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Meeting of Minds: Journal of Undergraduate Research is a joint publication of the University of Michigan-Dearborn, the University of Michigan-Flint, and Oakland University.

ABOUT THE MEETING OF MINDS:
JOURNAL OF UNDERGRADUATE RESEARCH

The *Meeting of Minds Journal of Undergraduate Research* specifically designed to offer undergraduate students the opportunity to experience the manuscript submission and review process. Students who participate in the Meeting of Minds Conference are invited to submit a written version of their presentation to the Journal Review Board for publication in the volume which corresponds to the presentation year. The initial volume published in 1998 incorporated submitted papers from the inception of the conference through the past year (i.e., 1993-1998). This volume presents papers from the fourteenth annual conference held at the University of Michigan-Dearborn in May 2006.

The articles in this journal represent the work of undergraduate students, with the assistance from a faculty mentor. The first author(s) is always an undergraduate student(s). The relationship between the mentor and the student is noted by the use of *faculty sponsor*.

This journal represents the culmination of many years of experience in the collaboration process between three undergraduate universities in Michigan. It also represents a strong personal commitment of many individual faculty members to undergraduate research and creative endeavors.

The Meeting of Minds Conference and this journal are a shared responsibility between the University of Michigan-Dearborn, the University of Michigan-Flint, and Oakland University. Each university accepts the responsibility to host the conference and subsequently to publish the journal on a rotating basis. The order of the responsibility follows the subsequent pattern: Oakland University in 2005, the University of Michigan-Dearborn in 2006, and the University of Michigan-Flint in 2007.

Manuscript Guidelines. Students' papers were to be submitted in MS Word for PC or MS Word for Macintosh. The text of all manuscripts was to be no more than 5-7 double-spaced pages typed in 10-12 point font size with one-inch margins. The instructions for preparing the manuscript are provided by the designated editor for a particular volume. Completed "Permission to Publish" and "Faculty Mentor's Approval" forms must also be included with the manuscript. These forms are available to students with the conference registration materials. The Editorial Board reviews submissions for documentation and compliance with manuscript guidelines. The authors are ultimately responsible for the content, information, and any interpretation within the manuscripts. Manuscripts accepted for publication become the property of the Journal Editorial Board. For each of the accepted manuscripts, a single complementary copy of the published journal is given to each author and faculty sponsor. Additional copies may be obtained from the editor at the host institution.

PREFACE

This journal gathers selected works presented at the 14th annual Meeting of Minds conference, which took place on May 19, 2006, on the campus of the University of Michigan-Dearborn. This lively undergraduate forum showcased the research projects of students from the University of Michigan-Dearborn, the University of Michigan-Flint, and Oakland University. The projects captured here—an impressive array representing a wide range of disciplines and methods and topics—are the products of close collaboration between the students and their dedicated faculty mentors. Some projects were traditional academic ones, and some were creative presentations that are hard to capture in the pages of a journal but enriched the live conference with performance and the use of multi-media.

Over 250 participants took part in the conference as both presenters and audience members. Presentations were grouped into themed sessions combining multiple disciplinary perspectives on related topics. This was an opportunity for students to see how different disciplines define and explore problems in uniquely productive ways, and to generate some speculation and communication across disciplinary boundaries. We know this was gratifying for students, because the post-presentation comments were thoughtful and provocative, and because so many of the presenters went on to refine their project reports for publication.

Like the Meeting of Minds conference, this journal celebrates student research—from the inception of a project to the articulation of the findings for a larger audience, applying fresh rhetorical conventions and new insights gained in the aftermath of the conference. We warmly thank the faculty mentors on each campus for shepherding this process as well as the Meeting of Minds coordinators and support staff at the participating campuses. Special thanks are due to my colleagues, Kathleen Moore at Oakland University, Sally Conley and Andre Louis at UM-Flint, as well as to Sue Gedert and Sharie Beard at UM-Dearborn, who managed the conference registration process, planning, and logistics. Sue Gedert was also responsible for the editorial and technical production of the journal.

We invite you to sample the work presented in the following pages. These papers are a window into an exciting undergraduate encounter with the rewards and demands of academic research and with the fruits of intellectual and creative inquiry. We hope you enjoy the results of our students' efforts.

— Sheryl Pearson
Associate Dean
College of Arts, Sciences, and Letters
UM-Dearborn

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DIFFERENCES IN TEACHING: INNER-CITY VS. SUBURB

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Do teachers in the inner-city have different expectations of their students than teachers in the suburbs? Ethnographic studies of the classroom such as one by Kathleen Wilcox in 1982 suggest they do. Wilcox describes education as "primarily a process of cultural transmission." For example, schools in a working class neighborhood have different expectations from their students than schools in a professional neighborhood. These differences in expectations translate into an emphasis on different ways of requiring students to complete class assignments. This difference in strategy better prepares the students for occupations they are likely to take part in in the future. Teachers might require students to complete assignments by working in groups or by working individually depending on the neighborhood setting.

This analysis is part of a larger ethnographic study of two sixth-grade science classrooms one in an urban inner-city, lower class Detroit, Michigan neighborhood and one in a suburban mid-upper middle class Dearborn, Michigan neighborhood. Its conclusions are based on what I observed in the classroom during a five day period. I observed each of the two classrooms five times, on five different days, during the first or second class period. This took place for forty-five minutes between the hours of 7:45 am and 9:00 am at each school. I took notes detailing the teacher's dialogue and the student's actions for the entire class period. I also interviewed the teacher in each classroom. What I found is that the suburban students primarily completed assignments by themselves or individually, whereas the inner-city students primarily completed assignments by working in groups. I also found that suburban students read out of their textbooks often, whereas the inner-city students, who had no updated textbooks, did not read often.
The suburban students did most of their assignments individually. Students did *bellwork*, wrote definitions to scientific terms in their own words, completed worksheets, and made diagrams describing plant stem anatomy—all on their own. *Bellwork* was the first assignment of the day, done individually by students at both schools. On a piece of paper, students answered a question related to a topic that they had been learning or would be learning about in class. An example of a suburban and inner-city school *bellwork* question is *List 3 functions of roots and stem* and *What living things are in our school yard?*

The suburban school teacher gave her students an assignment in which they used their textbooks to verify the definition of a scientific term and then wrote the definition in their own words. She believed that this exercise increased the breadth of the students' science vocabulary. She said that with this activity, "We try to introduce more vocabulary and talk more like scientists." The inner-city school students did not complete such an exercise.

