about their interaction partner could change, the predicted finding that those in face-to-face interactions would feel their feelings could be more easily changed than those who interacted online without emoticons, was found. While this supported the primary hypothesis, no significant difference was found between interaction types for subjects' ratings of how well they thought they knew their partner and how well they thought their partner knew them, nor in the deviation scores concerning enjoyment of the task, overall feelings, attractiveness, wanting to spend time with them in the future, and how they thought their partner felt about them.

It is possible that the lack of significance in some of these analyses was due to the small number of subjects used in this study, as each group consisted of 11 – 13 subjects. In addition, the topic of their interactions was rather bland; thoughts on summer school. It may be that an interaction which centered on a more arousing or intense topic could lead to greater differences between groups.

Unfortunately, this study did not have enough variation across subjects in shyness and comfort level in communicating online to test the second (that shyness enhances the quality of the online experience) and fourth (comfort with online communication would have a positive correlation with their enjoyment of doing the task online) hypotheses. It should be pointed out, however, that overall subjects in this study were quite comfortable in communicating online. This lack of variance in comfort level in online communication may be due to the study being conducted with subjects taking at least one college summer course at a technology-oriented college. Perhaps communicating online was more a matter of course for these subjects than in the general population.

Hypothesis 3, that perceived attractiveness of the confederate would correlate with more positive ratings on a number of items, received mixed support. In support of this hypothesis, perceived attractiveness of the confederate was significantly correlated with the subjects' enjoyment of the interaction, and subjects' desire to spend more time with their partner. However, perceived attractiveness was not significantly correlated with subjects' overall feelings towards their partner, nor the ease with which subjects felt their opinions about their partner could change. As there was a trend between attractiveness and overall feelings (p = .07), once again, the relatively low number of subjects used may have hidden a true difference.

Hypothesis 5, in essence that younger subjects would be more comfortable with communicating with others online than older subjects, was not supported. This may be due to age simply not being a factor in online communication comfort, a relatively small sample size, or that these subjects (those taking a summer course at a technology oriented college) are not representative of older individuals in the general population.

The field of internet communications and the emotional impact therein is becoming more and more relevant with the growth of the internet. With the internet being used for communication, initiating and maintaining relationships, education, and as a psychological support, it is important to be aware of the impact of these unique interactions.

The area of intimacy and the internet has serious implications. If the interactions on the internet lead to greater intimacy than face-to-face interactions, those seeking psychological support online might feel more helped; or they might run into a predator searching for an easy target to manipulate, resulting in the individual being taken advantage of during a time when they are vulnerable. The anonymity of being online may be freeing to some, but it could also allow for greater cruelty, where the results are not as clearly, or immediately, seen. As with face-to-face interactions, online interactions can help or hurt people who seek support from others.

Perhaps the most frightening implication of emotions intensifying over the internet is the idea of online sexual predators. The internet can be used as a way to meet people with similar interests, opinions, and worldviews. In theory, one could make great friends through web sites such as MySpace, which are designed for sharing pieces of one's life, be they thoughts, pictures, or even videos. However, it is not only adults who use these sites, but children as well. A predator can look at the information that a child gives out online and use that information to become that child's "ideal friend." If intimacy is greater in online interactions,

it would be that much easier for an online predator to lure a child into a bond with them, while hiding what would have been obvious information in face-to-face interactions until it is too late. Thus, a child might know not to interact with an adult stranger in real life, but may well interact with an adult stranger online thinking they are a peer of the same age. By the time they learn the truth, they may have experienced such intense feelings that they now believe, because they feel so much for this person, that a relationship should continue. Alternately, the child may not learn the person they have been interacting with online is an adult until a meeting takes place, at which time it may be too late. Further research into this topic is important to allow us to better understand the dynamics of internet interactions, both for the sake of gaining knowledge, but more importantly for the practical need for safety.

In conclusion, results for our main hypothesis were mixed as to as to whether internet interactions lead to greater emotional intensity than face-to-face interactions. Future research on the topic needs to be conducted and should include larger sample sizes and more realistic conversations.

References

Amichai-Hamburger, Y., Wainapel, G., & Fox, S. (2002). On the Internet no one knows I'm an introvert: extroversion, neuroticism, and internet interaction. CyberPsychology & Behavior, 5(2), 125-128.

Bargh, J., McKenna, K., & Fitzsimons, G. (2002). Can you see the real me? Activation and expression of the "true self" on the internet. Journal of Social Issues, 58(1), 33-48.

Baron, N. S. (2004). See you online: gender issues in college student use of instant messaging. Journal of Language and Social Psychology, 23(4), 397-423.

Baym, N. K., Zhang, V. B., & Lin, M. (2004). Social interactions across media: Interpersonal communication on the internet, telephone and face-to-face. New Media & Society, 6(3), 299-318.

Becker, J. A. H., & Stamp, G. H. (2005). Impression management in chat rooms: a grounded theory model. Computer Communication Studies, 56(3), 243-260.

Bernieri, F., Gillis, J., Davis, J., & Grahe, J. (1996). Dyad rapport and the accuracy of its judgment across situations: A lens model analysis. Journal of Personality and Social Psychology, 71(1), 110-129.

Birnie, S. A., & Horvath, P. (2002). Psychological predictors of Internet social communication. Journal of Computer-Mediated Communication, 7(4).

Retrieved April 1, 2006, from http://jcmc.indiana.edu/issues.html
Braithwaite, D. O., Waldron, V. R., & Finn, J. (1999). Communication of social support in computer-mediated groups for people with disabilities. Health Communication, 11(2), 123-151.

Breed, G. (1972). The effect of intimacy: Reciprocity or retreat? British Journal of Social & Clinical Psychology, Vol. 11(2), 135-142.

Burgoon, J. (1991). Relational message interpretations of touch, conversational distance, and posture. Journal of Nonverbal Behavior, 15(4), 233-259.

Burgoon, J., Buller, D., Hale, J., & DeTurck, M. (1984). Relational messages associated with nonverbal behaviors. Human Communication Research, 10(3), 351-378.
. . . .
Burgoon, J., & Le Poire, B. (1999). Nonverbal cues and interpersonal judgments: Participant and observer perceptions of intimacy, dominance, composure, and
formality. Communication Monographs, 66(2), 105-124.
. . . .
Calvert, S. L., Mahler, B. A , Zehnder, S. M., Jenkins, A., & Lee, M. S. (2003). Gender
differences in preadolescent children's online interactions: symbolic modes of self-presentation and self-expression. Journal of Applied Developmental Psychology, 24(6), 627-644.
. . . .
Chak, K., & Leung, L. (2004). Shyness and locus of control as predictors of Internet addiction. CyberPsychology & Behavior, 7(5), 559-570
. . . .
Coker, D. A., & Burgoon, J. K. (1987). The nature of conversational involvement and nonverbal encoding patterns. Human Communication Research, 13(4), 463-494.
. . . .
Cummings, J. N, Butler, B., & Kraut, R. (2002). The quality of online social relationships. Communications of the ACM, 45(7), 103-108.
. . . .
Eagly, A., Ashmore, R., Makhijani, M., & Longo, L. (1991). What is beautiful is good,
but . . .: A meta-analytic review of research on the physical attractiveness stereotype. Psychological Bulletin, 110(1), 109-128.
. . . .
Green, M. C., Hilken, J, Friedman, H., Grossman, K, Gasiewski, J., Adler, R., & Sabini, J. (2005). Communication via Instant Messenger: Short- and long-term effects. Journal of Applied Social Psychology, 35(3), 487-507.
. . . .
Gross, E. F. (2004). Adolescent Internet use: What we expect, what teens report. Journal of Applied Developmental Psychology, 25(6), 633-649.
. . . .
Guerrero, L., Jones, S., & Burgoon, J. (2000). Responses to nonverbal intimacy change in romantic dyads: Effects of behavioral valence and degree of behavioral change on
nonverbal and verbal reactions. Communication Monographs, 67(4), 325-346.
. . . .
Heinlen, K. T., Welfel, E. R., Richmond, E. N., & Rak, C. F. (2003). Scope of webcounseling: a survey of services and compliance with NBCC Standards for the ethical practice of webcounseling. Journal of Counseling & Development,
81(1), 61-69.
. . . .
Helgeson, V., Shaver, P., & Dyer, M. (1987). Prototypes of intimacy and distance in same-sex and opposite-sex relationships. Journal of Social and Personal Relationships, 4(2), 195-233.
. . . .
Hollander, D. (2002). Among young adults, use of the Internet to find sexual partners is rising. Perspectives on Sexual & Reproductive Health, 34(6), 318.
. . . .
Hook, M., Gerstein, L., Detterich, L., & Gridley, B. (2003). How close Are we? Measuring intimacy and examining gender differences. Journal of Counseling & Development, 81(4), 462-472.
. . . .
Hu, Y., Wood, J. F., Smith, V., & Westbrook, N. (2004) Friendships through IM: examining the relationship between instant messaging and intimacy. Journal of Computer-Mediated Communication, 10(1). Retrieved April 1, 2006, from http://jcmc.indiana.edu/issues.html
. . . .
Hudson, J. M., & Bruckman, A. S. (2002). IRC Français: The creation of an Internet-based SLA community. Computer Assisted Language Learning, 15(2), 109-134
. . . .
Kindred, J., & Roper, S. L. (2004) Making connections via instant messenger (IM): student use of IM to maintain personal relationships. Qualitative Research Reports in Communication, 5, 48-54.

Kirkpatrick, G. (2005). Online 'chat' facilities as pedagogic tools.   Active Learning in Higher Education, 6(2). 145-159.
. . . .
Kleinke, C., & Taylor, C. (1991). Evaluation of opposite-sex person as a function of gazing, smiling, and forward lean. Journal of Social Psychology, 131(3), 451-453.
. . . .
Kolko, B. E. (1999). Representing bodies in virtual space: the rhetoric of avatar design. Information Society, 15(3), 177-186.

Langlois, J., Kalakanis, L., Rubenstein, A., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. Psychological Bulletin, 126(3), 390-423.

. . . .

McCown, J. A., Fischer, D., Page, R., & Homant, M. (2001). Internet relationships: people who meet people. CyberPsychology & Behavior, 4(5), 593-596

. . . .

Pankoke-Babatz, U., & Jeffrey, P. (2002). Documented Norms and Conventions on the Internet. International Journal of Human-Computer Interaction, 14(2), 219-235

. . . .

Peris, R., Gimeno, M.A., Pinazo, D., Ortet, G., Carrero, V., & Sanchiz, M., Ibáñez, I (2002). Online chat rooms: virtual spaces of interaction for socially oriented people. CyberPsychology & Behavior, 5(1), 43-51.

. . . .

Peter, J., Valkenburg, P. M., Schouten, A. P. (2005). Developing a model of adolescent friendship formation on the Internet. CyberPsychology & Behavior, 8(5), 423-430.

. . . .

Roed, J. (2003). Language learner behaviour in a virtual environment. Computer Assisted Language Learning, 16(2-3), 155-172.

. . . .

Ross, M. W. (2005). Typing, doing, and being: sexuality on the internet. The Journal of Sex Research, 42(4), 342-352.

. . . .

Sangrador, J., & Yela, C. (2000). 'What is beautiful is loved': Physical attractiveness in love relationships in a representative sample. Social Behavior and Personality, 28(3), 207-218.

. . . .

Shaw, L. H, Gant, L. M., & Schouten, A. P. (2002). In defense of the Internet: the relationship between Internet communication and depression, loneliness, self-esteem, and perceived social support. CyberPsychology & Behavior, 5(2), 157-171.

. . . .

Shepherd, R., & Edelmann, R. J.(2005). Reasons for internet use and social anxiety. Personality and Individual Differences, 39(5), 949-958.

. . . .

Swickert, R. J., Hittner, J. B., Harris, J. L., & Herring, J. A. (2002). Relationships among Internet use, personality, and social support. Computers in Human Behavior, 18(2). 437-451.

. . . .

Tallent-Runnels, M. K, Lan, W. Y, Fryer, W., Thomas, J. A., Cooper, S., & Wang, K. (2005). The relationship between problems with technology and graduate students' evaluations of online teaching. Internet & Higher Education, 8(2), 167-164.

. . . .

Thomas, W. R., & Macgregor, S. K. (2005). Online project based learning: How collaborative strategies and problem solving processes impact performance. Journal of Interactive Learning Research, 16(1), 83-107.

. . . .

Town, J., & Harvey, J. (1981). Self-disclosure, attribution, and social interaction. Social Psychology Quarterly, 44(4), 291-300.

. . . .

Wada, M. (1990). The effect of interpersonal distance change on nonverbal behavior: Mediating effects of sex and intimacy levels in a dyad. Japanese Psychological Research, 32(2), 86-96.

. . . .

Walther, J. B., & D'Addario, K. P. (2001). The impacts of emoticons on message interpretation in computer-mediated communication. Social Science Computer Review, 19(3), 324-347.

. . . .

Ware, P. D. (2004). Confidence and competition online: ESL student perspectives on web-based discussions in the classroom. Computers & Composition, 21(4), 451-468.

. . . .

Whitty, M. T. (2004). Cyber-Flirting: an examination of men's and women's flirting behaviour both offline and on the Internet. Behaviour Change, 21(2), 115-126.

. . . .

Whitty, M. T. (2002). Liar, liar! An examination of how open, supportive and honest people are in chat rooms. Computers in Human Behavior, 18(4), 343-352.

. . . .

Witmer, D. F., & Katzman, S. L. (1997). On-line smiles: does gender make a difference in the use of graphic accents? Journal of Computer-Mediated Communication, 2(4), Retrieved March 25, 2006, from http://jcmc.indiana.edu/vol2/issue4/witmer1.html

. . . .

Wolf, A (2000). Emotional expression online: gender differences in emoticon use. Social Science Quarterly, 3(5) 827-833.

Table 1

Scores on Items x Group

Item	Face-to-Face (N=13)		AIM With Emoticons (N=11)		AIM Without Emoticons (N=11)		Total (N=35)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
How would you rate your overall feelings about summer classes?	5.54	1.13	5.18	1.26	5.54	0.93	5.42	1.17
How much did you enjoy interacting with your partner in this study?	6.69	0.63	6.00	1.00	5.90	1.04	6.23	0.94
Please rate you overall feelings towards your partner in the study:	6.62	0.77	6.46	0.52	6.00	0.77	6.37	0.73
How easily do you think your opinion of your partner in the study could be changed?	5.38	1.12	4.46	1.04	4.09	1.22	4.69	1.23
How well do you feel that you now know your partner in this study?	3.92	1.32	3.45	1.24	3.00	1.61	3.48	1.41
How attractive did you find your partner in this study to be?	4.67	1.07	4.90	1.59	4.20	1.03	4.59	1.24
How much would you like to spend time with your partner from this study in the future?	4.46	1.45	4.91	1.58	4.09	1.64	4.49	1.54
How well do you feel that your partner in this study now knows you?	4.00	1.00	3.55	1.29	3.45	1.57	3.69	1.28
How do you think your partner in the study would rate their overall feelings towards you?	5.38	0.87	5.18	0.87	4.27	0.47	4.97	0.89
How shy are you?	2.38	1.50	3.55	1.04	3.45	1.75	3.09	1.52
How comfortable are you in communicating with others online?	5.85	1.28	6.09	1.14	5.09	1.64	5.69	1.39

*One person in each of the groups in item 8 left this question blank.

Table 2

Deviation Scores for Items x Group

Item	Face-to-face (N=13)		AIM With Emoticons (N=11)		AIM Without Emoticons (N=11)		Total N (N=35)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
How much did you enjoy interacting with your partner in this study?	0.72	0.25	0.79	0.61	0.88	0.59	0.79	0.49
Please rate you overall feelings towards your partner in the study:	0.72	0.30	0.49	0.14	0.71	0.44	0.65	0.32
How attractive did you find your partner in this study to be?	0.90	.52	1.3	0.93	0.83	0.68	1.00	0.72
How much would you like to spend time with your partner from this study in the future?	1.19	0.76	1.23	1.01	1.32	0.98	1.24	0.89
How do you think your partner in the study would rate their overall feelings towards you?	0.71	0.63	0.56	0.68	0.71	0.44	0.67	0.58

*One person in each of the groups in item 8 left this question blank.

Appendix

Please answer each of the follow questions (please note that your partner in this study will not see your responses):

1) Are you taking any summer classes this summer? (Circle one)   Yes   No

2) How would you rate your overall feelings about summer classes?

1	2	3	4	5	6	7	
Very							Very
Negative					Positive		

3) Have you ever meet your partner in this study before today? (Circle one) Yes   No

4) How much did you enjoy interacting with your partner in this study?

1	2	3	4	5	6	7	
Not at							Very
All					Much		

5) Please rate you overall feelings towards your partner in the study:

1	2	3	4	5	6	7	
Very							Very
Negative					Positive		

6) How easily do you think your opinion of your partner in the study could be changed?

1	2	3	4	5	6	7	
Very							Very
Easily					Difficult		

7) How well do you feel that you now know your partner in this study?

1	2	3	4	5	6	7	
Very							Very
Little					Well		

8) How attractive did you find your partner in this study to be?

1	2	3	4	5	6	7	
Very							Very
Unattractive					Attractive		

(Appendix Continued)

9) How much would you like to spend time with your partner from this study in the future?

      1   2   3   4   5   6   7
  Not at   Very
   All   Much

10) How well do you feel that your partner in this study now knows you?

      1   2   3   4   5   6   7
  Very   Very
  Little   Well

11) How do you think your partner in the study would rate their overall feelings towards you?

      1   2   3   4   5   6   7
  Very   Very
Negative   Positive

12) How shy are you?

      1   2   3   4   5   6   7
  Not at   Very
   All   Much

13) How comfortable are you in communicating with others online?

      1   2   3   4   5   6   7
  Very   Very
Uncomfortable   Comfortable

Demographic Information

What is your gender?
(Circle one)
      Male   Female

What is your age? _____

What is your ethnic background?
(Circle one)
     White   African American   Asian

     Native American   Hispanic   Other _____

Do you have any comments about this study?

The Powers of Silence: Cistercian Monasticism as a Radical Critique of Information Age Epistemology

Brad Rubin

Brad Rubin is a senior majoring in Philosophy. This paper is part of a 2005 Adrian Tinsley Program Summer Grant Project mentored by Dr. Francine Quaglio. Brad also presented his work at NCUR in 2006.

Preface

The following is the text of a talk I gave at the 2006 National Conference on Undergraduate Research. It outlines the salient results of research which I began in 2005 in preparation from my undergraduate thesis. These results aim at a theoretical analysis of certain monastic deployments of silence and their relevance to socio-epistemological problems identified by certain contemporary social theorists.

Introduction

Eight Quotations:
Everywhere the masses are encouraged to speak, they are urged to live socially, electorally, sexually, in participation, in festival, in free speech…The spectre must be exorcised, it must pronounce its name. Nothing shows more dramatically that the only genuine problem today is the silence of the mass, the silence of the silent majority (Baudrilard 1983, 23).

Who sits in solitude and is quiet hath escaped from three wars: hearing, speaking, and seeing (Waddell).

But this silence is paradoxical—it isn't a silence which does not speak, it is a silence which refuses to be spoken for in its name. And in this sense, far from being a form of alienation, it is an absolute weapon (Baudrillard 1982 21-2).

I have endowed him with my spirit that he may bring justice to the nations. He does not cry out aloud, or make his voice heard in the streets (Isaiah 42:2).

Should we initiated an information dietetics? Should we thin out the obese, the obese systems, and create institutions to uninform? (Baudrillard 2001)

Go and sit in thy cell, and thy cell shall teach thee all things. (Waddell).

…Now, in fact, the masses have no history to write, neither past, nor future, they have no virtual energies to release, nor any desire to fulfill; their strength is actual, in the present, and sufficient unto itself. It consists in their silence, in their capacity to absorb and neutralize, already superior to any power acting on them… (Baudrillard 2001, 2).

From the beginning I have been silent. I have kept quiet, kept myself in check. I groan like a woman in labor. I suffocate, I stifle (Isaiah 42:14).

The preceeding words were those of theorist Jean Baudrillard, the Christian desert monastics, and, finally, Yahweh himself. Taken together they create a dialogue about the strategic power of deployment and retention, discursive practice and intuitive reticence, the a/historical capacities of speech and of its refusal. These concerns can be summarized in terms of two questions: What are the powers silence? And why should they be exercised?

 For the past year I have been writing a thesis which addresses these questions in two parts. In the first part I posit a socio-epsitemological problem: The ultra-proliferation of information accompanying the global economy has constituted the sublation or displacement of conventional forms of meaning in the West. The second part analyzes a system of physical, epistemological, theological, and philosophical structures which has theorized and deployed silence as a meta-sign for counter-culutral practice. This is the Catholic tradition of Cistercian Monasticism. The rest of this brief talk will be aimed at giving you a sense of how each main part of my thesis addresses my two intial questions.

I. And why should they be exercised?

The input/output of electronic media has replaced physical production as the driving force behind political, economic, and interpersonal life; thus "information age" becomes a platitutide. What is not widely acknowledged is that this shift in cultural geography constitutes a violent reconfiguration of human epistemologies. Our idea of "knowledge" and how to access it is inextricably linked to the possibilities we have for representing, viewing, and cognizing word and image. As McLuhan noted:

> …After three thousand years of exploration, by means of fragmentary and mechanical technology, the Western world is imploding…[electronic technology] is reshaping and restructuring patterns of social interdependence and every aspect of our personal lives…Whether the extension of our consciousness, so long sought by the advertisers for specific products, will be "a good thing" is a question which admits of a wide solution. (McLuhan 3)

McLuhan's anxiety about the ultimate social effects of this shift has been born by out by the present condition of conventional channels of meaning and by the irruption in the kinds of sources by which meaning is thought to originate. Let us consider this irruption of epistemic venues in terms of two conventionally Western meaning-structures: social discourse, natural science, and ontology.

The Social

Since the immediate aftermath of Gutenberg and continuing until the late 20th century the Western model of social discourse has been characterized by the propositional nature of speech and text and by the quantitative limits which analogue mediums imposed on them. In other words, social discourse was thought most appropriate when it took the form of rational argumentation expressed within the structural limitations of speeches, newspapers, and books. Neil Postman writes:

To engage the written word means to follow a line of thought, which requires considerable powers of classifying, inference-making and reasoning… It also means to weigh ideas, to compare and contrast assertions, to connect one generalization to another. (Postman 51)

Conventional Western understandings of the nature of meaning are related to both this notion of propositional interconnectedness and to the quantitative limitation of information through analogue formats. Meaning is concerned with integrating diverse informational fragments in such a way as to construct an intelligble, purposive reality. For this to occur it is necessary that information be manageable in terms of its context, quantity, and cognizability.

Speech and text, however, are no longer primary in the sphere of the social. Rather, the perpetual flicker of the image has become the model both of social "knowledge" itself and of the appropriate avenues of its exchange. This is to be seen in clearly documented phenomena such the hegemony of television in domestic life, the decline of the newspaper, the 24 hour news feed and its 30 second sound bites (Stephen 10). The problem here is twofold. Firstly, image-based media do not structurally allow for the kind of propositional argumentation which has historically consituted the social; the graphics of the poll replace the op. ed. letter as the voice-space of the masses. Secondly, the speed of the digital has proliferated information to such a staggering degree that it casts the process of coherently integrating informational fragments into a space of improbability and pastiche. Or, as Baudrillard puts it, this new epistemological currency constitutes "…..a liquidation of all referentials…a material more malleable than meaning in that it lends itself to all systems of equivalences, to all binary oppositions, to all combinatory algebras" (Baudrillard 1994, 2).

The Scope of Nature

Earlier I spoke of the onset of the digital economy as consituting a shift in cultural geography. In in a sense, it is a shift in physical geography—or at least in the relation between physical space and our "knowledge" of the natural world. The speed and ubiquity of the digital constructs a world of perpetual presence which is at the same time ontologically displaced by its fundamental status

as presentation or projection of electronic media. Paul Virilio describes this situation in terms of optical perception:

> This is an active (wave) optics, replacing in a thoroughgoing way the passive (geometric) optics of the era of Galileo's spy-glass. And doing so as though the loss of the horizon-line of geographical perspective…necessitated…a substitute horizon: the "artificial horizon" of a screen or monitor, capable of permanently displaying the new preponderance of media perspective over the immediate perspective of space. (Virilio 14)

This imposition of a new perpceptual horizon—a new, total "place-ness" of media—carries our discussion from the epistemological to the ontological. What is it to be in a world delimited by virtual space, by the tele-present?

Simulation

For Baudrillard the answer is that meaning-structures such as ontology no longer have anything to signify--nor do they signify nothing. Rather, they operate as simulations: virtual signs which neither point to a reality nor deny a truth. Rather, they obviate the difference between affirmation and denial. Baudrillard writes: Something has disappeared: the sovereign difference, between one and the other, that constituted the charm of abstraction. Because it is difference that constitutes the poetry of the map and the charm of the territory, the magic of the concept and the charm of the real. The imaginary of representation…disappears in the simulation whose operation is nuclear and genetic, no longer at all specular or discursive. It is all of metaphysics that is lost…(Baudrillard 1994, 2)

Meaning is an anachronism….

Or is it? Despite his avowed nihilism, Baudrillard does offer glimpses of strategies which might oppose the simulacrum of information-culture. Virtually all of these glimpses focus on tecnhniques of absence, reduction, negation, and silence. In Fatal Strategies Baudrillard poses a question which I quoted earlier. "Should we initiate an information dietics? Should we thin out the obese, the obese systems, and create institutions to uninform?" (Baudrillard 2001, 193) In a manner of speaking, the rest of this paper is about an institution to uniform. Really, it is about a way of thinking and living which uses silence as constructive strategy and a deconstructive weapon in order to preserve a model of meaning in the reality of its practioners.

II. What are the powers of silence?

The monastic order of Cistercians was founded at very end of the 11th century by french Benedictines looking for a simpler and more rigorous observation of the Benedictine rule. This included a strict observance of silence which became a central concept as the Cistercians theorized their practice in opposition to succeeding worldy cultures. In order to get a sense of what this practice has entailed I invite you to consider one aspect of the Cistercian strategy:

Silence and The Binary

Echoing the impossible unity of a tripartite God, Cistercian thought does not see silence as functioning through dialectical opposition; silence is not opposed to language, effacement to support, destruction to stability. Rather, these events are constituted by the same act of sublimation. The author of a monastic training book writes:

> They had adopted the famous maxim of St. Arsenius: Fuge, tace, quiesce; fly from everything that diverts you from God, observer an interior and exterior silence that so you may be enabled to hear the voice of God, allay all agitation of mind and heart in order to enjoy repose in God (SD 36).

This stands in contrast to the conventional Western understanding of legitimate conceptual reasoning. Following Aristotle's law of non-contradiction, Westerners generally understand meaning in binary terms: true/false, action/inaction, speech/silence. Historically, capitalist ethics and Enlightenment heritage work together, providing their own mythology of meaning; it's motto: "paucity of meaning must be countered with informational maximalization. Or, in binary terms: information/enlightenment/meaning // silence/darkness/meaninglessness.

Following the model of the crucifixion—the ultimate silencing which becomes the final redemption, Cistercian theory rejects meaning as a binary modality.

Silence as Epistemology

This rejection is closely linked to the Cistercian understanding of silence as an alternative espistemological space which moves between rationality and intuition. Silence becomes a mode of discernment or listening which by its very emptiness deconstructs information and provides an extra-rational context in which specific kinds of meaning emerge. Thus we read the opening line of the Bendictine Rule: " Listen my son, and with your heart hear the principles of your Master" (RB Prologue). It is significant that, from antiquity to the medieval period, the conceptual "heart" was seen as the bodies' epistemological space, circumscribing intellectual and spiritual activity. Also related to the idea of "discernment" or listening is the notion of God as the Word. Like ordinary language the Word is something which allows for and even demands understanding and exchange. Unlike ordinary language the Word requires a special mode of relation, the extra-rationality of engaged silence. For this reason Cistercian daily life is structured as rigorously staged performance of choreographed speech, silence, and text.

Conclusion

Perhaps what Cistercianism recommends to the laymen or secular is a perversely meaningful version of what Baudrillard calls "the strategy of the object" (Baudrillard 2001 85). This is the strategy of non-resistance, inertia, and refusal to respond. Note that in this strategy one acts paradoxically by renouncng subjectivity in order to achieve desired ends. Conversely, on this model (which is entirely consonant with Cistercian practice) it is the active acceptance of subjectivity which deters one from the strategic goal.

I hope that by now it is clear why I began with the quotations I did. Discourses as diverse as Catholic theology and postmodern theory—discourses which deny each other's foundational claims—often have much to say to each other in light of a particular problematic. I hope that, as limited this talk has been, you have. some intimations of why we are "urged to live socially, electorally, sexually, to pronounce [our] name," why Isaiah's bringer of justice "does not cry aloud or make his name heard in the streets," why Yahweh has kept quiet, kept himself in check, how silence can be "an absolute weapon."

Works Cited

Baudrillard, Jean. Selected Writings. Ed. Mark Poster. Stanford, CA: Stanford P, 2001.

Baudrillard, Jean. Simulacra and Simulation. Trans. Sheila Glaser. Michigan: U of Michigan P, 1994.

Baudrillard, Jean. In the Shadow of Silent Majorities. Trans. Paul Foss, John Johnston, Paul Patton. New York, NY: Semiotext(e), 1983.

New Jerusalem Bible. Garden City, NJ: Doubleday, 1985.

Lehodey, Vital. A Spiritual Directory for Religious. Trappist, Ky: Abbey of Our Lady of Gethesemani, 1946

Mcluhan, Marshall. The Medium is the Massage. Corte Madera, CA: Ginko Press, 2005.

Virilio, Paul. The Information Bomb. New York, NY: Verso, 2006.

Waddell Helen, ed. The Desert Fathers: Translations from the Latin. Ann Arbor: U of Michigan P, 1957.

A Comparison of Sexual Assault in the U.S., Canada, and England

Catie Carson

Catie Carson is a senior majoring in criminal justice and psychology. She plans to attend graduate school for criminal justice and wanted the experience of conducting formal research. This project was initiated by her advisor, Dr. Richard Wright, who acted as her mentor during the research process. Ms. Carson hopes to have a career in investigations.

Abstract

Is the sexual offense rate in the United States higher than that of other developed nations? If so, why and if not, why not? This exploratory research was conducted by funding through the Bridgewater State College Adrian Tinsley Grant Program during the summer of 2006. It will provide information that may help criminal justice professionals and psychologists understand more about factors in sexual assault, which may be unique to the United States. This comparative research examines the role of culture, politics, gender, historical foundations, legal structures, and sexual assault in three highly industrialized Western democracies. Before we can begin to understand why sexual offenders commit these crimes, we need to understand how sexual assault may vary in developed countries. Various research methods were utilized including: legal document analysis, agency record review, and journal and article reviews. Among these three nations, a higher incidence of less serious sexual assault rates was reported in Canada, while a higher incidence of more severe sexual assault rates was reported in the United States. Legal and social issues continue to affect sexual assault incidence, reporting, and prosecution.

Introduction

Violent crime affects many people, especially women. Rape is an appalling crime viewed as a deviant act by many societies. Unfortunately, the occurrence of rape happens more frequently than reported. It is exceptionally difficult to expect someone who has been victimized by rape to disclose the traumatizing event to authorities. Furthermore, victims may be compelled to relive their horrifying nightmare during a trial, while not only facing their accuser, but also facing the chance that they will be blamed for the crime.

Interpersonal violence, which includes sexual assault/rape, has become a widely recognized problem in England, Canada, and the United States. The United Nations declared that more research must be conducted by all member nations to address violence against women as a global issue. Little research has been conducted that assesses and compares the response to sexual assault for these three nations. Therefore, this study examines each nation's law reforms, support programs, role of the women's movements, status of women, and racial factors related to sexual assault in Canada, England, and the United States.

These particular countries were chosen for this exploratory study in part because of the similarities of their legal, political, and economic systems. Each nation

is a developed country with strong legal foundations traced back to English common law. Women were the primary focus for this research mainly because they represent a much higher percentage of rape victims than men do. Child sexual assault is outside the scope of this research because several additional factors are related to their victimization.

One difficulty faced when completing this research was the variability in terms and statistics. Each nation has different methods for data collection, and there is no universal survey used for all three nations. In addition, each nation differed in its historical and contemporary definitions of rape and sexual assault. Thus this presented some obstacles when comparing the sexual assault rates and responses for each country. Every consideration was made in an effort to make the data used in this research as comparable as possible.

National Overview

It is first necessary to have an overall picture of each country in order to understand specific details of sexual assault within each nation. Developed countries share many commonalities, especially England, Canada, and the United States. One of the most important common factors is that they each have roots in England. In addition, they have similar criminal justice, political, and legal systems that make them suitable for crime comparisons. Each nation is a well-established Western developed country engaging strong principles of democracy and freedom, and their economies are open market oriented. Where there are many similarities, differences in their crime priorities can also be noted. Particularly with sexual assault, as will be later discussed, incidence rates are somewhat lower than in the U.S. and Canada, but may be higher in other crime areas.

England has a much longer history than either Canada or the United States, but one could claim that England has not been as progressive with law reform as the other two nations. Furthermore, some traditional values of the family and motherhood remain planted in England, whereas less gendered norms appear in the U.S. and Canada. Other factors, such as racial diversity, raise an interesting relationship to sexual assault rates.

Consequences and Issues of Rape

There are significant social, psychological, financial and health results that are associated with the problem of rape. Many rape victims experience considerable injuries during their attack, and some psychological injuries take more time to heal. Victims suffer psychological distress that affects their lifestyle, family, and social relationships. When exposed as a rape victim, they must endure the process of investigation and trial if they choose to report the incident. Many rape victims require time away from work to recover from injuries and restore a sense of security and worth in their lives.

Financial and health costs of rape are immense. The Children's Safety Network Economics and Insurance Resource Center estimated that sexual assault costs $159 million per year in the United States alone. (World Health Organization, 2004). Although it is difficult to calculate the total cost of sexual assault in each nation, it is possible to analyze the type of costs involved.

After a victim is raped or sexually assaulted, that event can have traumatic effects on their psychological health. Many victims require counseling or psychotherapeutic services to aid them in their recovery. The average cost was estimated at $978 per rape victim for mental health services (National Center for Injury Prevention and Control, 2003). In addition, the National Center for Injury Prevention and Control (2003) estimated that rape victims eventually end up paying more than a quarter of the total costs related to their victimization.

In addition, many victims are injured during their attack and thus require medical care. The National Violence Against Women Survey (1995) found that 116,647 out of 322,230 intimate partner rapes resulted in injuries; 36,161 required medical care (Gerberding, 2003). Medical costs do not end with physical injuries. When a victim is taken for her rape examination, when she is in need of physical therapy or dental work, or if her injuries require multiple medical visits, the medical costs can amount to thousands of dollars per victim (National Center for Injury Prevention and Control, 2003).

Other costs to the victim and government can arise during the reporting and trial processes. When a victim reports her rape, police services are necessary for investigating the claim. This can range anywhere from the use of police officers for report taking, to the cost of evidence collection. When a rape case is prosecuted, fees are incurred and the victim may have to take several days off from work for the trial process.

Another issue with rape and sexual assault in particular is what some have referred to as a "second assault" by the criminal justice system. The credibility of a rape victim, such as her appearance, timeliness of the report, physical injuries, sexual history, occupation, or mental state, is still looked upon with incredulity like no other crime (Hodgson and Kelley, 2002). Kelly, Lovett, and Regan (2005), attribute this second victimization in part to existing rape myths.

The attitudes toward a victim can be heavily influenced by myths, and thus may deter a victim from reporting or continuing through the process. The police can have either negative or positive effects on rape reporting. Police behavior includes the recording of a sexual assault, investigation, and the decision whether to pursue a case that may be influenced by their personal beliefs (Jordan, 2001). Juries also have power in rape cases based on their acceptance or denial of rape myths. They

decide whether or not a person will be convicted, and they also decide whether or not to believe the victim. Low conviction rates have been established as a problem within each criminal justice system along with low reporting rates. Juror attitudes affect how police/prosecutors react because the police/prosecutor may decide not to send a case forward if they believe a jury will not convict (Rumney, 2001).

Martin and Yancy (2005) agreed with other scholars that statutory change is necessary because rape law reforms from the last few decades have not made a substantial change in sexual assault cases. Rape law reform has had limited success in decreasing the problem of rape and sexual assault.

History of the Women's Movements
It is critical in understanding sexual assault to understand the political role and impacts on women. By establishing the political and historical roles of women, it is easier to understand the evolution and impact of sexual assault laws. Women have been dealt countless obstacles in their fight for equality with men, yet to be fully attained. Each nation experienced a women's movement that encompassed political, economic, social and family, and educational spheres. Various milestones were achieved in the 18th, 19th, and 20th centuries, redefining the roles of women.

Feminism did not die out after suffrage and the achievement of political rights for women. However, over the next few decades, very little was pursued on the women's fronts in each nation. More focus was spent on the family after WWI and the Cold War, and soon after the baby boom occurred. A second major reform period did not begin until the 1960's and 1970's when women's education, equal pay, sexual freedom, political representation, and violence against women issues surfaced in the public sphere. Internationally, important reforms had already been addressed a decade earlier, however.

In 1951, the International Labor Organization (ILO) created Equal Remuneration Convention that mandated equal pay for equal work, which was aimed at improving labor participation (Neft and Levine, 1997). Seven years later, the Discrimination Convention was created to combat the incidence of sex discrimination in the workforce (training, hiring practices, etc). The U.S. government did not adopt these principles right away. An Equal Pay Act was passed in 1963 following the establishment of the Commission on the Status of Women. This was nearly a decade after a call for reform on the international level.

In 1994, the "Fair Pay Bill" expanded equal pay for women to work of equal value for women in the U.S. England experienced similar legislation. An Equal Pay Act was passed in 1970 and equal pay for work of equal value was added in 1983. In Canada,

the Employment Equity Act established these principles in 1986 (Neft and Levine, 1997).

Labor force participation has slowly been converging over the last century, but it is evident that it is still not equal between women and men (Jacobsen, 1998). Neft and Levine (1997) found a large difference in pay scales between women and men. In the U.S., women earned only 75% of what men earned in 1997. English women earn 70% of what men are paid and Canadian women are paid the least of all three nations. Women are paid 63% of what men are paid in Canada. Even within employment types, there are disparities. Many women continue to remain in traditional employment sectors, such as services and clerical work. Steele (1995) reported a low representation (19%) of women in the natural sciences, engineering, and mathematical fields in Canada, for example. Since some scholars have argued that women's employment outside the home impacts family life, women are measured by how well they can balance responsibilities of career success with success as a mother (Riggio, 2006).

In today's economy, it is far more common to have dual-earner families, especially in the U.S. (Riggio, 2006). However, it is also common to have single parent families, and this can be especially difficult for women. According to Spraggins (2003), twice as many U.S. women (4.4%) than men (2.8%) earned less than $10,000 in 2001. At the other end of the spectrum, only 5.5% of women earned over $75,000 in 2001 while three times as many men (15.8%) earned a salary in that same range. In Canada, aboriginal women are experiencing severe economic distress. The unemployment rate of aboriginal women was 21.1% in 1998 (Federal/Provincial/Territorial, 2002).

Economic differences should not immediately be attributed to education. In fact, there are larger percentages of women enrolled in higher education than men and this has been true since the 1970's in the U.S. (Cronin, 2006). Currently, 56% of students in the U.S., 49% of students in England, and 54% of students in Canada are women (Neft and Levine, 1997). Reitz (2005) made the argument that motherhood is no longer as affected by education. During the first half of the century, women were forced to choose between raising a family and becoming educated to further their chance at better employment. Today, women are expected to be educated if they wish to hold prominent positions more so than the expectations of men in those same positions.