Students at the suburban public school completed a worksheet known as *directed reading sheet* on their own. Answers to the questions on this worksheet could be found in the particular chapter being studied in the textbook. This assignment was aimed at getting students to go over the material in the textbook on their own. The teacher said, "*Directed reading sheets* force them to go

back and read the text (on their own)." The inner-city school students did not do this type of activity.

Another activity that the suburban students completed on their own was of an arts and crafts nature. Students were instructed to draw and label the different anatomical features of a plant stem along with their functions. This was the only art activity out of a total of two that the suburban students were required to do on their own. All activities that involved drawing or art were done as a group by the inner-city students.

The inner-city students did most of their assignments in groups. They did arts and crafts assignments, completed worksheets, and drew food webs of certain animals—all in groups. The suburban school students did only one assignment as a group. This was an arts and crafts assignment in which students were instructed to share each others art supplies to construct their own three dimensional model of a flower.

The first group activity the inner-city students took part in required them to draw everything they saw in a neighboring field. Students were divided into groups of four and an approximately ten square foot of land was assigned to each group for observation and drawing. The drawings were labeled *Habitat Maps* because students were learning about the types of organisms that inhabited the field. Students worked together as they spotted different organisms in the field, but each student was required to turn in his or her own drawing.

When students were completing the worksheet identifying insect body parts, they were guided by the teacher throughout the process. The worksheet was filled out by the class as a group with the teacher giving the students all the correct answers. At first, she would ask the students for the answer to each blank on the worksheet. However, if none of the students raised their hands or gave an incorrect answer, she would provide the class with the correct response.

The food web assignment required students to draw a food web depicting which animal was eaten by whom. The teacher asked everyone to listen as she explained how to make a food web. Before she began to give her instructions she said, "Listen carefully I'm only going to say this once." However, by the end of the class period the teacher had repeated the directions a total of twelve times and guided the students every step of the way. This included giving directions to the class as a whole and providing instructions and explanations one on one to certain students.

The suburban students did more reading exercises as compared to the inner-city students. This included reading from the textbook in class and at home. One of the reasons the teacher made the students read out loud in class was the language barrier some students faced. A large number of students in the class were of Middle Eastern descent. For many the primary language spoken at home was Arabic. Because the teacher thought these students might not be able to read or comprehend the material well if they were told to read it on their own, she had the class read as a group and then she discussed what had been read. She said, "I never assign text material to be read independently…without going over it in class. Usually we read it together in class first." She went on to say that she expects the students to reread the material on their own outside of class. She said, "I always remind my kids that just reading it with me in class is never enough."

In contrast, the inner-city students were never instructed to read in class. The reason for this could be a lack of updated textbooks. The teacher said, "To tell you the truth, the textbooks that we use here…are ten years old." The textbooks given to students at this school were published in

1995. The teacher believed they are so old that they are not worth reading from. This affected the students because they were missing another opportunity to improve their reading skills. To make up for the lack of updated textbooks, the teacher made copies of newer text and handed them out to the students. She said, "I have newer material I give them." However, I never saw the students read this material in class.

On the other hand, the suburban classroom had updated textbooks published in 2005 for each one of its students. "We just got new books here. They (the students) all have a textbook," said the teacher. In fact, she also said that the district was considering allotting two textbooks to each student. The teacher said, "The district wants to assign two textbooks to each student. One book stays at home and one at school. This would help students do their assignment at school even if they forgot their other textbook." If each student is given two textbooks as planned, the student would not have to worry about remembering to bring the text book to and from school. While the suburban school district had enough money to consider assigning two textbooks to each student, the inner-city school district didn't even have enough money to assign one updated textbook to each student. The amount of money spent per student by the Detroit public school district for the 2005-2006 school year was $7,259.00. $8,488.00 were spent per student by the Dearborn school district (MI Dept. of Education 2005). The Dearborn school district spent $1229.00 more per student than the Detroit school district.

The suburban students got more experience completing assignments on their own as compared to the inner-city students. Activities such as formulating definitions to scientific terms in their own words, completing *directed reading sheets*, and drawing plant components all exposed students to working and completing tasks on their own. The lack of money for textbooks puts the inner-city students at a serious disadvantage. While suburban students were going over the material in the chapter two to three times, inner-city students weren't reading much scientific literature at all.

Wilcox would agree that the suburban students are being required to work individually because they are being prepared for different types of future jobs than the inner-city students. The ability to decipher and complete tasks individually is an important part of the jobs requiring higher education that these students are more likely to enter. When inner-city students do most of their class work in groups under extensive guidance and instructions from the teacher, it prepares them to be able to cooperate with each other and to work with guidance and oversight. It does not prepare them for higher education.

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Inhibition and Aging: Evidence from the Stroop Color Naming Task in Adults Aged 18 to 90

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Abstract

Psychological research in aging suggests that older adults may experience declines in inhibitory processes. The Stroop task is among the measures used to study these processes (Stroop, 1935). The present study included data from 190 adults: 67 young adults aged 18-35, 60 aged 60-74 (young-old), and 63 adults aged 75 and older (old-old). The present analysis focuses on two Stroop conditions that measure (1) susceptibility to interference (stating the color for words printed in a different color) and (2) perseveration (stating the color for words when the target response was the suppressed response on the previous trial). Our results indicate a significant difference with old-old adult scores lower for both conditions than the other age groups. The relevance of our data to psychological theories pertaining to inhibition and aging will be highlighted, particularly as these are relevant to adults over 75 years.

Introduction

Since 1988, cognitive aging scientists have examined the viability of the Inhibition Hypothesis to explain various age-related declines in cognitive processes. The Inhibition Hypothesis states that as one ages there is a decline in the ability to suppress non-target information. The inhibitory deficit hypothesis, states that as one ages their ability to inhibit irrelevant information declines (Hasher & Zacks, 1988). In other words, older adults may have more problems suppressing irrelevant information with the activation of this information interfering with higher-order cognitive processes, such as comprehension or reasoning. One type of inhibitory problem pertains to susceptibility to random interference and a second type of inhibitory problem pertains to problems disassociating with information that used to be relevant but must be ignored or suppressed for efficient processing to occur. In contrast, other theories suggest age-related declines in inhibition could be contributed to general slowing of the cognitive processes with age. This general slowing theory suggests that the aging process decreases response time. Thus, it is not a specific area of decline (like inhibitory processing) but a widespread decline in all areas due to the aging process.

The Stroop task is one instrument used to examine inhibition (Stroop, 1935). The Stroop task consists of trials in which the individual is asked to identify the color of the word. The Stroop effect occurs when the response time is longer for trials in which the word and the color the word is presented in is different in comparison to trials that the word and the color of the word are the same. West & Alain (2000) studied the increase in the Stroop effect in older adults and hypothesized that impaired inhibitory processes, rather than general slowing, was responsible for age-related declines in inhibition tasks. Their findings support the theory impaired inhibitory processes affected Stroop performance, rather than age-related slowing (general slowing).

In studies of age related declines in inhibition, negative priming may be the most appropriate indicator of inhibition. Negative priming occurs when the information to be ignored on the prime trial becomes the target response on the next trial. For example, if the word 'yellow' is presented in red ink on the first trail the target response is 'red' and 'yellow' is to be ignored Negative priming occurs when the next trial requires that the participant respond 'yellow' which should be slowed because the participant may still be suppressing that response. Failure to respond correctly or very slow response times reflects interference from previously-relevant information, or perseveration. It is possible that participants actually tag (mentally) the non-response information and that this is problematic when these words (or other information) become the response shortly thereafter (Little & Hartley, 2000).

Hasher et al (1991) studied the carryover effects of negative priming on older adults using a letter-naming task. Subjects were presented with a pair of letters, a distractor and the target, and asked to either name the red or green letter. Negative priming conditions used the distractor letter of previous trials were used as the target letter on the next trial. Results revealed that younger adults had significantly slower response times on the negative priming condition. Hasher et al (1991) attribute the lack of negative priming effect on older adults to the inability of processing the distractor on the prime trial, thus there was no carryover effect to the next trial.

In our study susceptibility to interfering information and perseveration were both measured using the Stroop task. We included the young -old and old-old populations to study age effects in inhibitory processes, with particular emphasis on the performance of the old-old compared to the other two groups. Our hypothesis is that the largest age differences will be associated with the negative priming task, the next largest with the interference task, and the smallest with the color naming task. Specifically, the old-old, 75 years or older, will display the most susceptibility to random interference and perseveration or have the largest effect size (the biggest effect of age on Stroop performance).

Method
Participants
Participants included 190 community dwelling adults. Of these 190 participants, 67 were aged 18-35, 60 aged 60-74, and 63 aged 75 and older. Please see Table 1.

Table 1: Sample Demographics

	Young	Young-Old	Old-Old
Range	18-35	60-74	75+
N	67	60	63
Education	12.81	14.24	13.46
MMSE	29.12	28.12	27.43

Measures

  Stroop Color Naming Task. Participants were asked to identify the color of the word stimulus (red, blue, yellow, green) in three types of trials. The congruent trials consist of identifying the color of the stimulus, which is consistent with the word. For example, the word RED presented in red ink. The incongruent trials consisted of identifying the stimulus when presented in another ink color. For example, the word RED represented in blue ink. The negative priming trials consist of target responses for words that were a distractor on the previous trial.

Results

  We used between subjects' univariate analysis of variance (ANOVA) to compare the young, young-old, and old-old on congruent, incongruent and negative priming Stroop tasks. There was a significant main effect for age groups for all three analyses. Congruent Stroop scores show a medium effect size for age, $F (2, 186) = 7.18$, $p= .001$, $\eta^2= .072$, and large effect sizes for incongruent and negative priming trials $F (2,186) = 70.81$, $p\leq.001$, $\eta^2 = .432$ and $F (2,186) = 61.27$, $p\leq.001$, $\eta^2= .397$ respectively. Post hoc analyses of the mean differences found all of the age group differences at $p < .001$.   An omnibus test, age by total Stroop score was also significant, $F (2,186) = 44.12$, $p<. 001$, with all of the post-hoc comparisons also significant at $p <.001$.

Figure 1: Congruent, Incongruent, and Negative Priming Means by Age Group
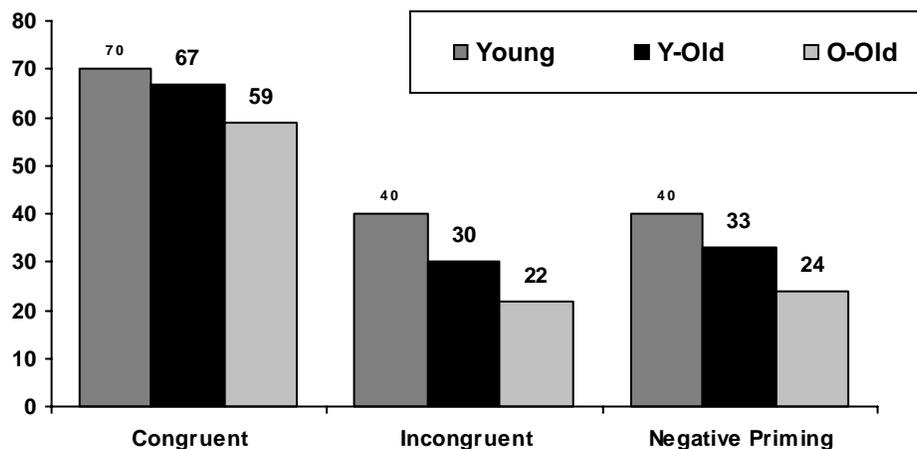
Discussion

  Our results show significant age differences on all three Stroop measures. The age declines across age groups on the congruent trials show a medium effect size, suggesting that general slowing affects responses that do not require any inhibition. A very large effect size was found on incongruent trials that measured interference, with a similar effect size obtained for the negative priming (perseveration) measure. The old-old did significantly worse than both the young and young-old.   We predicted that the old-old adults would perform worse on the negative priming task but this was not supported. The negative priming effect size remains large but

slightly smaller than the incongruent trials that measured random interference. The negative priming task may not have been as large as we expected because it was presented after the interference task, allowing subjects more practice. Another possibility is that the effect of random interference is so substantial that it overshadows the effect of the negative priming, as they may be occurring simultaneously.