A few women have been able to go further with their education than was ever possible in the 19th century. In 1931, Jane Addams became the first U.S. woman to win a Nobel Peace Prize. Since that time, nine other U.S. women have achieved that milestone. Only one woman in England, Dorothy Hodgkin, has won a Nobel Prize for chemistry in 1964. No woman from Canada has

yet to win this esteemed prize. (Neft and Levine, 1997). After the rebirth of feminism in the 70's, education curricula were altered to remove bias against women. Sex stereotypes were also reduced, especially after a redesign of the curriculum in 1989 for English classrooms. U.S. legislators followed in 1994 with the Gender Equity in Education Act aimed at addressing the same biases (Neft and Levine, 1997).

Employment discrimination was only one of several injustices women have experienced. In the U.S., an issue that faced extreme opposition and attention was the Civil Rights Movement. Not only was this an important struggle for minorities, but it also provided advancements for women. In 1964, the Civil Rights Act was passed to prohibit discrimination of anyone based on their race *or* gender (Matthews, 1992). The Kennedy Commission, established prior to the Civil Rights Act, was created to report on the status of women, and may have influenced the addition of gender to the Civil Rights Act. The political representation of women was also examined by the Kennedy Commission. The goal was to make women's positions more useful in their effect on political events. Later in 1971, the National Women's Political Caucus expanded upon the goals of the Kennedy Commission to encourage more women to seek political positions (Matthews, 1992).

Similarly to the Civil Rights Act, the Charter of Rights and Freedoms was written into the Canadian Constitution during the 1980's (Relsick, 1992). The Charter was a success after the Canadian Status of Women began in 1976 (Neft and Levine, 1997). Another organization that aided in the passing of the Charter of Freedoms was LEAF (Legal Education and Action Fund). Their role was to defend cases of discrimination against women (similar to the NAACP and minorities in the U.S.) (Razack, 1991). In England, the Women's National Commission was enacted in 1969 as an advisory board to the government in the same fashion as the Canadian Status of Women and the Kennedy Commission (Neft and Levine, 1997).

Once these programs were instituted, more political opportunities opened for women. The first English female Prime Minister, Margaret Thatcher, took office in 1979 and remained in office for eleven years. In Canada, the first female Prime Minister was elected in 1993. Unfortunately, no woman has held either the Vice Presidential or Presidential position in the U.S. The closest nomination came in 1984 when the first and only woman, Geraldine Ferraro, was placed on the Democratic ticket for vice president (Matthews, 1992).

The Employment Opportunities Commission (2002) reported that out of 659 total positions in the House of Commons, only 118 were women (17.9%). The House of Lords was comprised of only 16% women in 2002. Though percentages of women in both houses are low, Cabinet attendance records from as far back as 1976 revealed a high participation rate (346 attendances out of 460 summons) by female members. This suggested the problem was with getting women into the positions, not with their actions while in office (Vallance).

Worldwide, the U.S. ranks 58th for women's political leadership. Only 26 women have been governors in U.S. history (Shapiro, 2006). The Bureau of the Census (1995) found a ratio of 1 female to every 3 males in local governments during 1992. For every woman in county governments, there were 3.5 males. For municipal governments, the members of government boards reported even less representation of women with a ratio of 1 female to every four males (Bureau of Census, 1995). In 1993, a Canadian report disclosed a similar ratio of 1:3 males in the House of Commons (Political Women, 1995).

One of the main issues for women politically is the work/family struggle. If a woman pursues a position with large rewards, she will have greater responsibilities and thus will have greater difficulty balancing work with family duties (Shapiro, 2006).

On the social front, several controversial issues surfaced in the 20th century. After the suffrage movement, some legislators became increasingly aware of the hardships many women faced. In the U.S., the Sheppard Towner Act was passed in 1921 to allocate funds known as "welfare" for the first time (Matthews, 1992). This provided assistance in housing, food, and healthcare. Just as in the realms of women's education and politics, feminists had few successes with social issues during the following few decades.

After the rebirth of feminism in the 1960's, feminists expanded their goals to include the sexual freedom of women and right to abortion. Discrimination against women based on their gender largely reflected women's sexual freedom. One obstacle that remained for feminists during the 1960's was the legalization of birth control. It had been a goal since the early part of the century, but no advancements had been made. The U.S. and Canadian governments finally allowed the production of birth control for all women by the late 60's. In England, however, legislators were more hesitant and birth control was not legalized until 1971 (Bolt, 1993).

A parallel right for women's sexuality was that of abortion. The issue became public in the 1960's, and met fierce opposition, but it is still a controversial issue even today. The landmark case in the U.S. (1973), *Roe v. Wade,* established the precedent that it was a woman's right to choose whether or not to give birth, consequently legalizing abortion. The Canadian government

decriminalized abortion after more progressive action four years earlier (Relsick, 1992).

English courts legalized abortion much earlier in 1967, demonstrating less societal reluctance to abortion than in the U.S. and Canada. In each nation, abortion continues to be an extremely controversial topic. Violence, such as bombings of abortion clinics and protests, keep the pro-life and pro-choice debate alive.

Familial trends have been another social area of interest to feminists and governments that have affected women's status in the U.S, Canada, and England. Divorce has traditionally been considered a deviant and, at one time, illegal act. It was not until the 1970's that divorce was permitted at "no fault" to the spouse filing for divorce (Jacobsen, 1998). Essentially, a woman could finally have the right to leave her husband for social reasons, such as adultery. Once each nation changed laws regarding divorce, rates climbed over the next thirty years. In 1993, Neft and Levine (1997) found that 51 of every 100 married couples had been divorced.

The high rate of divorce created a separate issue for family life, the rise in single-parent families. Between 1991 and 1992, 1.3 million single-parent families were recorded in England. An overwhelming majority of these households were headed by women. Similarly, 1/3 of families residing in the U.S. in 1993 were single-parent families (Neft and Levine, 1997). If this trend continues, women will face further disparity by the burden of providing both financial and parental duties.

Maternity leave is a relatively new establishment for women in developed countries. It does, however, impact women's employment and financial status. Canada currently provides 15 weeks of paid maternity leave (60% of salary), and England provides 8-16 weeks of paid leave depending on length of employment and other factors (Neft and Levine, 1997). Only two major developed nations do not provide any paid maternity leave. New Zealand is one, and the U.S. is the other. In the U.S., the Family and Medical Leave Act was not passed until 1993, and even then, mandated only 12 weeks of unpaid maternity leave (Neft and Levine, 1997). Reform advocates continue in their attempt to change this act.

A final issue for women today is violence against women, especially interpersonal (IPV) and sexual violence. In 1989, Canada took the lead in addressing the status of women. The Coalition of Violence Against Women (VAW) was established in response to the increasing problem (Neft and Levine, 1997). A few years later, Match International (another program in Canada) was founded. Match International extended the issue to other nations as a global priority in 1988, where it has remained today (Pierson and Cohen, 1995). Rape law and reform efforts were then instituted to address violence against women in the U.S and England.

History of Rape Law Reform
Throughout English, American, and Canadian legal history, the crime of rape was founded upon myths and stereotypes about rape victims. As a crime, rape had been treated lightly until reforms of the 1970's and 1980's. Feminist and law reform advocates argued for the severity of the crime and the lack of proper response by the criminal justice system, calling for significant statutory changes.

In the last thirty years, many laws have been enacted to respond to rape. They have been modified again and again while professionals attempt to reach agreement on this controversial issue. These include the Sexual Offences Act of 1975 and 2003, the Youth Justice and Criminal Evidence Act of 1999, and the Criminal Justice Act of 2003 in England. In the United State similar legislation such as rape shield laws, the Violence Against Women Act (1994), and Michigan's Criminal Sexual Assault law (1974), were created in response to the crime of rape. In Canada, rape shield statutes outlined in amendments Bill C-127 (1983) and C-49 (1992) to the Criminal Code, the Canadian Charter of Rights and Freedoms (1983), and other amendments to the Criminal Code provided greater support for victims over time.

Underreporting of sexual assault remains though these efforts have been made. Gunn and Minch's study disclosed that victims are more likely to report if they blamed not themselves but the rapist, if the rapist was a stranger, if there was no past sexual victimization, and if visible injuries resulted (Sampert, 2005).

Discussion and Conclusions
This research examined key factors affecting sexual assault rates in the United States, Canada, and England. According to recent statistics, Canada has the highest rate of less serious sexual assaults and the United States experiences a higher rate of serious sexual assaults (including rape). England's sexual assault prevalence is lower than the other two nations.

Numerous secondary research questions were explored in this study in order to gain an accurate picture of each nation's sexual assault response.

§ How did the nations with the highest and lowest rates define sexual assault?

§ What were some differences in culture and family between those countries with lower rates and those with higher rates?

§ What other social issues correlate to the higher rates?

§ What key legislation was passed regarding sexual assault?

§ What political and international organizations have influenced sexual assault rates?

§ What were differences in racial populations of each nation, and was that a factor relating to sexual crime?

Through further exploration, this research was able to provide several answers to these specific questions. Each nation defined sexual assault differently in both police reported and self-reported statistics. After rape law reform occurred in each country, definitions changed. Canada classified sexual assault in three levels from less serious to more severe assaults. In all three nations, legal reforms included the dismissal of resistance and corroboration requirements. The consent standard was expanded upon, and penetration was changed to include other than vaginal orifices.

Several factors were found to correlate to the prevalence of sexual assault including poverty, the status of women, location, age of victim and offender, ethnicity, alcohol or drug use, and previous sexual assault victimizations. Another factor affecting women in each nation was the acceptance of existing rape myths. Upon examination of several of these factors, it was difficult to determine how racial factors played into rates of sexual assault for all three countries. However, Canada and the U.S. both have certain

populations of women of color that have a higher incidence of sexual assault than white women.

In Canada, indigenous women experience a higher rate of sexual assault and those regions heavily occupied by indigenous women have more cases of sexual assault than other regions of Canada. In the U.S., Native American women are at the highest risk of sexual assault, followed by African American women. Unfortunately, this study could not find data on sexual assault by race in England. Research is still needed that analyzes minority sexual assaults in England like those in Canada and the U.S. in order to expand this specific research in the future.

The status of women and the women's movements were examined as a major part of this research. Over the past century or more, women have struggled to gain equal rights with men in each nation. Feminists fought ardently for women's public access and the release of control by patriarchal systems. Once freedoms were gained in the area of education, they turned to economic and political advances. Yet even in this modern age, women do not share full equality with men as they earn less, do not have equal political success, and do not share the same equality in all areas of employment.

From the 1960's to the 1980's, the anti-rape segments of the feminist movements advocated for legal reform to improve the criminal justice process from the time of report to the resulting conviction of the offender. Since rape law reform initiatives were started, some scholars have examined the effects of the reforms.

Overall, most reforms have had little success in addressing conviction and reporting rates.

Rape shield laws have perhaps been the most criticized reforms in all three nations, and they continue to face scrutiny in today's courts. Many scholars have noted that they are failing to protect the victim. Furthermore, victims are still being subjected to what some have called "a second assault" by the criminal justice systems during the rape trial process. Even when rapes are reported, many do not result in a conviction for rape. In fact, the English government in particular has called attention to poor conviction rates as a major issue of concern.

Other issues continue to weigh heavily on the responses to sexual assault. Underreporting of rape is still a major problem. This can be attributed to many things including fear of retaliation, fear of the treatment by police or friends, shame, self-blame, and rape myths. In Canada and England, the use of video or screen testimony is allowed to ease victims, however it is only available for certain cases of child sexual abuse in the United States.

Though few, some positive outcomes from reform were able to address concerns of feminists. In each nation, support programs (such as Rape Crisis Centers or Sexual Assault Response Centres) were developed to aid the victims through the reporting and trial process. Relief funds have also been allocated to help pay for medical, psychological, and employment costs a victim incurs after her rape.

This research began in an effort to understand why sexual assault rates are at such high levels in three Western, developed nations. In an effort to locate specific correlations, the study has only opened wider doors for further research. Perhaps by examining several other developed and undeveloped countries, a more accurate picture could be constructed to help evaluate and improve responses to sexual assault. Secondary research looking at sexual offenders might be useful in understanding the rates of sexual assault as well. If more is learned about the effect of law reforms and current responses to sexual assault, then Canada, the United States, and England may be more capable of preventing this crime and improving the victim's experience in the criminal justice system. As evidenced by Tables 1 and 2, each nation has made significant, but not completely successful efforts to prevent and prosecute rape and sexual assault.

Summary- Sexual Assault Data 1

SELF REPORT DATA	UNITED STATES	CANADA	ENGLAND
Source	NVAW	VAWS/GSS	BCS
Lifetime Prevalence	17.60%	39%/20%	24%
S/A Rates within Sample Time	3%	N/A	.9% S/A, .4% Rape
Risks	Native American women (34.1%), women aged 12-24 (61.8%)	women aged 25 and under (18%)	women aged 16-24 (rate of 6.8% S/A and 2.1% rape), income of 10,000 or less (1.3% S/A and .7% rape)
Vic/Perp Relationship	Stranger (16.7%), Offender known to the victim (89.7%)	Stranger (19%), offender known to the victim (38%)	Stranger (8%), Offender known to the victim (92%)

Summary- Rape Law Reform

KEY REFORMS	UNITED STATES	CANADA	ENGLAND
Major Law 1	Michigan Model (1974)- Criminal Sexual Assault Law- dropped corroboration requirement/ utmost resistance, rape shield law, focus on offender	Bill C-52 (1978) and C-53 (1981) Criminal Code (Unsuccessful)	Sexual Offences Act (1976)- added consent, dropped resistance requirement, redefined rape
Major Law 2	Rape Shield Laws- eventually adopted by other states, but still an issue (Kobe Bryant Case)	Bill C-127 (1983) Criminal Code- rape shield, dropped marital rape exemption, 3 levels of S/A	Youth Justice and Criminal Evidence Act (1999)- support for vics, video/screen testimony
Major Law 3	Violence Against Women Act (1994)- established new crimes for S/A, gov't response to S/A as a problem, $ support and Rape Crisis Center support	Bill C-49 (1992) Criminal Code- R v. Seaboyer changed total restriction of vic's sexual hx to limited with written intent to use in court	Sexual Offences Act (2003)- rape redefined to include any penetration, different levels of S/A
Significant Cases	People v. Paxton (1967)- victim's sex hx allowed, not defendants	Pappajohn v. the Queen (1980)- Honest but mistaken belief defense	DPP v. Morgan (1976)- Honest though mistaken belief of consent

Summary- Women's Movements			
	UNITED STATES	CANADA	ENGLAND
Setbacks	Salem Witch Trials- 17th Century, religious and patriarchal oppression, "Doctrine of Separate Spheres"	Indian Act 1876, "Doctrine of Separate Spheres", religious and patriarchal oppression	European witchhunts 15-17th Centuries, religious and patriarchal oppression
Social Reform	Civil War and Slavery, Temperance Movement, Birth Control approved- 1963, Roe v. Wade- 1973	VAW initiative, Status of Women Canada, Birth Control 1960's	Utopian Socialism promoted, Enlightenment, Married Women's Property Act- 1882, Temperence Movement
Education	Colonial America- the novel, 10 Women Nobel Peace Prize Winners	0 Women Nobel Peace Prize Winners	Early England- the novel, 1 Woman Nobel Peace Prize Winner
Labor Force Participation	1850's- surge of immigrants- women in factories, peaked during WWII, Fair Pay Bill 1994	Women's labor peaked Industrial Revolution, Employment Equity Act 1986	Peaked in WWI, Sex Discrimination Act- 19, Equal Pay Act 1970
Political Representation/ Involvement	1848- Seneca Falls Convention, Eleanor Roosevelt (First Lady), Geraldine Ferraro ( ), Sandra Day O'Conner (Supreme Court) Suffrage- 1920	suffrage 1916 some provinces- Quebec 1940- Native women 1960, Kim Campbell 1st female Prime Minister	Suffrage- 1918, NUWSS and WSPU political organizations, Margaret Thatcher- 1st female and longest running Prime Minister
Women Today	Pol: underrepresented in government, still no female VP or Pres in U.S. Econ: women earn only 70% of mens wages Education: more women attending college than men Social: work/family struggle, rise in single mother households, abortion issues		

Bibliography

II. National Overview

Central Intelligence Agency. (2006). The World Factbook. Washington, DC. Retrieved June 9th, 2006 from: <www.odci.gov/cia/publications/factbook/index.html.>

. . . .

Farrington, David P., Patrick A. Langan and Michael Tonry. (2004). Cross-National Studies in Crime and Justice. U.S. Department of Justice. Washington, D.C.: Bureau of Justice Statistics.

. . . .

Merriam Webster. (2006). "Online Dictionary". Retrieved from: < http://www.m-w.com/dictionary/>.

. . . .

MSU Canadian Studies. (2003). "Quebec Independence/Separatism/Sovereignity". June 30, 2003. Retrieved from: <http://mcsrt.org/resources/quebec/chronology.htm. >

. . . .

Séguin, Rhéal. (2006). "Boisclair wins by-election". The Globe and Mail. August 15,2006. Page A2. Retrieved from: <http//www.theglobeandmail.com>.

. . . .

Tonry, Michael and David P. Farrington. (2005). Crime and Punishment in Western Countries, 1980-1999. Crime and Justice. Vol. 33. Chicago, IL: University of Chicago Press.

. . . .

U.S. Census Bureau. (2000). "Census of State and Local Law Enforcement Agencies 2000". Retrieved from: <www.census.gov.>

. . . .

U.S. Census Bureau. (2006). "Census Population Survey". March 2005. Retrieved from: < http://www.census. gov/population/www/socdemo/hh-fam.html>.

. . . .

III. Sexual Assault Data

Brzozowski, Jodi-Anne. (2004). Family Violence in Canada: A Statistical Profile 2004. Canadian Centre for Justice Statistics. Canada: Minister of Industry. Catalogue no. 85-224-XIE

. . . .

Canada. (2002). "Assessing Violence Against Women: A Statistical Profile".

. . . .

Catalano, Shannon M. (2005). Criminal Victimization, 2004. Bureau of Justice Statistics. Washington, DC. NCJ-210674

. . . .

Federal Bureau of Investigation. (2006). "Crime in the United States 2004". Department of Justice. Uniform Crime Reports: Washington D.C. Accessed February 26, 2006 from: <www.fbi.gov/ucr>.

. . . .

Gannon, Maire. (2001). "Crime Comparisons Between Canada and the United States". Statistics Canada. Vol 21-11. Catalogue #85-002-XPE. Canada: Minister of Industry.

Gerberding, Julie L. (2003). "Costs of Intimate Partner Violence Against Women in the United States". Centers for Disease Control and Prevention. United States: National Center for Injury Prevention and Control.

. . . .

Hodgson, James F. and Debra S. Kelley. (2002). Sexual Violence. "Policies, Practices, and Challenges in the United States and Canada." Westport, CT: Praeger Publishers.

. . . .

Jordan, Jan. (2002). Will any woman do? "Police, gender and rape victims". Policing: An International Journal of Police Strategies and Management. Vol. 25-2. MCB UP Limited.

. . . .

Kelley, Liz, Jo Lovett, and Linda Regan. (2005). "A Gap or a Chasm? Attrition in Reported Rape Cases". Home Office Research Study 293. London, United Kingdom: Home Office Research, Development and Statistics Directorate.

. . . .

Krug, Etienne G., Linda L. Dahlberg, James A. Mercy, Anthony B. Zwi and Rafael Lozano. (2002). "World Report on Violence and Health". Geneva, Switzerland: World Health Organization.

. . . .

Martin, Patricia Yancy. (2005). Rape Work: Victims, Gender, and Emotions in Organization and Community Context. New York, NY: Routledge Taylor and Francis Group.

. . . .

Myhill, Andy and Jonathan Allen. (2002). Rape and sexual assault of women: the extent and nature of the problem. Findings from the British Crime Survey. Home Office Research Study 237. London: Home Office Research, Development and Statistics Directorate.

National Center for Injury Prevention and Control. (2003). Costs of Intimate Partner Violence Against Women in the United States. Atlanta, Georgia: Centers for Disease Control and Prevention.

. . . .

Nicholas, San, David Povey, Alison Walker and Chris Kershaw. (2005). "Crime in England and Wales 2004/2005". Home Office Research. #1358-510X. Home Office Research and Statistics Directorate.

. . . .

Qureshi, Donna Iven. (1979). Rape: Social Facts From England and America. Champaign, IL: Stipes Publishing Company.

. . . .

Rumney, Philip N.S. (2001). The Review of Sex Offences and Rape Law Reform: Another False Dawn? The Modern Law Review Limited. Vol. 64:6. Malden, MA: Blackwell Publishers.

. . . .

Statistics Canada. (1999). "A Profile of Criminal Victimization: Results of the 1999 General Social Survey". Catalogue no. 85-552-XIE. Canadian Centre for Justice Statistics.

. . . .

Suave, Julie. (2005). "Crime and Statistics in Canada, 2004". Statistics Canada. Vol. 25-5. Catalogue no. 85-002-XIE. Canada: Minister of Industry.

. . . .

Tjaden, Patricia and Nancy Thoennes. (2006). Extent, Nature, and Consequences of Rape Victimization: Findings From the National Violence Against Women Survey. National Institute of Justice. Washington DC: U.S. Department of Justice.

. . . .

Walby, Sylvia and Jonathan Allen. (2004). Domestic violence, sexual assault and stalking: Findings from the British Crime Survey. Home Office Research Study 276. London: Home Office Research, Development and Statistics Directorate.

. . . .

World Health Organization. (2004). "The Economic Dimensions of Interpersonal Violence". Geneva, Switzerland: World Health Organizations.

. . . .

IV. History of the Women's Movements

. . . .

Anderson, Michelle. (2005). "All American Rape" St. John's Law Review.
Vol. 79, Issue 3. Accessed Feb 20, 2006 from: library.bridgew.edu:2298externalframe.asp.?+b=1&_ug=sid.

. . . .

Antler, Joyce. (1992). "A Purposeful Journey". Books and the Arts. The Nation. Vol. 58.

. . . .

BBC. (2006). "Early 20th Century. The Campaign for Women's Suffrage 1903". Accessed from: <bbc.co.uk/history/timelines/Britain/cen_w_suffrage.shtml>.

. . . .

Bolt, Christine. (1993). The Women's Movements in the United States and Britain from the 1970's to the 1920's. Amherst, MA: University of Massachusetts Press.

. . . .

Bureau of Census. (1995). "Popularly Elected Officials: 1992 census of Governments". GC92 (1)-2. U.S. Department of Commerce. Accessed June 23, 2006 from: <www.census.gov>.

. . . .

Coole, Diana. (2000). "Threads and Plaits or an Unfinished Project? Feminism Through the Twentieth Century". Journal of Political Ideologies. Vol. 5: 1. Pp 35-54.

. . . .

Economist. (2005). "Judge Not". The Economist. Vol. 376: 8438. Economist Newspaper LTD.

. . . .

Equal Opportunities Commission. (2002). "Women and Men in Britain: Public and Political Life". Manchester, UK: Arndale House.

. . . .

Federal-Provincial-Territorial. (2002). Assessing Violence Against Women: A Statistical Profile. Canada: Ministers Responsible for the Status of Women.

. . . .

Hall, David P. (1994). "Witchhunting in Salem". Christian History. Vol. 13:1.

. . . .

Jacobsen, Joyce P. (1998). The Economics of Gender. Second Edition. Malden, MA: Blackwell Publishers.

. . . .

Mackinnon, Catharine. (2001). Sex Equality: Rape Law. New York, New York: Foundation Press.

. . . .

Matthews, Glenna. (1992). The Rise of the Public Woman. "Woman's Power and Woman's Place in the United States 1630-1970. New York, NY: Oxford University Press.

. . . .

Neft, Naomi and Ann D. Levine. (1997).Where Women Stand. "An International Report on the Status of Women in 140 Countries 1997-1998". New York: Random House.

. . . .

Pelka, Fred. (1992). "The Women's Holocaust". The Humanist. September/October. American Humanist Association. Pp 5-9.

. . . .

Pierson, Ruth Roach and Marjorie Griffin Cohen. (1995). Canadian Women's Issues. "Volume II: Bold Visions". Ontario, Canada: James Lorimer and Company Ltd.

. . . .

Political Women. (1995). "Political Women". Canada and the World Backgrounder. Vol. 60: 4.

. . . .

Razack, Sherene. (1991). Canadian Feminism and the Law. Toronto, Canada: Second Story Press.

. . . .

Reitz, Victoria. (2005). "Educated Women Don't Scare off the Men". Engineering Career Buzz. Machine Design. Vol. 96.

. . . .

Relsick, Judy. (1992). "Unity in Diversity: The Women's Movement in Canada". Social Policy. Vol. 23:1. Pp 47-55.

. . . .

Riggio, Heidi R. (2006). "The Adaptive Response of Families to Maternal Employment: Part II- Family Perspectives". American Behavioral Scientist. Vol. 49:10. Sage Publications.

. . . .

Shapiro, Judith R. (2006). "Why Women Still Feel Persecuted". USA Today. Society for the Advancement of Education.

. . . .

Spraggins, Reneé E. (2003). "Women and Men in the United States" March 2002. P20-544. U.S. Census Bureau. United States: Department of Commerce.

. . . .

Steele, Scott. (1995). "Women at Work: Room to Improve". Maclean's. Vol. 108: 34.

. . . .

Vallance, Elizabeth. "Women in the House of Commons". Political Studies. Vol. XXIX:3. London: Blackwell Publishing Limited.

. . . .

Wojtczack, Helena. (2006). "English Women's History: The 19th and 20th Centuries". Accessed June 2nd, 2006 from: <www.hastingspress.co.uk/history/index.htm>.

. . . .

V. History of Rape Law Reform

Anderson, Michelle. (2002). "Understanding Rape Shield Laws". From Chastity Requirement to Sexuality License: Sexual Consent and a New Rape Shield Law. Vol. 70. George Washington Law Review. Pp 51-59.

. . . .

Bachman, Ronet. (2000). Violence Against Women Synthesis of Research for Criminal Justice Policymakers. National Institute of Justice. Accessed Feb 6, 2006 from: www.ncjrs.org/pdffiles1/nij/grants/199579.pdf

. . . .

Bell, Graham. (2002). "Reflection on the Law of Rape". The Journal. P. 17.

. . . .

Berger, Ronald, W., Lawrence Neuman and Patricia Searles. (1991). "The Social and Political Context of Rape Law Reform: An Aggregate Analysis". Social Science Quarterly. Vol. 72, No. 2. June 1991. University of Texas Press.

. . . .

Burgess, Ann. (1988). Rape and Sexual Assault II. New York and London: Garland Publishing, Inc.

. . . .

Chappell, Duncan, Robley Geis and Gilbert Geis. (1977). Forcible Rape. "The Crime, the Victim, and the Offender". New York: Columbia University Press.

. . . .

Crowell, Nancy and Ann Burgess. (1996). Understanding Violence Against Women. Washington, D.C.: National Academy Press.

. . . .

Crown. Sexual Offences Act of 2003. Chapter 42. Queen's Printer of Acts of Parliament. Retrieved April 2, 2006 from: www.opsi.gov.uk/acts/acts2003/20030042.htm.

. . . .

Denike, Margaret. (2000). "Sexual Violence and Fundamental Justice: on the failure of equality reforms to criminal proceedings." Canadian Women's Studies. Vol. 20:3. Pp. 151-159.

. . . .

Du Mont, Janice. (2003). "Charging and Sentencing in Sexual Assault Cases: An Exploratory Examination." Canadian Journal of Women and Law. Vol. 15.

. . . .

Englander, Elizabeth Kandel. (2003). Understanding Violence. Second Edition. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

. . . .

Gager, Nancy and Cathleen Schurr. (1976). Sexual Assault: Confronting Rape in America. New York: Grosset and Dunlap.

. . . .

Goldstein, Leslie. (1994). Contemporary Cases in Women's Rights. Madison, Wisconsin: University of Wisconsin Press.

. . . .

Grace, Sharon, Charles Lloyd and Lorna J.F. Smith.(1992). "Rape: From Recording to Conviction". Research and Planning Unit Paper 71. London, England: Home Office.

. . . .

Haddad, Richard I. (2005). "Shield or Sieve? People v. Bryant and the Rape Shield Law in High Profile Cases". Columbia Journal of Law and Social Problems. Vol. 39:185. New York, NY: Columbia University. Pp. 186-221.

. . . .

Harris, Jessica and Sharon Grace. (1999). "A Question of Evidence? Investigating and Prosecuting Rape in the 1990's". Home Office Research Study 196. London: Home Office Research, Development and Statistics Directorate.

. . . .

Hasday, Jill Elaine. (2000). Contest and Consent: A Legal History of Marital Rape. California Law Review Inc. Vol. 88:1373. California: University of California Press. Pp 1373-1505.

. . . .

Hinchliffe, Sara. (2000). Rape Law Reform in Britain. Society Abroad. May/June. Transaction Publishers.

. . . .

Jordan, Jan. (2001). Worlds Apart? Women Rape and the Police Reporting Process. Brit J. Criminal. Vol. 41. Pp 679-706. Centre for Crime and Justice Studies.

. . . .

Kwong-leung, Tang. (1998). "Rape Law Reform in Canada; the success and limits of legislation." International Journal of Offender Therapy and Comparative Criminology. Vol. 42:3. Pp. 258-270. Sage Publications.

. . . .

Meadows, Robert J. (2004). "Rape Shield Laws: A Need for an Ethical and Legal Re-examination?" Vol. 17: 3. Criminal Justice Studies. Pp. 281-290.

. . . .

Macfarlane, Bruce A. (1993). 100 years of the criminal code in Canada: essays commemorating the centenary of the Canadian criminal code. "Historical Development of the Offence of Rape". Manitoba: Canadian Bar Association.

. . . .

McGregor, Joan. (2005). Is it Rape? "On Acquaintance Rape and Taking Women's Consent Seriously". Burlington, Vermont: Ashgate Publishing Company.

. . . .

National Task Force to End Sexual and Domestic Violence Against Women. (2006). The Violence Against Women Act. "10 Years of Progress and Moving Foreward". Legal Momentum. Washington, DC.

. . . .

Nicholas, Susan, Alice Price and Rachel Rubin. (1986). Rights and Wrongs. "Women's Struggle for Legal Equality". 2nd Edition. New York: The Feminist Press at the City University of New York.

. . . .

Office for Criminal Justice Reform. (2006). "Convicting Rapists and Protecting Victims: Justice for Victims of Rape". United Kingdom.

. . . .

Osborne, Judith A. (1985). "Rape Law Reform: The New Cosmetic for Canadian Women". Women and Politics. Vol. 4:3. New York: Haworth Press.

. . . .

Raubinger. (2006). Committee on Model Civil Jury Instructions. (2006). MCR 2.516. Michigan Supreme Court Committee. Lansing, MI.

. . . .

Reddington, Frances P. and Betsy Wright Kreisel. (2005). Sexual Assault. "The Victims, the Perpetrators, and the Criminal Justice System". Durham, North Carolina: Carolina Academic Press.

. . . .

Regan, Linda, Jo Lovett, and Liz Kelly. (2004). "Forensic Nursing: an Option for Improving Responses to Reported Rape and Sexual Assault". Home Office Development and Practices Report. Communication Development Unit, London: Research, Development and Statistics Directorate.

Renzetti, Claire, Jeffrey Edleson and Raquel Kennedy Bergen. (2001). Sourcebook on Violence Against Women. Thousand Oaks, California: Sage Publications.

Renner, K. Edward and Suresh Sahjpaul. (1986). "The New Sexual Assault Law; What Has Been its Effect?" Canadian Journal of Criminology. Vol. 28:4. Pp. 407-413.

Roberts, Julian V. and Renate M. Mohr. (1994). "Confronting Sexual Assault: A Decade of Legal and Social Change. Canada: University of Toronto Press Inc.

Sampert, Shannon. The Song Remains the Same: Sexual Assault Myths in Canada. Edmonton Alberta Canada: University of Alberta.

Schissel, Bernard. (1996). "Law Reform and Social Change: A Time-Series Analysis of Sexual Assualt in Canada". Journal of Criminal Justice. Vol. 24:2. Pp. 123-138. United States: Elsevier Science Ltd.

Shepherd, Judy. (2002). Reflections on a Rape Trial: The Role of Rape Myths and Jury Selection in the Outcome of a Trial. Affilia. Vol. 17-1. Sage Publications.

Smith, Lorna J.F. (1989). "Concerns About Rape". Home Office Research Study No. 106. Pp. 1-55. London, England: Home Office.

Terry, Karen J. (2006). Sexual Offenses and Offenders. "Theory, Practice, and Policy". Belmont, California: Thomson Higher Education.

Tomaselli, Sylvana and Roy Porter. (1989). Rape an Historical and Social Enquiry. Great Britain: Basil Blackwell LTD.

U.S. Congress. (1984). Federal Rape Law Reform. House Subcommittee on the Judiciary House of Representatives Before the Subcommittee on Criminal Justice. 98th Congress, 2nd Session.

Wells, Celia. (1985). "Law Reform, Rape, and Ideology". Journal of Law Society. Vol. 12:1. Pp. 63-72.

Westmarland, Nicole. (2004). Rape Law Reform in England and Wales. April. School for Policy Studies. University of Bristol, UK. Retrieved April 2, 2006 from: www.bristol.ac.uk/sps.

<u>VI. Rape and Race</u>

Bevacqua, Maria. (2000). Rape on the Public Agenda. "Feminism and the Politics of Sexual Assault". Boston, MA: Northeastern University Press.

Brownridge, Douglas A. (2003). "Male Partner Violence Against Aboriginal Women in Canada". Journal of Interpersonal Violence. Vol. 18:1. Pp. 65-83. Sage Publications.

Eschholz, Sarah and Lynne M. Vieraitis. (2004). "Race-Specific Gender Equality and Rape: A Further Test of Feminist Hypotheses". Critical Criminology. Vol. 12: 2. Pp. 195-219. Netherlands: Kluwer Law International.

Irving, Toni. (2004). "Rape, Race, and Third Wave Feminism: A Tale of Two Cities". Black Renaissance/Renaissance Noir.

Nahance, T A. (1996). Profile Of Aboriginal Sex Offenders In Canadian Federal Custody. Forum. Vol. 8: 2. May 1996, Pp 8-9. Ottawa, Ontario, Canada. NCJ-166754.

Rennison, Callie. (2001). "Violent Victimization and Race, 1993-1998". NCJ 176354. Bureau of Justice Statistics Special Report. Washington D.C.: U.S. Department of Justice.

Statistics Canada. (1999). "A Profile of Criminal Victimization: Results of the 1999 General Social Survey". Catalogue no. 85-552-XIE. Canadian Centre for Justice Statistics.

Varelas, Nicole and Linda A. Foley. (1998). "Blacks and Whites Perceptions of Interracial and Intraracial Date Rape". The Journal of Social Psychology. Vol. 138:3. Pp. 392-400.

Wahab, Stephanie. (2004). "Intimate Partner Violence and Sexual Assault in Native American Communities". Trauma, Violence, and Abuse: A Review Journal. Vol. 5: 10/2004. Thousand Oaks, CA: Sage Publications.

Forging My Relationship with the Figure: A Personal Exploration of Art Employing the Human Form

Elizabeth Davenport

Elizabeth Davenport, from Stoughton, is a senior majoring in Art Education. This research was conducted in the summer of 2006 as an Adrian Tinsley Program Summer Grant Project under the direction of Prof. Collin Asmus. Elizabeth plans to pursue a career in the Visual Arts field.

This study provided insight into the technical complexities, social implications, and history of figurative artwork and portraiture. As a result of this research, I have realized that art employing the human figure has changed throughout time. What it is today is different from what it was in the past. In the Middle Ages up until the late 19th century, portraiture was used as a tool for aristocrats to preserve or commemorate themselves and draw attention to their wealth. Today it has a more expansive definition. Contemporary artists, like Lucian Freud, Paula Rego, Alice Neel, and Jenny Saville have taken traditional figurative work to a new level. Through carefully placed elements and abstractions these artists often create a personal mythology surrounding a figure that sometimes even a face to face meeting cannot do. My goal with this research is to convey a similar effect with my own artwork.

Many different artists and artistic styles were explored in order to create a series of two-dimensional pieces employing the human form. Each piece deals with the elements of composition, gesture, proportion, and identity, as well as tapping into the expressive qualities of the body. With this project I have become a more competent draftsman and begun to develop my own artistic language. Hopefully, through the exhibition of my work, I can prompt others to recognize the relevance of this form of art.

The ability to draw the human form or face is a skill that is complex and should be practiced and cultivated. It involves composition, gesture, proportion, perspective, light, and expression – All of which are essential, and should be studied and practiced, if one wants to be a competent figurative artist. I practiced these techniques extensively throughout the past few months and have found that, while I do not have the innate abilities that some artists have, I have made substantial progress when it comes to rendering a believable human form.

All of this practice has resulted in a series of finished art pieces. With each piece I constructed a visual and written sketchbook/journal that provides a map of my process while preparing each one. In the following pages I have included a written summation of each of my sketchbook/journals as well as pictures of each of my finished pieces. They are in chronological order (beginning with Piece #1; ending with Piece #5) and my hope is that each piece displays some sort of progression or growth in my artistic abilities and influences. A bit of my

"chatter" is redundant or hard to follow but I believe that each "entry" is a true representation of my thoughts on each piece.

Sketchbook/Journal Entries
Pieces 1-5

Piece #1
"A Portrait is a model complicated by an artist."
Charles Baudeliare

This is my first large-scale finished piece; a self portrait. I plan to start and finish with a self portrait in order to highlight my progression through this project's process. I hope to enhance my perception of my own artwork and ultimately of myself.

I am having a difficult time feeling satisfied with this portrait. I can see parts of the body that are out of proportion, could have been drafted more accurately, and are simply awkward. But after pointing out all these flaws in my work, I usually ask myself, "Aren't these flaws and exaggerations the things that that make an art piece unique to a particular artist? Distinguishable? Expressive? If the artist's depiction of themselves or their sitter is an exact

representation, wouldn't it be easier to just take a photograph instead?"

Yes, perhaps . . .
But I think that before you can become a master of abstraction/ expressionism and the figure, you need to be able to depict the human form accurately. I have had the opportunity to see the artwork of many artists throughout the past few weeks. I have noticed that "giants" in the field, Picasso, Matisse etc., create beautifully abstracted pieces. I've have also seen very realistically prepared pieces created by them as well. These artists really had a firm grasp on how to depict the human form and I feel that this made their abstractions all the more powerful.

I plan to create 5-6 large scale portraits. Each one, except for this one (indirectly- naturally it was influenced by many factors), will be influenced by a specific artist. My ultimate goal when creating these portraits is to become a more competent draftsman while also developing my own artistic sensibility. This first self-portrait displays my abilities and influences at the beginning of this project. Hopefully, with the completion of each portrait I will add more to the collection of marks, influences, and ideas that are already present within my artistic repertoire.

"No single man can be taken as a model for the perfect figure, for no man lives on earth who is endowed with the whole of beauty."
Albrecht Durer

Albrecht Durer lived from 1471-1528 and is often referred to as the best artist of the Northern Renaissance. He was an "innovator in the field of woodcuts and engravings, and in the theory of proportions and the human figure" (Strauss V).

This piece/artist's book was influenced by Durer and his dedication to the human form. I decided to do it in the style of an artist book, which is art in a book form, because I felt like it suited the antiquated feeling of Durer's work. I tried to vaguely mimic the opulent and detailed style of the illuminated manuscripts (a heavily decorated/illustrated text) which were prevalent during the 15th century and in Durer's lifetime in order to establish some kind of connection between my work and his.

This piece does not portray an intimate moment between a model and an artist. I want my portraits to express some sort of intimacy, therefore I will not refer to this artwork as a portrait, but simply as a piece. The models I depicted in this piece posed only for a short time in a classroom environment. I did not get a sense of who they were from their poses. Despite this, most of the models were able to convey a sense of emotion and drama with their bodies.

The surroundings I drew around the models were fabricated. I felt that the nude models seemed to fit nicely into a Roman bath-like atmosphere so I tried to draw pots, goblets, and items that were reminiscent of that theme and also reflected a Renaissance style. Some of the images I used were borrowed (and modified) from Albrecht Durer's Dresden Sketchbook.