In the future, cognitive aging scientists should work on developing better measures of inhibition, with an emphasis on measures that differentiate between random interference and perseveration. Also, including old-old samples in aging research is important, because as our results indicate there is a large decline in performance after 75 years. Many studies have a mean age of 70-72; however, at this age adults appear to be performing at near optimal levels still. This fourth age group indicates that age -related declines become significant in adults 75 and older, as suggested by Baltes (1997).

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"Monkey Business" Among the Great Apes:
An Ethological Observation of Social Relationships of Chimpanzees at the Detroit Zoological Institute

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Abstract

In 1928, the Detroit Zoological Institute (DZI) pioneered open landscapes to exhibit the animals instead of in cages behind bars. The Chimps of Harambee exhibit, which opened in 1989, continued this tradition, offering the public and researchers an opportunity to study chimpanzees in captivity in a more natural setting. The chimpanzee, *Pan troglodytes*, lives in totally social groups consisting of adult males, females, juveniles, and infants. The social group is based on a hierarchy of dominance. This hierarchy and the individual personalities of the chimpanzees have major influences on the transmission of certain behaviors, such as feeding, grooming, and fighting. Dominance is achieved through aggressive and peaceful actions toward others in the group. In 2003, the DZI attempted to form a troop of two male and seven female chimpanzees via gradual and peaceful introductions. Over the next year, aggressive behaviors and illness forced their separation. During the winter 2006 semester, I observed the social behavior of the reintroduced chimpanzees. In this study, I focus on the behavioral strategies of a younger male, Imara, when confronted by older dominant females.

Introduction

Chimpanzees, *Pan troglodytes,* have been used as models for the evolution of human biology and behavior because of many morphologic, physiologic, and genetic similarities (Falk 2000; Relethford 2003). Approximately 5-6 million years ago, a common ancestor of chimps and humans lived in Africa (Relethford 2004), and molecular techniques prove 98% genetic similarity between the species (The Chimpanzee Sequencing and Analysis Consortium 2005). While remote human ancestors may not have resembled any living nonhuman primate, similar problems faced in a particular environment may have lead to similar anatomical and behavioral solutions (Paterson 2001). Studying the similarities and differences between humans and chimpanzees helps to gather insight to the adaptations of human ecological, behavioral, cultural, social, linguistic, and cognitive evolution.

Humans and chimpanzees are sometimes talked about as distance cousins because chimpanzees "look like us, act like us, and even catch many of our diseases" (Falk 2000). By observing wild and captive chimpanzee behavior, primatologists seek to learn about the relationship between their subjects and the following: the environment occupied by the species, the particular way the species exploits the habitat, the social organization of the group, and the anatomy and biomechanics of members of the species (Paterson 2001). The Detroit Zoological Institute (DZI) and the great ape exhibit, Chimps of Harambee, provide the opportunity to study chimpanzees in captivity in a more natural setting (Detroit Zoological Institute et al. 2003).

Since the requirements of surviving in a zoo are different than those in the wild, many behaviors may be affected, such as behavioral patterns may be suppressed, enhanced, or distorted, and this should be considered in the results of the study (Paterson 2001). Additionally, behavior is internalized and interpreted by an observer, a human being, which is also subject to error and bias (e.g. anthropomorphism and anthropocentrism).

This study focuses on the gender relationships of the chimpanzees at the DZI as they are reintegrated back into one troop. The core group of chimpanzees consists of seven females (Beauty, Trixie, Bubbles, Abby, Akati, Tanya, and Chiana) who have been with each other for varying years. The group is dominated by the physically strongest female, Beauty. The two males come from different zoos and have different back grounds. Bahati, who is 21 years old, came from a zoo in Portland, Oregon. Imara, who is 10 years old, came from the Chaffee Zoo in Fresno, California (Table 1).

Table 1 The Detroit Zoological Institute chimpanzee troop

Name	Sex	Birth Date *=estimated	Birth Type	Rearing
Trixie	F	1/1/1970*	Wild Caught	Unknown
Bubbles	F	1/1/1971*	Wild Caught	Unknown
Beauty	F	1/1/1973*	Wild Caught	Unknown
Abby	F	5/16/1983	Captive Born	Mother Raised
Bahati	M	3/13/1984	Wild Caught	Portland, OR
Akati	F	1/20/1987	Captive Born	Hand Raised/Surrogate: Bubbles
Tanya	F	4/8/1991	Captive Born	Mother Raised-Parents: Joe Joe & Trixie
Chiana	F	2/9/1994	Captive Born	Mother Raised-Parents: Joe Joe & Abby
Imara	M	8/18/1995	Captive Born	Fresno, CA

When the original introduction took place in 2003, the DZI had great success. The dominant females, Beauty and Abby, were expected to cause problems in the introduction, especially to Imara. In the past, they have been aggressive and overruling to males or other chimpanzees they do not like. For this reason, introductions were made slowly. The individuals chosen for the initial introduction were carefully selected by the principle keeper of the exhibit, saving the more difficult situation with Beauty and Abby until the end. This proved to help the troop's relationship because Beauty and Abby seen the relationships built between the Bahati, Imara, and the less dominate females. They realized Bahati might possibly become a dominant male. Imara, on the other hand, was always at risk of having troubles with these females because he is young and easily pushed around. Neither Bahati nor Imara were in social situations at their previous locations where they had to defend their dominance or stick up for a fellow male. The females eventually realized Bahati is peaceful and would not defend Imara in a fight.