Durer's works, specifically his prints, are very detailed. He used a lot of line to build up volume and form. I tried to do this with my figures as well, although mine are not even close to being as proportionate as Durer's and my work at times is overly stylized-these are definitely some things I will continue to work on.

facing page
Artist's Book/Piece #2-
Inspired by Albrecht Durer

Piece #3-
Inspired by Lucian Freud

"My work is purely autobiographical. It is about myself and my surroundings. I work from people that interest me and that I care about, in rooms that I know."
Lucian Freud

Lucian Freud's Double Portrait -1985-86
-courtesy of artnetMagazine

My third piece was inspired by Lucian Freud, more specifically his piece titled "Double Portrait." I chose to reference Freud because I really get a sense of depth and emotion from his work. Perhaps this is because he chooses to depict subjects that are intimate-friends, family, lovers. I see his work as being very intimate-the bond between artist and subject is really evident. I wanted to convey a similar experience with my own model in my piece.
I decided to draw a close friend. I chose her because her body language and style scream "drama" (in a good way). The day I drew her she appeared tired so I positioned her in a pose that reflected that. In Freud's piece the girl appears to be comforted by a dog. In my piece my friend was comforted by her Mp3 player. Technology, something contemporary, replaced something living as a source of comfort-a sign of the times I suppose.

In Freud's piece he uses heavy shading and line-work to give the illusion of skin, softness, fur, and texture. I tried to do the same in my piece. I do not have the innate abilities that Freud has, but I do believe that this was a productive exercise and overall I like my piece.

Piece #4-
Inspired by Kathe Kollwitz

"I do not want to die... until I have faithfully made the most of my talent and cultivated the seed that was placed in me until the last small twig has grown."
Kathe Kollwitz

My original intent with this piece was for it to be inspired by Kathe Kollwitz. She is a German artist who uses heavy charcoal and various printmaking techniques to create work that explores the human condition. She touches upon poverty, death, greed, losing a child and tragedy in her work. Thankfully, I have little experience with these events so I found it difficult to explore them in my work. So, after some consideration, I decided to draw my mother. Kollwitz spends a great deal of time portraying woman, especially mothers, in her work. I wanted to do the same in a more lighthearted manner.

I used a heavy charcoal base to draw my mom sitting on the couch reading the newspaper. This is the quintessential image of my mom, at least in my eyes. It is a routine that she has had every night for what seems like forever. It is her way to decompress. Drawing her in this manner sort of helped me unwind too. Moving the charcoal around with my hands was very therapeutic. I'd like to do more work like this.

Piece #5
Inspired by David Hockney

"One of the things I'm doing in Yorkshire is finding out how difficult it is to learn not to see like cameras, which has had such an effect on us. The camera sees everything at once. We don't. There's a hierarchy. Why do I pick out that thing as opposed to that thing or that thing?"
David Hockney

I recently had the opportunity to attend the David Hockney Portraits exhibit at the Museum of Fine Arts, Boston. It was, truly, an eye-opening experience. His work varied from pencil and ink drawings (more traditional compositions) to portraits composed of a collage of Polaroids (which questioned the limited perspective that a camera provides). I was inspired by all of Hockney's work, but chose to mimic the contour drawings that he did with pen ink. I was impressed with them because, although at first glance they looked simple, Hockney was really able to construct a believable and intimate portrait using only a few lines; which is not really a simple thing to do at all.

I chose to draw my brother. He has the relaxed, social attitude that many of Hockney's sitters also appear to have. Unlike Hockney though, I chose to add color to my pieces- I cannot really say why I added it and I am not really sure that it was the right choice. Perhaps I was trying to make up for the fact that my figures are not as believable as Hockney's by "spicing" the portraits up with some vibrancy. I also think that I was growing a bit sick of black and white and simply needed some color in my work.

Overall, I think that these pieces are "ok". I think that they are images that a viewer might glance over for a couple of minutes then forget soon after. I'm not satisfied with that result and hope to change with future work and practice.

What I've learned from this research
The Adrian Tinsley Program has provided me with a wonderful opportunity this summer. This grant allowed me to create a focused body of studio work that has significantly helped develop my competence and understanding in portraiture and figure studies. My mentor, Prof. Collin Asmus, has also been an inspiration. He has led by example; showing me the amount of commitment, hard work, and passion it takes to become a successful working artist and educator. His guidance has been invaluable. My project is still ongoing but, in the end, it will result in a body of work that portrays my commitment to drawing and design and will help me become a more well-rounded artist and individual.

While participating in the Adrian Tinsley Program I had the opportunity to visit many museums and galleries and see the work of many artists. These experiences were truly inspiring. Seeing such a wide range of mark-making and interpretations of the human form has helped enhance my own ideas about art and the creation of art. This research has also taught me that I still have a lot to learn. I have definitely not mastered drawing the human form and probably never will; few people possess the innate ability to look and draw what they see. Despite this, I have learned how to "look a little harder" and observe and draw details that make my artwork more "believable" and hopefully a little more interesting for the viewer.

Artist's Statement
My goal as a visual artist is to never stop learning and experimenting with new materials and ideas. My goal in completing this project was to work in a genre that I had little familiarity with. I believe I achieved both of these goals to some extent this summer. I now recognize the human form's role in the art world and I hope to incorporate it into many of my future artistic endeavors. Through the exhibition of my own work and by introducing the work of artists like Albrecht Durer, David Hockney, Kathe Kollwitz, and Lucian Freud, I hope to enhance many of my peers' and colleagues' interest in new ideas in art as well.

Resources

ArtQuotes-http://www.artquotes.net/masters/freud-lucian-quotes.htm 19, Jul. 2006

. . . .

Barnett, Sylvan. A Short Guide to Writing About Art. New York: Pearson Longman Tufts University), 2005.

. . . .

Beyers, Andreas. Portraits: A History. Munich: Harry N. Abrams, Inc., 2003.

. . . .

Gibson, Robin. Painting the Century: 1010 Partrait Masterpieces 1900-2000.
London:Watson-Guptill Publications, 2000.

. . . .

Guide to the Boston Art World –http://www.fine-arts-unlimited.com/ag.htm
20, May 1006

. . . .

Howgate, Sarah et al. David Hockney Portraits. London: National Portrait Gallery, 2006. (Published to
accompany the exhibitions held at the National Portrait Gallery-London, and the Museum of Fine Arts-
Boston, in collaboration with the Los Angeles County Museum of Art)

. . . .

Kozloff, Max, ed. Face Value: American Portraits. New York: Parrish Art Museum, 1995.

. . . .

Strauss, Walter L., ed. The Human Figure by Albrecht Durer-The Complete Dresden Sketchbook.
New York: Dover Publications, 1972.

. . . .

Simblet, Sarah. Anatomy for the Artist. New York: DK Publishing, 2001.

. . . .

WebMuseum- www.webmuseum.com

NCUR: National Conferences on Undergraduate Research

The Undergraduate Review
Vol. III

A Philosophical Examination of Proofs in Mathematics

Eric Almeida

Eric Almeida is a Philosophy Major. This project was mentored by Dr. Catherine Womack.

"The purpose of a proof is to understand, not verify"-- Arnold Ross.

In mathematics, a proof is a demonstration that, given certain axioms, some statement of interest is necessarily true. Proofs employ logic but usually include some amount of natural language which of course admits some ambiguity. In fact, the vast majority of proofs in written mathematics can be considered as applications of informal logic. The distinction has led to much examination of current and historical mathematical practice, quasi-empiricism in mathematics. One of the concerns with the philosophy of mathematics is the role of language and logic in proofs, and mathematics as a language. Regardless of one's attitude to formalism, the result that is proved to be true is a theorem; in a completely formal proof it would be the final word, and the complete proof shows how it follows from the axioms alone. Once a theorem is proved, it can be used as the basis to prove further statements. The so-called foundations of mathematics are those statements one cannot, or need not, prove. These were once the primary study of philosophers or mathematicians. Today focus is more on practice, i.e. acceptable techniques. Pictures are commonly used in mathematical practice to help further understanding of mathematical knowledge.

The purpose of this paper is to explain the relationship between visual or geometric proofs and verbal-symbolic or analytic proofs in mathematics. Through philosophical analysis of some important cases of geometric proofs, I want to show that their function is primarily to help us "see" how the corresponding analytic proof of a theorem is true. Furthermore, I argue (contra philosopher Imre Lakatos), that producing standard analytic proofs is the *real* business of mathematics.

Philosopher Imre Lakatos, describing the history of mathematics, sees three major theoretical views of mathematics: Euclidean, Inductivist, and Quasi-Empirical. The Euclidean theory characterizes mathematics as a set of axioms and the whole "process" transmits truth down through a proof to get to the truth of a mathematical proposition. This is the classical view of mathematics as most ordinary mathematicians would view it.

The Inductivist theory follows in the wake of increased rigor in science, by starting with theories and observation statements, then collecting data which can confirm evidence for generalization; you could say a true proposition transmits

truth upward. This can be viewed as an empiricist theory which is applied to scientific research.

Quasi-Empirical theories are the opposite of the Inductivist theory because in this theory falsity is "transmitted upward" through falsifiers. With the use of heuristic falsifiers we can then suspect that a certain proposition is false. In the Quasi-Empirical theory, one can argue that no science is capable of finding all counter-examples to a theory, therefore, no science is strictly empirical, and it's all quasi-empirical. But usually, the term "quasi-empirical" refers to the means of choosing problems to focus on (or ignore), selecting prior work on which to build an argument or proof, notations for informal claims, peer review and acceptance, and incentives to discover, ignore, or correct errors. Imre Lakatos thinks most of the work in mathematics falls under this theory. Crucial to making a quasi-empiricist philosophy of mathematics work is the distinction between formal and informal mathematics. In formal mathematics the basic structures are axioms, rules of inference, and formal proofs. In mathematics all of these concepts are rigorously defined which in turn no longer make them intuitive. However, through rigorous inference we get certainty out of formal mathematics. But Lakatos says that as we gain certainty of formal mathematics we lose content because we lose sight of the intuitive objects of mathematics. So, he wants to use informal mathematics as a means to securing content of mathematical concepts. Lakatos says that informal mathematics is formal mathematics which suppresses mention of the logical rules of inference and logical axioms, and indicates only every use of specific postulates. Informal mathematics is about objects of intuition (e.g. objects like circles, spheres, planes, etc). Informal mathematical operations are less formal or rigorously defined (rotation, division, bisection, etc). Lakatos thinks this is where the *real* work is done in mathematics. But, I want to show that mathematics isn't really established without precision and rigor of actual formal mathematics.

In formal mathematics, truths are established via proof. There are many ways to falsify mathematics; most of these include finding flaws that can be revealed in the proof of a proposition. We can show a conjecture to be false through counterexamples. Consider the example, *all primes are odd*. The counterexample for this conjecture is the number 2, which has been proven to be prime, which leads to a contradiction of the original conjecture. This is different from cases in science in which data falsify theories which leads to a disconfirmed theory, not a false one. The question is then, is there a mathematical correlate to data which run contrary to a theory?

The potential falsifiers of science express the *hard facts*. But is there anything equivalent to *hard facts* in mathematics? Lakatos says that if we accept the view that a formal axiomatic theory implicitly defines its subject-matter, then there would be no mathematical falsifiers except logical ones. But if we insist that a formal theory should be the formalization of some informal theory, then a formal theory may be said to be *refuted* if one of its theorems is negated by the corresponding theorem of the informal theory. Lakatos calls such an informal theorem a *heuristic falsifier* of the formal theory (Lakatos, 1976).

Lakatos uses an example of heuristic falsification, citing Goldbach's Conjecture. Recall Goldbach's conjecture that every even integer *k* greater than two is the sum of two primes. It has not yet been proven, although it has been confirmed for a large number of cases. Lakatos suggests the following scenario to explain the notion of a heuristic falsifier:

> We may some day face a situation where some machine churns out a formal proof in a formal set theory of a formula whose intended interpretation is that there exists a non-Goldbachian even number. At the same time, a number theorist might prove (informally) that all even numbers are Goldbachian. If his proof can be formalized within our system of set theory, then our theory will be inconsistent. But, if [the informal proof] cannot be thus formalized, the formal set theory will not [have been shown to] be inconsistent, but only to be a *false* theory of arithmetic. The theory is false in respect of the informal explanandum that it had set out to explain; we had better replace it with a better one (Lakatos, 1976).

Lakatos calls this informal proof a *heuristic falsifier* because it shows that there is a problem with the formal theory; namely, that it does not explain some fact demonstrated informally. To remedy the problem, Lakatos suggests we check the definitions (in this case the definition of `natural number' may be suspect) and adjust the definitions to accommodate the heuristic falsifiers (Womack, 1996).

What does heuristic falsification have to do with formal vs. informal mathematics? Geometric proofs seem to fall into the informal category, whereas verbal, rigorous, symbolic proofs fall into the formal category. Are they equally acceptable and equally certain? Geometric proofs are an important part of the work of informal mathematics; they help show how a theorem could be true, providing some informal reasoning. Lakatos tried to establish that no theorem of informal mathematics is final or perfect. This means that we should not think that a theorem is ultimately true, only that no counterexample has been found. Once a counterexample is found, we adjust the theorem, possibly extending the domain of its validity. This is a continuous way our knowledge accumulates, through the logic and process of proofs and refutations. Lakatos is opposed of turning geometrical proofs into analytic ones because he thinks that formalizing ignores the

substance of an argument by focusing on the proof rather than the context in which the argument was raised.

The thesis of Lakatos' book *Proofs and Refutations* is that the development of mathematics does not consist (as conventional philosophy of mathematics tells us it does) in the steady accumulation of eternal truths. Mathematics develops, according to Lakatos, in a much more dramatic and exciting way - by a process of conjecture, followed by attempts to 'prove' the conjecture (i.e. to reduce it to other conjectures) followed by criticism via attempts to produce counter-examples both to the conjectured theorem and to the various steps in the proof.

To test Lakatos' views on varieties of proofs, I will examine some cases of geometric and analytic proofs. The most famous of these is the Euler Conjecture—that the number of vertices minus the number of edges plus the number of faces for regular polyhedra equals two ($V - E + F = 2$). We can see this for a cube: it has eight vertices, twelve edges and six faces; $8 - 12 + 6 = 2$. Its geometric proof is revealing, but I argue that its real function is to help us construct a more abstract symbolic or analytic proof. The latter conveys what is really important about the class of polyhedra. This example shown in *Proofs and Refutations* illustrates more than the way in which new formal theories are born, it illustrates the nature of mathematical progress: how analytical proof helps capture the fundamental subject. Lakatos say that mathematicians *would* accept this proof. But he says we did not *prove* anything in any logical sense. There are no postulates, no well-defined underlying logic, and there does not seem to be any feasible way to formalize this reasoning. What we did was intuitively show that the theorem was true. Lakatos says that because our proof really isn't a proof then this informal proof cannot be defined; this in turn means a theorem cannot be defined. There is no verification. He continues to say that if there is no method of verification, there is certainly a method of falsification (Lakatos, 1976).

Mathematics *is* based on proof in the end, when one field of interest reaches its final, axiomatic stage - so much should be granted for the formalist school – but then this field becomes empty and dead. The introduction of the historical dimension of mathematics serves the purpose of seeing mathematics as a *process*: in philosophy, what we are interested in is not the formal features of knowledge, but rather the growth of knowledge. As Lakatos emphasizes: in mathematics, all growth in rigor is transformed to be a growth in content; that is, every criticism that increases the strictness of methodology and terminology in one question, also increases the range of our knowledge and understanding available for scientific (i.e. inductive) methods (Brown, 1999).

The task at hand is to figure out what a given mathematical concept is, and what a stretch of mathematical discourse says. The Lakatos study begins with a proof consisting of a thought experiment in which one removes the face of a given polyhedron, stretches the remainder out on a flat surface, and then draws lines, cuts, and removes the various parts. The development is convincing and has the flavor of a proof, but it is not at all clear how the discussion is to be understood. This shows that sometimes developments within mathematics lead to unclarities about what a certain concept is and it seems that the proper methodology, and the logic, of mathematics is at stake (Shapiro, 2000).

The question to ask now is what's the connection between Lakatos' geometric proof and analytic proof? My answer to the question is that for geometric proofs you need the axiomatic form of the analytic proof; without it, it is not clear what is doing the logical work. If you don't know what is following from what, you'll be less certain of the results. In a sense, geometric proofs are only a starting point for proving a mathematical theorem; that is to say, they lack some features of analytic proof.

Let's now look at a case of a very compelling geometric proof in the history of mathematics – Cantor's countability of the rational numbers.

Geometric proof:

(Mathematical Foundations, 2000)

This first picture shows the way to list all of the rational numbers without omitting any (a close inspection will reveal that all of the numbers, *ad infinitum,* will appear. The problem with this approach is that you'll never finish row 1. Hence, you can't possibly count all of the rationals this way. But, it turns out that there is a way to count them. Again, start at row 1, column 1. Then, go to R1C2. After that, go to: R2C1, R3C1, R2C2, R1C3, R1C4, etc.... This is illustrated ahead:
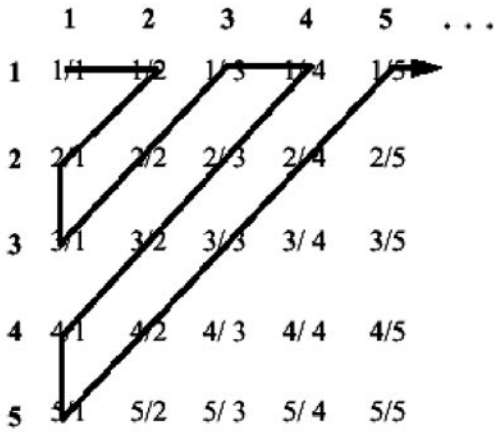
(Mathematical Foundations, 2000)

This picture shows a function that, by following the diagonal line, we count each of the rational numbers listed by assigning a natural number to each rational number, without omitting any. Thus a one-to-one correlation between the natural and rational numbers is demonstrated, thus proving the countability of the rational numbers.

Many questions arise when looking at this geometric proof of the countablility of the rational numbers. For instance: what counts as a right way of listing *all* of the rational numbers? Cantor seems to have grasped a solution to the list, but is there a different and possibly better way? This proof leaves itself open to all kinds of questions which lead to heuristic falsification. What we need is a more explicit way of characterizing this function to understand how and why it works.

Let us now look at a standard symbolic proof:

Symbolic Proof:
Consider a base-12 number system with / as the symbol for the digit 10 and – as the symbol for 11. Define the map ϕ: $Q\_N_{(12)}$ (natural numbers base-12) by $\phi(a/b)=a/b$, where on the left-hand side, a/b is the lowest terms representation of a typical element Q and on the right-hand side, a/b mean the base-12 number consisting of the digits of a (possibly preceded by a minus sign) followed by the division slash / and then the digits of b.
For example, $\phi(-5/12) = -5/12$. Let σ: $N_{(12)}\_N$ be the obvious injection converting a number from base-12 to base-10. Continuing our example, this means:
$\sigma(-5/12) = 11 \_ 12^4 + 5 \_ 12^3 + 10 \_ 12^2 + 1 \_ 12^1 + 2 \_ 12^0 = 238,190$
Then $\sigma \_ \phi$: Q_N is an injection, where by $|Q| \leq |N|$.
Inclusion provides the reverse inequality and we conclude
$|Q| = |N|$ (Ginsberg, 2005).

Here I have presented two very different ways to show that the rational numbers are countable. This method of enumerating sets certainly does not displace Cantor's classic technique, but it does show another, more rigorous way to accomplish the task. Though we applied it only to Q, the method presented here can, be used to count any set **X**, such that **N ≤ X** (so we may apply inclusion) for which a sufficiently clever function from **X** into $N_{(n)}$ for some base-n can be found. However, this proof, unlike Cantor's proof, doesn't leave itself open to questions or speculations about possible alternatives except formal, identifiable flaws in proof (e.g. wrong definition of bijection, etc). Picture proofs don't answer as many questions as they raise whereas rigorous/symbolic proofs settle the matter about very *specific* content.

Despite my criticism, I find there are benefits to thinking about proof in Lakatos' way. With the informal view of mathematics we can see it as a growth area where new problems arise as well as new principles. However, what Lakatos' view lacks is explicitness: following proof from axioms down through the logical process to arrive at the demonstration of the truth of a proposition. Picture proofs also lacks certainty. Without the *inferential transparency* (Womack, 1996) - the explicit step-by-step explanation of how one step follows from another in the process of proof - we begin to lose certainty about the theorem. This, to me, shows that informal mathematics cannot replace formal mathematics; it instead helps formal mathematics in its process. We *need* formal proof as a final judge of truth.

Sources:

Brown, James R. Philosophy of Mathematics: An Introduction to the World of Proofs and Picture. Routledge, 1999.

. . . .

Ginsberg, Brian D. A "Base" Count of the Rationals. Mathematics Magazine: vol. 78, #3, June 2005. pp. 227-228.

. . . .

Mathematical Foundations: Integers, Rationals and Reals. James Madison University. 2000. https://users. cs.jmu.edu/bernstdh/web/common/help/countability.php

. . . .

Shapiro, Stewart. Thinking about Mathematics: The Philosophy of Mathematics. Oxford University Press, 2000.

. . . .

Womack, Catherine A. "Logical vs. Heuristic Falsification: the Case Against Fallibilism in Lakatos"; in LOGICA 95--- proceedings of the 10th annual symposium: FILOSOPHIA, Praha 1996.

Harmony and Diversity: Confucian and Daoist Discourses on Learning in Ancient China

Casey Rekowski

Casey Rekowski is a senior majoring in History and minoring in Secondary Education. She conducted this research under the mentorship of Dr. Wing-Kai To of the History Department. This paper was written as part of a history colloquium about the intellectual traditions of China; she presented it at the Intergenerational Graduate Student Conference on Diversity in East Asia at U-Mass Amherst. After graduating from Bridgewater State College in May, Casey plans to find a teaching position at a local high school and to pursue her masters and doctorial degrees.

Abstract:

Unlike many areas of the world where religious conflicts have torn countries apart, diversity in ancient China actually helped to promote unification and preserve continuity of the Chinese culture. Through the use of translated primary source documents, such as the Daodejing and the Analects, this paper examines Daoism and Confucianism, and their respective ideas about knowledge and learning. It shows how Daoism taught its followers that the only way an individual can follow the Dao is if he replaces classical book learning and the knowledge of the sages with a greater appreciation of the relationship between the humans and the cosmos. Unlike the Daoist path of natural harmony, the Confucian discourse taught its followers that an individual can achieve personal harmony (and follow the Confucian way) only if he engages in self-cultivation and learns the wisdom of the sages. While holding dichotomous ideas about what constitutes "good learning," these Chinese philosophies peacefully coexisted in China. The vast differences in these philosophies did not prevent individuals from subscribing to both seemingly contradictory philosophies at the same time; many Chinese were Daoist in private and Confucian in public. This kind of philosophical pluralism and intellectual diversity was embraced by the Chinese people and the government; it played an important role in the later development of a literati ideal and political culture that was compatible with both Confucian and Daoist teachings.

Daoism and Confucianism are "indigenous doctrines in China that emerged roughly in the same period."[1] What is most interesting about these two philosophies is their dichotomous ideas about learning and knowledge. Daoism teaches that the only way individuals can follow the Dao is if they detach themselves from learning and knowledge of the classics. Having an appreciation for the relationship between humans and the cosmos is more important than classical knowledge according to Daoist discourse. Confucianism, on the other hand, teaches that an individual can only achieve personal harmony (and follow the Confucian way) if he or she engages in self-cultivation and learns the wisdom of the sages.[2]

One theme that is apparent throughout Daoist texts is the Daoist aversion of an educated population. Daoists did not believe that learning was important for individual development; in fact, the texts of Daoism make it clear learning was considered dangerous, corrupting, and otherwise useless to the pursuit of the Dao. The Daoists were adamantly opposed to book learning. According to passages in

their books, an ideal state is one in which, "There are no books; the people have no use for them." ³ Maintaining one's natural state, even if that natural state meant ignorance, was what the Daoists strived to accomplish.

The human who sought learning and knowledge, according to the Daoists, polluted his or her natural state, risked becoming immoral, wasted his or her time on mediocre knowledge, jeopardized his or her ability to effectively follow the Dao, and could potentially become unruly and difficult to govern. Ignorance of the classics was encouraged for those striving to be good subjects and those seeking inner peace. Daoism was more concerned with individuals gaining knowledge about themselves, their natural environment, and the Dao, than with individuals learning from classical Confucian texts or other texts of the sages. Daoists believed that learning would do more harm than good for the person who sought knowledge. Seeking knowledge would not bring an individual closer to the Dao; it may actually lead a person further from "the way."

The Daoist antipathy to learning is most directly stated in one of the major ideas of Daoism- P'u, or the un-carved block. P'u is the Daoists "symbol of a man's natural state, when his inborn powers (te) have not been tampered with by knowledge."⁴ The word 'tampered', usually carries a negative connotation; by using this negative word, with the word 'knowledge', the Daoists are able to effectively demonstrate their distrust of learning. This idea that knowledge negatively interferes with simplicity of an individual's natural state is further explored in the idea that the sense organs, which can be elements used to acquire unnecessary knowledge, were also dangerous to an individual's natural, pure state. The Daoist believed that the "'eye is a menace to clear sight, the ear is a menace to subtle hearing, the mind is a menace to wisdom, every organ that senses is a menace to its own capacity. Sad indeed is it that man should look upon these seats of menace as his greatest treasure.'" ⁵ The Daoists were dismayed that most individuals used their sense organs to acquire new, useless knowledge to pollute their natural state.

The story of Nanyungch'u gives a concrete example of how knowledge can pollute a person's natural state to the point that they do not know how to get back to the Dao. In the story, Nanyungch'u travels to see Lao-tzu. When he arrives at Lao-tzu's house, Lao-tzu asks him what is troubling him (Lao-tzu can tell by Nanyungch'u's facial expression that something is wrong). Nanyungch'u replies, "'The trouble with me is that if I do not know knowledge, people call me a fool. And if I learn knowledge, it makes me so sad.'"⁶ Lao-tzu replies to him,

> Indeed, you are a lost soul! You wish to recover your original nature, but are confused and do not know where to begin. I am so sorry for you…. Those who are disturbed by their senses and their minds cannot preserve their own character. How

much less they can they follow the Dao.⁷ Nanyungch'u's story helps to clarify what the Daoists meant when they talked about how the senses and knowledge can pollute the body and prevent people from finding the Dao.

When knowledge polluted a person's natural state, they were at increased risk of becoming immoral; this was another reason Daoists believed knowledge was dangerous. Daoism warned rulers and others to "Exalt not the wise/ so that the people shall not scheme and contend."⁸ Knowledge for the Daoist was an "instrument of evil that lead one away from the moral life."⁹ Daoists urged their followers to use their minds like mirrors, "reflecting what is received without concealment," instead of using them as "a clearing house of plans and strategy."¹⁰ If an individual used his/her mind passively the way a mirror passively reflects what is placed in front of it, the Daoist believed that it would be unlikely for any knowledge that entered to have any lasting effect on, or cause injury to, the person's moral conscious¹¹.

In addition to losing one's way and becoming immoral, Daoists believed that any book learning available to individuals was a waste of time because of its uselessness. According to the Daoist, Chuang Tzu, the classical books of the so called "sages" were nothing greater then the "lees and scum of bygone men.¹²" This idea is fully explored in the excerpt from Chuang Tzu about the Duke Huan of Chi. In this passage, the Duke of Huan is reading a book about the wisdom of the sages. A wheelwright, who is in the same hallway as the Duke of Huan, explains that he has continued to work at his profession, even at the age of seventy, because his skill is so difficult and cannot be effectively explained or otherwise passed on to his son.¹³

Using the philosophical ideas of Daoism, the wheelwright, explains that the contents of the books of sages are similar to his situation of passing on his knowledge to his son. The wheelwright believes that like his skills, the best ideas of the sages "cannot be put into words."¹⁴ The most useful knowledge of the sages was too difficult to explain, describe, or, like the skill and talent of the wheelwright, pass on to others. Thus, the contents of the sage's books included only those things that were the easiest to explain and describe, not necessarily the best advice or wisdom that the sages possessed. The wheelwright states, "All that was worth handing on, died with [the sages]; the rest, they put into their books."¹⁵ Thus, any learning that individuals gained from books was nothing but useless, mediocre knowledge- the so called "lees and scum of bygone men."¹⁶

Among other reasons, Daoists were opposed to learning because they were afraid those who attempted to "better themselves" through book learning would forget the basic tenets of finding the way and following the Dao. It was feared that such learning would cause people to forget about the basic, most important principles of living a harmonious life. This idea is best illustrated by the passage from

Chuang Tzu which discusses the child from Shou-ling, who, "was sent to Han-tan to learn the 'Han-tan walk'. He failed to master the steps, but spent so much time in trying to acquire them that in the end he forgot how one usually walks, and came home to Shou-ling crawling on all fours."[17] Metaphorically, this passage illustrates the claim that learning has the potential for causing individuals to lose sight of the Dao, and could perhaps cripple an individual's ability to find his or her way back to the Dao.

Another reason for Daoist's aversion to learning is the fear that an educated populace would make governing them impossible. Stated differently by Daoist Lao-tzu, "[w]hen a people become difficult to govern, it is because it has learned too much."[18] The government of the sages, Daoists claimed, "ought to aim at emptying the minds…to keep people in pathetic ignorance should be the chief and constant care."[19] Having a population that knew nothing would "have no desires, will cost but little for superintendence, and will yield richly for the state."[20] Lao-tzu believed that "it would be better if people knew less, if they gave up tools and abandoned writing, if they lost their desires to travel and engage in war. They would be satisfied with their own lives and not envy their neighbors"[21] In addition, such a population would "keep the county safe"[22] from internal conflict and demise.

On this subject, the Daoist Lao-tzu went as far as stating, "If I were king of a state… I would put all intelligent men aside, would lead the people back to a primitive ignorance, and forbid all communication with neighboring countries."[23] If people in their ignorance did not know they were missing anything, they would not have any reason to rebel. Additionally, in their primitive state they would be completely dependant upon the ruler for their every need. Daoists strongly believed that individuals should be kept as ignorant as a small child; this would ease a ruler's burden and maintain a peaceful population. Keeping people ignorant, according to the Daoist's view is an easy way to ensure the ruler's power over them.

Unlike the Daoists, who had a strong distaste for learning and knowledge, Confucianism embraced learning. Confucians believed that learning was a way to improve oneself and cultivate one's morals. Following the Confucian way meant becoming a "lover of learning" and "rever[ing] the words of the sages."[24] Confucianism respected learning and knowledge to the extent that Confucius hoped that his students and followers would, "Learn as if you were following someone who you could not catch up, as though it were someone you were frightened of losing." [25] Learning, according to Confucius, was not something to be feared; rather it was something that was supposed to be actively sought after.

For many of the same reasons that Daoists resisted learning and distrusted the power of knowledge, the followers of Confucius embraced learning. Confucius himself once "spent a whole day without food and the whole night without sleep in order to meditate.

It was of no use. It is better to learn."[26] Confucians valued time spent studying and gaining knowledge more than time spent meditating and thinking about the metaphysical the way the Daoists would. Confucians believed that learning improved one's moral character, made people easier to rule, and was worthwhile because it improved an individual's ability to follow the Confucian way. Confucianism even advocated the construction of formal institutions to educate the young. Learning was one of the most important elements of Confucianism.

Confucians believed that learning first and foremost improved an individual's moral character. Learning, it was believed, enhanced and helped to recover an individual's natural "good capacity . . . good knowledge . . . [and] . . . good feelings . . . which had been rubbed away by the rough contacts of daily life."[27] Spoken from a slightly different perspective,

One who studies widely and with set purpose, Who questions earnestly then thinks for himself what he has heard - Such a one will incidentally achieve Goodness.[28]

Recovering one's goodness and good sense of morality through learning, according to Confucius, could occur anywhere. Confucius, demonstrating this idea, stated, "Even when walking in a party of no more than three, I can always be certain of learning from those I am with. There will be good qualities that I can select for imitation and bad ones that will teach me what requires correction in myself."[29] Confucianism, unlike Daoism, was not concerned that learning would corrupt an individual's morals. Learning in any form, even leaning "pick[ed] up from [one's] inferiors," Confucians believed, would give an individual insight into how to improve his or her morals.[30]

In an idea completely opposite to the Daoist beliefs, Confucianism believed that those who studied and became knowledgeable were actually easier to rule. While the Daoists attempted to keep populations ignorant and uneducated so that they would be easier to control, Confucians attempted to encourage individuals to gain an education. According to Confucius's student Xunzi, it was when "people lack teachers, their tendencies are not corrected; [and] when they do not have ritual and moral principles, then their lawlessness is not controlled."[31] Through learning and knowledge of Confucian rituals and the moral principles of sages, people were taught to be morally upright and good citizens. Confucius believed that "The gentleman who is widely versed in letters… is not likely to go far wrong."[32] Thus, according to this principle of Confucianism, educated individuals are easier to govern.

While Daoists believed that learning was frivolous, Confucians believed that learning was a worthwhile activity that should be performed as often and as frequently as possible. Even Confucius, who began studying at the age of fifteen, dedicated much time to studying;

Confucius said, "Give me a few more years, so that I may have spent a whole fifty in study."[33] Not only did learning help individuals to recover their innate goodness, it also provided wisdom. Confucius often advised his students to take note of who they were with, and "In the presence of a good man, think all the time how you may learn to equal him."[34] Students of Confucius were also encouraged to study the wisdom of the sages; it was believed that this knowledge was some of the best the students could acquire. It was through the acquisition of knowledge and wisdom that one would be best suited to follow the Confucian way.

To promote the cycle of learning, Confucius and his student Mencius laid the groundwork for formal educational institutions. Confucius advised his students to praise individuals who followed Confucius's "unwearying effort to learn and unflagging patients in teaching others."[35] Confucius believed that "those who have received knowledge [had] a duty to share it with others."[36] Confucius's student Mencius advocated the establishment of institutions where individuals could receive an education "centered on moral instruction."[37] These schools were to promote Confucian ideas and traditions; teaching was "the duty of children to parents and of the young to their elders."[38] (Mencius does not discuss the schools in any great detail, but he does

stress the fact that they should exist).[39] Learning was so important in Confucianism that there were attempts to formalize a system to educate its followers.

When all of the elements of Daoism and Confucianism are considered, it is not surprising that they take such different positions in regards to learning and self-cultivation. For Daoism, which promotes inaction and the preservation of one's natural state, it only makes since that they would distrust outside learning, such as the books of sages or Confucian Classics. First of all, the learning gained from these books may have (and would have) contradicted Daoist teachings. Additionally, by nature, learning violated the main Daoist principle of inaction. Confucianism on the other hand, which promotes action, would naturally encourage followers to be active by enthusiastically seeking learning and the advice of the sages. Literati scholars were able to strike a balance between the two extremes of the philosophies and find them meaningful in their everyday life. Unlike many areas of the world where religious conflicts have torn countries apart, diversity in ancient China actually helped to promote unification and preserve continuity of the Chinese culture.

(Endnotes)

1   2   Ibid.

3   Arthur Waley, <u>Three Ways of Thought in Ancient China</u>, (Stanford: Stanford University Press, 1982), 68

4   Ibid., 66

5   Ibid.

6   Lin Yutang, <u>The Wisdom of Laotse</u>, (New York: Random House 1948), 84

7   Ibid., 84- 85

8   Ibid., 56

9   Ibid., 58

10   Ibid., 110

11   Ibid.

12   Waley, <u>Three Ways of Thought in Ancient China</u>, 15

13   Ibid.

14   Ibid.

15   Ibid., 16

16   Ibid., 15

17   Ibid., 36

18   L. Wieger, <u>A History of the Religious Beliefs and Philosophical Opinions in China</u>, (New York: Arno Press, 1969), 154

19   Ibid., 153

20   Ibid., 154

21   Patricia Buckley Ebrey, <u>The Cambridge Illustrated History of China</u>, (New York: Cambridge University Press, 2004), 48

22   L. Wieger, 154

23   Ibid.

24   Patricia Buckley Ebrey <u>Chinese Civilization: A Sourcebook</u> (New York: Free Press, 1993), 18

25   Arthur Waley, <u>The Analects of Confucius</u> (New York: Vintage Books, 1938), 136
26   Xinzhong, 210
27   Waley, <u>Three Ways of Thought in Ancient China</u>, 83-84
28   Waley, <u>The Analects of Confucius</u>, 225
29   Ibid., 127
30   Ibid.
31   Ebrey, <u>Chinese Civilization: A Sourcebook</u>, 25.
32   Waley, <u>The Analects of Confucius,</u> 121
33   Ibid., 126
34   Ibid., 105
35   Ibid., 130
36   Archie J. Bahm <u>The Heart of Confucius: Interpretations of Genuine Living and Great Wisdom</u> (New York: Walker/Weatherhill, 1969), 122
37   Waley, <u>Three Ways of Thought in Ancient China</u>, 88-89
38   Waley, <u>Three Ways of Thought in Ancient China, 111</u>
39   Waley, <u>Three Ways of Thought in Ancient China, 89</u>

Bibliography

Bahm, Archi J. The Heart of Confucius: Interpretations of Genuine Living and Great Wisdom. New York: Walker/ Weatherhill, 1969.
. . . .
Ebrey, Patricia Buckley. Chinese Civilization: A Sourcebook. New York: Free Press, 1993.
. . . .
Ebrey, Patricia Buckley. The Cambridge Illustrated History of China. New York: Cambridge University Press, 2004.
. . . .
Waley, Arthur. The Analects of Confucius. New York: Vintage Books, 1938.
. . . .
Waley, Arthur. Three Ways of Thought in Ancient China. Stanford: Stanford University Press, 1982.
. . . .
Wieger, L. A History of the Religious Beliefs and Philosophical Opinions in China. New York: Arno Press, 1969.
. . . .
Yao, Xinzhong. An Introduction to Confucianism. New York: Cambridge University Press, 2000.
. . . .
Yutang, Lin. The Wisdom of Laotse. New York: Random House 1948.

Coursework

The Undergraduate Review
Vol. III

Selfless: *Buffy's* Anya and the Problem of Identity

Victoria Large

Victoria Large graduated summa cum laude from Bridgewater State College in May 2006 after earning a Bachelor of Arts in English with a concentration in writing. She is currently earning of a Master of Arts in English with a concentration in creative writing at BSC. Her criticism and academic and creative writing has appeared in such publications as The Bridge, Bright Lights Film Journal, Film Threat, and Perfect Sound Forever Online Music Magazine, and she is a frequent contributor to the Film Notes series sponsored by the Brattle Theatre in Cambridge, MA. She presented her work regarding Buffy creator Joss Whedon's series Firefly at a recent conference held by the Southwest/Texas Popular Culture and American Culture Associations

The television series *Buffy the Vampire Slayer*, which aired for seven seasons, beginning in 1997 and ending in 2003, was a bona fide pop culture phenomenon that maintains the interest of fans and academics alike today. There are many aspects of the series worthy of discussion and study, not the least of which is its handling of gender roles. The title character, Buffy Summers, is one of many powerful females featured on the show. Also featured is Willow, a powerful witch, who is referred to as a "goddess" during the show's seventh series finale, "Chosen." In her essay "Just a Girl: Buffy as Icon," Anne Millard Daugherty writes, "The French feminists of the twentieth century decry the phallogocentrism of Western culture as limiting women to 'other'. Buffy breaks through these traditional representations. She may be a high school girl, but she is a powerful and capable one" (154). Indeed, Buffy is often seen overpowering and defeating male villains, or defending male characters that are not as capable as she is in dealing with vampires or other threats. She is not presented as inferior to men but rather quite the opposite. "Buffy manifests everything to countermand Aristotle's dismissal of the female as 'lacking,'" Daugherty writes, "Buffy has everything…Buffy is everything the men would hope to be" (152). While initially under the supervision of the Watcher's Council, an organization of men who have controlled vampire slayers for centuries, Buffy is never willing to give in to this patriarchal authority, and eventually rejects it entirely, as does her fellow slayer, Faith.

Within this context of powerful women, we are presented with the powerful, but problematic, character of Anya. Anya first appears in the season three *Buffy* episode "The Wish." A demon in the guise of a high school girl, Anya is a being that grants wishes of revenge to women who have been hurt by unfaithful men. By the end of "The Wish," Anya has lost her powers and become a mortal woman, and soon thereafter she begins a relationship with Buffy's friend Xander Harris in the episode "The Prom." Anya and Xander are eventually engaged to be married, but when their relationship fails, Anya becomes a vengeance demon once more. Thus, Anya allows herself to be defined by her relationship to men in a way that Buffy, Willow, Faith, and other female characters in the series do not. In other words, Anya allows herself to be defined as the Other. As Simone de Beauvoir, one of the "French feminists" that Daugherty refers to; writes in *The Second Sex*, woman becomes "the Other" by being "subjected to the man's will" (80) rather than her own. Melanie Sexton writes in her explanation of the Self/Other dichotomy that "woman's (experience) is perceived as inessential, alien,

negative…in a patriarchal society, woman is denied full selfhood, alienated from her own subjectivity" (620). Anya's failure to define herself for herself, and forge an identity independent of men and patriarchal assumptions, was never fully addressed on *Buffy* until the season seven episode "Selfless," which, as its punning title implies, dealt with Anya's lack of a "self." In being identified only by her relationship to men, Anya lacked a true "self" and was instead viewed as the Other.

The problematic nature of Anya's character is evident from her first appearance in "The Wish." She comes to Sunnydale High School posing as a high school student named Anya, which is in fact a shortened version of her demonic name, Anyanka. Cordelia has just ended her relationship with Xander because he was unfaithful to her with Willow, and now Anyanka has arrived to help Cordelia get her revenge. Cordelia comes to blame Buffy, not Xander or Willow, for her failed relationship, and so wishes that Buffy never came to Sunnydale in the first place.

Anyanka grants the wish, revealing her monstrous, demonic true face as she does so. The image of Anyanka as monster presents a problematic aspect of her character: she is the representative of the woman scorned, but she is an inhuman creature, and she sets off a nightmarish chain of events in granting the wish. The evil, monstrous woman is a fixture in mythology. De Beauvoir writes of those in power viewing "the Other (as) a threat, a danger" and notes that the patriarchal fear of woman is revealed in religion and myth: "Eve, given to Adam to be his companion, worked the ruin of mankind; when they wish to wreak vengeance upon man, the pagan gods invent woman; and it is the first-born of these female creatures, Pandora, who lets loose all the ills of suffering humanity" (de Beauvoir 80). Adding an interesting wrinkle to "The Wish" is that fact that Anyanka "lets loose all the ill of suffering" by eliminating the presence of Buffy, an independent and heroic woman. In Buffy's absence, the male vampire The Master has taken over Sunnydale, establishing a new society that is inherently evil and, notably, patriarchal. Far from empowering the women to whom she grants wishes, Anyanka's evil nature creates horrific situations that the wisher will quickly regret. In the alternate universe that Cordelia's wish creates, Xander and Willow are soulless vampires who feed off of and kill Cordelia. Anyanka and the wishes she grants create a monstrous distortion of woman and her emotions that only strengthen the patriarchal view of woman as Other.

It is appropriate, then, that when the character reappears a few episodes later in "Doppelgangland," having lost her powers and continued living life as Anya, the twelfth grader, she is pleading with a male demon, D'Hoffryn, for him to return her powers to her. The monstrous figure Anyanka is in service of a male, not a female, and certainly not herself. D'Hoffryn refuses to restore Anyanka's power, and so she remains the mortal woman Anya.

Ironically, Anya becomes romantically involved with Xander, the man she came to Sunnydale to punish. She invites him to senior prom, telling him, "You're not quite as obnoxious as most of the alpha males around here." It is true that Xander is a man who is not threatened by the presence of powerful women – his best friends are the independent and more physically adept Buffy and the intelligent and supernaturally gifted Willow, and he has only just gotten out of a relationship with Cordelia, who is of higher social standing and more forceful personality than Xander. At the same time, however, there are patriarchal overtones in Anya's phrasing when she calls Xander an "alpha male." The fact that the former vengeance demon now wants to go to the prom with a young man is played for laughs in the episode, but it is the first indication of how Anya will use her relationship with Xander to create her identity. The other women on the show are not defined solely by their relationships, but Anya's life as a mortal woman seems to begin with her adoption of the new identity of girlfriend. That we have seen Anya only as Xander's girlfriend or as an aberrant demon presents a problem both for the character of Anya and for a series that ostensibly views strong and independent women in a positive light.

After a fairly tentative start, Anya and Xander's relationship becomes a major part of both character's lives, but more so for Anya than Xander, who clearly has other concerns outside of the relationship. Unlike Buffy and Willow, Xander does not enter college after high school, instead struggling to establish himself in the adult world, combating fears of being left behind by his old friends. Yet Xander does not get left behind, and eventually finds his niche. On the other hand, Anya relies on Xander and his already-established friendships as a means of finding her way, eventually getting a job at The Magic Box, a magic shop owned and operated by Buffy's onetime watcher, Giles, and frequented by Xander and his demon-battling friends.

Anya's reliance on Xander in creating her own identity is notably evident in the fifth season episode "Triangle." The episode opens with Anya and Xander lying in bed, and Anya expressing her fear that Xander might leave her one day:

> Xander, if you ever decide to go, I want a warning. You know - big, flashing red lights and one of those clocks that counts down, like a bomb in a movie? And there's a whole bunch of colored wires, and I'm not sure which is the right one to cut, but I guess the green one. And then at the last second, no, the red one and then click, it stops with three-tenths of a second left, and then you don't leave.

This moment establishes Anya's reliance on her relationship with Xander. It seems she can't even fathom coping with the possibility of him leaving her.

The rest of "Triangle" affirms Anya's insecurity. The episode centers on Anya's jealousy of Xander's relationship with Willow. Willow has been Xander's best friend since childhood, and their brief romance was the cause of Cordelia and Xander's break-up. Anya is concerned despite the fact that Willow has since made a discovery regarding her own sexuality and is now happily dating another woman, Tara. Bickering with one another while casting a spell, Willow and Anya inadvertently unleash the troll Olaf. There is a revelation regarding Anya's past: she and Olaf were both human once, and they used to date. Anya cast a spell that transformed Olaf into a troll, and this led to D'Hoffryn's recruiting of Anya as a vengeance demon. The revelation makes it clear that Anya's identity as vengeance demon was the result of her reaction to the males in her life.

At one point in "Triangle," Olaf threatens to kill Xander. "Choose me!" Anya pleads with the troll, "Don't take him! Don't take Xander!" While it is clear by now that Anya and Xander do have genuine feelings for one another, this moment, coupled with Anya's earlier speech about Xander not leaving her, gives the distinct impression that Anya fears losing Xander because he is what defines her. Her phrasing of the plea – "Don't *take* Xander!" – implies a certain possessiveness or ownership. While the cry stems partly from love and concern, there is also an implication that Anya views Xander as something of hers (an essential part of her identity), and she would sooner die than have him taken from her. Olaf spares Xander, but scoffs that he and Anya's love will never last, insisting that Xander is "ludicrous, and far too breakable." Olaf's description of Xander as "breakable" is notable because it paints him as vulnerable in a way that few women on the show ever would be – no one would describe Buffy as "breakable." However, the moment also serves as foreshadowing for Anya's character. In pointing out Xander's fragility, Olaf highlights the fragility of Anya's identity as a woman. She has based her identity on one very breakable, very human man and her imperfect, possibly impermanent relationship with him.

The possible impermanence of Xander and Anya's relationship ironically becomes clearer after they become engaged. It is obvious that Xander is having second thoughts almost immediately after he proposes to Anya. At the same time, Anya becomes obsessive about her wedding plans and her new identity as wife.

The season six episode "Once More, With Feeling!" sees all of Sunnydale falling under a spell that makes them sing about their problems and secrets, and Xander and Anya perform a song that reveals both of their insecurities about the union. Anya begins the song: "This is the man that I plan to entangle/ Isn't he fine?/ My claim to fame was to maim and to mangle/Vengeance was mine/Now I'm out of the biz/The name I made I'll trade for his." Anya's desire to trade the "name (she) made" for that of her fiancé

is quite revealing and problematic. Anya is willing to sacrifice her identity of centuries past, that of a vengeance demon, and take on the role of wife. The problem is that Anya has never developed her identity as a woman or really, as a human being. De Beauvoir writes that "marriage should be a combining of two whole, independent existences, not a retreat, an annexation, a flight, a remedy" (de Beauvoir 478). Referencing Henrik Ibsen's seminal play *A Doll's House*, de Beauvoir continues: "Ibsen's Nora understands this when she makes up her mind that before she can be a wife and mother she must first become a complete person" (de Beauvoir 478-9). Unfortunately for Anya, she has failed to recognize what Nora did, and leaps into her marriage to Xander as a way of defining herself without becoming the "complete person" that de Beauvoir describes. It is not surprising then, that when Xander leaves Anya waiting at the altar and the wedding is called off in the sixth season episode "Hell's Bells," Anya accepts D'Hoffryn's offer to revert to her life as a vengeance demon. Having failed to define herself outside of her relationship with Xander, Anya does not consider the possibility of living life as an "ordinary" single woman, a human being with her own unique identity.

The seventh season episode "Selfless" is the first time that struggle for identity is explicitly acknowledged and actually made the focus of the hour. It could be argued that prior to this episode, the producers and writers of *Buffy* are guilty of characterizing Anya in a way that reinforces gender stereotypes. The early incarnation of the character as Anyanka in "The Wish" (an episode penned by eventual co-executive producer Marti Noxon) depicts the destructive power of a monstrous woman in a way that harks back to some of the oldest patriarchal myths and stories. When Anya becomes human she is mainly a source of comic relief, typically identified either with her status as Xander's girlfriend or her formerly demonic nature. "Selfless" finally places the character in fitting perspective. More is revealed about her past than ever before, and as a result, Anya's need to forge her own identity at last comes to the fore.

As "Selfless" begins, Buffy's younger sister Dawn is seen advising Willow about how to fit in by conforming. A parallel can easily be drawn to Anya's situation. By conforming to the societal pressures placed on women to find a man and get married, Anya has failed to become the "complete person" of de Beauvoir's writings. Driving this concept home is Buffy and Xander's conversation upon entering the room. In discussing his current relationship (or lack thereof) with Anya, Xander tells Buffy that while he is enjoying the single life as a "strong successful male," he worries about Anya because she "seems so sad." In this moment, Xander has inadvertently given voice to society's double standard for single men and women. Notably referring to his own gender when defining himself as strong and successful, Xander touches on the fact that society more easily accepts the idea of the "strong

successful male" while still often viewing the solitary woman as "so sad." In the context of *Buffy the Vampire Slayer*, of course, viewers have long been made conscious of the fact that women can be strong on their own. One notable (non-supernatural) example of the strong successful *female* on the series is Buffy's single mother, Joyce Summers, whose identity is clearly separate from that of Buffy's rarely seen or mentioned father. In this context then, it is clear that Anya's failure to be "strong and successful" instead of "sad" is a result of her internalization of society's expectations of her gender, and no actual shortcoming of her gender.

As the episode continues, Anya's struggle for identity takes center stage. Since the breakup of her relationship with Xander, Anya has become a vengeance demon once more, but she has begun to feel remorse for committing acts of vengeance. Most recently, Anya has horrifically murdered an entire college fraternity by way of granting a brokenhearted young woman's wish. The young woman of course regrets the wish and wants to see the act undone, and in fact, so does Anya. Anya no longer wants to hurt people, but nonetheless tries to defend her actions to Willow by reminding her that horrific scenes such as the one at the fraternity house are what vengeance demons are meant to create. Here lies the problem – as Xander states, Anya "was hurt, and she went back to what she knew" – Anya is only acting out the role of the monstrous woman because she does not see any other option.

Throughout the episode, Anya is consistently being told who she is by other characters. In a flashback scene, Anya and Olaf are still human, and it is revealed that Anya's original name was Aud. As Aud dotes on him, Olaf tells her, "You are my perfect Aud." Olaf's referring to Aud as his defines her as the object, instead of the subject – she is made to be the Other. "I could not live without you," Aud tells Olaf in a moment reminiscent of how Anya views Xander in "Triangle." With no identity of her own, the man in Aud/Anya's life becomes her life. Upon meeting D'Hoffryn, Aud is told by the demon: "I'm afraid you don't know your true self. You are Anyanka." D'Hoffryn's naming of Anyanka brings to mind that lyric from "Once More, With Feeling!" in which Anya sings: "The name I made I'll trade for his." The point being that whether becoming a demon or becoming a wife, Anya is allowing herself to be identified as the Other, defined by her relationship with men. Willow stands as a counterpoint to Aud/Anya's decision to become a demon. The powerful witch is also propositioned by D'Hoffryn, but because she has a strong sense of her own identity, Willow refuses the demon.

Throughout the episode, Anya's willingness to accept the labels that the patriarchal society places on her are what prevent her from defining herself as an individual. "Vengeance is what I am," she tells a fellow vengeance demon Halfrek during one flashback.

A separate flashback returns to a year prior, when Anya and Xander were still engaged and Sunnydale was under the spell that causes its citizens to sing. In the flashback, Anya's hair and clothing suggest an exaggerated version of the idealized wife. Her hair is long and very blonde, and she wears a pink dress (that Anya did not appear this way in the original "Once More, With Feeling!" suggests that *Buffy*'s creative team made her up in this way to drive home a point). After construction worker Xander falls asleep in his chair, Anya cheerfully covers him with a blanket and tidies up the apartment. She begins to sing:

> Mr. Xander Harris, that's what he is to the world outside
> That's the name he carries with pride
> I'm just lately Anya, not very much to the world I know.
> All these years with nothing to show:
> I've boned a troll; I've wreaked some wrath,
> But on the whole I've had no path,
> I like to bowl; I'm good with math,
> But who am I? Now I reply:
> I'm the missus, I will be his missus.

The song makes Anya's problem explicit – she has consistently bent to what others have told her she is, whether it be Anyanka the vengeance demon or very nearly, Mrs. Xander Harris. During the song, Anya sings "Here comes the bride" and is instantly seen in a long white wedding gown. As she holds the final note of the song, the episode cuts to an image of Anya with a sword lodged in her chest (the result of a battle with Buffy) and a tear running down her face. It's a sharp comment on what Anya's lack of an individual identity has done to her.

Of course, being an immortal vengeance demon, Anya dislodges the sword from her chest and the battle over what to do about Anya, and the deaths of young men in the fraternity, continues. D'Hoffryn, Xander, and Buffy argue, and D'Hoffryn at last notes: "I'm not sure if anyone's bothered to find out what Anyanka herself wants." "Her name is Anya!" Xander counters, not realizing that her name was originally neither Anyanka nor Anya. Both names were taken on by the woman originally known as Aud as a means of fulfilling the stereotypical identities that were thrust upon her. Anya agrees to sacrifice herself to restore the lives of the boys, brushing aside Xander's attempt to sacrifice himself in her place. "Xander, you can't help me," Anya tells him, "I'm not even sure there's a me to help." The moment offers another interesting parallel between "Selfless" and "Triangle." As in that episode, Xander stands to sacrifice himself for love, while Anya is willing to sacrifice herself because she has not found an identity of her own. The sacrifice is willingly made because Anya has no real "self." Maliciously, D'Hoffryn sacrifices Anya's demonic friend Halfrek in Anya's place. "But she was yours," Anya protests after Halfrek's death. D'Hoffryn reminds Anya that she too was his, and the problematic language again makes explicit that Anya's

life as a vengeance demon was a life controlled by males, by D'Hoffryn and by her obligation to punish men in a way that did not empower women.

As the episode concludes, Anya has become a mortal once again, permanently, and she may at last be ready to begin building an identity of her own. When Xander follows her out of the fraternity house, she tells Xander that she should be alone. "My whole life, I've just clung to whatever came along," Anya tells him. In admitting this, Anya is at last ready to make a change, but she's still fearful of what she might discover. A meaningful exchange with Xander follows:

> Anya: Xander, what if I'm really nobody?
> Xander: Don't be a dope.
> Anya: I'm a dope.
> Xander: Sometimes.
> Anya: That's a start.

Anya then watches Xander walk away, and bracing herself, walks off in the other direction. At last she realizes that she must define her own identity before she can enter into a relationship with another person. De Beauvoir illuminates the issue, writing that within a couple "each individual should be integrated into society at large, where each (whether male or female) could flourish without aid," thus the "attachments" between the couple "would be founded upon the acknowledgement that both are free" (De Beauvoir 479). Buffy expresses the same idea in another way when explaining to Angel why she isn't ready for a relationship

in the episode "Chosen." "I'm cookie dough," Buffy tells him, "I'm not done baking. I'm not finished becoming whoever the hell it is I'm gonna turn out to be." Anya might have said the same thing to Xander in "Selfless."

Anya may be the product of a patriarchal society, but she is surrounded by women who prove that there is no reason to bend to that society's expectations. Buffy, Willow, Faith and Joyce are all women with their own talents and identities who do not rely on men to define them. There is no reason that Anya could not be the same. As Virginia Woolf admonished female readers in *A Room of One's Own*, "the excuse of a lack of opportunity, training, encouragement, leisure and money no longer holds good" (Woolf 113). In *Buffy*'s world, and in ours, women do have the power to reject patriarchal expectations and reject the label of the Other.

As a female character whose existence has been defined by men, Anya is uniquely problematic within the world of *Buffy the Vampire Slayer*. It is clear that she did, as she says in "Selfless," cling to whatever came along, and in her life, what came along was an identity defined by males – first Olaf, then D'Hoffryn, and then Xander. Her sex is not what has limited her, but rather her failure to reject the harmful expectations that society puts forth for her sex.

After centuries of conforming to debilitating stereotypes, Anya at last realizes that she must reject these same stereotypes and discover who she really is, despite her fears.

Works Cited

"Chosen." By Joss Whedon. Dir. Joss Whedon. Perf. Sarah Michelle Gellar, Alyson
Hannigan. Buffy the Vampire Slayer. UPN. 20 May 2003.

. . . .

"Doppelgangland." By Joss Whedon. Dir. Joss Whedon. Perf. Emma Caulfield,Andy Umberger. Buffy the
Vampire Slayer. 23 February 1999.

. . . .

Daugherty, Anne Millard. "Just a Girl: Buffy as Icon." Reading the Vampire Slayer: An Unofficial Critical
Companion to Buffy and Angel. New York: Tauris Parke Paperbacks. 2002. 148-165.

. . . .

de Beauvoir, Simone. Trans. H. M. Parshley. The Second Sex. New York: Alfred A. Knopf. 1968.

. . . .

"Hell's Bells." By Rebecca Rand Kirshner. Dir. David Solomon. Perf. Emma Caulfield, Nicholas Brendon. UPN.
5 March 2002.

. . . .

"Once More, With Feeling!" By Joss Whedon. Dir. Joss Whedon. Perf. Emma Caulfield, Nicholas Brendon.
UPN. 6 November 2003.

. . . .

"The Prom." By Marti Noxon. Dir. David Solomon. Perf. Emma Caulfield, Nicholas Brendon. Buffy the
Vampire Slayer. WB. 11 May 1999.

. . . .

"Selfless." By Drew Goddard. Dir. David Solomon. Perf. Emma Caulfield, Nicholas Brendon, Andy Umberger,
Abraham Benrubi. Buffy the Vampire Slayer. UPN. 22 October 2002.

. . . .

Sexton, Melanie. "Self/Other."
"Triangle." By Jane Epenson. Dir. Christopher Hibler. Perf. Emma Caulfield, Nicholas
Brendon, Alyson Hanningan, Abraham Benrubi. Buffy the Vampire Slayer. WB. 9 January 2001.

. . . .

"The Wish." By Marti Noxon. Dir. David Greenwalt. Perf. Emma Caulfield, Charisma Carpenter, Mark
Metcalf. Buffy the Vampire Slayer. WB. 8 December 1998.

. . . .

Woolf, Virginia. A Room of One's Own. New York: Harcourt Brace Jovanovich. 1981.

Universals and Particulars: Aristotle's Ontological Theory and Criticism of the Platonic Forms

Brad Vezina

Brad Vezina is a senior English major from Berkley, MA. He wrote this piece in Dr. Aeon Skoble's Aristotle and Plato class in Fall 2005.

"To say that Forms are patterns and that other things participate in them is empty talk, mere poetic metaphors."
Aristotle – Metaphysics.

As a staunch empiricist and systematic thinker, Aristotle found little appeal in Plato's theory of Forms. Proponents of this theory argued that all material objects are based on universal, immutable concepts called Forms and that for a thing to exist it must share or participate in these Forms. Ultimately, this theory holds that knowledge cannot be derived though our perception of sensible things, but only though our contemplation of the Forms, a position contrary to Aristotle's. Instead, Aristotle argues that reality is not dependent on universal abstracts (Forms), but on particular substances of physical things. As such, Aristotle holds that we can ground our beliefs in the sensible world with some assurance.

At the heart of Aristotle's criticism of Plato's Theory of Forms is the idea that universals are not separate from particulars. Platonists argue that each material object has its own corresponding Form(s), which is not embodied in the object itself, but separate from it. For example, things are said to be beautiful in so much as they participate in the Form of Beauty, which is detached from the sensible world. So a woman is beautiful in so much as she reflects the Form of Beauty, not in that she embodies the Form of beauty. In this case, a particular (the woman) shares in a separate, detached universal (the Form), as opposed to the Form of Beauty being an inherent or intrinsic quality of the woman.

Aristotle refutes this separation of universals from particulars in two simple ways: first, he argues that Forms cannot constitute a substance; and, secondly, that since Forms are not substances, Forms cannot cause a substance's coming into being. While Platonists hold that Forms are detached, non-physical entities that underlie—and cause—physical things, Aristotle is quick to point out the impossibility of such a claim: "It would seem impossible for a substance to be separate from what it is the substance of. How, then, if the Forms are the substances of things, could they be separate from them" (Metaphysics 991b). How is it, Aristotle is asking, that a non-substance (the Forms) can affect the qualities of a substance (the object of a Form)?

He addresses the impossibility of this problem in Book II of the Physics by introducing four causes responsible for a things change: the material, formal, efficient, and final cause. Of these four causes, the Platonic Forms fails to explain two—that is, the material cause and the efficient cause. Aristotle defines the efficient cause as the "source of the primary principle of change or stability" (194b30). Because the Forms are non-substances, it is impossible, according to Aristotle, for a physical object's substance to be primarily determined by its Form, especially considering that a Form is nothing more than a universal concept. And since an object's Form is a non-material, it would seem impossible for it to be the efficient cause of the object, simply for the reason that, as a non-material, no physical causation is possible.

Aristotle also points out that if Forms underlie and cause all physical objects, then even the most odd and remote object will have its own form. "[S]ome [Proofs] yield Forms of things that we think have no Forms," he states (Metaphysics 990b10) as an example. It would certainly be a stretch to conceive that dust and lint have their own Forms. If this were so, then the Theory of Forms would designate Forms to the most trifling and minute objects that, to us, would seem ridiculous. And for this reason, Aristotle felt that such a theory did not provide insight into and knowledge about the physical world.

Instead, Aristotle proposes the idea that universal concepts are not separate from particular things, but merely commonalities shared by objects. Take two yellow flowers, a marigold and a buttercup, for example. According to a Platonist, the yellow marigold and buttercup exist and are yellow because they both share in the Form of Yellow. Yet it would seem that both flowers' color and existence are caused by several Forms: the Form of Yellow, Flower, and Yellow Flower. And for Aristotle, this mingling and sharing of numerous Forms seems implausible and empty. Instead, Aristotle believes that the marigold and buttercup's color is not caused by a detached Form, but that their color is simply a shared quality among the two flowers. The universal is not separate from a particular but inherent in it.

Indeed, the cornerstone of Aristotle's ontology is his theory that reality is based on the substances of physical objects, not Forms. "'What is being?' is just the question 'What is substance?'" Aristotle states in the Metaphysics (1028b5). Aristotle conceives that our understanding of what is real is simply a matter of understanding the relationship between particular substances and their universal qualities. Of course, the question raised here is what does Aristotle mean by substance? He offers an account of what a substance is in Book V of the Metaphysics: "Substance is spoken of in two ways. It is both the ultimate subject, which is no longer said of anything else, and whatever, being a this, is also separable" (1017b25). A substance, then, is individual and particular, which is not predicated of other things, but other things are predicated of it.

To understand what Aristotle means by substances being particulars that are subject to predication, we turn to the Categories. Here Aristotle offers ten classes of being such as quantity, quality, where, and relative to name a few. In essence, Aristotle is showing that there are many ways of being. For instance, things are often said to be of a certain color, shape, size, or in a certain location. But of the ten classes offered, the thing being predicated on, the substance, takes priority. This is crucial in that, while there are many ways of being (more than the ten offered by in the Categories), Aristotle is arguing that all classes of being are in some way dependent on substance—that is, that universal predications are dependent on particular substances. For example, let us return to the yellow marigold and buttercup. Of the qualities shared by these flowers is the color yellow (i.e. yellow is predicated on both). By describing the marigold and buttercup as yellow, we are making reference to their substance. A thing—a substance—must exist in order for it to be called yellow, just as person must exist before we describe him as healthy. Instead of attributing a particular's (each flower) existence to the universal's (the color Yellow), a view held by Platonists, Aristotle maintains the opposite: that particulars are the bases of reality and share universal commonalities, that universals depend on particular substances. At the heart of this argument is that substance is a primary principle of being, whereas universal predications are merely secondary.

Furthermore, like Plato, Aristotle understood that all physical substances are continually in motion and changing. In Book I of the Physics, Aristotle explains that objects can change through many ways, such as addition, subtraction, or alteration, and that each change can be attributed to four specific causes (as I mentioned earlier). For example, a once solid and strong log can be made hollow and soft by insects. In this instance, a log passes from one state to another. What Aristotle is concerned with here is the element which persists throughout the change, which is the substance, "the things that are without qualification" (190b). Therefore particulars, that is, substances, also consist of form and stuff. A ball of clay, for instance, can be molded continuously but the clay itself, the substance, persists throughout.

On the other hand, Aristotle is quick to point out in the Physics and Metaphysics that in order for a substance to change it must have the potential to do so. Things can only change in so far as they are changeable. For example, as human beings we can use our reasoning faculties to find happiness and flourish in life in so far as we are potentially reasonable. Indeed, the main goal for us as human beings—and most other living things such as plants and animals—according to Aristotle, is to actualize our potentials. In

this way, particulars are continually changing in accordance with the potentials inherent in them.

However, unlike Plato, Aristotle holds this constant change of objects in the physical world as a movement towards a more perfected end goal. Plato maintained that particular things continually change in so far as things may deform or degrade and, thus, are unreliable to our senses. It is the universal Form of these physical objects that offers reliability. On the other hand, Aristotle dismisses this. Aristotle believes that substances or particulars do not suffer a continual degradation, but go through a process of perfection in that each living thing strives to actualize its potentials. Thus, life becomes a process of actualization and perfection instead of degradation and corruption.

Although both Plato and Aristotle claim that there is an objective reality underpinning the physical world and that the world is knowable, Aristotle's ontology offers a more pragmatic and plausible theory in that he grounds his epistemology, theory of knowledge, in the physical world. Knowledge of what is real, according to Plato, is conferred by the Forms. But what are the Forms? Plato claims that they are immutable, universal concepts that underpin all objects, yet no one can prove their existence – not even Plato. In this way, Plato's theory becomes mystical and faith-based (Indeed at the heart of Plato's Metaphysical theory is that the soul is immortal, a belief that cannot be proven nor disproved).

Aristotle, on the other hand, grounds reality on the sensible world, stating that reality is based on individual (particular) substances. In this way, an understanding of what is real can be attained through the observation and testing of individual things—that is, the reality of things can be scientifically explored. This, of course, seems more appealing in that our beliefs, being grounded on physical objects, hold some truth. It is also more appealing and plausible in that Aristotle epistemology through particulars is accessible by all people not just a few. Plato held that only a few people could understand the Forms using dialectics and mathematics. The few who are able grasp the Forms, the philosophers, were obligated to help enlighten their fellow contemporaries, a belief he introduces through the Allegory of The Cave. Aristotle, in contrast, believes that all people can find truth through merely observing and understanding particular objects.

In conclusion, given Aristotle's empirical nature, it is not surprising that he rejects Plato's Theory of Forms. The notion that reality cannot be found through the perception of particulars in the sensible world certainly draw Aristotle's criticism, especially considering that such a theory could not be substantiated. That all particulars (substances) were dependent on universal concepts (Forms) Aristotle quickly deemed as mystical conjecture. Instead, Aristotle maintains that reality is based on particulars, on individual substances, which share universal commonalities. Aristotle places understanding and knowledge as objects that can be attained through our empirical observations of the physical realm. Ultimately, he offers a systematic ontology than can be substantiated with physical evidence, with particulars.

Works Cited

Aristotle. "Physics." Aristotle: Selections. Ed. Terence Irwin and Gail Fine. Indianapolis, Cambridge: Hacket Publishing Company. 83-137.

Aristotle. "Metaphysics." Aristotle: Selections. Ed. Terence Irwin and Gail Fine. Indianapolis, Cambridge: Hacket Publishing Company. 221-344.

Aristotle. "Categories." Aristotle: Selections. Ed. Terence Irwin and Gail Fine. Indianapolis, Cambridge: Hacket Publishing Company. 1-12.

"That Dog Don't Hunt": Persuasive Language and Imagery in an NRA Advertisement

James Whittle

The purpose of any advertisement, obviously, is to persuade. When we think of why companies advertise we can boil it down to a short, catchy series of "p-words": Persuade People to Purchase a Product to gain Profit. This theory is simple enough when discussing product sales, but what about a different p-word that also uses advertising to persuade? This word is Politics, and the "product" is usually a campaign slogan, name, and/or idea.

Whether or not the intended outcome of political advertising is ultimately profit-driven or if the campaign truly wants to improve our society, is another, much larger question altogether. I don't plan to touch it, and I'm not asking the rather esoteric question of "what are the campaign's/ad's true intentions?"

Rather, I am looking at the phenomenon that is political advertising and how it works: what methods of persuasion are used, both in language and in imagery, to convince the people to support that particular slogan, name, and/or idea. Also I am asking why these methods work. And finally, if and when they don't work, as when they dissuade voters from voting at all, then why do political organizations still continue to use them?

 To understand the question of why these methods work, I must first explain what type of ad I will be looking at, and its importance. The ad I will examine is a negative advertisement, or, in short, an advertisement which a campaign or organization uses to attack opposing candidates by exposing their character flaws, hypocrisies, or instances of weak decision-making. While issue advertising, where candidates champion their own "selling points" or appealing qualities to voters, is still perhaps the most traditional form of campaigning, the use of negative/attack advertising has grown immensely in recent times. According to a study released in 1981 by Larry Sabato, entitled "The Rise of Political Consultants: New Way of Winning Elections":

> Even when television is used to communicate political truth (at least from one candidate's perspective), the truth can be negatively packaged—attacking the opponent's character and record rather than supporting one's own. If there is a single trend obvious to most American consultants, it is the increasing proportion of negative political advertising....At least a third of all spot commercials in recent campaigns have been negative, and in a minority of campaigns half or more of the spots are negative in tone or substance. (Chang, Park, and Shim)

Though Sabato is referring to television commercials, which have long since defeated print ads in popularity, the trend can also be seen in modern print advertisements. It is more than evident in the ad I will be looking at: a 2004 NRA advertisement which slanders John Kerry as "anti-sportsman," despite Kerry's claim that he supports sportsmen's rights.

This ad was not paid for by the Bush campaign, but it is still a relevant political ad.   The legal disclaimer at the bottom of the ad reads, "Paid for by NRA Political Victory Fund…Not Authorized by any Candidate or Candidate's Committee."   Though not in direct support of the Bush campaign, the National Rifle Association's intentions are clear within the ad and we know who the "Political Victory" is intended for. We also know that the ad is, beyond the shadow of a doubt, anti-Kerry, with the intention of persuading voters against Kerry.

Figure 1
<http://www.nrapvf.org/media/pdf/doghunt.htm>

At first glance, there are obvious negative-images used to attack John Kerry, though the ad uses both image and linguistic

persuasion. The most prevalent image is the white poodle dog brandishing a blue "Kerry" garment around its midsection, taking up nearly half the page, located directly above the largest, boldest words on the whole page: "That dog don't hunt." This sentence is the ad's main caption. The idea here is clearly to liken Mr. Kerry to a non-sportsmen's dog, a dog whose purpose is more for show, a dog who wouldn't know how to hunt an animal if you brought it into the woods and made it. The dog is clearly ready for show, brandishing a pink bow on its forehead, and displaying freshly groomed front and hind legs and backside, and a groomed tail. The hair that remains looks freshly washed and puffed out, and, taking all of this imagery into account, one might speculate that the dog is female, i.e. not a hunting dog, not a "man's" dog. This is the ad's primary image, encompassing the main idea expressed therein, which is also written as a sub-caption in smaller text beneath "That dog don't hunt": "John Kerry says he supports Sportsmen's Rights. But his record says something else."

The other images which negatively represent John Kerry are the seven "thumbs down" symbols which bullet the seven points negatively characterizing the presidential candidate. The simple, effective symbol of a thumbs down lets the voter know that these are seven negative points about John Kerry: seven instances of supposed hypocrisy, weak-will, and anti-firearm politics.

While most of the ad's text is written in black over a white background, each bulleted point contains a word or phrase written in red text, using the color red for its traditional purpose of expressing "danger" or "warning."   Of the seven words or phrases, five of them are words that most commonly have a negative connotation: "outlaw," "higher taxes," "banning," "close," and "voting against." The other two red-letter phrases are "allow" and "commend Rosie O'Donnell's," and when read in the context of the entire bulleted point, they too, obviously, are used to reflect negatively on John Kerry. Therefore, without having seen or read more than the words displayed in red, the poodle image, the main caption and sub caption, and the thumb's down bullets, the viewer (i.e. potential voter) knows that the ad is meant to damage Mr. Kerry's character for his apparently hypocritical stance on gun control. It should also be noted that the ad does not cite an instance when John Kerry claimed to be in support of sportsmen's rights, it merely claims that he once did.

If the viewer examines the bulleted points they will see what linguistic tactics the ad uses to dissuade them from supporting Kerry. Most drastically, the ad uses language to suggest that gun control and pro-gun control organizations are of "radical" and "extreme" nature. In bulleted point six, the ad reads, "John Kerry voted to commend Rosie O'Donnell's Million Mom March, an organization calling for gun owner licensing, gun registration, and other radical restrictions on law-abiding gun owners." *The Oxford English Dictionary* has many meanings for the word

"radical," the most relevant to this usage being, "Characterized by independence of, or departure from, what is usual or traditional; progressive, unorthodox, or revolutionary (in outlook, conception, design, etc.)" In other words, the ad-sponsor (the NRA) considers gun owner licensing and gun registration to be abnormal, unorthodox.

Similarly, in the seventh and final bulleted point, the ad states, "With a 20-year record of voting against sportsmen's rights, it's no wonder John Kerry has been called a 'hero' by the Humane Society of the United States, an extremist group that wants to outlaw hunting in America." *The Oxford English Dictionary* only lists one definition for "extremist": "One who is disposed to go to the extreme, or who holds extreme opinions; a member of a party advocating extreme measures." In other words, the Humane Society, which believes in protecting animals, is in no way a "moderate" group, in fact they represent extreme opinions.

Beneath the seven bulleted points the ad's message is summarized by the words in bold: "If John Kerry wins, you lose." Here we find the return of the color red, as the words "you lose" are underlined in red. The ad isn't addressing any old sportsmen per se; it is speaking to you, the reader, and it is taking the liberty of assuming that you are in favor of gun ownership. The ad's establishment of a personal connection with the potential voter is one final method of persuasion.

So why do these methods work to persuade people? Aren't people able to interpret information for themselves, without needing to be fed a package of persuasive language and imagery? An article by John Harms and Douglas Kellner explains that advertising isn't based just on information, but more on cultural and social identity:

> Advertising is significant because, in consumer capitalism, individuals depend on it for meanings -- a source of social information embedded in commodities that mediate interpersonal relations and personal identity. Advertising should therefore be conceived as an important institution in the consumer society because it produces 'patterned systems of meaning' which play a key role in individual socialization and social reproduction. (Harms and Kellner)

This explains, then, why the NRA would present an image of a poodle to compare to John Kerry's character. The effeminate image is used to remind gun owners of their own identity. Since the ad is targeted towards gun owners and many gun owners are male, the image suggests that supporting Kerry aligns the voter with the feminine, "Million Mom Marching" group represented by the show-dog. According to the ad's argument, however indirect or subliminal, voting against Kerry is a chance for the voters to reaffirm their maleness.

Furthermore, Torben Vestergaard and Kim Schroder discuss the importance/purpose of advertisers to reach their audience on a personal level:

> For unashamedly commercial media like advertising, it is absolutely essential to be in contact with the readers' consciousness, first in order to catch their attention, and secondly to dispose them favourably towards the product advertised. Advertisers therefore have to please the readers, never disturb or offend them; and because adverts [sic] are under this obligation to reflect the attitudes, hopes and dreams of their readers as closely as possible, we can gain an insight into the readers' consciousness, their ways of thinking, their ideology, by analyzing the structures of meaning found in advertisements. (Vestergaard and Schroder 121)

In the NRA's case, the poodle image is an obvious attention-getter, but while it reflects the attitudes of the audience, it simultaneously demands them to "pick a side." A gun owner concerned with sportsmen's rights is more likely to relate to a hunting dog or a firearm image and disassociate heavily from a poodle dog image. Norman Fairclough also suggests that imagery is responsible for connecting the audience to the ad's message. From his book *Language and Power*:

> Visual images underline the reliance of the image-building process upon the audience: where visual images are juxtaposed the interpreter has to make the connection, whereas in language connections can be made for the interpreter. (208)

In this case, the poodle image is juxtaposed with the caption "That dog don't hunt," which establishes a connection to the social identity of the interpreters. Again, the poodle represents Kerry, which in turn connects the interpreters with their own roles as gun owners, i.e. anti-poodle.

Imagery is crucial to influencing people's interpretation of an advertisement, but the importance of language can not be understated. Says Ernest Partridge in his essay on political propaganda:

> Heedless of the cost in social disorder, right wing propaganda deliberately and willfully distorts language to serve the purposes of the party, of the faction, of the sponsor. This is no secret. In his GOPAC memo of 1994, Newt Gingrich candidly identified language as "a key mechanism of control." (Partidge)

The use of language as control is precisely why the NRA uses words like "radical" and "extremist" to label opposing factions that aren't actually radical. To the advertiser, the implications of these words are far more important than whether or not the

accused are actually guilty. After all, "political advertising, unlike product advertising, must get results in a short period of time": therefore the advertisers must use words that are the most likely to invoke their desired result (Chang, Park, and Shim).

In my opening paragraph, I expressed the similarity between product sales and political campaigning, suggesting that the "product" politicians or organizations are trying to sell is their slogan, name, or idea. Consequently, the language and imagery of the NRA ad mimics the "five-part pattern" of a product ad that Hugh Rank diagrams in his book on ad persuasion entitled *The Pitch.* Rank claims that basically every ad follows the same five steps to grab hold of the audience and persuade them into buying, or in this case, voting accordingly. They are attention-getting, confidence-building, desire-stimulating, urgency-stressing, and response-seeking.

The poodle image is what Rank calls the "emotional attention-getter" because it is an image of "strong emotional associations" (20). "Emotional appeals", says Rank, "are very effective in getting our attention and persuading us into action" (22). Recall that the purpose of the image is to reach the gun owning voter by calling on his masculinity and reminding him that Kerry is somehow effeminate because he "don't hunt." While a company's ad would attempt to "link their product with something desired by the intended audience," a political attack ad follows a different method: "linking the product or idea with something already disliked or feared by the intended audience" (Rank 22). This method shakes the audience at their roots, essentially saying, "vote for this person and you will be supporting/becoming what you dislike or (more accurately) are afraid of."