After approximately a year of peaceful interactions, the females began to gang up on Imara. Several injuries later, Imara was separated from Beauty and Abby. It proved difficult to rotate individuals within the troop and keep Imara separate from the females while maintaining strong relationships with everyone else within the troop. One night without warning, Bahati became extremely sick and was almost paralyzed. After five months of MRI's, CAT scans, spinal taps,

and several immobilizations, the DZI was not sure what caused the illness. It appeared to be a stroke or spinal damage but could have been viral. Imara spent most of his time keeping Bahati company as he recovered. Occasionally, the females would rotate in to see Bahait, and Imara would be with the females. However, Imara was never with Beauty.

Reintroductions too place in early fall 2005. During the winter 2006 semester, I observed the social behavior of the reintroduced chimpanzees. In this study, I focus on the behavioral strategies of a younger male, Imara, when confronted by older dominant females.

Methods and Materials

Study Site

A total of 20 hours of observations were made between January and March 2006 at the Detroit Zoological Institute located in Royal Oak, MI. The observations were made between the hours of 12:00 pm and 3:00 pm when the troop is most active. The indoor enclosure measures 18 ft by 45 ft by 58 ft by 13 ft by 63 ft (Figure 1). A concrete ledge 15 ft from the floor surrounds the exhibit on all sides except the keeper and public observation areas. The total height of the exhibit is 25 ft. Several artificial, concrete trees are within the enclosure. My indoor observation took place from the public observation area. The outdoor area is a little more than two acres. The outdoor exhibit has a varied elevation savanna landscape. The ground was covered with abundant grasses of various lengths and many other wildflowers and plants. Some trees, both real and artificial, are found in the landscape.

58 feet

13 feet

45 feet
(keeper observation area)

63 feet

18 feet
(public observation area)
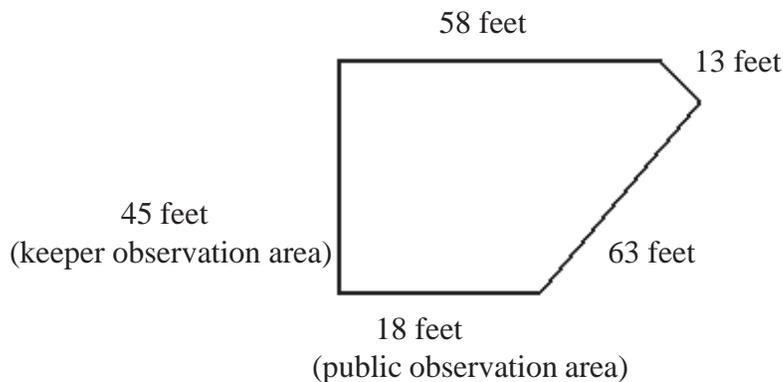
Figure 1 Area of the indoor Chimps of Harambee exhibit at the Detroit Zoological Institute

Ethogram

A behavior inventory was modified from *The Chimpanzoo Observers Guide* (A Program of the Jane Goodall Institute) to categorize the behavior of the primate subject, Imara (Table 2). By categorizing behaviors, the observer will gain knowledge about how the subject acts in the environment, with other individuals, and in solitary.

Table 2 Observed behaviors of Imara

Behavior	Definition
Tanya-present	to show hindquarters to a male to solicit mating
Swing	to travel off ground to another location by grasping a fixed support
Stare	to gaze intently at another chimp
Scream	to sustain a loud shrill vocalization
Scan	to look around at others or environment
Retreat	to rapidly flee a chase by another chimp
Rest	no locomotion occurring regardless of posture
Receive hit	to be slapped, poked, or pushed by another chimp, may occur with a fist
Receive embrace	to have another chimp place one or both arms around the body
Present	to show erect penis to a female to solicit mating
Play	to engage in non-aggressive manner with self, others, or objects
Peaceful	state of harmony among individuals or group
Pace	to repeatedly move from one point to another and back again
Observe public	to look around at spectators
Locomotion	to move from one point to another
Leap	to jump upward or outward having all limbs in the air
Hang	to dangle oneself above the ground by one or more limbs
Groom self	to pick, scratch, or remove debris from hair of oneself
Groom	to pick, scratch, or remove debris from hair of others
Give kiss	to briefly press lips against the body, face, or limbs of another chimp
Give embrace	to place one or both arms around another chimps body
Forage	to actively search for food with hands or mouth
Feed	to place food given by keepers into mouth, chew, and swallow
Eat	to place food not given by keepers into mouth, chew, and swallow
Drink	to open mouth to receive water and swallow
Copulation	to engage in sexual behavior with thrusting motions and genital to genital contact
Cling	to hold with a limb or limbs to any object
Climb	to move upward from one point to another
Chiana-present	to show hindquarters to a male to solicit mating
Chase	to rapidly and aggressively charge another chimp
Bob	to move head up and down
Bipedal locomotion	to move from one point to another upright on two legs
Being kissed	to have another chimp briefly press lips against the body, face, or limbs
Being groomed	to have others pick, scratch, or remove debris from hair
Bark	to produce a short vocalization
Aggressive display	to show energetic force, assault, or encroachment toward self or others

Data Collection and Analysis

   Imara's behaviors were analyzed using focal animal sampling, which is a fixed period of continuous observation on a single individual or small group of individuals. Event behaviors, which are instantaneous or momentary, occur without measurable duration, and can be considered the onset of any behavior, were recorded into a field journal. The frequency of one behavior was divided by the total number of identified behaviors to yield the relative frequencies and the probability of a behavior occurring at a particular time (Paterson 2001).

Results

   Imara was observed to have 36 defined behaviors (Figure 2). Locomotion had the highest relative frequency of 0.25. The second highest was rest recorded at 0.13. The relative frequency of groom self was 0.09 and receive embrace was 0.08. Scan had a relative frequency of 0.07. Groom and Chiana-present was recorded at 0.05 and 0.04 respectively. Forage, bark, receive hit, and stare all had a relative frequencies of 0.03. Being kissed, scream, bob, retreat, and play had relative frequencies of 0.02. The relative frequencies of give embrace and eat was 0.01. Leap, climb, copulation, and feed had relative frequencies of 0.006. Aggressive display and pace was recorded at 0.004. The relative frequencies of swing, being groomed, cling, and chase all were 0.003. The lowest relative frequency of 0.001 was recorded in the behaviors Tanya-present, observe public, give kiss, bipedal locomotion, hang, and drink. Present and Peaceful had no relative frequency (Figure 2).