The text that follows the poodle image in the bulleted points appears "informed," "competent," and "knowledgeable," all characteristics that Rank cites as being crucial to the "confidence-building" step (31). The purpose of this step is to establish trust in the audience, and a list of facts will do just that, even if the facts are slightly skewed or if rhetoric like "radical" and "extremist" is used inappropriately. According to Rank, "Aristotle points out that [expertise is] still very effective for the persuader even if there is only the appearance of these qualities of expertise, sincerity, and benevolence" (32).

Rank's final three steps of desire-stimulating, urgency-stressing, and response-seeking are all found in the ever so important line, "If John Kerry wins, you lose." The pronoun "you" establishes desire in the audience by placing the matter in their hands. In other words, "you must vote against John Kerry, or else you will suffer when sportsmen's rights are outlawed." The ad is presenting what Rank calls "a pain to be avoided" or "a problem to be solved" (41). A vote against Kerry helps to ensure that

you may continue to enjoy gun ownership. The outlawing of gun ownership is the potential pain or problem. At the same time, the red underlining of "you lose" stresses urgency and demands response. It is what Rank refers to as "command propaganda", seeking immediate response from voters (134). After all, the advertiser is attempting to influence an election and therefore working on a relatively short timeframe. The ad tells the voter, respond now or suffer later.

Yet what is startling about negative political advertising in general, is that a lot of research has concluded that it is ineffective. Politics is in large part an image game and "the public, once able to judge a man on his merits, must now make its decision on the basis of which candidate presents the best image" (Burmester 42). Though the NRA ad doesn't necessarily represent a candidate, it could project a negative image on conservatives in general due to its mean-spiritedness. The NRA's play on gender roles and use of unfounded claims could cause any potential voter to make the fair conclusion that the ad is nothing but mean.

Why, then, do political organizations continue to release attack ads? One theory is that negative campaigns turn many viewers off (dissuade them from voting at all) and thus play into the hands of politicians, generally conservative Republican ones, who rely on the minority of conservative Republicans who do vote (in contrast to the majority of generally liberal Democrats, who don't vote) (Berger 92).

If the NRA can release an ad attacking John Kerry that appeals to conservative voters, and at the same time dissuades liberal voters from voting at all, why not? And research has shown that it will do exactly that. A study in the mid-nineties shows that "negative campaign tactics may alienate voters and discourage them from political participation" (Pinkleton 24).

To the advertiser's dismay, however, other research has concluded that attack campaign tactics can cause a backlash among the audience. Bruce E. Pinkleton researched this phenomenon and concluded:

> Negative voter perceptions of the sponsoring candidate, based in part on campaign tactics, are likely to translate into anticandidate voting behavior. This may be especially likely when the advertising is deemed unfair or excessive, or when the advertising is image oriented rather than issue oriented. (33)

Based on this conclusion, the NRA ad likening John Kerry to a female show dog in an attempt to appeal to gun owning sportsmen could actually lose the organization more followers than it will win. Perhaps the advertiser hopes conservative voters and/or gun owners are more susceptible to image advertising and less likely to react in backlash.

But what about ads that cause potential voters to disengage from political participation in general? Many "frames" do just that. The term "frame" is used in news media to describe an advertisement or any public presentation where "stylistic or thematic organizations of text emphasize a particular story line" (Procter, Rumsey, and Schenk-Hamlin 54). The problem for advertisers is that recent research has show that the overall package presented within these frames has led much of the public to develop a cynicism towards politics in general, regardless of which party the advertiser is affiliated with.

Politically, "candidate theme frames" are used to construct a negative image around the opposing candidate based on one theme. In this instance, imagery is organized thematically along with the text to create the image. Simple themes are aligned with the candidate to project a negative image:

> The opposing candidate is attacked by attaching pejorative, and often stereotyped, political themes to his or her orientation (e.g., Sam Brownback, too extreme for Kansas), representation (e.g., Randy Rathbun is controlled by labor's union bosses), and/or character (e.g., Vince Snowbarger is a liar and a cheat). The inference about the opposing candidate's character is often drawn from recurring past conduct. If specific issues appear at all, they merely support the overall image of the opposing candidate (Procter, Rumsey, and Schenk-Hamlin 57).

These tactics can and have been noted in the NRA advertisement, but their potential impact on voters is remarkable. Research shows that candidate theme frames have led viewers to stop reacting to politicians as individuals, but as a class. In other words, negative ads have caused many viewers to see the big picture, i.e. politicians are all in the same boat, in competition with each other for office. And currently, the class of politicians might be the most unsafe class for a politician. For as long as they are aligned with class, "viewers will regard politicians as a whole with greater contempt and hold them responsible for the country's political ills" (Procter, Rumsey, and Schenk-Hamlin 60).

Competition could be the simplest explanation as to why advertisers release attack ads in spite of risking the endangerment of their own organization. Politics is competitive and the nature of competition has always involved grit, ferocity, and unwillingness to admit defeat. To paraphrase an age old maxim, when the dirt gets political, the political get dirty. In other words, when one attack is launched, the other side responds similarly for fear of getting buried by attacks. Political gun drawing and mud slinging aren't necessarily done out of mean-spirit, but more as a means of staying afloat in one of the most cut-throat games ever played. No competition has been won by letting up on the opponent, and politics is no different. The book Going Negative studies the phenomenon in depth and finds this:

> Put bluntly, candidates attack out of fear: fear that the opposition will throw the first punch, fear that they will appear weak if they don't respond in kind. In politics the best defense is a strong offense, and negative advertising is the most expedient way to fend off the opposition's attacks. (Stephen Ansolabehere and Shanto Iyengar 115-116)

The game isn't played just between politicians either. But politicians aren't the only ones with vested interests in campaigns. In this study, I've looked at an ad released by an organization with no direct ad funding from a politician. Ansolabehere and Iyengar write, "Corporations, professional associations, unions, and other organizations have large stakes in the outcomes of elections, and they don't remain on the sidelines long" (116). The NRA stood to suffer deeply from the election of a Democratic candidate, so naturally they played the game in classic form. "Through unrestrained independent advertising, interest groups can and do influence the tone, the issues, and even the outcome of elections", and unrestrained the ad certainly is (Ansolabehere and Iyengar 116).

We know the ad's purpose was obviously to persuade and can see methods in the advertisement that were used to do just that. While language is used to inform the audience about John Kerry's anti-firearm stance, imagery is used to reach a bit deeper and connect the audience with their own social roles. Both language and imagery are used to establish a personal connection with the viewers. The advertiser hopes this technique will influence the viewer's decision to adopt the advertisers view. Meanwhile, the prospect of dissuading liberal voters from voting at all only benefits the advertiser.

Though no product was sold per se, an idea was sold to the voter viewing the ad: the idea that a vote for John Kerry would endanger the rights of gun owners. It is no surprise, then, that the ad follows the same structure as a corporation's product ad. After all, political organizations and corporate advertisers have the same goal in mind: to persuade the people.

Works Cited

Ansolabehere, Stephen and Shanto Iyengar. Going Negative. New York: The Free Press, 1995.

. . . .

Berger, Asa Arthur. Ads, Fads, & Consumer Culture. 2nd ed. Oxford: Rowan & Littlefield, 2004.

. . . .

Burmester, David. "The Language of Deceit." Language and Public Policy. Ed. Hugh Rank. Urbana, Illinois: National Council of Teachers of English, 1974. 40-51.

. . . .

Chang, Won Ho, Jae-Jin Park, and Sung Wook Shim. "Effectiveness of Negative Political Advertising." Web Journal of Mass Communication Research 2: 1 December 1998. 18 March 2006. <http://www.scripps.ohiou. edu/wjmcr/vol02/2-1a.HTM>

. . . .

Fairclough, Norman. Language and Power. Boston: Addison Wesley Publishing Company, 1989.

. . . .

Harms, John and Douglass Kellner. "Toward a Critical Theory of Advertising." Illuminations. University of Texas at Austin. 15 March 2006. <http://www.uta.edu/huma/illuminations/kell6.htm>

. . . .

National Rifle Association. 2004. "Poodle Ad." 15 March 2006. <http://www.nrapvf.org/media/pdf/ doghunt.htm>

. . . .

Oxford English Dictionary. 2006. Oxford University Press. 17 October 2006. <http://dictionary.oed.com>

. . . .

Partridge, Ernest. "Political Propaganda: Selling Lies like Cigarettes." 13 July 2004.

. . . .

The Crisis Papers. 15 March 2006. <http://www.crisispapers.org/essays/propaganda.htm>

. . . .

Pinkleton, Bruce. E. "Effects of Print Comparative Political Advertising on Political Decision-Making and Participation." Journal of Communication (Autumn 1998): 24-36.

. . . .

Procter, David E., Deborah J. Rumsey, and William J. Schenk-Hamlin. "The Influence of Negative Advertising Frames on Political Cynicism and Politician Accountability." Human Communication Research 26.1 (2000): 53-74.

. . . .

Rank, Hugh. The Pitch. Park Forest, Illinois: The Counter-Propaganda Press, 1982. 9-17.

. . . .

Vestergaard, Torben and Kim Schroder. The Language of Advertising. New York: Basil Blackwell, 1985.

Daring Deeds: Independent Moral Thought and Action in *Hope Leslie*

Amanda Viana

Amanda completed this piece as a final paper for the Rise of the American Novel seminar her senior year for Dr. Ann Brunjes. She is currently finishing an Honors Thesis.

Catharine Maria Sedgwick's *Hope Leslie*, published in 1827 but set in seventeenth-century Puritan New England, explores the complex themes of authority and independence in the American colonies in order to gain perspective on post-colonial controversies. In the novel Sedgwick's main character, Hope Leslie, is orphaned and sent from Britain to live with relatives in the American colonies. Living among the Puritans in a settlement near Boston, Hope often clashes with authority. When the settlement comes into conflict with nearby tribes of Native Americans Hope's sister is kidnapped and other relatives are killed. Despite these circumstances Hope often defends and even plots to protect several Native American characters throughout the novel. Her strong will and disobedient actions often get Hope into trouble with Puritan authorities; however she follows her own ethical code until the very end of the novel, when, as an adult, she must once again face her sister and her kidnappers.

Hope Leslie, is a young woman of a unique and independent spirit, in fact "nothing could be more unlike the authentic, 'thoroughly educated' and thoroughly disciplined young ladies of the present day, than Hope Leslie…sportive, free, and beautiful" (Sedgwick 121). Hope's best friend Esther Downing, on the other hand, is "restrained within prescribed and formal limits, and devoted to utility" (Sedgwick 121). Hope tells Esther that she is "as wise as Solomon, and always in the right" (Sedgwick 130); however Hope often disregards Esther's advice (and the directives of her superiors) in favor of her own moral judgment. Sedgwick contrasts the independence of Hope Leslie and the obedience of Esther Downing as a means to illustrate the conflict between the new American ideal of self-governance and the patriarchal expectations of obedience, and to emphasize independent moral judgment or "reliance on conscience as a legitimation of political action" (Garvey), particularly for women in post-colonial America. Further complicating the novel's argument is the presence of Magawisca, a Native American girl who is sent away from her family to serve the Fletcher family. Magawisca is complicated because she neither disregards authority and tradition for her own judgment like Hope, nor does she blindly obey authority like Esther. Instead she provides a kind of balance between authority and self-governance. Twice Magawisca disobeys authority—both times to her own peril. However she still expresses a deep respect and obedience in her everyday life, even when her conscience feels torn between two forces.

Seventeenth-century Puritans left Great Britain in order to pursue self-governance and independence. Once they arrived in the American colonies, they established a patriarchal rule and expected obedience. Even 50 years after the American Revolution, during the Jacksonian period of democracy, Americans were still struggling with new concepts of democracy. How would the government of a new nation impose law and order without compromising the ideals of independence and self-governance that the country was founded on, especially considering that the nation's birth took place as a result of revolution? The American Revolution, according to the laws of Great Britain, was illegal, treasonous and, many Loyalists would argue, immoral. *Hope Leslie* "[raises] questions about the legitimate resistance to authority" (Strand), and ultimately accepts individual political action as justifiable as long as it is based in a moral justification. Changing social debate during Sedgwick's lifetime under the influence of "urbanization, industrialization, and democratization" led to the "barriers preventing women from circumventing traditional norms…being vigorously debated" (Garvey). Not only was the role of the individual American male's participation in the political and legal arenas still on shaky ground, the controversial roles of American women in the public realm were being debated in Jacksonian America. Sedgwick's contemporaries were "[beginning] to exercise the political voice foundational to claiming democratic citizenship" (Strand). In fact, as Amy Dunham Strand explains in "Interpositions: *Hope Leslie*, Women's Petitions, and Historical Fiction in Jacksonian America", in the 1830's, less than a decade after the novel was published, women began to write petitions to Congress on behalf of Native Americans. Strand comments:

> While there is no direct historical link between Hope Leslie and women's actual petitions, they share remarkable rhetorical similarities. Both fundamentally announced themselves as interpositions on behalf of others' natural rights, initially made use of a supplicating stance and humble tone, and ultimately challenged patriarchal structures through their articulation of political opinion, moving women an important step toward citizenship. (Strand)

Although Sedgwick herself felt uncomfortable in the public eye, her contemporaries were beginning to insert themselves into the public sphere, albeit for the sake of others. Although their methods are more similar to Magawisca's balance of resistance within the structures of society rather than Hope's outright defiance, the petitions are in direct opposition to the kind of obedience that Esther represents in the novel.

The novel begins with the story of William Fletcher, who begins his life in England and is led, by his religious beliefs, to the American colonies. Unfortunately he must leave without the love of his youth: his cousin, Alice. Fletcher's uncle disapproves of his nephew's politics, and his self-governance:

> The pliant courtier was struck with the lofty independence of the youth who, from the first, shewed that neither frowns nor favor would induce him to bow the knee to the idols Sir William had served. There was something in this independence that awed the inferior mind of the uncle. (Sedgwick 9)

Fletcher's conflicts with authority and his independent sense of morality foreshadow Hope's independent spirit and actions later in the novel. Although he is Hope's legal and moral guardian, he has trouble disciplining her when she goes against the community's leaders. He often seems to be caught between his respect for authority and his understanding of Hope's reliance on her own moral judgment to guide her actions. Though he sometimes seems to want to see events in terms of black and white, he has trouble disciplining Hope for her self-governance. At one point in the novel he admits to Hope, "I have proved myself not fit to teach, or to guide thee" (Sedgwick 114).

Hope Leslie, Sedgwick's title character, is the elder daughter and the spitting image of Alice, and when her parents die she and her sister are sent to live with Fletcher. Because of Fletcher's love for her, and because his "denying virtues were all self-denying" (Sedgwick 122) he fails to discipline Hope in a manner acceptable to the Puritans, particularly Governor Winthrop. While Fletcher has no trouble governing himself in a respectable manner and obeying the rules of morality and decorum set forth by the community's religious leaders, he finds it nearly impossible to hold Hope to the same strict standards. He seems to respect her mind and reasoning and therefore has intense trouble instructing her to obey her superiors rather than her own conscience. Sedgwick emphasizes Hope's differences from her Puritan friends and neighbors. She is "[endowed] with the beauty with which poetry has invested Hebe" (Sedgwick 122). She is also indulged—first by her mother, then her mother's cousin and her guardian Mr. Fletcher, and by her aunt Grafton especially. Aunt Grafton guides Hope's rebellious attitude toward the Puritans. Hope's parents were members of the established church, and Aunt Grafton's criticism of some of the Puritan's ways led Hope to "doubt their infallibility" (Sedgwick 123).

Hope Leslie is not content to blindly obey authority because she has her own moral compass and she is the very picture of independence and self-governance. The patriarchal authority of the Puritans does not approve, and sometimes even her friends do not understand Hope's actions. Everell laments, "Fortune, and beauty, and indulgence, had had their usual and fatal effect on Hope Leslie" (Sedgwick 207). He is disappointed by her secrecy and what he sees as her lack of consideration for those who care for her: "'How changed,' thought Everell, as his eye glanced toward her, 'thus selfishly and impatiently to pursue her own pleasure

without the slightest notice of her friend's disappointment'" (Sedgwick 209). Everell misinterprets Hope's actions on behalf of an inferior who she feels has been wronged as selfishness and concern with her own pleasure and whim. After Hope releases a Native American herbalist, Nelema, from a Puritan jail (she has falsely been accused of witchcraft after healing Hope's tutor from a snakebite), Fletcher tells Hope, "I have proved myself not fit to teach, or to guide thee" (Sedgwick 114). Therefore Hope must travel to Boston to be supervised by Governor Winthrop's family, and influenced by Winthrop's wife and her niece, Esther Downing. In response to this sentence Hope writes to her cousin Everell, "The idea of this puritanical guardianship did not strike me agreeably" (Sedgwick 114). Hope has become used to the somewhat flexible guidance of her uncle and cannot bear the idea of having to submit to such strict authoritarianism as Governor Winthrop is sure to provide.

Esther Downing could not be more different from Hope Leslie. "They were unlike in every thing that distinguished each….but, however variant their dispositions, they melted into each other, like light and shade, each enhancing the beauty and effect of the other" (Sedgwick 139). Esther is "raised in the strictest school of the Puritans" (Sedgwick 135) and cannot bring herself to disobey. "She attained the age of nineteen, without one truant wish straying beyond the narrow bound of domestic duty and religious exercises" (Sedgwick 136). It is not in her nature to object to or disregard the rules set for her. Unlike Hope, who sees all situations in shades of gray, and considers it her duty to judge right from wrong, Esther sees things in black and white. She believes that right and wrong have already been determined by the authorities of the community. She does not view it as her place to interpret legal or moral authority, but simply to obey. Although Fletcher's son Everell and Hope both have affection and respect for Esther, they often get fed up with her dogmatic obedience. When Everell asks Esther to help him free his Native American friend Magawisca from prison, she refuses. Everell is tired of Esther's strict submission to authority and says to her, "'But surely, Esther, there must be warrant, as you call it, for sometimes resisting legitimate authority, or all our friends in England would not be at open war with their king.'" Esther disagrees, and asserts that these "friends" are men of Puritan authority and are therefore guided by the Lord and his scripture (Sedgwick 278). Hope also becomes disenchanted with her obedience, often begging Esther to stop censuring Hope's actions. At one point she calls Esther a "born preacher" and remarks, "'Now, Esther, don't look at me so, as if I was little better than one of the wicked'" (Sedgwick 180).

Magawisca complicates Sedgwick's dichotomy between Hope and Esther. Magawisca is the daughter of Chief Mononotto, and therefore Pequod royalty, who witnesses the massacre of her family by English settlers. She is captured and sent by Governor Winthrop to serve in the Fletcher household, along with her brother. Magawisca submits to authority and even becomes familiar and friendly with the family; in fact, Everell becomes her best friend and Sedgwick includes a subtext of both sibling and romantic love in their relationship. However when Magawisca's father comes to save his children and executes most of the Fletcher family, Magawisca follows her father, much to the confusion and even consternation of the white settlers who have encompassed her into their lives. Although Magawisca respects her father's judgment and authority she protests when he wants to kill the innocent Fletcher family:

> Magawisca uttered a cry of agony, and springing forward with her arms uplifted, as if deprecating his approach, she sunk down at her father's feet, and clasping her hands, "save them—save them," she cried, "the mother—the children—oh they are all good—take vengeance on your enemies—but spare—spare our friends—our benefactors—I bleed when they are struck—oh command them to stop!" she screamed, looking to the companions of her father, who unchecked by her cries, went pressing on to their deadly work. (Sedgwick 62)

Magawisca's pleas fall on deaf ears. However when her father kidnaps Everell and attempts to behead him, Magawisca cannot stand by. She physically interposes herself in between her father and Everell, and loses her arm in the process. Magawisca is willing to sacrifice herself for the sake of another. Unlike Hope, who uses coquetry and cunning to achieve her ends, Magawisca is willing to sacrifice her freedom, standing in the community, and even her life in order to save her friend.

It seems that Magawisca's view of her own authority figures is more respectful than Hope's because she feels that the Native American's authority is based on morality. Speaking of the beheading of her brother by the Puritans, she says to Everell, "You English tell us, Everell, that the book of your law is better than that written on our hearts, for ye say it teaches mercy, compassion, forgiveness—if ye had such a law and believed it, would ye thus have treated a captive boy?" (Sedgwick 51). Magawisca and Hope challenge and ultimately reject the authority of the Puritans because they feel that it leaves no room for independent moral judgment. The codified laws of the Puritans cannot match the law written on the hearts of the Pequod tribe because it does not leave room for the individuals to show mercy, compassion, or forgiveness. This is also expressed in a different way through Esther, who although she seems to feel a tug of empathy for Magawisca, refuses to help Everell free her because it goes against the codified authority.

However it is important to note that even the Pequod code of law and moral judgment dismisses female points of view—unless those females are thinking in "masculine" ways. When Magawisca's mother tells the warriors to avenge the deaths of their people, Mononotto says, "when women put down their womanish thoughts and counsel like men, they should be obeyed" (Sedgwick 52). Although Mononotto seems to respect his wife and later his daughter, it is only because he feels they are behaving in masculine ways. When Magawisca's later actions—her petitioning to her father to spare the Fletcher family and her interception in behalf of Everell—go beyond this interpretation of reasoning free of "womanish thoughts" she is largely ignored. Hope and Magawisca's disobedience to authority is acted out in a feminine way. Both girls petition the authority in order to help the innocent, much like Sedgwick's contemporaries writing petitions to Congress in the 1830's; a strictly feminine method of protest. These women "departed from previous efforts by abandoning male intermediaries" (Strand).

Magawisca's role in the novel is complicated not only by her gender, but also by her race. Although she, like Hope, follows her own conscience against the Puritan authorities she is not treated in the same manner that Hope is. Although Hope frees two prisoners during the course of novel, as well as other smaller acts of disobedience, she is never put on trial or even harshly punished for her actions. Furthermore the Puritans refuse to acknowledge that Magawisca answers to an authority other than their own. They judge her based on their own system of laws, values and morals. Magawisca is separated from this code of ethics twice over. Not only is her position as a Native American separate her from this society that has so intrusively begun to take over her own, she is also a woman. In Jacksonian American women were just beginning to be considered in the lawmaking process, and their personal involvement in matters of government and law was even scarcer.

The Puritans of Boston find Magawisca's attitude a personal affront to their way of life. During her trial a man comments to Everell, "See, with what an air she comes among her betters as if she were a queen of us all" (Sedgwick 282). If her gender makes her less capable of discerning right from wrong, in the minds of the Puritans her status as a racial other makes it next to impossible. By the time Sedgwick was writing *Hope Leslie,* Americans had given up on trying to convert Native Americans to their way of life and were now focused on "removing" them. Puritans may have seen the potential for improvement in Native Americans but the racism of the Jacksonian era refused to even consider the possibility. Sedgwick, however, seems to refute this point of view with her portrayal of Magawisca as a noble, dignified and highly moral figure. Entering the courtroom on the day of her trial, Magawisca's "erect attitude, her free and lofty tread, and the perfect composure of her countenance, all expressed the courage and dignity of her soul" (Sedgwick 282).

In the end, it is Hope's freeing of Magawisca that brings an end to the conflict of the novel, and perhaps some of the future conflicts of the colony. Maria Karafilis calls Hope's philosophy her "radical democratic individualism" and asserts that "when the state fails to serve the functions and provide the protections that it was created to secure" Hope is free to act to correct these mistakes. Strand argues that:

> Sedgwick viewed justified interpositions as sympathetic, mediatory acts on behalf of the "rights of innocence" –acts that in turn challenged power hierarchies in the defense of natural rights, that touched on questions of republican citizenship, and that finally found particularly persuasive expression in the form of the petition.

As Karafilis puts it, "Hope's freeing of Magawisca…ironically secures the good of the Puritan community by preventing retaliatory attacks…." Even Governor Winthrop begins to trust Hope, saying to Mr. Fletcher, "' we may trust your wild-wood bird; her flights are somewhat devious, but her instincts are safer than I once thought them'" (Sedgwick 303). Esther's obedience harms no one, but it does not help anyone either. Her refusal to see the necessity for independent judgment and "the existence of multiple and often conflicting 'truths' or perspectives" (Karafilis) leave her powerless to help anyone.

Sedgwick contrasts the beliefs and actions (or inactions) of Hope Leslie and Esther Downing in order to illustrate the importance of self-governance and independent moral judgment. Although both women are happy with their respective fates, in the end it is Hope who refuses to completely submit her will and moral judgment to Puritan patriarchal authority, and Hope who accomplishes her goals. Esther remains frozen by her commitment to obedience. She also returns to England for most of her life (eventually she comes back to Boston), a sign that Sedgwick feels Esther's morals are more suited to the Old World than the New. In Jacksonian America women were beginning to "exercise the political voice foundational to claiming democratic citizenship" (Strand). Esther's refusal to exercise or even acknowledge her role as an individual with her own moral judgment simply does not fit within the scope of Sedgwick's America. Magawisca complicates Sedgwick's argument. Although she does petition and act on behalf of others and exercises her own judgment, she is still not able to separate from what she ultimately believes is right: staying with her tribe. Although she loves the Fletchers she explains to Everell and Hope, "the Indian and the white man can no more mingle, and become one, than day and night" (Sedgwick 330). Magawisca must return to her people and their set of laws, although part of her heart does yearn to stay with her friends.

It is clear that Sedgwick was using a historical perspective to illustrate contemporary conflicts and issues that arose with the establishment of the United States of America as an independent nation, and Jacksonian American debates over the presence of women in the public realm. Sedgwick makes a case for what Karafilis calls "radical democratic individualism" by giving Hope and Magawisca the tools and judgment to act according to their own moral compasses for the good of the community as a whole and thereby endorsing the role of the individual in political and legal decision making. "In effect, she asserts that the female conscience is as valid a source of social authority as is the legal power held by men" (Garvey). Hope and Magawisca's moral convictions, and especially their decisions to act on those convictions, are what set them apart from the other characters in the novel and give voice to the roles and responsibilities of the individual in a new and changing society. Magawisca's role as a racial other further complicates Sedgwick's argument by illustrating the undertone of racism in Puritan society to expose the same trend in Jacksonian America.

Works Cited

Davidson, Cathy N. Revolution and the Word: The Rise of the Novel in America. Oxford University Press, 2004.

. . . .

Gregory Garvey, T.. "Risking Reprisal: Catharine Sedgwick's Hope Leslie and the Legitimation of Public Action by Women." American Transcendental Quarterly Dec. 1994: 287-299.

. . . .

Karafilis, Maria. "Catharine Maria Sedgwick's Hope Leslie: The Crisis Between Ethical Political Action and US Literary Nationalism in the New Republic." American Transcendental Quarterly Dec. 1998: 327-345. MLA International Bibliography. EBSCOhost. Clement C. Maxwell Library, Bridgewater State College. 09/29/2006 <http://library.bridgew.edu:3260/login.aspx?direct=true&db=mzh&AN=1998020051&site=ehost-live>.

. . . .

Sedgwick, Catharine Maria. Hope Leslie; Or, Early Times in the Massachusetts. New Brunswick, NJ: Rutgers University Press, 1987.

. . . .

Strand, Amy Dunham. "Interpositions: Hope Leslie, women's petitions, and historical fiction in Jacksonian America." Studies in American Fiction Autumn 2004: 131-165. Expanded Academic ASAP. Thomson Gale. Somerset Public Library. 10/6/2006 <http://find.galegroup.com/itx/infomark.do?&contentSet=IAC-Documents&type=retrieve&tabID=T002&prodId=EAIM&docId=A129250672&source=gale&user

. . . .

Watts, Steven. The Romance of Real Life: Charles Brockden Brown and the Origins of American Culture. Baltimore: Johns Hopkins University Press, 1994.

Inverting the Cave: *Edgar Huntly* and the Enlightenment

Abby Sherwood

Abby is a Senior majoring in English and minoring in Secondary Education. This piece was completed as a final paper for Dr. Ann Brunjes' seminar, The Rise of the American Novel. Abby is planning to attend graduate school after graduation and will eventually pursue a career teaching high school English.

Writers of post-Revolutionary America used their work to explore the changing atmosphere of the newly formed republic. Like several of his contemporaries, Charles Brockden Brown uses his writing to examine and comment on the political debate surrounding American independence. Brown's work demonstrates distrust in the American Enlightenment, the philosophy accepted by many Republican optimists such as Thomas Jefferson. Brown's skepticism is grounded in the contextual, political debate between Federalism and Republicanism. In *Edgar Huntly or Memoirs of a Sleep-walker*, Brown challenges the fundamental beliefs of the Enlightenment and aligns himself with the Federalists. Through Edgar's quest for truth, Brown explores the motif of light versus darkness and attempts to invert the Platonic ascension to enlightenment. Through the use of the American gothic, Brown ultimately questions republican optimism, the belief in progress, and the people's ability to use reason to rule themselves.

In his essay titled "What is Enlightenment? Some American Answers" Robert Ferguson explains how Immanuel Kant describes the Enlightenment as "man's emergence from his self-incurred immaturity" and an "uncertain struggle of light against darkness" (371). Kant's emphasis on Enlightenment as a process conveniently accounts for the "anxiety," "extraordinary social upheaval," and "disaster" that accompanied the American Revolutionary War. Ferguson explains how the anxiety over separation from England creates a struggle between success and failure: "Separation from the mother country can imply either a natural movement toward the control of one's own destiny or the untimely, irreparable loss of the orphan" (383). It is within this tension that Brown emerges with his interpretation of the Enlightenment and prediction of the future of America. According to Ferguson, American literature "thrives in the resonant space between the hope of blessing and the fear of curse. It defines itself in that crisis; this is where it hold its audience" (387).

In the preface to *Edgar Huntly*, Brown explains that his novel is the result of "new springs of action" taking place in America (3). It is clear that Brown sees his narrative as a reflection of prevalent issues of the time. He also states that, "It is the purpose of this work…to exhibit a series of adventures, growing out of the condition of our country, and connected with one of the most common and most wonderful diseases or affections of the human frame" (3). This explanation encourages the reader not to view Edgar as an isolated figure but as a representation of the human condition.

Brown begins his story with the distraught narrative of Edgar Huntly, a man who claims to embody reasonable thinking and a dedication to methodical investigation. Edgar laments the recent death of his close friend Waldgrave and, overcoming his emotions, he vows to find the murderer: "Time and reason seemed to have dissolved the spell which made me deaf to the dictates of duty and discretion" (8). Edgar's quest begins with confidence in his abilities: "For this end I was to make minute inquiries, and to put seasonable interrogatories. From this conduct I promise myself an ultimate solution of my doubts" (15). His language, as well as the total absence of the law, suggests that he is capable of seeking out truth and administering justice entirely on his own. This type of self-governance is Brown's parallel to independence advocated by Jeffersonian Republicanism. Once he has asserted his ability to use reason, he begins his quest to find Waldgrave's killer.

At the beginning, Edgar seems in control of his quest: "Curiosity is vicious, if undisciplined by reason, and inconducive to benefit" (16). He demonstrates reflection and reasoning as he meditates on how to conduct his search. Edgar seems to possess characteristics such as truth, justice, courage, and self-control that mirror Plato's definition of a philosopher (Plato 180). Brown establishes these characteristics through Edgar's determination to find Waldgrave's killer. Because he embodies these characteristics, Edgar is meant to appear "enlightened." His philosophical reasoning demonstrates a faith in human nature and optimism in man's abilities. This is the starting point of Edgar's character from which he will slowly regress.

As Edgar develops an interest in Clithero, he gradually deserts his original objective. He becomes obsessed with forgiving and excusing Clithero of the crimes that drove him from his foreign home to America and states: "Could I not subdue his perverse disdain and immeasurable abhorrence of himself? His upbraiding and his scorn were unmerited and misplaced…Reason was no less an antidote to the illusions of insanity like his, than to the illusion of error" (91). Edgar thinks he can cure Clithero of his guilt and save him from insanity or suicide by teaching him to reason.
The shift from Waldgrave to Clithero leads Edgar away from reason and into the cave and darkness. Upon his first encounter with the cave, Edgar states: "at a few yards from the mouth the light disappeared, and I found myself immersed in the dimmest obscurity…But here it seemed as if I was surrounded by barriers that would forever cut off my return to air and to light" (95, 96). The entrance into the cave represents Edgar's first step towards regression and the primitive. As he leaves behind the light, he is also leaving behind reason and philosophy. In this way, Edgar begins the introverted journey of ascension. Instead of beginning in the dark and traveling towards light, Edgar abandons his philosophical state and travels downwards into the cave. In his article "*Edgar Huntly* as Quest Romance" Dieter Schulz explains

that "In the course of his search, the hero turns from his role as active agent of his quest into the object of uncontrollable forces within his own self" (325). This loss of self-control shows that there is darkness in the true nature of man.

According to Schulz, "Huntly's sleepwalking marks the point where the dark self fully asserts its power by breaking though the barriers of reason and morality" (330). When Edgar wakes from sleepwalking he finds himself engulfed in darkness: "but that which threw me into deepest consternation was, my inability to see. I turned my head to different quarters, I stretched me eyelids, and exerted every visual energy, but in vain. I was wrapt in the murkiest and most impenetrable gloom" (153). This lack of sight parallels the image of men chained to the wall in Plato's allegory of the cave (208). They too have restricted sight and are engulfed in darkness or lack of enlightenment. While Plato explains this as the starting point of mankind from which they can then rise, Brown portrays this decline as a natural state of mankind.

Edgar has gone from light to darkness and soon his behavior begins to reflect this change. He first admits that he has abandoned intellect and then becomes obsessed with satisfying his basic needs, hunger and thirst (153). This exchange demonstrates an animal-like transformation:

> My hunger speedily became ferocious. I tore the linen of my shirt between my teeth and swallowed the fragments. I felt a strong propensity to bite the flesh of my arm. My heart overflowed with cruelty, and I pondered on the delight I should experience in rending some living animal to pieces, and drinking its blood and grinding its quivering fibres between my teeth. (156-157)

Here, Brown uses imagery to portray the barbaric savagery that is taking hold of Edgar as he reverts to a primitive being. Schulz further explores Edgar's experience in the cave in relation to his quest: "The episodes in the caverns demonstrate the release of the dark self, under circumstances where the laws of morality are suspended. Even after he awakes in the pit, Huntly is sleepwalking in the sense that he has no control over his actions" (330). This regression demonstrates Brown's lack of faith in human nature.

Brown cleverly toys with the concept of light in the cave and inverts its meaning. Inside the cave there are two sources of light that attract Edgar's attention. Each source—the eyes of the panther and the Native American's fire—brings him deeper into chaos and barbarism and further from reason and enlightenment. The eyes of the panther are the first source of light:

> The darkness was no less intense than in the pit below, and yet two objects were distinctly seen. They resembled a fixed

and obscure flame. They were motionless. Though lustrous themselves they created no illumination around them…These were the eyes of the panther. (159)

This source of light does not illuminate but instead leads him to kill and devour the panther: "I did not turn from the yet warm blood and reeking fibres of a brute" (160). This gruesome account further establishes Edgar's increasing barbaric nature.

Once he has satisfied his hunger, Edgar searches out a source to quench his thirst. This quest leads him to the Native Americans:

> At length, on the right hand a gleam, infinitely faint, caught my attention. It was wavering and unequal. I directed my steps towards it. It became more vivid, and permanent. It was of that kind, however, which proceeded from a fire, kindled with dry sticks, and not from the sun. I now heard the crackling of flames. (163)

Again, this source of light brings out the savage in Edgar. Motivated by his own hatred for the Natives and the demands of thirst, Edgar debates whether or not he should kill the Native American. When the Native becomes aware of his presence Edgar learns that violence is necessary to survive and thus, he commits his first act of murder. This action confirms Brown's belief that: "violence lurked just beneath the social surface and within every man beat the heart of a beast" (Watts 120). This depiction of survival and savagery further demonstrates Brown's vision of America as an untamed wilderness in need of a stronger ruling government.

Similarly to how Brown inverts the meaning of light, he also alters the idea of reality. In Plato, Socrates explains that once man is brought into the light: "He will be able to see the sun, and not mere reflections of him in the water, but he will see him in his own proper place, and not in another; and he will contemplate him as he is" (210). Whereas in Plato man finds reality in the sun, Brown inverts this idea and Edgar discovers the reality of his natural self in darkness. Brown's reality is man's inclination towards savagery. This sharp contrast further emphasizes Brown's pessimism and lack of faith in the Enlightenment.

The murder of the Native leads to a series of violent scenes where Edgar massacres three more Native Americans. He admits to a "desperate impulse of passion" and irrational actions: "I was the instrument of their destruction. This scene of carnage and blood was laid by me. To this havock and horror was I led by such rapid footsteps" (181, 185-86). Edgar has lost his sense of justice and ability to exert self-control. He is no longer a rational being or a model of the Platonic philosopher; he has gone from enlightened individual to a desperate savage. Edgar is aware of his regression: "the transition I had undergone was so wild and inexplicable; all

that I had performed; all that I had witnessed since my egress from the pit, were so contradictory to precedent events, that I still cling to the belief that my thoughts were confused by delirium" (186). Although he has emerged from the cave, acts of irrational violence bring him deeper into chaos and darkness. As Schulz states: "There is a steady escalation in horror, from the killing of the panther to the butchery of the last Indian" (330).

As Edgar journeys through the wilderness he is under the false assumption that once he finds civilization he will leave behind the horrific scenes and insanity that has plagued him since he entered the cave. Instead, he happens upon evidence of violence, chaos, and lawlessness throughout his journey. Edgar returns home a different man from when he left: "An horrid scar upon my cheek, and my uncombed locks; hallow eyes, made ghastly by abstinence and cold, and the ruthless passions of which my mind had been the theatre, added to the musquet which I carried in my hand, would prepossess them with the notion of a maniac or ruffian" (227). This image suggests that Edgar is a changed man and will never again be the rational creature he once thought he was. His journey has transformed him and brought out the darkness within him.

Steven Watts, author of *The Romance of Real Life: Charles Brockden Brown and the Origins of American Culture*, explores how Edgar's madness is paralleled in Clithero, therefore arguing for the universality of his themes. Watts states that "Brown depicted the maniacal Irishman as almost an alter ego for the protagonist" (126). He does this by having Edgar discover an "obsessive identification with Clithero" (126). Similarly to Edgar, Clithero explains through his story that he was once a respectable man. Before he accidentally killed Mrs. Lorimer's brother he led a normal and happy life. Both men undergo transformations from reasonable men, to subconscious sleepwalkers, to madmen. Watts states that while Clithero, "anguished over his domination by the darker impulses of his nature," likewise Edgar "revealed himself as a creature of confused perceptions and profound unconscious impulses" (124). Neither men are able to govern their minds with reason and ultimately give in to their darker selves.

Through the use of the American gothic, Brown effectively captures the dissent of the period. As Watts states: "Gothic texts… challenged confident liberal individualism by showing isolated characters confronting the brutality of the modern world as well as the hidden monsters of human nature" (18). *Edgar Huntly* is a true example of the American gothic because in contrast to European gothic—which characteristically ends with a resolution of some kind—*Edgar Huntly* ends in disturbing chaos. The use of this genre further demonstrates Brown's themes. Edgar's foolish attempt to reunite Mrs. Lorimer and Clithero, causing Clithero's suicide and Mrs. Lorimer's miscarriage, leaves a lingering sense

of chaos and darkness. Edgar, finally realizing his mistakes, exclaims: "Disastrous and humiliating is the state of man! By his own hands, is constructed the mass of misery and error in which his steps are forever involved…How total is our blindness with regard to our own performances!" (268). Blindness, or darkness, is the state in which Brown ends his gothic tale. This pessimism is a direct contradiction to the optimism and faith in human nature advocated by Plato.

In Jane Tompkins' discussion of Charles Brockden Brown's novel *Wieland*, she explores how the "key to *Wieland's* meaning lies in the historical situation that the novel itself attempted to shape" (43). Tompkins bases her argument in the fact that immediately after he finished writing the novel, Brown sent a copy to Vice President Thomas Jefferson. She states that this action proves that Brown believed the "usefulness [of the novel] lay in the area of natural politics" (43). *Edgar Huntly* is similar to *Wieland* in that its meaning is also closely related to its historical context. Both novels are an attempt to influence the political atmosphere by demonstrating a darker view of human nature and a distrust of republican optimism. Not unlike *Edgar Huntly*, *Wieland* is a novel where "the plot offers a direct refutation of the Republican faith in men's capacity to govern themselves without the supports and constraints of an established order" (Tompkins 49). This is seen in *Edgar Huntly* where the lack of authority results in chaotic violence and unleashed barbarism.

According to Tompkins: "whether one was for or against the Constitution, for or against the French Revolution, for or against Jeffersonian democracy, turned largely on whether one believed that men were by nature fit to govern themselves or needed the restraining force of an entrenched ruling order" (47). Brown uses *Edgar Huntly* to demonstrate that he does not see man capable of using reason to govern himself because of a the dark side of human nature. Edgar's quest explores this dark side and directly counters Kant's Enlightenment and Plato's optimism. Instead of emerging from his immaturity, Edgar's quest leads him on an inverted journey of ascension back to a primitive, anti-philosophical state. Brown inverts the meaning of light and argues that reality lies in understanding that there is darkness in human nature. Emory Elliot states: "Most of all, Brown questioned the confidence of his age in the rational faculties of man…[and] came to believe that it is absurd to think that people are always guided by reason" (221). This lack of faith in human nature questions the enlightenment theory and demonstrates a lack of faith in the newly formed American government.

Works Cited

Brown, Charles Brockden. Edgar Huntly or, Memoirs of a Sleep-Walker. New York: Penguin Books, 1988.

Elliott, Emory. Revolutionary Writers: Literature and Authority in the New Republic, 1725-1810. New York: Oxford University Press, 1986.

Ferguson, Robert A. "What is Enlightenment? Some American Answers." The Cambridge History of American Literature. Ed. Sacvan Bercovitch. New York: Cambridge University Press, 1994. 368-389.

Plato. The Republic. Trans. C. D. C. Reeve. Indianapolis, IN: Hackett Publishing Company, 2004.

Schulz, Dieter. "Edgar Huntly as Quest Romance." American Literature 43 (1971): 323-335. MLA International Bibliography. EBSCO. Bridgewater State College Lib., Bridgewater, MA. 6 Dec. 2006 <http://web14.epnet.com/>.

Tompkins, Jane. Sensational Designs: The Cultural Work of American Fiction 1790-1860. New York: Oxford University Press, 1985.

Watts, Steven. The Romance of Real Life: Charles Brockden Brown and the Origins of American Culture. Baltimore: The Johns Hopkins University Press, 1994.

The E.P.R. Paradox

George Levesque

George graduated from Bridgewater State College with majors in Physics, Mathematics, Criminal Justice, and Sociology. This piece is his Honors project for Electricity and Magnetism advised by Dr. Edward Deveney. George ruminated to help the reader formulate, and accept, why quantum mechanics, though weird, is valid.

This paper intends to discuss the E.P.R. paradox and its implications for quantum mechanics. In order to do so, this paper will discuss the features of intrinsic spin of a particle, the Stern-Gerlach experiment, the E.P.R. paradox itself and the views it portrays. In addition, we will consider where such a classical picture succeeds and, eventually, as we will see in Bell's inequality, fails in the strange world we live in – the world of quantum mechanics.

Intrinsic Spin

Intrinsic spin angular momentum is odd to describe by any normal terms. It is unlike, and often entirely unrelated to, the classical "orbital angular momentum." But luckily we can describe the intrinsic spin by its relationship to the magnetic moment of the particle being considered. The magnetic moment can be given by:

$$\mu = \frac{IA}{c} = \left(\frac{q}{T}\right)\frac{\pi r^2}{c} = \frac{qvr}{2c} = \frac{q}{2mc}L$$

This brief derivation can be seen to apply where mass and charge coincide in space. More generally, we tend to consider:

$$\mu = \frac{gq}{2mc}S$$

where g is an experimentally determined number (depending on the particle used like g = 2.00 for an electron). This is essentially useful background for when we put our particle into a Stern-Gerlach device.

Stern-Gerlach Experiments

Stern-Gerlach devices utilize the magnetic moment of a particle by placing it in a non-uniform magnetic field as depicted here:
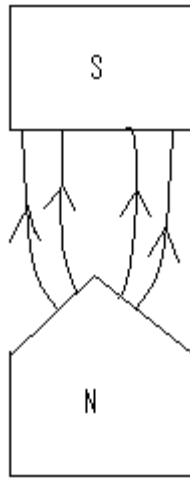
While $F = \nabla(\mu \cdot B)$ for a neutral atom entering the device, since $-(\mu \cdot B)$ is the energy of a magnetic dipole placed in a magnetic field), the magnetic field is largely in one direction (here we can call it the z-direction). So,

$$F_z = \mu \circ \frac{\partial B}{\partial z} \cong \mu_z \frac{\partial B_z}{\partial z}$$

Normally, a statement like this may not raise too many eyebrows but there is quantum weirdness here as well. Classically, the magnetic moment will take on a continuum of values (from $\mu_z = |\mu|\cos\theta$ where theta is the azimuthal angle). But in our experiment it takes on the values of *only*

$$S_z = \pm\frac{\hbar}{2}$$

Our assumption may be that the particles are oriented in this way from the start but the experimenters shot the particles from an oven (as to acquire a random and expectedly continuous distribution of magnetic moments) as below:
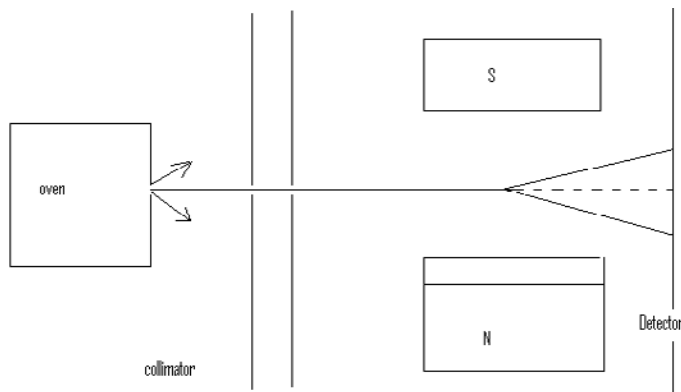
So there is little doubt that a non-continuous distribution is unexpected. The result is something that is famously known as "space quantization" and was indeed a "big deal" at the time of its discovery. As a result, there was much focus on this experiment and its implications for science. There were adaptations of this experiment to get a deeper understanding of nature. One of these is diagramed below:
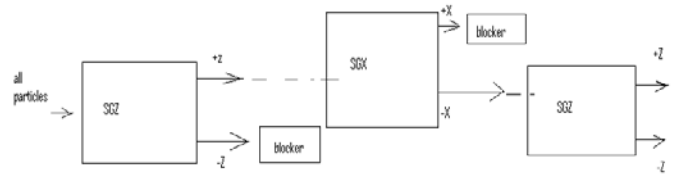
Note how this experiment reveals that we can send all particles through a Z-axis oriented device and get a 50% / 50% distribution and then remove one state completely from the system (with a blocker), and send it through an X-axis oriented SG (Stern-Gerlach) device and get 50/50 again. Most amazingly we can take half of these away and put the remaining ones through another SGZ and wind up with a 50/50 distribution all over again.

In other words, not only do we get some sort of binary nature out of what was thought to be a random orientation of particles, but making another measurement on the particles (in this case with an SGX) destroys the information that preceded it so that we can wind up with a 50/50 distribution all over again.

It is the result of these experiments that leads to many important quantum mechanical ideas. First off, the notion that particles do not exist in either one state or another but exist in a "superposition" of states (or "both states simultaneously"). This is evident in the notation of quantum. (For example, $|\varphi\rangle = \frac{1}{\sqrt{2}}|+z\rangle + \frac{1}{\sqrt{2}}|-z\rangle$ shows us that the orientation of a particle can be seen as some probability (when squared just like the psi – or wave – function) of both states being existent simultaneously.) Also, it is the idea of quantum mechanics that the particle exists in this superposition until a measurement is made. Without, or after, an interaction it returns to this superposition. This type of experimental result led to the questioning of and investigation about the world on the quantum mechanical level. During this time there was much questioning and discontent. It is out of this discontent for experimental results that we get the E.P.R. paradox.

The E.P.R. Paradox

In order to cast a shade of doubt on the quantum mechanical world, three scientists (A. Einsten, B. Podolsky, and N. Rosen) proposed a thought experiment that raised a reasonable doubt about the beliefs of quantum mechanics. You see, it brought great

discontent to the "realists" that were Einstein, Podolsky, and Rosen and the idea that the measurement created the particle to exist in some state was appalling. In their view, it was quite apparent that the particle existed in this state before the measurement and that the measurement was only the future observation of this state. (There is one notable quotation from Einstein to another scientist, A. Pais when they were out on a walk talking on this subject and Einstein asked whether he believed the moon was there when he wasn't looking).

So our three scientists devised an experiment that can be diagramed as below:
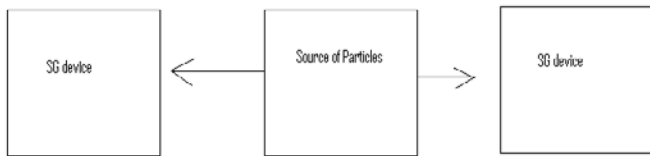
Here we have a set of particles, emitted two at a time, from some common origin such that their combined orbital angular momentum is zero. Here it is seen that, if the SG devices are oriented similarly, if one device measures a particle in the +z state then the other will have to note a −z state (in order to conserve angular momentum).

But Einstein, Podolsky, and Rosen propose that we assume these SG devices have different settings (or directions of orientation). This way we could consider a hidden-variable theory of quantum mechanics. More explicitly, if we were handed particles in the state |+x>, there would be half which (when measured in a SGz) would be in the |+z> state and half in the |-z> state. Further, if we were handed these |+x> particles (prior to measurement), while they would have the attribute to be either |+z> or |-z>, we would be unable to distinguish them unless we measured them.

But the biggest implication of the E.P.R. experimental design is the following "paradox:" if quantum mechanics is right (and one particles measurement would force it to be in one state and, thus, slam its pair particle to be in the other to conserve angular momentum before it is measured), then two vastly far SG devices in our experimental design would force some sort of faster-than-the-speed-of-light communication between them - an awkward and ugly conclusion that would drive some to question the beliefs of quantum mechanics.

Moving Toward Bell's Inequality

For a single SG device, the realists would say that 50% of the particles exist in one state (like {+z}) and 50% in the other (like {-z}). The followers of quantum mechanics would say:

If $|\varphi\rangle = \frac{1}{\sqrt{2}}|+z\rangle - \frac{1}{\sqrt{2}}|-z\rangle$

then

$\langle +z|\varphi\rangle = \frac{1}{\sqrt{2}}\langle +z|+z\rangle - \frac{1}{\sqrt{2}}\langle +z|-z\rangle = \frac{1}{\sqrt{2}}\langle +z|+z\rangle - 0 = \frac{1}{\sqrt{2}}$

So, the probability is $\left|\langle +z|\varphi\rangle\right|^2 = \frac{1}{2}$ for this state.

And

$\langle -z|\varphi\rangle = \frac{1}{\sqrt{2}}\langle -z|+z\rangle - \frac{1}{\sqrt{2}}\langle -z|-z\rangle = \frac{1}{\sqrt{2}}\langle -z|-z\rangle - 0 = \frac{1}{\sqrt{2}}$

So, the probability is $\left|\langle -z|\varphi\rangle\right|^2 = \frac{1}{2}$ for this state.

Since there is no contradiction, we continue to advance our experimental method, in search of some sort of contradiction to test. For the two particle SG device, the realist would say that half of the particles are in the {+z, -z} state and half are in the {-z,+z} state (where this notation is the states of particles 1 and 2 respectively). The followers of quantum mechanics would say:

If $|0,0\rangle = \frac{1}{\sqrt{2}}|+z,-z\rangle - \frac{1}{\sqrt{2}}|-z,+z\rangle$

(or a state of conservative angular momentum) then

$\langle +z,-z|0,0\rangle = \frac{1}{\sqrt{2}}\langle +z,-z|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle +z,-z|-z,+z\rangle =$

$= \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle -z|-z\rangle - \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle -z|-z\rangle = \frac{1}{\sqrt{2}}(1) - 0 = \frac{1}{\sqrt{2}}$

So, the probability is $\left|\langle +z,-z|0,0\rangle\right|^2 = \frac{1}{2}$ for this state.

And then,

$\langle -z,+z|0,0\rangle = \frac{1}{\sqrt{2}}\langle -z,+z|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle -z,+z|-z,+z\rangle =$

$= \frac{1}{\sqrt{2}}\langle -z|+z\rangle\langle +z|-z\rangle - \frac{1}{\sqrt{2}}\langle -z|-z\rangle\langle +z|+z\rangle = 0 - \frac{1}{\sqrt{2}}(1) = -\frac{1}{\sqrt{2}}$

So, the probability is $\left|\langle -z,+z|0,0\rangle\right|^2 = \frac{1}{2}$ for this state.

Now let us kick up the level of difficulty another notch. Let us say that we maintain a two particle device but now we can set our SG devices in either the z-axis (an SGz device) or the x axis (SGx device). Now since we have two states the local realist would say that every particle emitted would have a two-part instruction set (one in case it reaches an SGx and one for an SGz). The realist might say there exists

Population	Particle 1	Particle 2
1	{+x, +z}	{-x, -z}
2	{+x, -z}	{-x, +z}

3	{-x, +z}	{+x, -z}
4	{-x, -z}	{+x, +z}

Here these populations occur equally so, for populations 1 and 4 measurements in either x or z, for either device, will always yield particles oriented in opposing states. For populations 2 and 3, randomly oriented devices will yield spin down and spin up measurements only half the time. The other half 2 and 3 will yield similarly oriented particles (spin up or spin down but along different axis). So in total, if measurements are taken in different axis, there will be opposite signs 2/4*1=50% of the time.

Now the follower of quantum mechanics would say,

knowing

$$|0,0\rangle = \frac{1}{\sqrt{2}}|+z,-z\rangle - \frac{1}{\sqrt{2}}|-z,+z\rangle$$

and also that

$$|+n\rangle = \cos\frac{\theta}{2}|+z\rangle + e^{i\phi}\sin\frac{\theta}{2}|-z\rangle.$$

$$\langle +z,+x\|0,0\rangle = \frac{1}{\sqrt{2}}\langle +z,+x\|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle +z,+x\|-z,+z\rangle =$$

$$= \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle +x|-z\rangle - \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle -z|-z\rangle = \frac{1}{\sqrt{2}}(1)\sin\frac{\theta}{2} - 0 = \frac{1}{\sqrt{2}}\frac{1}{\sqrt{2}} = \frac{1}{2}$$

So, the probability is $\left|\langle +z,+x|0,0\rangle\right|^2 = \frac{1}{4}$ for this state.

$$\langle +z,-x\|0,0\rangle = \frac{1}{\sqrt{2}}\langle +z,-x\|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle +z,-x\|-z,+z\rangle =$$

$$= \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle -x|-z\rangle - \frac{1}{\sqrt{2}}\langle +z|+z\rangle\langle -x|-z\rangle = \frac{1}{\sqrt{2}}(1)\cos\frac{\theta}{2} - 0 = \frac{1}{\sqrt{2}}\frac{1}{\sqrt{2}} = \frac{1}{2}$$

So, the probability is $\left|\langle +z,-x|0,0\rangle\right|^2 = \frac{1}{4}$ for this state.

$$\langle -z,+x\|0,0\rangle = \frac{1}{\sqrt{2}}\langle -z,+x\|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle -z,+x\|-z,+z\rangle =$$

$$= \frac{1}{\sqrt{2}}\langle -z|+z\rangle\langle +x|-z\rangle - \frac{1}{\sqrt{2}}\langle -z|-z\rangle\langle +x|-z\rangle = 0 - \frac{1}{\sqrt{2}}(1)\sin\frac{\theta}{2} = -\frac{1}{\sqrt{2}}\frac{1}{\sqrt{2}} = -\frac{1}{2}$$

So, the probability is $\left|\langle -z,+x|0,0\rangle\right|^2 = \frac{1}{4}$ for this state.

$$\langle -z,-x\|0,0\rangle = \frac{1}{\sqrt{2}}\langle -z,-x\|+z,-z\rangle - \frac{1}{\sqrt{2}}\langle -z,-x\|-z,+z\rangle =$$

$$= \frac{1}{\sqrt{2}}\langle -z|+z\rangle\langle -x|-z\rangle - \frac{1}{\sqrt{2}}\langle -z|-z\rangle\langle -x|-z\rangle = 0 - \frac{1}{\sqrt{2}}(1)\cos\frac{\theta}{2} = \frac{-1}{\sqrt{2}}\frac{1}{\sqrt{2}} = \frac{-1}{2}$$

So, the probability is $\left|\langle -z,-x|0,0\rangle\right|^2 = \frac{1}{4}$ for this state.

Opposite signs in opposite axis still amount to ¼ + ¼ = ½ of the time.

All right, let us kick it up just one more notch of difficulty. Consider the two particle SG experiment with different settings but this time make it three separate (coplanar) orientations. (Note: none of these may be the x or z axis so we will give them general vector labels of a, b, and c.)

Well, let us see what our local realist has to say.

Population	Particle 1	Particle 2
N1	{+a, +b, +c}	{-a, -b, -c}
N2	{+a, +b, -c}	{-a, -b, +c}
N3	{+a, -b, +c}	{-a, +b, -c}
N4	{+a, -b, -c}	{-a, +b, +c}
N5	{-a, +b, +c}	{+a, -b, -c}
N6	{-a, +b, -c}	{+a, -b, +c}
N7	{-a, -b, +c}	{+a, +b, -c}
N8	{-a, -b, -c}	{+a, +b, +c}

Consider all of the possible state "bra's" of the two states measured by A and B respectively (representative of states to be projected onto another state in usual ket form):

<+a, +a|	<+b, +a|	<+c, +a|
<+a, -a|	<+b, -a|	<+c, -a|
<-a, +a|	<-b, +a|	<-c, +a|
<-a, -a|	<-b, -a|	<-c, -a|
<+a, +b|	<+b, +b|	<+c, +b|
<+a, -b|	<+b, -b|	<+c, -b|
<-a, +b|	<-b, +b|	<-c, +b|
<-a, -b|	<-b, -b|	<-c, -b|
<+a, +c|	<+b, +c|	<+c, +c|
<+a, -c|	<+b, -c|	<+c, -c|
<-a, +c|	<-b, +c|	<-c, +c|
<-a, -c|	<-b, -c|	<-c, -c|

Now consider those just in different orientations and that also have opposite signs:

X	X	X
X	<+b, -a|	<+c, -a|
X	<-b, +a|	<-c, +a|
X	X	X
X	X	X
<+a, -b|	X	<+c, -b|
<-a, +b|	X	<-c, +b|
X	X	X
X	X	X
<+a, -c|	<+b, -c| X	X
<-a, +c|	<-b, +c| X	X
X	X	X

Looking at the remaining states here, we could say (without much thought) that these occur a third of the time for populations N2 through N7. We also could see that if we measure opposite orientations each time that populations N1 and N8 will *always*

yield one of the kets above. So we can say that these states occur *at least a third of the time* (as illustrated by just N2 through N7) and if all of the populations occur the same amount then these states happen $1/3*(3/4) + 1*(1/4) = \frac{1}{2}$ of the time.

Now let us move to the follower of quantum mechanics.

Let us use $|0,0\rangle = \frac{1}{\sqrt{2}}|+a,-a\rangle - \frac{1}{\sqrt{2}}|-a,+a\rangle$ and also that

$|+n\rangle = \cos\frac{\theta}{2}|+z\rangle + e^{i\phi}\sin\frac{\theta}{2}|-z\rangle$ applies generally.

Now let us compute:

$\langle +a,-b|0,0\rangle = \frac{1}{\sqrt{2}}\langle +a,-b|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle +a,-b|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle +a|+a\rangle\langle -b|-a\rangle - \frac{1}{\sqrt{2}}\langle +a|-a\rangle\langle -b|+a\rangle$

$= \frac{1}{\sqrt{2}}\langle -b|-a\rangle$

where $\langle -b|-a\rangle = \cos\frac{\theta_{ab}}{2}$

So, the probability $|\langle +a,-b|0,0\rangle|^2 = \frac{1}{2}\cos^2\frac{\theta_{ab}}{2}$. Now

$\langle -a,+b|0,0\rangle = \frac{1}{\sqrt{2}}\langle -a,+b|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle -a,+b|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle -a|+a\rangle\langle +b|-a\rangle - \frac{1}{\sqrt{2}}\langle -a|-a\rangle\langle +b|+a\rangle$

$= -\frac{1}{\sqrt{2}}\langle +b|+a\rangle$

where $\langle +b|+a\rangle = \cos\frac{\theta_{ab}}{2}$.

So, the probability is $|\langle -a,+b|0,0\rangle|^2 = \frac{1}{2}\cos^2\frac{\theta_{ab}}{2}$.

Now,

$\langle +a,-c|0,0\rangle = \frac{1}{\sqrt{2}}\langle +a,-c|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle +a,-c|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle +a|+a\rangle\langle -c|-a\rangle - \frac{1}{\sqrt{2}}\langle +a|-a\rangle\langle -c|+a\rangle$

$= \frac{1}{\sqrt{2}}\langle -c|-a\rangle$

where $\langle -c|-a\rangle = \cos\frac{\theta_{ac}}{2}$. So, the probability is $|\langle +a,-c|0,0\rangle|^2 = \frac{1}{2}\cos^2\frac{\theta_{ac}}{2}$. Now,

$\langle -a,+c|0,0\rangle = \frac{1}{\sqrt{2}}\langle -a,+c|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle -a,+c|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle -a|+a\rangle\langle +c|-a\rangle - \frac{1}{\sqrt{2}}\langle -a|-a\rangle\langle +c|+a\rangle$

$= -\frac{1}{\sqrt{2}}\langle +c|+a\rangle$

where $\langle +c|+a\rangle = \cos\frac{\theta_{ac}}{2}$. So, the probability is $|\langle -a,+c|0,0\rangle|^2 = \frac{1}{2}\cos^2\frac{\theta_{ab}}{2}$.

Now for something slightly different. Here we will consider a different basis vector of the form

$|0,0\rangle = \frac{1}{\sqrt{2}}|+c,-c\rangle - \frac{1}{\sqrt{2}}|-c,+c\rangle$ for simplicity.

,

Now let us calculate,

$$\langle -b,+c|0,0\rangle = \frac{1}{\sqrt{2}}\langle -b,+c|+c,-c\rangle - \frac{1}{\sqrt{2}}\langle -b,+c|-c,+c\rangle = \frac{1}{\sqrt{2}}\langle -b|+c\rangle\langle +c|-c\rangle - \frac{1}{\sqrt{2}}\langle -b|-c\rangle\langle +c|+c\rangle$$

$$= -\frac{1}{\sqrt{2}}\langle -b|-c\rangle$$

$$= -\frac{1}{\sqrt{2}}\langle -b|-c\rangle$$

where $\langle -b|-c\rangle = \cos\frac{\theta_{bc}}{2}$. So, the probability is $\left|\langle -b,+c|0,0\rangle\right|^2 = \frac{1}{2}\cos^2\frac{\theta_{bc}}{2}$. Similarly,

$$\langle +b,-c|0,0\rangle = \frac{1}{\sqrt{2}}\langle +b,-c|+c,-c\rangle - \frac{1}{\sqrt{2}}\langle +b,-c|-c,+c\rangle = \frac{1}{\sqrt{2}}\langle +b|+c\rangle\langle -c|-c\rangle - \frac{1}{\sqrt{2}}\langle +b|-c\rangle\langle -c|+c\rangle$$

$$= \frac{1}{\sqrt{2}}\langle +b|+c\rangle$$

where $\langle +b|+c\rangle = \cos\frac{\theta_{bc}}{2}$. So, the probability is $\left|\langle +b,-c|0,0\rangle\right|^2 = \frac{1}{2}\cos^2\frac{\theta_{bc}}{2}$.

While we calculated all the probabilities,

$$\left|\langle -b,+c|0,0\rangle\right|^2, \left|\langle +b,-c|0,0\rangle\right|^2, \left|\langle -a,+c|0,0\rangle\right|^2, \left|\langle +a,-c|0,0\rangle\right|^2, \left|\langle +a,-b|0,0\rangle\right|^2, and \left|\langle -a,+b|0,0\rangle\right|^2$$

we did not compute the probabilities for their reverse states

$$\left|\langle +c,-b|0,0\rangle\right|^2, \left|\langle -c,+b|0,0\rangle\right|^2, \left|\langle +c,-a|0,0\rangle\right|^2, \left|\langle -c,+a|0,0\rangle\right|^2, \left|\langle -b,+a|0,0\rangle\right|^2, and \left|\langle +b,-a|0,0\rangle\right|^2,$$

respectively. It should be noted that the calculations are nearly exactly the same but with a slightly different order. A physicist should note that calculating the probability of particle 1 to be in the |+a> state and particle 2 to be in the |-b> state is nearly identical to calculating the probability of having particle 1 in the |-b> state and particle 2 in the |+a> state. (Or, more simply, deciding which particle is named "particle 1" or "2" is arbitrary.)

Now, with all of these probabilities in the form of some function of theta we must choose some orientation of the vectors a, b, and c. Let us choose the one below:
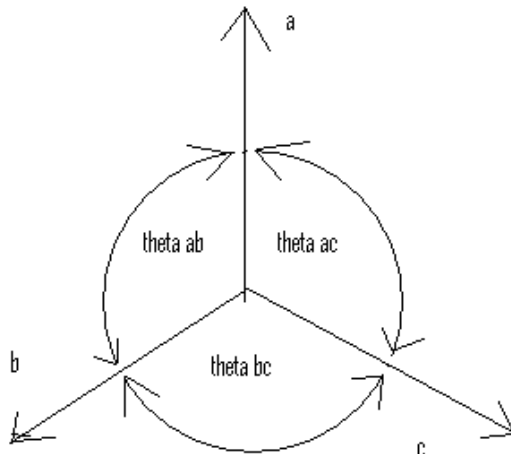
Here all of the angles depicted are 120 degrees. This makes some exemplary calculations simple as all of the probabilities, which are of the form $\frac{1}{2}\cos^2\frac{\theta}{2}$, yield ¼.

As a result, the occurrence of any different setting SG's yielding opposing values is ¼.

But notice . . . this probability is distinctly different from the one from the realist perspective (of "at least one third"). This grounds of difference becomes the playing grounds for experimentation. In the end the real world results will determine which theory is correct. But first let us generalize our quantum mechanical calculations into an inequality that tests infinitely many orientations of a, b, and c. We call this Bell's inequality.

Bell's Inequality

Recalling our prior realist's populations N1 through N8, we can create many inequalities. A prime example may be

$$N3 + N4 \leq (N2 + N4) + (N3 + N7)$$

(as two additional populations will certainly yield amounts greater than the previous unless the occurrence of these additional populations is nonexistent – then there is no effect).

We can also look at which populations will create particle one and two like

$$\frac{N3 + N4}{\sum N_i} = P(+a;+b)$$

$$\frac{N2 + N4}{\sum N_i} = P(+a;+c)$$

$$\frac{N3 + N7}{\sum N_i} = P(+c;+b)$$

(or in other words the probability of particle 1 and 2 to end up in specific states is equivalent to the sum of the populations that they occur in divided by the total number of populations).

Simply, this leads us down the garden path to the following substitution,

$$P(+a;+b) \leq P(+a;+c) + P(+c;+b)$$

These probabilities invite us to take advantage of our knowledge of quantum mechanics for another substitution. So, once again we say let us use

$$|0,0\rangle = \frac{1}{\sqrt{2}}|+a,-a\rangle - \frac{1}{\sqrt{2}}|-a,+a\rangle$$ and also that

$$|+n\rangle = \cos\frac{\theta}{2}|+z\rangle + e^{i\phi}\sin\frac{\theta}{2}|-z\rangle$$ applies generally.

Now let us compute:

$$\langle +a,+b|0,0\rangle = \frac{1}{\sqrt{2}}\langle +a,+b|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle +a,+b|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle +a|+a\rangle\langle +b|-a\rangle - \frac{1}{\sqrt{2}}\langle +a|-a\rangle\langle +b|+a\rangle$$

$$= \frac{1}{\sqrt{2}}\langle +b|-a\rangle$$

where $\langle +b|-a\rangle = \sin\frac{\theta_{ab}}{2}$. So, the probability P(+a;+b) is $\left|\langle +a,-b|0,0\rangle\right|^2 = \frac{1}{2}\sin^2\frac{\theta_{ab}}{2}$.

Also, let's compute P(+a;+c):

$$\langle +a,+c|0,0\rangle = \frac{1}{\sqrt{2}}\langle +a,+c|+a,-a\rangle - \frac{1}{\sqrt{2}}\langle +a,+c|-a,+a\rangle = \frac{1}{\sqrt{2}}\langle +a|+a\rangle\langle +c|-a\rangle - \frac{1}{\sqrt{2}}\langle +a|-a\rangle\langle +c|+a\rangle$$

$$= \frac{1}{\sqrt{2}}\langle +c|-a\rangle$$

where $\langle +c|-a\rangle = \sin\frac{\theta_{ac}}{2}$. So, the probability P(+a;+c) is $\left|\langle +a,+c|0,0\rangle\right|^2 = \frac{1}{2}\sin^2\frac{\theta_{ac}}{2}$.

Finally we will compute P(+c;+b). Once again, we will consider a different basis vector of the form

$$\left|0,0\right\rangle = \frac{1}{\sqrt{2}}\left|+c,-c\right\rangle - \frac{1}{\sqrt{2}}\left|-c,+c\right\rangle \text{ for simplicity.}$$

$$\left\langle +c,+b \mid 0,0\right\rangle = \frac{1}{\sqrt{2}}\left\langle +c,+b \mid +c,-c\right\rangle - \frac{1}{\sqrt{2}}\left\langle +c,+b \mid -c,+c\right\rangle = \frac{1}{\sqrt{2}}\left\langle +c \mid +c\right\rangle\left\langle +b \mid -c\right\rangle - \frac{1}{\sqrt{2}}\left\langle +c \mid -c\right\rangle\left\langle +b \mid +c\right\rangle$$

$$= \frac{1}{\sqrt{2}}\left\langle +b \mid -c\right\rangle$$

Where $\left\langle +b \mid -c\right\rangle = \sin\dfrac{\theta_{bc}}{2}$.

So, the probability P(+c;+b) is $\left|\left\langle +c,+b \mid 0,0\right\rangle\right|^2 = \dfrac{1}{2}\sin^2\dfrac{\theta_{bc}}{2}$.

Now with these functions of probability we can substitute into
$$P(+a;+b) \le P(+a;+c) + P(+c;+b)$$ to get

$$\sin^2\frac{\theta_{ab}}{2} \le \sin^2\frac{\theta_{ac}}{2} + \sin^2\frac{\theta_{cb}}{2}$$

It is this inequality that is recognized as Bell's inequality as it is accredited to John S. Bell in 1964. Notice what this derivation implies. Since we started with an initial assumption (made by the realist and how his/her proposed populations with defined attributes should be related to one another), then any violations of this inequality could be attributed to our initial assumption – that of the realists "hidden-variable theory" of quantum mechanics that created the populations. (Please note that the inequality is now dependent on the angles that are between our three arbitrary vectors. This is valuable since it is testable.)

If we were to wonder at which angles Bell's inequality is violated, we could easily quench our prying curiosity with a simple computer program to step through all possible angles that any three vectors can take with respect to one another. (Please see the attached computer program for an example). The results might be more continuous than one would think (once again see attached).

Experimental Results

But so far as this discussion goes, no proof of whether the realist or the avid determinist is right has been given. Indeed, we did go through some effort just to come up with a disagreement between the two theories. In order to see who is right and who is wrong we turn to experiment. So here we merely do the experiment as we have already outlined (two Stern-Gerlach devices with random orientations and particles from some common origin to conserve momentum).

Enter Aspect et. al. who conclude that there are certainly correlations that violate Bell's inequality from two standard deviations (99% confidence level) and even all the way up to nine standard deviations (nearly 100% confidence level). In the end it is quantum mechanics that comes out on top and regarded as correct with empirical support.

Implications

So, what does it all mean? Well, quite plainly the realists (even with the notable Einstein himself) were wrong. But more even more disgustingly awkward it what this implies. This means that the particle before it is measured really does exist in some sort of superposition of states and afterward chooses a state that we can predict (somehow) using accurate probabilistic methods. (In a different light, this means that particles do not carry around some sort of instruction set or obey the proposed hidden-variable theory of quantum mechanics).

Also, this implies that the particles really do have some way to communicate to each other in order to preserve the conservative laws of momentum for us (the observers). These particles can "communicate" with one another at rates that are faster than the speed of light. So in the end, the E.P.R. paradox is no longer seen as a questionable doubt but an actual fact – both a quality and quandary of our quantum mechanical world.

Resources

A. Aspect, P. Grangier, and G. Roger, Phys. Rev. Lett. 49, 91 (1982).

B. A. Aspect, J. Dailbard, and G. Roger, Phys. Rev. Lett. 49, 1804 (1982).

A. Pais, Rev. Mod. Phys. 59, 863 (1979).

A. Einstein, B. Podolsky, and N. Rosen, Phys. Rev. Lett. 47, 777 (1935).

J. S. Bell, Physics 1, 195 (1964).

J. S. Townsend, A Modern Approach to Quantum Mechanics, 137 (2000).

Behind The Face of Radio

Melanie Terrill

Melanie is a graduating senior majoring in English. She wrote this piece under the mentorship of Professor Michelle Cox. Writing has always been a part of who she is and she hopes it continues with her into her future. Though unsure of what life after Bridgewater may bring, she is always interested in where books may take her and where the -- more literal -- public transportation may drop her next. She finds flying cross-country liberating, and library shelves endearing.

I can remember lying in my room at night, years ago before I barely knew CD players existed, relying on the songs on the radio to lull me to sleep. I remember recognizing songs and singing along, more interested in listening than sleeping. One particular song I remember listening to late at night is "Waterfalls" by TLC. I was eleven years old then, and had no real knowledge about the music industry. The name "Clear Channel" had not existed in my vocabulary. Now, though the industry continues to change, Clear Channel remains in control of it, and as a result the company affects what artists we are exposed to.

The radio. It's something I used to swear by, the free service that opens doors for any music fan. Whether I'm hitting buttons or turning a knob to switch frequencies between stations, I've done it oh-so-often before. I love the way that songs flow into each other, disrupted by ads for consumerism, a reminder of what radio is really driven by. There are rare occasions -- when I'm a little tired of over playing my CDs, or it's just too difficult to find that one album I'm looking for while driving – that I still rely on the radio for some sort of entertainment value. And maybe the radio will always be there. Because, let's face it, even if you don't listen to it, don't you still know most of the songs it plays? Not because you listen to that sort of music (or, okay, maybe you do) but it's also because the music is everywhere. Pop music, for lack of a better word, has popped right into our lives, and will not allow us to forget it.

Listening to the radio today, there is a delightful mix of "pop" genres. There is the hip-hop pop where mostly female singers sing about life in the hip hop lane: Biance, Cierra. Singer song-writers pour their hearts out into their guitars (John Mayer) while pop-rock artists (which are similar to singer-song writers, except with entire bands) are doing their thing: The Fray, Goo Goo Dolls. Then there are the newly undefined pop-punk meets emo tunes with bands whose male members sometimes wear eye liner, or exploit naked pictures of themselves on the internet: Fall Out Boy, Panic! At The Disco.

But what is it that drives these stations to play what they play? Why can I listen to the same station for, yet in the end I lose count of the number of times I've heard most of these songs? One hour of radio is all you need in a day, because after that, you are listening to just a different order of the same music.

Is radio today a reflection of the music industry, pregnant with every means to make that extra buck and sell one more album? It seems that music isn't just about the music anymore. Instead it's about what companies decide which music and image the public likes, or will like. Teenage girls are manufactured into sex symbols, their voices exploited to pop tunes and lip sync concerts. Bands fight to play what they want, and they lose the battle. Morning shows take over the AM hours replacing music with celebrity gossip. Commercials sink their way into the airwaves between songs and subliminally convince you that you need those new shows and to buy an extra handbag. By now you've forgotten about the songs that just played. You can hear them again. It is about control, and what's controlling this is something larger. I knew that there was a company controlling this, one that's unknown to many college-aged listeners, but influential nonetheless. The company, Clear Channel, has slowly been infiltrating our radio stations, making the radio what it is today.

Lowry Mays and Red McCombs founded Clear Channel in 1972. The name comes from a term in AM radio where only one station hits that frequency. The company, whose headquarters are located in San Antonio, Texas, owns exclusive rights to all of their radio frequencies. The company is the largest owning radio station company in America, grossing over $3.5 in 2005 alone.

Clear Channel owns over 989 radio stations (including 9 satellite stations) in the United States (48 in New England alone), and several television stations. On Clear Channel's website, there is a section that addresses "myths" about the company, in attempt to abolish rumors about their business. In most of these, however, they fail to be direct about what is being said about the station. The company is rumored to have play lists for radio stations, a knack for deciding what music people want to hear, and the ability to prevent other radio stations they do not own from playing these songs on their play lists. Though these are only rumors, they encase the company, which openly denies each of these claims.

For example, one of the myths is "Clear Channel Radio dominates radio in the United States." Clear Channel responds by saying that there are 13,000 radio stations and Clear Channel only owns 9%. What they do not mention, however, is how many of those 13,000 stations are AM, satellite or independently owned (such as college radio stations).

Another myth comments on radio consolidation, and the fact that is it at an all time high. Clear Channel does not actually respond to this, instead says that radio is the least consolidated form of media today. What Clear Channel does not mention, however, is that the company has the highest consolidation in the radio industry today. According to stateofthenewsmedia.org, Clear Channel's ownership makes up for the largest chunk of radio

consolidation. This means that they have the most influence on what is played on the radio today and ultimately, they have the most influence on radio listeners' exposure to music artists.

Two other myths -- "Clear Channel Radio restricts play lists and issues corporate mandates" and "Clear Channel Radio beams homogenized programming from central locations" -- are both answered in the same way. Clear Channel says that their stations are managed and programmed locally, based on research about their audience. It seems that, by addressing these rumors, the company is trying to cover its own tracks, explain itself and the root of myth, but all it does is dodge the questions.

Have you heard of Clear Channel? Perhaps you've seen their name in the corner of billboards, but haven't paid much attention to the name, or what it means. I wanted to know who knew about Clear Channel, and how they had heard about the company. I surveyed 12 Bridgewater State College students asking them how they feel about the radio, if they know about Clear Channel and how, and if they'd like to know more. I asked questions such as, "Do you listen to the radio today?" (Nine said yes, one said no and two said not often), how they feel about listening to the same songs over and over, and if they knew about Clear Channel.

The only two students who did know about Clear Channel heard about the company because of Howard Stern. In 2004, Clear Channel decided to eliminate indecent content from their airwaves, which was part of a "responsible broadcasting initiative." Howard Stern, who is known for explicit sexual content on his shows, had no intention of following Clear Channel's new initiative. His show, which aired on six Clear Channel stations, was later dropped from those stations all together.

These sort of radio-related problems made me think about other people, artists and bands that have been negatively affected by the radio. On their website, Clear Channel denies negatively impacting particular musicians. The first one is regarding Madonna. The rumor is that Clear Channel banned Madonna after she made some political comments. What the comments were isn't clear. Clear Channel denies this, offering the percentage of her new CD (29%) that's been played.

Clear Channel radio stations banned airplay of the Dixie Chicks after their political comments. This is the second rumor that the company addresses. They say that the company that banned Dixie Chicks was not them; it was a different company who had a CD smashing party in Atlanta, GA near its headquarters.

Clear Channel's effects on artists' and bands' radio airplay also contribute to music artists having problems with their

record labels. These problems are indirectly related to the radio because of consolidation. The labels dictate whether or not they want a band to make a new album, or if they will release a new album depending on whether or not they think the general public will like this music. The music, they assume, will ultimately be heard on the radio because it's a main source of promotion – 75% of CD purchases are influenced by songs heard on the radio.