Figure 2 Relative frequencies of defined behaviors.

Figure 2 Relative frequencies of defined behaviors.
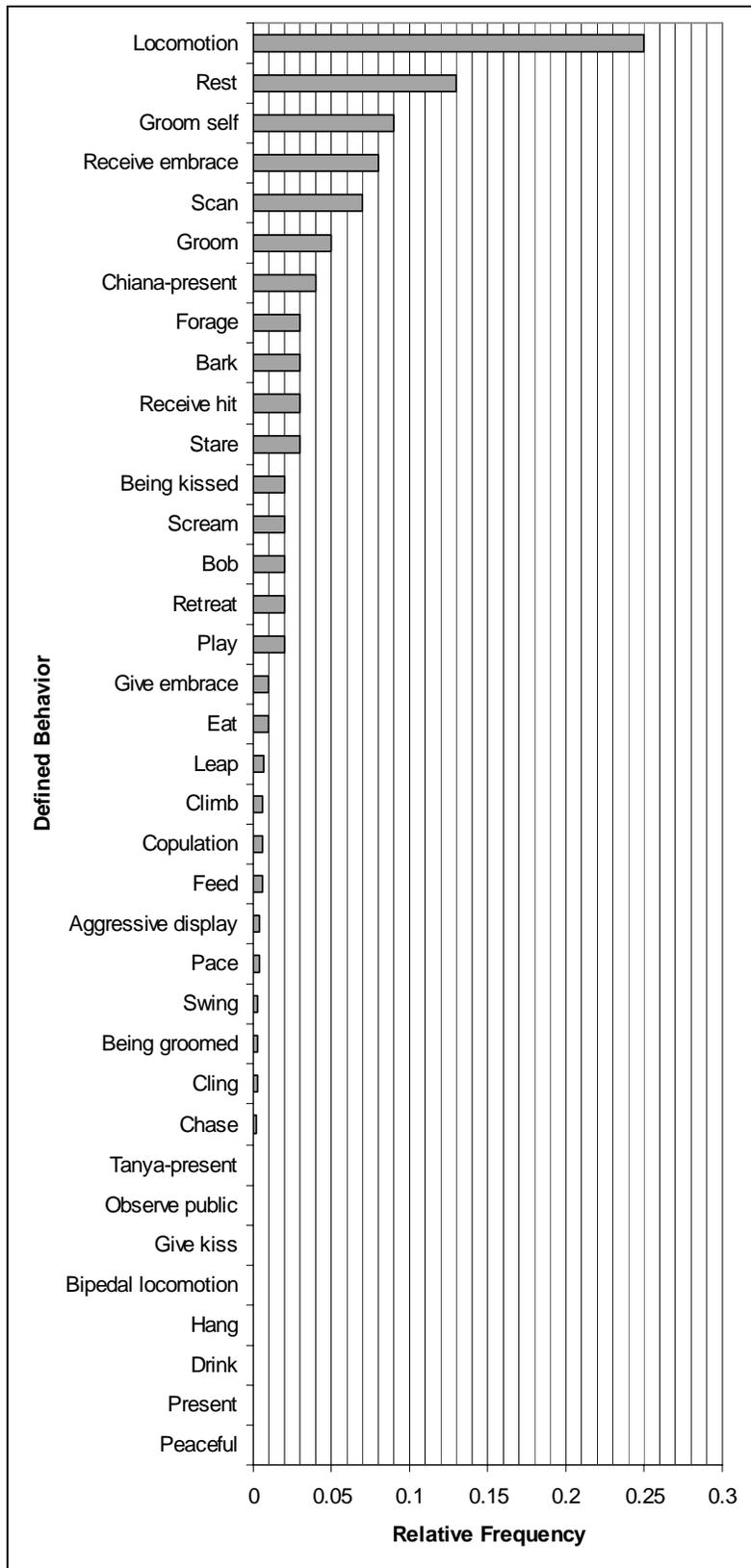
Discussion

Behavior is the actions or reactions of a person or animal in response to external or internal stimuli. Quoting Alexander on the complexity and value of this field of study is important for understanding motives behind this research. "The study of behavior encompasses all of the movements and sensations by which animals and men mediate their relationships with their external environments-physical, biotic, and social. No scientific field is more complex, and none is more central to human problems and aspirations" (Alexander 1975). The study of primate behavior joins individuals from various fields, such as anthropology, psychology, linguists, and zoology, and offers a blending of methods and theories. This approach should be taken in all fields of study to more realistically address questions and discover conclusions.

I must comment on the validity of my research because this is my first professional attempt to study primate behavior. Also, without any inter-observer reliability testing (e.g. do two people see the same thing), I can only conclude with my own perceptions as an observer the dynamic and interactive relationship that is variable in time and space to the observed. The central focus in any ethological study addressed to the level of individuals and

individual behavior attempts to answers "proximal" or "how" questions, while "ultimate" or "why" questions based on evolutionary ideas are better answered if directed to groups, populations, and species (Paterson 2001). With this in mind, I begin with great efforts toward accuracy in summarizing and describing the complex social interactions Imara has faced when confronted by dominant females.

A typical day for Imara is spent in isolation or seclusion from everyone in the troop usually self-grooming, resting, or scanning. Previous research on chimpanzee personality suggests his behavior may be based on genetic inheritability, age, and sex (Weiss et al. 2000; King et al. 2005). I speculate Imara, who is not quite an adult, may have a social phobia (i.e. fear of being observed) because he voluntarily eliminates himself from the group's social interactions (e.g. grooming). Grooming is a highly social activity and strengthens bonds between members of the troop. Imara has been observed grooming only Bahati and Trixie, and both seem very accepting of his company.