I first heard about Clear Channel from the band Hanson. In 2002, Hanson began to have trouble with their record label Island Def Jam. In 2003, the band announced their split from their record label. Since then, Hanson has launched themselves into an independent campaign called Are You Listening? They set out to teach fans and anyone else who would listen about their struggle. Their documentary, *Strong Enough to Break*, has yet to hit the video stores, but in 2005, Hanson toured colleges in the United States and screened the film for students. After each screening they held a question and answer session. During these sessions, Hanson has done a good job letting their fans know about what problems they see in the music industry.

The one station I've heard their newest music played on is WPRO 92.3 out of Providence, Rhode Island. Their DJs are the only ones who haven't laughed me off the phone with my requests to play them. I found this fitting, because this station is not owned by Clear Channel, therefore providing a small link to why they'll play the band. It also said in Hanson's film that after putting out a record on their own, they could only afford to send their song off to fifteen radio stations in the United States.

Their campaign, "Are You Listening" (AYL), lists a multitude of "independent" bands, along with a message from the creators of the site, speaking out about radio. Part of AYL's message says, "Radio is more focused on selling advertising than on giving you good music, so they ignore you and take a lot of money from a few record companies to play those mediocre songs that keep you listening long enough to sell you something

Hanson is not the only band having trouble with their record labels. Both of Fiona Apple's first albums are considered platinum by the RIAA, but after she recorded her third album *Extraordinary Machine*, her record label decided not to release it. Sony didn't think *Extraordinary Machine* would sell enough so they decided to drop it all together.

Though Fiona Apple fans weren't happy about Sony's decision for *Extraordinary Machine*, they compensated by using P2P programs to spread leaked MP3s from the album all over the internet. The website *Free Fiona* was also launched to petition against Sony. In 2005, Fiona's album was finally released. Again Fiona Apple's

struggles are indirectly related to Clear Channel, and the radio industry today. Record labels remain in the best interests of themselves, and what music will help them make money. If they feel that artists such as Fiona Apple aren't producing music that will get radio play, the lack of radio play would result in lower album sales and companies like Sony can decide not to put out certain albums, or sign certain artists.

In mid-November 2006, Clear Channel was bought out by a group of private equity firms. Private equity firms use private equity funds to invest in specific companies. It isn't clear what this means for Clear Channel itself. The company has been talking of selling its television stations, and some of their radio stations that aren't Top 40. A lot of executives from Clear Channel remain in their positions, however, so the direction of the company can't really be predicted right now. Because they have so much influence in radio today, there is a lot of possibility for the company to use their powers for good.

Whether or not that happens, though, I can imagine there will always be the radio. For any person who was ever a fan of music, and for any band that ever wants their music played, they need the radio -- one of the only free forms of media. The radio is relied on as a source of entertainment, and a way to possibly hear a new song. If you've ever wanted to hear a certain band the radio won't play, or if you've ever wanted to smash the speakers in from hearing the same Britney Spears song over and over, you have a right to know what's behind those speakers. There's a good chance Clear Channel is somewhere in the great distance, influencing each and every song you hear. Though Clear Channel and the radio is morphing into something new and exciting everyday, the basis behind it is the same. Whether it's Satellite Radio or the free kind you listen to on a summer day in your car with the volume at high, and the windows rolled all the way down, it will be here along with us.

First Year Work

The Undergraduate Review
Vol. III

Streambed

Ryan Manning

Ryan Manning is a freshman at Bridgewater State College who has not yet chosen a major. He wrote this piece for Dr. Lee Torda's Writing 101 class, and also presented it at the Mid-year Symposium in the fall of 2006.

There's a backyard that I once knew so well. At the edge of this backyard, there is a well-traveled dirt path, which leads through a wooded area where a stream flows freely. This wooded area comes to life every year just behind a small but comfortable house in the town of Sharon, Massachusetts. In the spring, the lively woods are filled with muscular trees, which are just starting to fill in with green leaves. I can just barely make out the back of a house in the distance, when you stand at the woods' entrance. I was born in the springtime on March 27. My first view of the backyard woods would have been in the spring. The birds would have been chirping; the sky would have been filled with streaks of blue; the clouds would have floated far above my head, all puffy and white. A cool spring breeze would have been running through these woods to the edge of the backyard. The buds on flowers were probably starting to bloom as the sun shone overhead. The vegetable garden would have also been planted in the spring, as it is every spring, in hopes it will produce many kinds of vegetables in all shapes and forms, from round red tomatoes, to bell-shaped green peppers.

An apple tree is planted in the backyard; his name is Jonathan. He is named after the famous nurseryman, John Chapman who planted apple trees for a living. He was better known as Johnny Appleseed. It is believed that when a young apple tree is planted near a home, that home becomes a more permanent and loving one. The days were getting longer; the green leaves were growing bigger. The smell of spring is fresh and clean, it is the smell of new life. Spring is newborn, like I was then. Spring is full of new hopes and dreams.

Some of my first steps in life were taken on this fresh grown grass in the spring. My first visit to the rapidly flowing stream, which lies deep in these woods, would have been reached by following a dirt path, now muddy with melted snow. Everything around me, from tree branches to the ferns on a fern tree, would have amazed me as I continued my walk through the muddy trail, toward the flowing stream that I was so anxious to see.

In the summer, everything is at its peak. The sun shines its brightest and longest in late June. The backyard grass needs mowing every other week. The days are hot and sometimes very humid. When I was three, I would fill my blown-up kiddie pool up with cold water from the house hose, and place my plastic slide into the pool, and climb the few steps on the slide's ladder and plunge a

few feet down into the cold, refreshing water. The garden, which lies a few feet from my kiddie pool, produces very little because the groundhogs and deer eat everything. I believe the apple tree, Jonathan, still needs time to produce apples. It flowered, but the silk worms destroyed its hope this season. The raspberry bushes off to the side of the woods' entrance give off huge wild red raspberries. They are sweet and delicious to the taste. I eat them right away. The trees in the woods are now completely filled in with leaves and life, and stand with strength. I can no longer see the back of that house way off in the distance.

I follow the bare dirt path to the calm, flowing stream. The sound it makes is soothing to the human ear, as it flows fine and clear. I can hear the birds chirping their sweet melodies to each other, and can hear the squirrels leaping from tree branch to tree branch. I watch the chipmunks chase one another, in a playful way, up and down tree trunks. The trees try to enjoy the warm and humid days, soaking in as much heat and nutrients as they possibly can, knowing soon the weather will turn cold.

Fall in the woods is amazing. When the leaves turn brilliant bright yellow, red and orange, it is a sea of colors. The days are getting shorter now. The sun is not as bright as it used to be. The nights are starting to become cold. We may even turn the heat on tonight. The air in the fall around the backyard and in the woods is cool and crisp. The leaves start to fall. Soon the yard is littered with them. We rake them up, even though we know that they will keep falling until there is no more left to fall. We rake the crispy, dried up, lifeless leaves into piles and plunge into them.

A visit down the path to the stream reveals more leaves that have fallen but will not be raked. Leaves from many, many years have fallen here, building up the earth's ground and giving its soil new life. The stream is quiet and dull, spilling out as much water as it has left in it. It is beginning to run dry. Some days I am able to walk through the streambed where water once covered. The stream lays bare and dehydrated. I don't hear many birds or animals, but I do notice movement near the stream. It was a sick and dying groundhog, left for dead. It lay in the streambed soil, shaking and speaking unusual noises. Slowly, thinking it could be rabid, I run home to call animal control for them to come take it away. This is my first view of disease and death.

Winter is a time of cold nights, dark days, and harsh and fierce snowstorms. However, I also saw bright sunny days with two feet of white, puffy, and powdery snow, to play in with my friends. We build long tunnels through the snow to play adventurer, or have snowball fights and build the best snowman. The snowman would eventually melt, looking eerie and contorted. The days of a snowstorm would bring no school the next day.

The snow is deep and heavy, but I still visit the stream in the woods, now covered with ice. It was hard to follow the bare dirt path, which is now covered with powered snow, but I finally make it. The woods look different in the winter. They sound very quiet and seem almost lifeless. I can see more of the back of that house in the distance. The trees are bare of their leaves. I do not hear little animals, but I know they are out there. Most of the birds have gone south, but some remain here. I see signs of life in the snow of other animals. Deer droppings, raccoon paw prints. Most animals are hibernating for the winter. The winter does not last forever. Spring will be here soon, and another cycle will start.

The backyard of that small, but comfortable house in Sharon, Massachusetts still remains, although I no longer live there. I know with every season, the woods still change, even though I am not there to see it.

Dakota and *All We Know of Heaven:* A Spiritual Desert

MATTHEW COLLINS

Matthew Collins wrote this essay under the mentorship of Dr. Ben Carson.

The two works, *All We Know of Heaven* by Rèmy Rougeau and *Dakota* by Kathleen Norris deal with themes of how monasticism and rural society interact and differ from mainstream society. *All We Know of Heaven* is a fictional work that tells the story of Paul Seneschal, who joins a Cistercian monastery in hope of finding meaning in life. *Dakota* is a collection of essays about rural society and spirituality in the Dakota region of the United States. These works show how monasticism and rural society are characterized by rugged simplification of everyday material life, a distrust of the outside world that ignores and shuns them, and a way of life that is slowly becoming a thing of the past.

In *All We Know of Heaven* Paul Seneschal, who becomes Brother Antoine, enters a Cistercian monastery, in part because of the spiritual enlightenment offered from the rugged simplicity of everyday life. Dom Jacques, Abbot of the monastery, explains to Paul why the monks live so simply: "We monks, in order to appreciate our place in the world and the mystery of God's love for us, leave aside the distractions of the secular world. We forget every other concern and live monastic life in all its simplicity, that we may be attentive" (24). The monks in the Abbey choose to deprive themselves of everyday comforts because they believe that those comforts, which are very popular in mainstream society, distract the soul from salvation. In addition to physical simplification of life, the monks also argue a mental simplification represented by refraining from speech as much as possible. The Abbot explains their embrace of silence to Brother Antoine. "We don't know how to put the truth into sentences. It's too difficult. That's one reason why monks try to live life in silence" (55). Throughout the novel, Brother Antoine has doubts as to whether or not he made the right choice to join the monastery. While confessing to Brother Yves-Marie about his doubts, Brother Antoine is reassured that work is all part of the monastic life. "I'm still not attentive in prayer," Antoine told his confessor, Yves-Marie. "My attention is always on my work." "Never mind," the priest answered. "It's all of a piece. The chores, the prayer, the silence. Each flows into the next, and one without the other would be incomplete. Trust it. Monastic life transforms you as you live it" (151). Rougeau argues through Brother Antoine's experience that living a simpler, more rugged life can lead to ultimate happiness. This argument is very different than the concept that material wealth leads to happiness that is prevalent throughout mainstream western society.

Because of the ideological differences between monasticism and mainstream society, there seems to be a mutual distrust in which mainstream society either rejects or shuns monasticism or forgets about it entirely. This idea is illustrated by Paul when he is talking about how his parents feel about his decision to join the Abbey: "My parents think life is unbalanced, too holy for normal people" (9). Paul's parents are used by Rougeau to represent mainstream society. His mother is mayor of their town; his father runs a farm and works as a crop insurance man. The family attends church and recognizes Christian holidays. However when faced with the idea of monasticism, they react with fear and rejection. When Paul finally decides to join the Abbey for sure his mother chastises him for ruining Christmas with his announcement. "'What?' she yelled. "You want to spoil Christmas for everyone? I thought you had the monk business flushed out of you" (18). After Paul joined the Abbey and became Brother Antoine, he had a first-hand realization of the unimportance of the Abbey to the outside world. Almost every year, in the spring, the river next to the Abbey grounds floods and the monks have to gather the washed up trash. In order to dispose of the trash, the monks burn it in a great bonfire. On observing this fire Antoine was filled with a sense of fear that the fire somehow gave away the Abbey's location, or would arouse the suspicion of the authorities. However, Antoine realizes how silly his notions were when he thinks, "The drama of the big fire fed his imagination. In reality, what did the world want with monks anyway?" (188). From his experiences in the Abbey, and his meeting with Buddhist monks who visit the abbey on an ecumenical good-will tour, Antoine makes a dramatic realization about the nature of monks in mainstream society when he observes the actions of an old Buddhist monk nicknamed Cello:

> Antoine was transfixed. He had never seen anything so peculiar: there she was, the Venerable Cello, abbes of Geden Choling Nunnery, foundress – he would later learn – of five other nunneries like it and spiritual mother to six thousand nuns, eating crab apples from the grass. As sunlight drew away from the orchard it came to him, the thread that bound their lives together. Cello *was* abandoned by society. She was marginal. The abbess was as defenseless and as irrelevant to the world as an orphan. And as a monk, so was he. (137)

Antoine realizes that people from the outside world do not value monks. Cello, who is responsible for founding five nunneries, and is the leader of six thousand nuns, is completely unknown to the outside world.

One of Rougeau's themes is the end of monasticism as a way of life. Antoine was faced with the problem of the monastery literally running out of monks. "Brother Antoine had attended five funerals in five years. In the same length of time, no new monks had made solemn profession of vows" (162). Not only were

there no new people becoming initiates into the monastery, but most of the monks were becoming old men, "Overall, the balance tipped toward the elderly. Nine were retired. Six of these were in the infirmary. And because several years had gone by without a single inquiry or young person coming in, the community itself seemed to be dying" (162). The abbey is dying because of the lack of interest from the outside world. People of mainstream society are no longer interested in monastic life. Even the elderly, people who grew up in a society more accepting of monasticism, now shun it. When Paul told an old lady on the subway that he was thinking of becoming a monk she responded, "Excuse me?" and after Paul clarified, "The lady blinked. 'Oh,' she said. 'Why would anyone do that?' 'To find meaning in life,' Paul responded. 'Oh dear,' she said and became mute" (2). Rougeau uses these characters to show that the dominance of mainstream culture and society has become so encompassing, so enveloping, that subcultures are slowly being destroyed through attrition.

In *Dakota*, Kathleen Norris echoes many of the themes presented in *All We Know of Heaven*. Norris argues that the rough geography and limited connection to "city technologies" make the rural areas of the Dakotas spiritually rich. Much in the same way that the silence within the Abbey provides the peace required for spiritual inflection, Norris says that, "[…] the western Plains now seem bountiful in their emptiness, offering solitude and room to grow" (3). Norris actually credits the plains with inspiring her relationship with monasticism:

> It was the Plains the first drew me to the monastery, which I suppose is ironic, for who would go seeking a desert within a desert? Both Plains and Monastery are places where distractions are at a minimum and you must rely on your own resources, only to find yourself utterly dependent on forces beyond your control; where time seems to stand still, as it does in the liturgy; where your life is defined by waiting. (17-18)

Norris argues that the deprivations of living in the Dakotas, as well as the deprivations of monastic life teach people to truly appreciate the things necessary for life: "The deprivations of Plains life and monastic life tend to turn small gifts into treasures, and gratitude is one of the first flowers to spring forth when hope is rewarded and the desert blooms" (18). Norris views the ruggedness and harshness of the Dakotan geography as holy, much in the same way that Antoine valued the ruggedness and harshness of monastic life as a path towards salvation.

Norris points out that both monks and people of the Dakotas are weary of the outside world that only seems to value a place if it can make money:

> Monks are accustomed to taking the long view, another countercultural stance in our fast-paced, anything-for-a-

buck society which has corrupted even the culture of farming into "agribusiness." Kardong and many other writers of the desert West, including myself, are really speaking of values when they find beauty in this land no one wants [...] The so-called emptiness of the Plains is full of such miraculous "little things." (9-10)

The people of the Plains have distrust for outsiders who only seem to care for the people of the Dakotas when there is something to be financially gained from their interaction. Norris writes about how people in small Plains towns are not accepting of outsiders. She attributes this lack of acceptance to that fact that in order to survive in their harsh environment they have to band together and rely on one another for support. Because of this "cloistering" of small towns, the Plains people are in many ways adding to their separation from the outside world.

Similar to the decline in the population of the abbey in *All We Know of Heaven*, Norris writes about the decline in population in the Plains. Norris says that the plains are a place that people are from; not a place that people move to. There is little to be gained in terms of material wealth from the Dakotas and this lack of monetary value has been one of the contributing factors to the "Diaspora" as Norris describes it, from the Plains towns. Because of the unity and closeness of small towns, communities want to keep small businesses in business. The concern for small businesses keeps big industry away from the small Plains communities and as Norris describes it, "[...] such attitudes have hindered economic development so greatly as to be self-defeating. The young wage earners move away" (48). The Dakotas have the problem of not being able to hold on to their younger population. This is similar to the problems that the Abbey faced when trying to sustain their numbers: the young had no interest in becoming monks. This lack of interest in the plight of the Dakotan farmers is illustrated in one of Norris' anecdotes:

I once heard a Lakota holy man say to college students at the University of North Dakota, "Farmers are the next Indians, going through the same thing we did." The students had been rude to him, carrying on conversations while he spoke. He was just an old man, just an Indian who described himself as an unemployed plumber. But when he asked, "How man of us are going to stand beside the farmer and see justice done for these people?" there was silence in the room. At least a few of the students, the ones from farms, had wondered that themselves (37).

The Plains life, as well as the monastic life are endangered forms of existence. They are endangered because the mainstream life which is necessary to sustain them is either too distant, or not trusted enough to provide the manna required to revive and continue them.

Rèmy Rougeau wrote *All We Know of Heaven*, as a fictional work intended to show to mainstream society the value of monastic life. Kathleen Norris wrote *Dakota* to show mainstream society the beauty and importance of the Plains. Norris frequently references monks in her writings, and Rougeau echoes many of the themes in *Dakota* in his writing. Both these writers mourn the looming doom in their respective subjects' institution. They both see the beauty and value in the existence of their subjects of writing. Perhaps the best was to capitulate both of their feelings comes from a passage by Norris where she writes, "Coyotes will begin calling in the coulees to the north. Soon, the monks, too, will begin to sing, the gentle lullaby of vespers and compline, at one with the rhythm of evening, the failing light and the rise of the moon. Together, monks and coyotes will sing the world to sleep" (217).

Works Cited

Norris, Kathleen. Dakota. Boston: Houghton Mifflin Company, 1993.

Rougeau, Remy. All We Know of Heaven. Boston: Houghton Mifflin Company, 2001

The Angel No Longer in the Household

Jason Williams

Jason Williams is currently a seventeen-year old freshman at Bridgewater State College who lives right on the edge of campus, a very convenient location. Currently undecided as to his major, he is taking a mix of classes to feel out possibilities and fulfill core requirements, while spending his free time writing, reading, and playing video games, only occasionally at the same time. Jason was mentored in writing this essay by Dr. Leora Lev.

An interesting thing about human culture is this: the more things change, the more they stay the same. A bit cliché, but it happens to be true. For example, the Victorian ideal of womanhood is called the Household Angel, or occasionally household nun. A very nurturing, docile, selfless person, the Angel in the Household was all her name would suggest. This concept came about due to the problem presented by the ruthlessly competitive world of business, according to *Idols of Perversity*, by Bram Dijkstra. Complete focus on victory was necessary in order to move up the economic ladder, but what of the cost to the soul of the businessman. The solution was that the wife would act as caretaker of the husband's soul, refreshing it with her own purity. An interesting idea in my mind; crazy and easily leading to sexism, but still interesting. This idea was what caused the concept of the Household Angel, something pure enough to keep the businessman from going to hell for his ambition by being married to her. And if you think she was killed over the past century, which was filled with many cultural revolutions, you might want to take a look at various modern fiction, in which you would discover that she has instead transformed into the Guardian Angel, a being just as nurturing and, sometimes, selfless, if not as docile, and with a decidedly different purpose. In this essay, I will show just how the Household Angel appears in the late twentieth century, via the famous novel *Dracula*, by Bram Stoker, and how she has moved from Household to Guardian.

I would guess that everyone has heard of *Dracula*. It set the "rules" of the vampire, and remains a staple in literature courses to this day. In this ever-explored novel, one of the main characters shines, occasionally literally, as a perfect example of the ethereal, caring Household Angel: Mina Harker, the wife of one of the main heroes, who puts her considerable intellect to use in -- what else? -- the effort to destroy Dracula. Never showing anything like ambition or arrogance, her only thought is for helping those around her, nursing her husband Jonathan back to health and organizing the group's information. She is the symbol of purity for the vampire hunters, which is why the attack on her by Dracula so inflames their efforts. With her intelligence and compassion, Mina's only weakness is a complete lack of self-defense ability. A trademark of the Household Angel is fragility, often being compared to a flower, and Mina certainly has it as greatly as her tendency for nursing. Throughout *Dracula*, Mina is the beautiful beacon of goodness, the Angel in the Household. It really is not as nauseating as it sounds, by the way.

To reiterate, the traits of the Household Angel were as follows, as can be seen in the original concept and the character of Mina Harker: caring, nurturing, beautiful, pure, and delicate, with no ambition or anything like an iron will or independence, and a tendency to stay in one place, where you left her, in the Household. Not to say that these traits are negative, but applied as a stereotype, they are certainly unfair, and they were certainly applied as a stereotype, an ideal, in the mid-to-late nineteenth-century. Now, what do we see in some fictional characters in more recent times, specifically, the heroines of Resident Evil, a popular video game series?

There is a genre of video games called "Survival-Horror." While this genre probably has its origins in the Alone in the Dark series from the early 1990s, the 1996 game called Resident Evil, which was made by the game company CAPCOM, named, defined, and popularized the genre. Along with such lines as Mario and Final Fantasy, Resident Evil is one of the most well-known series of games. Simply put, the genre of survival-horror involves the main character (or characters, as the signature survival-horror game, Resident Evil, allows you to play as two different main characters, one male and one female, both human, in each game) in an enormously bad situation, from which s/he must escape with extremely limited options and supplies. Gameplay-wise, this means a survival-horror game will provide the player with only a few weapons and severely limited extra ammo, with no ability to "buy" ammo or weapons or find them easily, as is the case in a shooter game. Camera angles are commonly used to create a sense of tension, wariness, and claustrophobia. In Resident Evil (at least until RE4), you can never see what's around the next corner, as opposed to being able to use the controllable camera of platformers, shooters, adventure games, etc, to peek around corners and see what is waiting, and enemies have a nasty habit of bursting through windows or from openings in the ceiling to boot.

Now, remember what I said about the traits of the Household Angel? Well, here are short descriptions of two of the main heroines of Resident Evil: Firstly, Rebecca Chambers, who is a medic, apparently selfless, and often in physical danger. And secondly, Jill Valentine, who is very kind, and rescues and is rescued by others on many occasions. If you notice a similarity between those two and the previously enumerated traits of the Household Angel, you are not alone.

Just by glancing at two modern-day characters, it is clear that the Household Angel has not completely vanished over the past century, merely transforming into something different, which I have dubbed the Guardian Angel. This archetype shares all of the traits of the previous incarnation, but with a general trend towards greater strength of character (and physical strength

and capability), independence, and less of an air of frailty or etherealness, not to mention the fact that she does not have to be utterly pure and virtuous. So, essentially, the big difference between the Household and the Guardian is personal strength, or power; the Household has little to none, whereas the Guardian has moderate to great. The understanding and kindly nature remains a constant, as can be seen in the story of Jill Valentine in the first Resident Evil game. When her partner Barry Burton is manipulated into betraying her, she spares his life and is eventually saved by him in turn (a running theme between the two; there is a suspicion in my mind that Barry has a Jill-in-danger radar). She immediately accepts his clumsy apology, saying that it was not his fault. Now, if that is not understanding and compassionate, I do not know what is. While Jill is a skilled soldier, particularly considering her young age, there can be little doubt that her personality closely resembles that of Mina's, only Jill is approximately a hundred times more strong-willed. Her goals, on the other hand, are rather different. Compared to Mina's objectives, which are to aid her husband, Jill's are more varied and out-going. A member of an elite team of soldiers, Jill is constantly trying to discover information on the corrupt pharmaceutical company Umbrella while avoiding or defeating its terrible creations.

A second example of the Guardians of Resident Evil is Ada Wong. Ada is probably a more interesting figure when you consider how the Household Angel came about. While she may be working for the "bad guys", she is dedicated to the protagonist Leon S. Kennedy. She is dedicated to him above herself in some cases, in fact, as she risks her mission, job, and life in order to help him in the events of Resident Evil 4. As mentioned before, selflessness is a defining trait of both Angel types. Ada may seem to be heartless, using her beauty as much like a weapon as her gun, but it does not take the rookie cop Leon, with his loyalty and innocence, very long to accidentally capture her heart, thereby proving its existence. Even when she is pointing a gun at him, Ada still cares about Leon's safety, shown by the fact that she has never actually shot at him despite holding him at gunpoint about three times to date.

Ada is an interesting case amongst the Guardians of Resident Evil, as she does not work for nice people, and unlike all three other Guardians in Resident Evil (Jill Valentine, Claire Redfield, and Rebecca Chambers), she projects a cool exterior, as noted above. In fact, she works for, or rather is pretending to work for, the main villain, Albert Wesker, though as she herself puts it in Resident Evil 4, "I don't always play by your [Wesker's] rules". While seemingly self-serving, Ada has shown her compassion, at least in regards to Leon, too often to not be included from the list of Guardian Angels, though she has almost nothing in common with the Household Angel. For one thing, she never stays in

one place. There have been at least half a dozen times when she has charged off with someone, usually Leon, calling after her to wait; not very Household-like behavior. The woman does not stay put, ever. She drops in, occasionally literally, to help Leon or otherwise interact with him, and then neatly, or sometimes not-so-neatly, escapes the area, back to the shadows. She also does not particularly care about the state of anyone's soul, whether her own or Leon's. She cares about his safety, obviously, but there is no hint of any "refreshing of the soul" by Ada, though the argument could be made that Leon is actually doing that, an interesting reversal.

Claire Redfield is, along with Jill, perhaps the best example of the combination of sweet and strong, rescuer and rescued, that is the Guardian Angel of Resident Evil. In Claire's introduction, we quickly see that while she is understandably frightened by the fact that Raccoon City has been taken over by zombies, not to mention the later appearance of even worse creatures, she never freezes, and recovers remarkably well from the heavy shocks the plot of Resident Evil 2 --and later, Code: Veronica X-- throws at her. Along the way, she encounters a young girl named Sherry, and, what with the girl's biological mother being more worried about her transformed-himself-into-a-monster-that-just-will-not-die husband then her daughter who is being chased by said monster, becomes a mother-figure in about five minutes, keeping Sherry from being infected by the nasty viruses flying all over Raccoon City.

If Jill Valentine and Claire Redfield are the embodiment of the Guardian and Ada Wong is a new angle on it, neatly reversing the traditional roles of the Household Angel while retaining a few of its characteristics, Rebecca Chambers is the link between the Guardian and the old Household. For one thing, unlike the other three, she actually stays in one place as often as not. She does not go racing all over the crazy geography of the world of Resident Evil the way Ada does, or even show the ability to vanish into thin air like Claire. In Resident Evil 1, she spends most of her time ready to dispense healing to Chris Redfield, and needing a rescue from a stray Hunter, a deadly reptilian creature. She does, however, move around a couple times, to fry the roots of a plant-monster so Chris can actually fight it, to play the particular piano tune that triggers yet another secret of the mansion, and to set off its self-destruct system, a regular feature in all secret bases. In each of these incidents the hero needs specific help, of course. Rebecca is also the only Resident Evil heroine who has been more frequently rescued, as opposed to Jill and Claire who have more balanced records, and Ada who is more often the rescuer. Although Rebecca was shown to be much more capable a fighter in the prequel Resident Evil 0, she still does not match up to the other heroines in strength of character. This makes her more like the Household Angel than the Guardian, though again

Resident Evil 0 put her a bit more towards the latter. Evidence of how well the Household Angel has survived over the last century, can be found in Rebecca Chambers. On the flip-side, Ada Wong shows how much it has changed.

The Household Angel's transformation into the Guardian Angel is an interesting topic that touches on the differences between Victorian culture and today's culture -- and their occasional similarities. With both, compassion in some form is a constant, along with a non-self-serving goal; but while the Household Angel achieves this goal through passive virtue, the Guardian takes an active role in preserving what she wants to preserve and destroying what needs to be destroyed. So similar and yet so dissimilar: the Angel is still there, but no longer in the Household.

Honors Thesis

The Undergraduate Review
Vol. III

Bianchi Identities and Weak Gravitational Lensing

Brian Keith

Brian Keith graduated from Bridgewater State with a double major in Physics and Math. He received an ATP grant for the summer of 2004 to work with Dr. Kling of the physics department on weak lensing. He is currently a graduate student at Clark University in Worcester.

Abstract

Gravitational lensing is the bending of light rays due to the gravitational attraction between light and massive objects such as galaxies. Weak gravitational lensing, the distortion of the shapes of light rays, and general relativity, our modern theory of gravity, have had divergent paths. Astronomers who study weak lensing don't rely on the principles of general relativity but use approximations to understand their observations. The purpose of this paper is to study how general relativity can be used to explain weak gravitational lensing. The formal language for general relativity's explanation of weak lensing is a null tetrad of vectors associated with light rays and the spin coefficient formalism. The Bianchi identities, which come from the theory of relativity, may be the fundamental equations of weak lensing.

I. Introduction

The phenomena of gravitational lensing occurs when a large object is between an observer and light rays emitted from a distant star. According to general relativity, light is bent by significantly massive objects. Weak lensing is when a massive object (the lens) is between the source and the observer and the light from the source is bent in such a way as to make the images we would normally see more elliptical or sheared.


Figure 1 is an example of weak lensing. This is an HST image of Abel 1969, a cluster of galaxies (yellow blobs). Notice that the light ray rings that have formed on the edges of the edges of the galaxies. The gravity of the cluster has sheared the light rays emitted from galaxies behind it relative to us.

Currently, there is a way to find the mass of the object in the way of the source and observer. The mass of the lens can be obtained from information about the amount of shearing that the source images undergo. The approach that astrophysicists use to reach this goal does not start from a fundamental equation in general relativity. But physicists like to categorize things; finding the fundamental equations in general relativity would make the theory more complete and would give it more credibility. We believe that we may have found the fundamental equations of weak lensing in the Bianchi identities of general relativity.

We are speculating that integrating the Bianchi identities, a set of nine coupled partial differential equations which relate components of the Ricci curvature tensor to components of the Weyl curvature tensor, is the key to finding the fundamental equations of weak lensing. We will be working in the null tetrad and the spin coefficient formalism. The null tetrad is a way to track a light ray's path. This is done by identifying four vectors, one that is in the direction of the light ray, one that is perpendicular, and two complex ones that curl in opposite directions around the light ray. The spin coefficients are a set of 12 quantities that describe certain properties of the light rays (also called a pencil of rays) in question.

For example, r is the convergence of the light rays and s is the shear of the light rays as seen in Figure 2 below. The circle with the arrows on the left side of the picture represents the convergence of a pencil of rays. The radius of the cross-sectional area of the pencil of rays diminishes. The picture on the right represents the shearing or stretching of the pencil of rays. This gives the circular pencil of rays eccentricity. We can imagine looking at this picture from the front and seeing the pencil of rays as elliptical. From the side we can see that the reason is the pencil gets shifted from the plane so that light rays at the bottom of the pencil is closer than rays at the top of the pencil. This shift is what produces the elliptical shape of the pencil.

Figure 1: The figure on the left shows convergence which is when the radius of the pencil of light rays shrink. The picture on the right demonstrates shearing. When a pencil is sheared, the circle's plane gets shifted which results in the twisting of the incoming light rays.
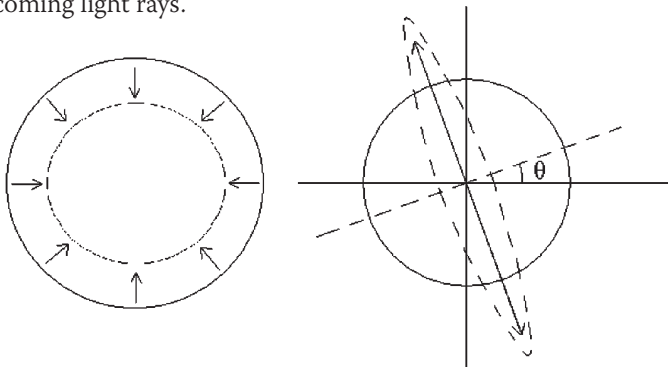
The first Bianchi identity in spin coefficient formalism is

$$\bar{\delta}\,\Psi_0 - D\,\Psi_1 + D\,\Phi_{01} - \delta\,\Phi_{00} = (4\alpha - \pi)\,\Psi_0 - 2(2\rho + \varepsilon)\,\Psi_1 + 3\kappa\,\Psi_2$$

$$+ (\pi^- - 2\bar{\alpha} - 2\beta)\Phi_{00} + 2(\varepsilon + \bar{\rho})\,\Phi_{01} + 2\sigma\,\Phi_{10} - 2\kappa\,\Phi_{11} - \bar{\kappa}\,\Phi_{02}. \ [1]$$

The lower case greek letters on the right side of Eq. 1 are spin coefficients, the Ψ_A are Weyl tensor components and the Φ_{AA} are the Ricci tensor components. On the right hand side of the equation, δ^-, δ, and D are derivative operators.

The Ricci and Weyl tensors are the curvature tensors that we hope to find and the topic in Section II. The null tetrad, explained in section III, is the mathematical language we have employed to express weak lensing in, as well as the Ricci and Weyl tensors. The spin coefficient formalism follows from this and is also discussed in this section. Section IV explains how the first Bianchi identity could simplify down to the fundamental equation of weak lensing by good choice of tetrad, perturbating to first order in the weak perturbation of spacetime, and restricting the light rays to the lens plane. In Section V, we discuss the relevance of our findings and future work with this project.

II. Ricci and Weyl tensors

The Ricci tensor is one of the components of the decomposition of the Riemann tensor; the other is the (trace-free) Weyl tensor. Before we look at these tensors we must first introduce the Christoffel symbols defined:

$$\Gamma^{\rho}_{\mu\upsilon} = \frac{1}{2}\Sigma_{\sigma}g^{\rho\sigma}\left(\frac{\partial g_{\upsilon\sigma}}{\partial x^{\mu}} + \frac{\partial g_{\mu\sigma}}{\partial x^{\upsilon}} - \frac{\partial g_{\mu\upsilon}}{\partial x^{\sigma}}\right) \quad [2]$$

It is the idea of covariance that is pivotal to general relativity. The idea of parallel transport of vectors is related to this. If one parallel transports a vector in flat space around a small closed loop with ordinary derivative operators, the vector will return to its original position with its integrity intact. But this is not true in curved space or even for spheres in flat space. As we change coordinate systems we must use covariant derivatives to preserve the integrity of vectors. The Christoffel symbols mediate what the derivative operators are in different coordinate systems. The symbols are a map to the covariant derivatives for the particular coordinate system. The Riemann tensor is a (0,4) curvature tensor that utilizes the fact that parallel transporting is path dependent in a curved space. It is defined in terms of the Christoffel symbols, with ``, index" denoting partial derivative with respect to the index:

$$R_{\mu\upsilon\rho}{}^{\sigma} = \Gamma^{\sigma}_{\mu\rho,\upsilon} - \Gamma^{\sigma}_{\upsilon\rho,\mu} + \Sigma_{\alpha}\left(\Gamma^{\alpha}_{\mu\rho}\Gamma^{\sigma}_{\alpha\upsilon} - \Gamma^{\alpha}_{\upsilon\rho}\Gamma^{\sigma}_{\alpha\mu}\right).$$
[2]   (3)

The Riemann tensor obeys four properties,

1. $R_{abc}{}^{d} = -R_{bac}{}^{d}$,

2. $R_{[abc]}{}^{d}$, where "[ ]" denotes commutation of the indices (i.e.
$R_{[abc]} = R_{abc} - R_{bac}$),

3. For the derivative operator ∇_a naturally associated with the metric, $\nabla_a g_{bc} = 0$, we have $R_{abcd} = -R_{abdc}$.

4. The Bianchi identity holds $\nabla_{[a}R_{bc]d}{}^{e} = 0$.

Contracting Eq. 3 yields the Ricci tensor,

$$R_{\mu\rho} = \Sigma_{\upsilon}R^{\upsilon}_{\mu\upsilon\rho} = \Sigma_{\upsilon}\Gamma^{\upsilon}_{\mu\rho,\upsilon} - \Sigma_{\upsilon}\Gamma^{\upsilon}_{\upsilon\rho,\mu} + \Sigma_{\alpha,\upsilon}\left(\Gamma^{\alpha}_{\mu\rho}\Gamma^{\upsilon}_{\alpha\upsilon} - \Gamma^{\alpha}_{\upsilon\rho}\Gamma^{\upsilon}_{\alpha\mu}\right)$$
(4)

The Weyl tensor is the trace-free, anti-symmetric part of the decomposition of the Riemann tensor. It is a product of commuting the metric and the Ricci tensor,

$$C_{abcd} = \frac{2}{n-2}\left(g_{a[c}R_{d]b} - g_{a[c}R_{d]a}\right) - \frac{2}{(n-1)(n-2)}Rg_{a[c}g_{d]b} - R_{abcd},$$
[2]   (5)

where R is the scalar curvature, defined as the trace of the Ricci tensor. The four properties above that hold for the Riemann tensor also hold for the Weyl tensor.

III. Null tetrad and spin coefficient formalism

The null tetrad is a set of four vectors and is used to track a light ray's path. The four vectors identified are in the direction of the light ray, perpendicular to it, and two complex ones that curl in opposite directions around the light ray. The spin coefficients are a set of 12 quantities that describe certain properties of the light rays in question. For example, r is the convergence of the light rays and s is the shear of the light rays.

Since we are using the null tetrad and spin coefficient formalism, the Ricci and Weyl tensors must be expressed in that way. The tensor quantities in spin coefficient formalism are attained by contracting the quantities with prescribed tetrad components. We have computed the Φ_{AA} and the Ψ_{A} in a weak field metric of a gravitational potential $\varphi(x,y,z)$ satisfying $\nabla^2\varphi = 4\pi\rho$ where $\rho(x,y,z)$ is the matter density.

We align the light rays along the z-axis by choosing the tetrad to be

$$\ell^a = \frac{1}{\sqrt{2}}(1,0,0,1), \qquad n^a = \frac{1}{\sqrt{2}}(1,0,0,-1),$$

$$m^a = \frac{1}{\sqrt{2}}(0,1,i,0), \qquad \overline{m}^a = \frac{1}{\sqrt{2}}(0,1,-i,0).$$
(6)

This allows us to define four derivative operators as

$$\delta = \frac{1}{\sqrt{2}}\left(\frac{\partial}{\partial x} + i\frac{\partial}{\partial y}\right), \qquad D = \frac{1}{\sqrt{2}}\left(\frac{\partial}{\partial t} + \frac{\partial}{\partial z}\right)$$

$$\overline{\delta} = \frac{1}{\sqrt{2}}\left(\frac{\partial}{\partial x} - i\frac{\partial}{\partial y}\right), \qquad \Delta = \frac{-1}{\sqrt{2}}\left(\frac{\partial}{\partial t} + \frac{\partial}{\partial z}\right)$$
(7)

We assume Minkowski (flat) space for the spin coefficients. This condition forces the spin coeffients to be 0. The calculation of the Ricci tensor is given in Appendix A.1. We choose to perturbate to first order in j, and as a result, the Ricci tensor simplifies to

$$\Phi_{00} = \Phi_{22} = 2\Phi_{11} = \frac{\nabla^2\varphi}{2}. \quad (8)$$

The calculation of the Weyl tensor is in Appendix A.2 and is

$$\Psi_0 = \Psi_4 = \frac{1}{2}\left(\varphi_{xx} - \varphi_{yy} + 2i\varphi_{xy}\right),$$

$$\Psi_1 = -\overline{\Psi}_3 = \frac{1}{2}\left(-\varphi_{xx} + i\varphi_{yz}\right), \qquad (9)$$

$$\Psi_2 = \frac{1}{2}\left(\varphi_{zz} - \frac{\nabla^2\varphi}{3}\right).$$

IV. 1st Bianchi identity: the fundamental equation of weak lensing?

At this point we can create a differential relation between the Ricci and Weyl tensors by using the results of the previous section and using a thin lens approximation. We believe that the first Bianchi identity may simplify to the fundamental equations of weak lensing. The Bianchi identities are the result of taking covariant derivatives of the commuted Riemann tensor and contracting it.

They are defined as

$$\nabla_{[a}R_{bc]d}{}^{e} = 0 \quad [2]$$ (10)

Start with the first Bianchi identity,

$$\bar{\delta}\,\Psi_0 - D\,\Psi_1 + D\,\Phi_{01} - \delta\,\Phi_{00} = (4\alpha - \pi)\,\Psi_0 - 2(2\rho + \varepsilon)\,\Psi_1 + 3\kappa\,\Psi_2$$

$$+ (\pi^- - 2\bar{\alpha} - 2\beta)\Phi_{00} + 2(\varepsilon + \bar{\rho})\,\Phi_{01} + 2\sigma\,\Phi_{10} - 2\kappa\,\Phi_{11} - \bar{\kappa}\,\Phi_{02}, \ [1]$$

(11)

we identify $D, \Delta, \delta, \text{and}\ \bar{\delta}$ are derivative operators that are defined in Eq. 7 and are associated with the null tetrad. The first Bianchi identity after we assume flat space and perturbate to first order discussed in previous sections is

$$\bar{\delta}\,\Psi_0 - D\,\Psi_1 - \delta\,\Phi_{00} = 0$$ (12)

We assume that the Weyl tensor has support in the lens plane and define $\Phi_{00} = {}_L\Phi_{00}\,\delta(z\text{-}L)$ (the lens is thin) and $\Psi_i = {}_L\Psi_i\,\delta(z\text{-}L)$ where $\delta(z\text{-}L) = \begin{cases} 1 & z=L \\ 0 & z\neq L \end{cases}$ and $\int \delta(z)dz = 1$. We will proceed to integrate out in the z direction (perpendicular to the lens plane) to compress all the matter into the lens plane, yielding

$$\int_{-\infty}^{\infty}\bar{\delta}\,\Psi_0\ dz = \int_{-\infty}^{\infty}\bar{\delta}_L\Psi_0\ \delta(z-L)dz = \bar{\delta}_L\Psi_0\ ,$$

$$\int_{-\infty}^{\infty}\delta\,\Phi_{00}\ dz = \int_{-\infty}^{\infty}\delta_L\Phi_{00}\ \delta(z-L)dz = \delta_L\Phi_{00}\ ,$$

(13)

Due to the condition of asymptotic flatness in Minkowski space, φ is zero at ∞ and the same goes for any change in φ, thus,

$$\int_{-\infty}^{\infty}D\Psi_1\ dz = \int_{-\infty}^{\infty}-\frac{1}{2}\left(\varphi_{xz} + i\varphi_{yz}\right)dz = -\frac{1}{2}\left(\varphi_x + i\varphi_y\right)\Big|_{-\infty}^{\infty} = 0.$$

(14)

Now we can write the final result as

$$\bar{\delta}\,\Psi_0 - \delta\,\Phi_{00} = 0$$ (15)

The Weyl tensor is a measurable quantity and we can find the mass density from this equation.

V. Discussion

An integral relationship between the Ricci and the Weyl tensors has already been found where the Weyl tensor is some kernel of the Ricci tensor and the setting is the lens plane:

$$_L\Phi_{00}(\vec{r}) = \int(d\vec{r}\,')\frac{{}_L\Psi_0\vec{r}}{\pi}\frac{e^{-2i\eta}}{|\vec{r}-\vec{r}\,'|^2},\ [3]$$

(16)

We have found a differential relation between the two. These two different formats for weak lensing lends to each other's relevance. The integral relation is stable, smoothes out noise and is less precise than the differential version which is at times unstable, but more exact.

A very important aspect about the differential version is that it was found by starting with first principles. If this equation is relevant, then it lends to the foundation and the strength of general relativity as a theory, as well as being another approach to weak lensing. Also, it could serve as a first principle to other physicists who would like to find an equation for something starting with first principles in general relativity.

To prove the relevance of this equation of weak lensing we must first plug in values for a simple mock case. If the numbers come out correct there, then we will try it out with real data. This involves writing code that will map the values of the spin coefficients and Weyl tensor at every point in the lens plane to the Ricci tensor that we expect.

A. Appendix

A.1 Ricci tensor

The Ricci tensor components R_{ab} in spin coefficient formalism Φ_{AA} are computed by contracting over a combination of two vectors from the null tetrad chosen,

$$\ell^a = \frac{1}{\sqrt{2}}(1,0,0,1), \qquad n^a = \frac{1}{\sqrt{2}}(1,0,0,-1),$$

$$m^a = \frac{1}{\sqrt{2}}(0,1,i,0), \qquad \bar{m} = \frac{1}{\sqrt{2}}(0,1,-i,0).$$

(17)

The contractions that produce non-trivial results are defined:

$$\Phi_{00} = -\frac{1}{2}R_{00} = -\frac{1}{2}R_{ab}\ell^a\ell^b = -\frac{1}{2}\left(\frac{1}{2}+\frac{1}{2}\right)\nabla^2\varphi = \frac{-\nabla^2\varphi}{2},$$

$$\Phi_{11} = -\frac{1}{2}(R_{01}+R_{23}) = -\frac{1}{2}\left(R_{ab}\ell^a n^b + R_{ab}m^a\overline{m}^b\right) = -\frac{1}{2}\left(0+\left(\frac{1}{2}-\frac{i^2}{2}\right)\nabla^2\varphi\right) = \frac{-\nabla^2\varphi}{4}$$

$$\Phi_{22} = -\frac{1}{2}R_{11} = R_{ab}n^a n^b = -\frac{1}{2}\left(\frac{1}{2}+\frac{1}{2}\right)\nabla^2\varphi = \frac{-\nabla^2\varphi}{2}.$$

The subscripts in the component denotes which vector to contract with. For instance, $R_{01} = R_{ab}\lambda^a\, n^b$ while $R_{23} = R_{ab}\, m^a\overline{m}^b$. When the vectors are chosen only the contractions over the same part of respective vectors are eligible to be non-zero since $R_{aa} = \nabla^2\varphi$.

A.2 Weyl tensor

The Weyl tensor components (C_{abcd}) in spin coefficient formalism (Ψ_A) are computed by contracting over a combination of 4 vectors from the null tetrad. The spin coefficient version components of the Weyl tensor are defined:

$$\Psi_0 = -C_{0202} = -C_{abcd}\ell^a m^b \ell^c m^d,$$

$$\Psi_1 = -C_{0102} = -C_{abcd}\ell^a n^b \ell^c m^d,$$

$$\Psi_2 = -\frac{1}{2}(C_{0101}-C_{0123}) = -\frac{1}{2}\left(C_{abcd}\ell^a n^b \ell^c n^d - C_{abcd}\ell^a n^b m^c\overline{m}^d\right),$$

$$\Psi_3 = C_{0113} = C_{abcd}\ell^a n^b n^c \overline{m}^d,$$

$$\Psi_4 = -C_{1313} = -C_{abcd}n^a m^{b-} n^c \overline{m}^d.$$

(19)

A symbolic logic program calculated the components of the Weyl tensor to be

$$C_{0i0i} = \frac{1}{3}\left(-3\varphi_{ii}+\nabla^2\varphi\right), \qquad C_{0i0j} = -\varphi_{ij}, \quad i \neq j$$

$$C_{ijij} = \frac{1}{3}\left(3\varphi_{kk}-\nabla^2\varphi\right), \qquad C_{ijik} = -\varphi_{jk}, \quad i \neq j \neq k$$

(20)

where i, j and k can represent either x, y or z.

The non-zero calculations omitting the specific vector contractions are

$$\Psi_0 = \Psi_4 = -\left(C_{obod}+C_{3b3d}\right) = \frac{1}{2}\left(\varphi_{xx}-\varphi_{yy}+2i\varphi_{xy}\right),$$

$$\Psi_1 = -\Psi_3^- = -\left(C_{03cd}+C_{30cd}\right) = \frac{1}{2}\left(-\varphi_{xx}+i\varphi_{yz}\right),$$

$$\Psi_2 = -2\left(C_{03cd}+C_{30cd}\right)\frac{1}{2}\left(\varphi_{zz}-\frac{\nabla^2\varphi}{3}\right).$$

(21)

References

[1] E. T. Newman, K. P. Tod. Asymptotically Flat Space-Times from General relativity and Gravitation, Vol. 2, (Picnum publishing Corporation, 1980).

. . . .

[2] Robert Wald. General Relativity, (University of Chicago press, Chicago 1984).

. . . .

[3] Kling, T.P. 2002, Talk at Connecticut college.

. . . .

[4] Jeremy Bernstein, Paul M. Fishbane, Stephen Gasiorowicz. Modern Physics, (Prentice Hall, New Jersey, 2000).

. . . .

[5] Albert Einstein. Relativity, (Crown Publishers Inc., New York 1961).

. . . .

[6] James B. Hartle. Gravity: An introduction to Einstein's general relativity, (Pearson Education Inc., San Francisco, 2003).

. . . .

[7] Steven R. Lay. Analysis with an Introduction to Proof, (Upper Saddle River, New Jersey: Prentice Hall Inc., 1999).

. . . .

[8] H. A. Lorentz, H. Weyl, H. Minkowski. Notes by A. Sommerfield. The Principle of Relativity, (General Publishing Company, Toronto 1952).

. . . .

[9] James Peacock. Cosmological Physics, (Cambridge University press, Cambridge 1999).

. . . .

[10] R. Penrose, W. Rindler. Spinors and spacetime: volume I, (Cambridge University Press, Cambridge 1984).

. . . .

[11] R. Penrose, W. Rindler. Spinors and spacetime: volume II, (Cambridge University Press, Cambridge 1986).

Shea Scholar Program

The Bridgewater Alumni Association (BAA) established the Shea Scholar Program during the 1987-88 academic year in honor of Dr. Ellen M. Shea, Dean of Students Emerita. A graduate of the Class of 1935, Dr. Shea returned to her alma mater and served first as Dean of Women and later as Dean of Students. Her distinguished career in education, her concern for the welfare and success of students, and her role as mentor to generations of Bridgewater students served to guide the Association in the design of the criteria for this prestigious award which is funded through a generous bequest left by Dr. Shea to the college for the purpose of scholarly assistance. The awards are presented by the BAA's Shea Scholar Committee, chaired by Carol Wilusz Kryzanek '69. Bethany Masten is the 2006 recipient of the Shea Scholarship, and we proudly present her work here.

Surge of Green: A Sustainable Approach to Conductive Polymers

Beth Masten, Shea Scholar

Introduction

Chemists are known for their ability to take natural resources and, through a series of chemical processes, convert them into useful materials ranging from agricultural chemicals to pharmaceuticals. Plastics are a unique subset of these materials in that they are polymers: substances composed of long chains of connected molecules, the chemical equivalent of a string of pearls. Polymers have unique properties that arise from the way the monomer subunits are strung together. Although some polymers are naturally occurring, such as skin, bones, wood, and fibers, a great deal of the others are synthetic (1). Following the emergence of the field of polymer chemistry in the 1920's came the booming use of polymers in the 1950's plastic industry. Long prized for their applications in the textile, pharmaceutical, agricultural, electronics, and automotive industries, polymers are used today in the largest quantity of all synthetic materials (1). Such was the history that 'set the stage' for the development of conductive polymers, according to Laureate Dr. Alan Heeger during his address upon receiving the 2000 Nobel Prize in Chemistry for his part in the development of conductive polymers.

Conductive polymers are a class of chemical materials characterized by the ability to conduct electricity along their long molecular chains - they are essentially plastics that can carry an electric current (2). Unlike conventional polymers, the ability of conductive polymers to act as charge carriers arises from the presence of extensive conjugation along the polymer backbone. This conjugation itself does not give rise to the conductive properties of polymers; rather, it is when the material becomes "doped," when negative charges (electrons) and positive charges ("holes") are introduced into the material. As electrons jump from neighboring positions to fill in holes, new holes are formed and charges can be carried along long distances (Figure 1).

Figure 1. Schematic of Polaron Formation (a-b) and Migration (c-e) in Undecahexane (3).
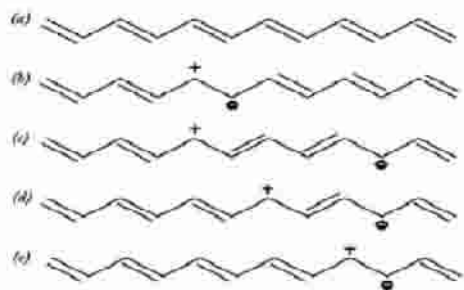
The development of plastics capable of conducting electricity has numerous and exciting potential applications. Among those listed in a 2003 *Business Week* article (3) are "smart tags" that can be cheaply processed and easily imprinted onto all manner of commercial goods, "video wallpaper" capable of turning entire walls into affordable television screens, ultra-tiny transistors, and even electronic newsprint. Additional applications are unique to biodegradable conductive plastics, including the potential to act as nerve guidance channels: conduits onto which two severed nerve ends can be attached for repair of nerve damage (4). Conductive polymers are currently used for electromagnetic shielding, as corrosion inhibitors, in electroluminescent and cellular phone displays, for static dissipation, and for various sensing devices (5).

Polyaniline. Current commercial conductive plastics are made from a chemical material called polyaniline. Among the properties that make polyaniline more useful than other conductive polymers are its good air and moisture stability in both its doped and insulating forms, as well as the simple acid-base chemistry required for switching between its conductive and nonconductive forms (6). Unfortunately, polyaniline is synthesized from aniline, a non-renewable feedstock obtained from petroleum resources (7). The chemical oxidation of aniline to form polyaniline can be achieved by electrochemical means utilizing organic solvents or in aqueous solution from aniline hydrochloride (Figure 2). Polymerization requires strongly acidic conditions and the conductivity and solubility of the resulting polyaniline depends in part on the choice of acid used for protonation (5).

Figure 2. Structures of Aniline (Monomer Unit) and Polyaniline.
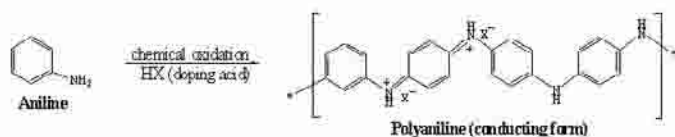
In addition to its potentially harmful polymerization conditions, aniline is also problematic in that it is a hazardous chemical material with documented health risks; the health risks associated with *polyaniline* have not yet been studied (8). Although the use of anilinium hydrochloride is preferred over liquid aniline from a hazards standpoint, there is still a real hazard to industrial plant workers, and a potential hazard to the consumer if polymer products are contaminated with raw materials. There is also an environmental hazard as aniline is a known environmental toxin (8). Finally, neither aniline nor polyaniline are readily biodegradable, and polyaniline would be expensive to reclaim and recycle once it has served its useful purpose (8, 9). The environmental stability of polyaniline is the property responsible for its extensive investigation as a potential conductive plastic (10). Before the commercial production and use of this class of conductive plastics becomes more widespread, it is critical that an environmentally sound alternative be found.

Green and Sustainable Chemistry. Environmental sustainability is one of the most pressing needs faced by the human race. The demands of human society for everyday materials, from plastics to medicines, have been met through unprecedented industrial production since the 18th century. Meeting these needs, however, consumes our planet's natural resources and produces waste that is prohibitively expensive to recycle or reuse. This non-sustainable use of natural resources by our culture has created a real concern about the quality of life for future generations. Ensuring that the needs of today can be met without compromising the ability of future generations to meet their needs is the core of sustainability, as defined by the United Nations World Commission on Environment and Development in their report, "Our Common Future" (11).

The field of Green and Sustainable Chemistry (GSC) seeks to make the chemical industry's practices more environmentally benign, such that value-added goods can continue to be made for years to come. The goals of GSC are pursued through the use of a set of guiding "principles" that seek to reduce hazard and environmental impact by designing chemicals and chemical procedures to be benign from the start, and the use of environmentally benign materials. Current conductive polymer production contradicts GSC principles in many ways and therefore there are ample opportunities for improvement. Current conductive polymers, like polyaniline, are made from nonrenewable feedstocks, which could be replaced with naturally-occurring, renewable substances. Toxic raw materials are employed leading to the hazardous processing conditions that could be eliminated if a non-toxic feedstock was employed instead. Finally, current conductive polymers are persistent in the environment. If natural, biodegradable materials are substituted as starting materials, then the potential is very good that nature will also be able to degrade the resulting polymers. This project seeks to develop "greener" indole-derived conductive plastics to help remedy these problems.

Recent Progress. Green Chemistry principles have already

been successfully incorporated into the synthesis of conductive polymers through the use of environmentally-friendly catalysts employed in polymerization. These include enzymes such as horseradish peroxidase (HRP) and iron-based biomimetic catalysts like hematin (12). GSC encourages the use of a catalyst, a reusable substance that lowers the amount of energy required for a reaction to occur without being consumed by the reaction. With polyaniline, enzyme catalysis allows for environmentally benign reaction conditions, more control over the reaction rate, and a higher product yield (13). The oxidation can occur at a pH closer to neutral while also allowing for manipulation of the reaction's progress and generation of more polymer.

Although structurally similar to the starting materials of many known conductive plastics, indole, along with its derivatives, has not been extensively investigated as a feedstock for potential conductive polymers (14). These chemical materials are naturally occurring: indole is found naturally occurring in feces, indole acetic acid is a plant growth hormone, and tryptophan is an abundant amino acid (Figure 3). In general, indoles are non-toxic, found in a variety of plants, consumed in foods, widely used in medicine, and are known to readily biodegrade (8). Indoles are already in use in the dye, perfume, and pharmaceutical industries (8).

Figure 3. Structures of Some Common, Naturally Occurring Indoles.
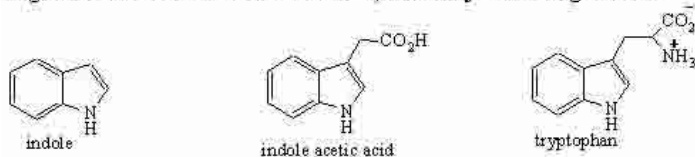
Preliminary investigative work was conducted on polyindoles (PINDs) as possible conductive polymers, but PIND was abandoned for the more easily characterized polyaniline. Recently, the presence of multiple polyindole products was proposed as the reason for difficulty in characterization (10, 15). Polyindoles can exist in at least three distinct, non-planar arrangements and this heterogeneity is believed to result in PINDs lower polymerization efficiency and conductivity compared to other polymers (Figure 4) (15). Thus, while polyindole films have been synthesized by chemical methods, the highly-branched products have been poorly investigated. In particular, no enzyme-catalyzed syntheses have been published to date.

Figure 4. Proposed Structures for the Conducting Form of Indole Polymers.
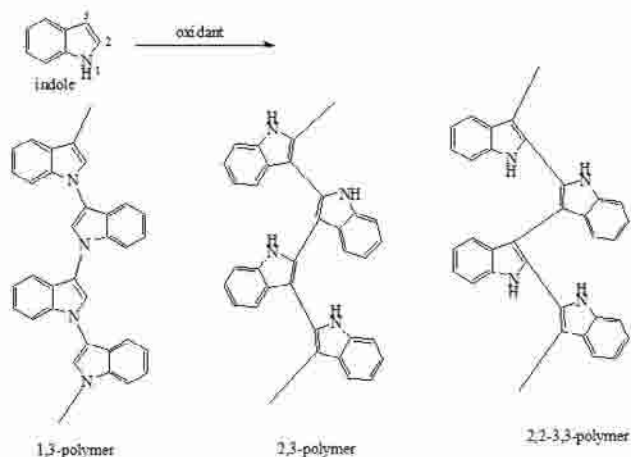
Advances in technology, especially the use of polymeric "scaffolding" as a template for building polymers with well-defined structures and properties, have reduced the heterogeneity of commonly synthesized conductive polymers (13, 16). The use of a template in the synthesis of conductive polymers can have multiple advantages, including electrostatic alignment (providing a more linear and thus more conductive film); supplying counter ions for the doping process; and allowing for water solubility (13). One commonly-used template for the synthesis of polyaniline, sulfonated polystyrene (SPS), is of particular interest for use in producing conductive polyindoles. SPS can be made to hold a negative charge that attracts positively charged ions, such as the monomers used for construction of conductive plastics. This electrostatic interaction helps build linearly arranged polymeric films known to have desirable electrical conducting properties. Without the scaffold, aniline still polymerizes, but the polyaniline formed has a "branched" structure, leading to poor conductivity. This reaction is shown in Figure 5.

Figure 5. Template-Based Reaction Scheme for the Generation of Polyaniline.
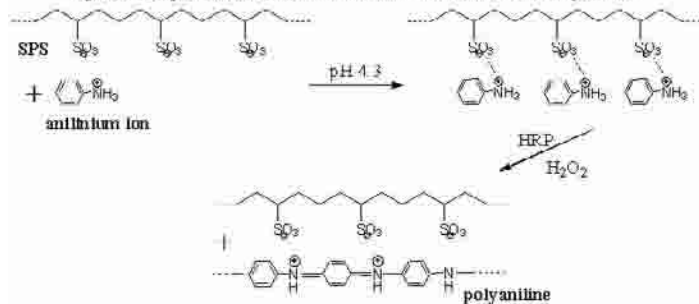
The synthesis of conductive polymers that utilizes enzymatic catalysis and a molecular template allows for the additional ease of "one-pot" synthesis, essentially creating a "nanoreactor" (12). Within this nanoreactor, it is necessary to oxidize the individual monomer ions and cause them to bond, or link together, to form

polymers. One way of achieving this is to use hydrogen peroxide and an enzyme called horseradish peroxidase. In the field of GSC, these are both considered to be "green" reagents: hydrogen peroxide forms benign water and oxygen when it reacts, and the naturally-occurring enzyme acts a catalyst that can either be reused or safely thrown down the drain when done.

Goals and Objectives. The goal of this project was to employ the principles of Green and Sustainable Chemistry to investigate a naturally-occurring and renewable group of chemicals known as indoles as a new and unique class of potential conductive polymers.

The objectives of this project were to:
i.   Study template-based synthetic methods of generating polyaniline to establish proficiency working with conductive polymers employing Green and Sustainable Chemistry techniques;
ii. Develop polymeric indole films using Green and Sustainable Chemistry synthesis schemes, and to characterize their chemical and conductive properties;
iii. Investigate naturally occurring substances as possible replacements for the undesirable and non-renewable molecular scaffolds currently used in conducting polymer synthesis.

**Experimental.** For detailed experimental procedures, please contact ebrush@bridgew.edu.

Results and Discussion - General. This project represents the preliminary phase of a long-term investigation into the relatively young field of Conducting Organic Polymers ("plastic electronics"). The main goal of this project was to investigate novel experimental methods toward the synthesis of sustainable conductive polymers. This work required investigations into numerous experimental approaches and has generated an enormous amount of synthetic data; discussion is focused only on those synthetic products that showed significant potential to be electrically conductive.

In general, the properties associated with conductivity were determined through a detailed, preliminary analysis of the known conductive polymer, polyaniline, synthesized enzymatically using the SPS anionic template (PANI-SPS) (Figure 5). PANI prepared in this manner was found to exhibit properties comparable with commercially produced PANI (13). The synthesis of conductive PANI-SPS is most obvious through simple visual inspection, as the material is a very dark emerald green color, and undergoes a reversible pH dependent color change upon "doping" (Figure 6). This color change corresponds with a shift in the UV-vis spectrum as seen in Figure 7.

Figure 6. Photograph of PANI-SPS Solution in 1 M HCl (green) and 1 M NaOH (blue).

Figure 7. UV-vis Spectra of PANI-SPS in 1M HCl (green) and 1M NaOH (purple).
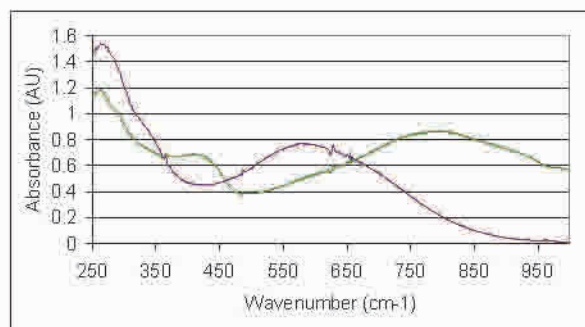
The term "doping" is borrowed from a similar process associated with inorganic semiconductors in which materials are switched to either an insulating or a conducting state (17). This change is often referred to as a reversible redox reaction, although it is more accurately thought of as an acid-base reaction; the PANI-SPS can be titrated between acid and base forms (Figures 8 and 9).

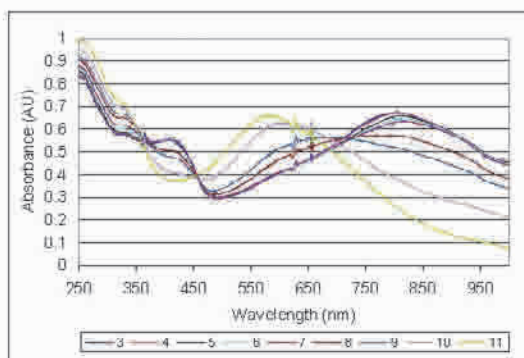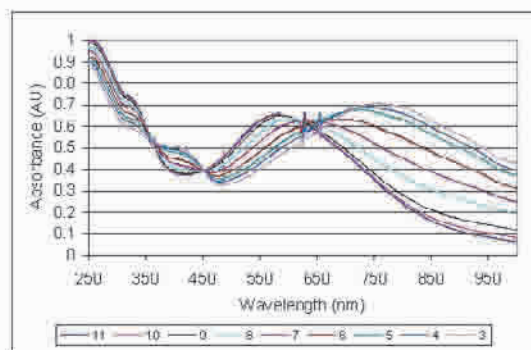Figure 8. PANI Redox Reversibility Data Titrating From pH 3 to pH 11.

Figure 9. PANI Redox Reversibility Data Titrating From pH 11 to pH 3.

The isobestic points at 353 and 457 nm further confirm the presence of electroactive PANI-SPS (13). As seen in Figure 10, if the absorbances of PANI-SPS at 823 and 467 nm are plotted against pH when titrated with sodium hydroxide, the absorbance from pH 3 to 6 is constant, indicating that the free protons in solution are neutralized first, unlike chemically synthesized PANI that is dedoped by pH 4; the high concentration of protons in the vicinity of the PANI backbone, provided by the template, is responsible for this higher pH retention of the doped state (13). The strong interaction between the template and the PANI causes a pronounced delay in the redox process and is the basis for the formation of a hysteresis loop presented by the absorbances at 823 and 567 nm (13).

Figure 10. UV-vis Data for PANI Showing Variations of Absorbance at Various pH Values.
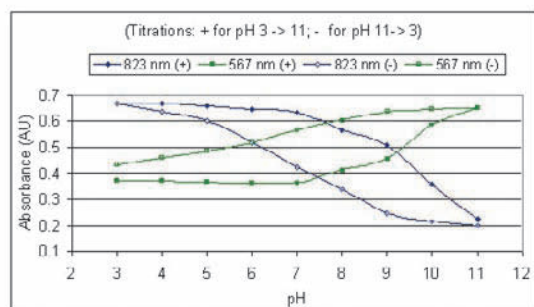
This behavior is well documented for PANI-SPS: at a high pH, PANI-SPS exists in its non-conducting, emeraldine base form, while a decrease in pH increases the conjugation of the polymer chains and converts the PANI-SPS to its doped, emeraldine salt conductive form (13). Spectroscopic analysis of conducting PANI-SPS at acidic pH reveals strong absorption bands at 414 and 843 nm, these are known to be polaron transition bands, as found in chemically synthesized PANI (13). For conductive polymers, polarons are defined as radical ions associated with a lattice distortion while the localized electronic bands in the gap are referred to as polaron states (17). These electronic bands are formed through the interactions of polymer subunits with their neighbors, just as in a crystal, and consist of the valence band (highest occupied level, HOMO) and conduction band (lowest unoccupied level, LUMO). The energy difference between these two levels is referred to as the band gap (17). The oxidation of PANI and other conductive polymers is akin to p-type doping, and is associated with a change in geometry that causes an upward shift in the HOMO and a downward shift of the LUMO (17). When the polymer is then ionized through an acid-base change, a hole (unfilled level) is created on the top of the valence band, that allows electrons to "hop" along the polymer from hole to hole and leads to the metallic, conductive character of doped conductive polymers (Figure 1).

The IR spectrum of PANI-SPS, summarized in Table 1, is also well documented and was used as another basis for comparison. Experimental results are consistent with these known values, indicating that a para-substituted, doped, conductive complex of PANI-SPS was formed (13). Our assessment of the electrical conductivity of other synthetic polymers prepared through this project was based on the initial visual observation of water solubility, dark emerald green products, and observation of characteristic UV-vis and IR spectra. Polymer products that did not show these key characteristics were assumed to be non-conducting, and were not subjected to further characterization.

Table 1. Summary of PANI-SPS FT-IR Spectra.

| Wavenumber (cm^{-1})	Assigned Vibration (12)
1584	Quinone ring deformation
1484	Benzene ring deformation
1310	C-N stretching of a 2° aromatic amine
830	C-H out-of-plane bending
1584, 1484	Relative intensities indicate doped state
1034	Asymmetric S=O stretching
1008	Symmetric S=O stretching

Mechanochemical Synthesis - General. Based on the knowledge that liquid aniline monomer forms salts with the doping acids during polymerization, it was hypothesized that a room-temperature, solid-state synthesis of polyaniline should be possible if a solid anilinium salt was used as the monomer (6). Kaner and co-workers found the resulting polyaniline to be chemically equivalent to that synthesized by traditional methods, with a yield of 65% and conductivity measurements in the range of traditional semiconductors, 10^{-2} S/cm. This polymerization method is considered advantageous to both the chemical and electrochemical oxidations because no solvents are required; hence hazards associated with solvent use are eliminated.

Throughout this project, greener methods were consistently investigated to make the polymer syntheses more sustainable. It was, therefore, very exciting to discover a solid-state route to make these conductive polymers. Mechanochemical synthesis essentially involves grinding together the required chemical reagents which completely eliminates solvents from the experimental procedure (9). Elimination of solvent use, especially the use of hazardous solvents, is one of the goals of Green and Sustainable Chemistry; hence this method was extensively investigated (18). Promising mechanochemical products included polyaniline (PANI), polyaniline-sulfonated polystyrene complex (PANI-SPS), polyindole (PIND), polyindole-sulfonated polystyrene complex (PIND-SPS), and polyaniline-alginic acid complex (PANI-AA). Experimental attempts aimed at producing poly(indole acetic acid) (PIAA) and poly(indole acetic acid)-sulfonated polystyrene complex (PIAA-SPS) were not promising, as the products did not exhibit the characteristic conjugation, and possessed UV-vis spectra of a highly-branched, non-conducting polymer. Other products, including polyaniline-poly(styrene

sulfonic acid) complex (PANI-PSSA), polyindole-poly(styrene sulfonic acid) complex (PIND-PSSA), and polyindole-alginic acid complex (PIND-AA) did possess a weak absorbance band at 800 nm (A_{800}), and thus may be slightly conductive, but they were not investigated further because the UV-vis did not indicate a strong polaron band and the solids were not significantly water soluble. Only those products with high potential for conductivity were pursued, as discussed below.
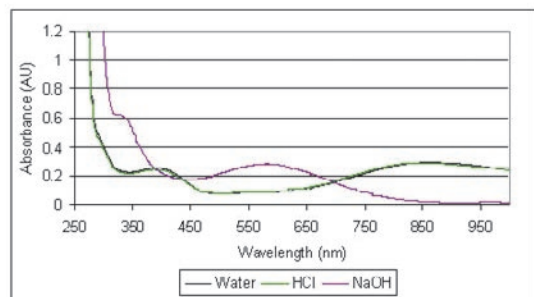
Mechanochemical Synthesis - Polyaniline (PANI). Attempted enzymatic synthesis of PANI in aqueous solution, but without the SPS template, leads to the formation of a highly-branched, nonconductive polymer. This product was characterized by UV-vis spectroscopy, and although a strong A_{440} absorbance band was present, there was no observable polaron band at A_{800}. As such, conductive PANI must be generated in another manner, and the mechanochemical method served to produce a green solid in high yield. This PANI, however, had poor water solubility and thus exhibited low absorptivity, it was difficult to characterize by UV-vis spectroscopy as a result (Figure 11).


Figure 11. UV-Vis Spectra of Mechanochemical PANI.
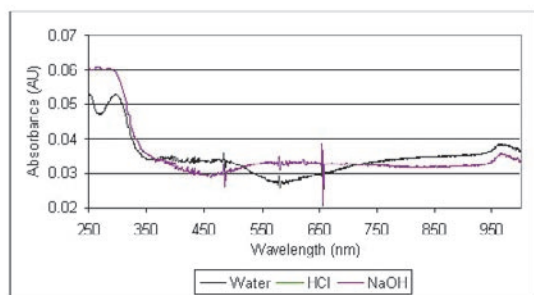
A sample is awaiting conductivity measurements, and will be used as a standard against which any conductivity increases due to presence of template will be observable. In particular, the PANI will be compared to the mechanochemical PANI-SPS, which exhibits significantly higher water solubility than the non-coordinated PANI. The PANI-SPS was produced in a very low yield, but did exhibit the entire range of UV-Vis behaviors characteristic of enzymatically synthesized PANI-SPS (Figure 12).

Figure 12. UV-Vis Spectra of Mechanochemical PANI-SPS.

Mechanochemical Synthesis - Polyindole (PIND). Indole has low aqueous solubility in the pH range through which the horseradish peroxidase catalyst is active, thus it was determined early on that the enzymatic synthesis of PIND would not be possible without significant alterations to the procedure. The mechanochemical route to PIND, however, produces a yellow-green solid in good yield. The product is slightly water soluble, and UV-vis spectroscopy indicated that the polaron band at A_{800} is present, though not as strong as the band possessed by mechanochemical PANI. The mechanochemical PIND-SPS also had a greater A_{800} than the PIND, perhaps indicating that the template was serving to align indole monomers to produce a more linear chain (Figure 13). Regardless, the presence of the template definitely served to impart water solubility onto the PIND-SPS complex. These results are exciting, as both PIND and PIND-SPS have characteristics of conductive polymers, and will be characterized further to determine conductivity and the effect of the template on conductivity.

Figure 13. UV-vis Spectra of Mechanochemical PIND-SPS.
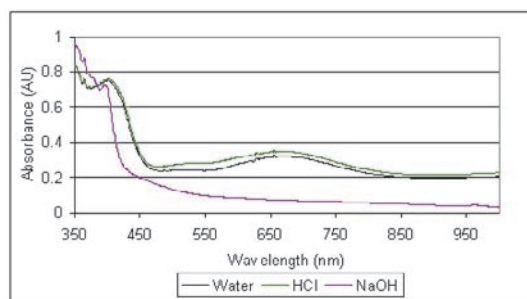
Conclusion. The objectives of this study were all fulfilled during the duration of this project: (1) to establish proficiency working with conductive polymers, (2) to develop and characterize polymeric indole films using Green and Sustainable Chemistry synthesis schemes, and (3) to investigate naturally occurring substances as possible replacements for petroleum-derived templates. My initial investigations into known conductive polymers were very enlightening. I successfully synthesized new complexes with both polyaniline and polyindole, utilizing the mechanochemical synthetic route. Future work should include an evaluation of the oxidizing agents used with the mechanochemical route to conducting polymers, to determine the most benign method of synthesis, optimize the mechanochemical route, and evaluate the environmental impact of different purification procedures. Physical characterizations of the mechanochemical products all indicate great potential for conductivity. These results suggest that Green and Sustainable Chemical Technologies are indeed capable of producing conductive polymers that not only possess identical physical properties to known polymers, but that have significant environmental benefits over known polymers. Such a "Surge of Green" should be welcomed by the field of Conducting Organic Polymers for the benefits it offers for today's products and tomorrow's world.

Literature Cited

(1) "Nobel Lecture: Semiconducting and metallic polymers: The fourth generation of polymeric materials," Heeger, A. J., (2001) Reviews of Modern Physics, 73, 681-699.
. . . .

(2) "Conducting polymer nanocomposites: a brief overview," Gangopadhyay, R. and De, A., (2000) Chem. Mater., 12, 608-622.
. . . .

(3) "Tech Wave 3: Plastic Electronics," Port, O., (2003) Business Week Online, Last accessed 30 January 2006. <http://www.businessweek.com/magazine/content/03_34/b3846625.htm>
. . . .

(4) "In vivo performance of a new biodegradable polyester urethane system used as a nerve guidance channel," Borkenhagen, M., Stoll, R.C., Neuenschwander, P., Suter, U.W., and Aebischer, P., (1998) Biomaterials, 19, 2155-2165.
. . . .

(5) "The Nobel Prize in Chemistry, 2000: Conducting Polymers," Norden, B. and Krutmeijer, E., (2000) Kungl. Vetenskapsakademien, Last accessed 30 January 2006.<http://www.kva.se>.
. . . .

(6) "Mechanochemical Route to Conducting Polymer Polyaniline," Kaner, R. B., Huang, J., Moore, J. A., Acquaye, J. H. (2005) Macromol., 38, 317-321.
. . . .

(7) "Biomimetic synthesis of a water soluble conducting molecular complex of polyaniline and lignosulfonate," Roy, S., Fortier, J.M., Nagarajan, R., Tripathy, S., Kumar, J., Samuelson, L.A., Bruno, F.F., (2002) Biomacromolecules, 3, 937-941.
. . . .

(8) The Merck Index 13th Edition, Copyright 2001-2004 by Merck & Co., Inc., Whitehouse Station, NJ, USA.
. . . .

(9) "Properties of electronically conductive polyaniline: a comparison between some well-known literature data and some recent experimental findings," Lux, F., (1994) Polymer Review, 35, 2915-2936.
. . . .

(10) "Synthesis and characterization of poly(N-heptyl indole)," John, A.; Palaniappan, S., (2005) Polymer, 46, 12037-12039.
. . . .

(11) "Our Common Future," United Nations World Commission on Environment and Development. (1987), Last accessed 30 January 2006. http://www.are.admin.ch/are/en/nachhaltig/international_uno/ unterseite02330/. 24 (3.27).
. . . .

(12) "Biomimetic synthesis of water-soluble conducting copolymers/homopolymers of pyrrole and 3,4-ethylenedioxythiophene," Bruno, F. F.; Fossey, S. A.; Nagarajan, S.; Nagarajan, R.; Kumar, J.; Samuelson, L. A., (2006) Biomacromolecules, 7, 586-589.
. . . .

(13) "Enzymatically Synthesized Conducting Polyaniline," Samuelson, L., (1999) J. Am. Chem. Soc., 121, 71-78.
. . . .

(14) "Formation and redox behavior of polycarbazole prepared by electropolymerization of solid carbazole crystals immobilized on an electrode surface," Inzelt, G., (2003) J. Solid State Electrochem., 7, 503-510.
. . . .

(15) "Structure of polyindoles from anodic coupling of indoles: an electrochemical approach," Zotti, G., Zecchin, S., Schiavon, G., Seraglia, R., Berlin, A., and Canavesi, A. (1994) Chem. Mater., 6, 1742-1748.
. . . .

(16) "Patterning of electrically conductive poly(aniline-co-aniline sulfonic acid) and its application in the immobilization of cytochrome c," Oh, S.Y., Oh, I.S., and Choi, J.W. (2004) Mat. Sci. Eng., C, 24, 307-309.
. . . .

(17) "Polarons, Bipolarons, and Solitons in Conducting Polymers," Street, G. B. and Bredas, J. L., Acc. Chem. Res. (1985) 18, 309-315.
. . . .

(18) Anastas, P.T. and Warner, J.C., Green Chemistry Theory and Practice, Oxford University Press: Oxford (1998).