I have observed instances when Bahati appears frustrated with Bubbles and aggression toward her leads to a complex chase of Imara. For example, Bubbles will not acknowledge Bahati presenting, and Bahati will begin an aggressive display. After a few minutes of a stand-off between Bahati and Bubbles, Bubbles will look for Imara and chase him. Several occasions resulted in the whole troop joining and chasing Imara. A few of these chases were instigated by Chiana. Chiana, who has copulated with Imara, may be trying to change her position in the troop. It is important to note that Imara has never presented to any of the females, and regularly turns away from them if they proceed in his direction. Female reproductive strategies are difficult to evaluate and have many variables (Nadler et al. 1994; Boesch 1997; Wrangham 1997; Gagneux et al. 1997). Potential research in this field with Chiana may provide clues to female mating patterns. Additionally, with many chimpanzees in zoos being unrelated, apathy or empathy towards others within a troop is difficult to prove (Silk 2005).

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SOME MEASURE OF JUSTICE:
WHAT DOES MARIANA GET OUT OF THIS DEAL?

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In *Measure for Measure*, Mariana is faced with a unique opportunity: she can simultaneously save a man's life, and a woman's chastity. All she has to do is sleep with the man who ruined her life.

Mariana does it. Why?

The Duke believes that although Mariana has been scorned, jilted and ruined, she still is madly in love with Angelo. When introducing his plan of substitution to Isabella, he explains: "This forenamed maid hath yet in her the continuance of her first affection. His unjust unkindness, that in all reason should have quenched her love, hath, like an impediment in the current, made it more violent and unruly (3.1.241-245)."

The Duke's theory of cruelty breeding a wild affection seems decidedly unlikely. Angelo has been incredibly cruel to Mariana. When her brother, and more importantly it seems, her dowry, perished at sea, Angelo was not content to only break off the betrothal. He also spread lies about her, "pretending in her discoveries of dishonor (3.1.229)." Thus, Angelo effectively ruined Mariana's chances for marriage with anybody else. In a society where both virginity and wealth were highly prized, an impoverished woman with a shady reputation didn't have much of a chance.This being the case, it is hard to imagine Mariana cherishing romantic notions about Angelo.

Even if the audience does not question the Duke's assessment of Mariana in Act 3.1, Mariana's actual appearance presents a challenge. When the Duke, disguised as a friar, comes to tell Mariana of his brilliant plot, she is clearly depressed. She looks to the friar to soothe her "brawling discontent (4.1.9)." "Brawling discontent" is hardly crazed affection. She is unhappy with her situation. She is woeful. That her discontent is "brawling," rather than "weeping", suggests that's she's not only sad, she's angry. She sits, with only a young musician for company, and seems ashamed even of taking pleasure from the music. "I cry you mercy, sir, and well could wish you had not found me here so musical. Let me excuse me, and believe me so: my mirth it much displeased, but pleased my woe (4.1.10-13)." Tellingly, she mentions that she has "sat here all day (4.1.19-20)." She has no family, apparently no friends, and no husband. She is utterly bereft. In the course of a song and a few short lines, Shakespeare presents a woman with nothing to lose.

It is in this state of despair that the plot is introduced to Mariana. The audience never sees the conversation she has with Isabella, but when the two women return to the Duke, Mariana has agreed to the plan, if her friar advises it. Shakespeare did not give his audience the argument Isabella made, or the reasons Mariana agreed. Rather, he only shows Mariana's final resolve: "Fear me not (4.1.68)."

She goes for it. She proves to the audience, the world, and herself that Angelo a man who will take a girl's virginity in exchange for legal favors. If ever she doubted he was corrupt, Mariana certainly knows at that point. Angelo clearly thought she was Isabella, and knowing that, there's no way for Mariana to get sentimental.

When the Duke's plan comes together, and Mariana brings her accusation against Angelo, Angelo once again proves how much disdain he has for her. Though she asserts, "This is the body that took away the match from Isabel, and did supply thee at thy garden-house in her imagined person (5.1.206-9)", Angelo refuses to confess, brushes her off, and restates his doubts about her chastity. There is nothing in Mariana's speeches to the Duke to indicate that she loves Angelo. Though she calls him her husband, she also calls him cruel. She publicly reminds him of his two-faced affection for her, and blazes his crimes to the city.

This is what Mariana is offered from the entire plot. It is not a foolish jump for the love she always wanted, rather it is a chance for some measure of justice. Though she cannot get back an untarnished reputation, or an innocent love, she can publicly prove what she is, and what Angelo is, and forever settle the question of who is morally superior. She ruins the man who ruined her, by showing how he ruined himself.

It is surprising that Mariana marries Angelo, knowing what she knows. Though the Duke forces the ceremony for the sake of her chastity, Mariana seems to want to be married for real. Why? She knows Angelo is evil, knows the cruelty he's capable of, and still, she wants him to live. So she can be truly married to him? Does Mariana suddenly get stupid at the end of Act 5?

It certainly depends on production choices, but it can certainly be argued that Mariana does not become stupid, but rather, is remarkably savvy. If Angelo dies, Mariana will once more be a lone woman, largely ignored by society. Though the Duke can assure her wealth, he cannot assure her a good second husband. If Angelo lives, Mariana will be socially secure, with a husband who *owes* her, and cannot question her morality, or her conduct. "I crave no other, nor no better man (5.1.423)," she says. While this could be read as Mariana taking what she can get, or actually being in love with Angelo, it can also be read as her statement that she wants what she knows. Another man, a better man, would not owe her his life, would not be forced to acknowledge her virtue. "They say best men are moulded out of faults, and, for the most, become much more the better for being a little bad. So may my husband (5.1.436-38)." Mariana does not have any illusions about the upright character of the men of her society. She is not waiting for a white knight. She has a man who cannot pretend to be her superior, and who would have to have a lot of nerve to be mean to her. Mariana has a kind of security with Angelo that she couldn't have with anyone else.

This reading is surely not the only possibility. If a production chose to focus on certain lines, Mariana could, in fact, be madly in love with Angelo. It would take some doing, but it's possible. In a reading that renders Mariana more manipulative, it can be noted that she consistently deprives Angelo of what he wants, all through Act 5. He wants his sin covered, she brings it out. He wants to meet the justice of the law, she forces him to accept mercy. He wants to die, she makes sure he lives. Most of all, he doesn't want to be married to her, and she makes sure he is. Mariana's participation in the plot could be read as her ultimate revenge. Her own happiness is a little sacrifice to cause Angelo's complete and utter downfall. Or maybe she's just really easily convinced to participate in crazy schemes. Or a self-sacrificing saint, who will give all to protect others. This deep character, and her participation in a ridiculous plot, holds many possibilities.

ADULT AGE DIFFERENCES IN LETTER AND CATEGORY FLUENCY: NEUROANATOMICAL IMPLICATIONS

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Abstract

People of all ages tend to generate more words when presented with a category (category fluency) than when presented with the initial letter (letter fluency). The present study (N=128) reveals age-related declines in category fluency, $F(2, 125) = 10.197$, $p < .001$ with old-old adults performing worse than the other age groups. In contrast, letter fluency was associated with stability across the life span. This age-related category-letter dissociation may be due to the age-related declines in brain areas recruited across recall tasks with left temporal activity associated with category recall and left frontal activity with letter recall (Capitani, Laiacona, & Basso, 1998). This study augments the cognitive aging literature by including a sizable sample of adults older than 75.

Background

Cognitive Aging and the Fourth Age

Virtually all cognitive processes are subject to the negative consequences of human aging (Backman, Small, Wahlin, & Larsson, 2000). Recent studies of adults after the age of 75 suggest that the rate of decline may increase after that age. Baltes (1997) refers to this part of the life span as the fourth age, with his data suggesting that this is a time when cognitive declines can be precipitous in a noticeable proportion of older adults.

Category and Letter Fluency

Semantic memory is among those processes consistent with a rate change in late life, with no or minimal decline before 75, after which deterioration is gradual in most individuals (Backman et al., 2000). Ability to recall information is often tested through verbal fluency. Among all age groups, there is a lower rate of recall in letter fluency tasks than in category fluency tasks (Rodriguez-Aranda, 2003; Brickman, Paul, Cohen, Williams, MacGregor, Jefferson, Tate, Gunstad, & Gordon, 2005). In addition to this, while letter fluency may remain relatively stable over the lifetime, category fluency tends to decline as age increases (Rodriguez-Aranda, 2003; Brickman et al., 2005).

Frontal Lobe Hypothesis

Some cognitive aging scientists propose that the frontal lobes may be associated with significant age-related deterioration, affecting processes dependent on these neuroanatomical areas (Woodruff-Pak, 1997; Kaszniak & Newman, 2000). Because letter fluency is among the processes dependent on frontal lobe integrity (Lezak, 1995), age-related changes to the frontal lobe may result in letter fluency declines in affected individuals. This dissociation implies that age-related degenerative processes may result in greater declines in frontal lobe processes, such as letter fluency, compared to temporal processes, such as category fluency.

<u>Hypotheses</u>

The current study examined age differences in letter and category fluency. It was hypothesized that a difference in the two tasks will be found, with category fluency scores exceeding letter fluency, yielding a significant main effect of task. In addition, older adults should produce fewer responses overall: a main effect of age group. In addition, it was hypothesized that there will be an age by fluency interaction – with the oldest participants (old-old) producing the lowest scores on the letter fluency task. The latter prediction reflects the frontal lobe hypothesis discussed previously – that aging processes are most deleterious in frontal regions of the brain. It is expected that age groups will not differ on the category task.

Method

Participants

One hundred thirty seven healthy participants between the ages of 18 and 93 participated in this experiment. Participants were grouped by age: young adults aged 18-35 (n = 43); young-old adults aged 65-74 (n = 48) and old-old adults aged 75+ (n = 46). Young participants were recruited through the Psychology subject pool. Participants 65+ were recruited through community organizations throughout Oakland and Macomb Counties in Southeast Michigan. Older participants lived independent in the community and were screened for cognitive and visual impairments. No age differences in education were observed with young adults averaging 13.07 years of education (*SD*=1.24), young-old, 14.27 (*SD* = 2.47), and old-old, 13.76 (*SD*=2.12).

Design & Procedure

Verbal Fluency: Participants were given sixty seconds to generate words that started with a particular letter. Participants generated words for three letters (r, p, w). Counts reflect total number of words generated.

Category Generation: Participants were given sixty seconds to generate words that belonged to a specific category. The categories were "colors," "fruits," "animals," and "towns." Every word generated was counted unless it was a proper name, abbreviation, or a different form of a previously stated word.

Results

The average fluency scores for young, young-old, and old-old were found for both verbal and categorical fluency. These are presented in Figure 1.

Figure 1: *Fluency Means by Age-Group*
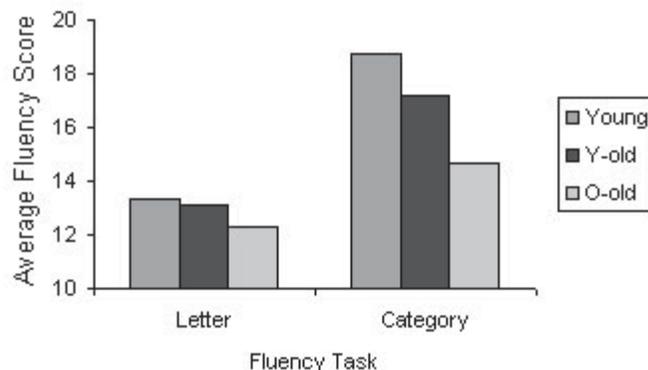
<u>Analysis of Variance</u>

A 2x3 repeated measures analysis of variance (ANOVA) was conducted examining the effects of the fluency task (verbal, categorical) and age group (young, y-old, o-old) on fluency scores. As predicted, there was a significant main effect of fluency task, $F(1, 134) = 140.85$, $p < .001$, with the overall categorical fluency mean ($M=16.81$, $SD= 3.95$) higher than the verbal fluency mean ($M=12.89$, $SD = 4.02$). There was also a significant main effect of age group, $F(2, 134) = 6.84$, $p = .001$. The old-old had fewer responses across both tasks than the young. The fluency by age interaction was significant, $F(2, 134) = 53.27$, $p < .001$. A Bonferroni Post-Hoc analysis was conducted, yielding a significant difference at $p< .05$ for old-old ($M=14.65$, $SD = 3.09$) and the young ($M=18.73$, $SD = 2.99$) on category fluency; and for old-old and young-old ($M = 17.16$, $SD = 4.48$) at $p< .05$ for category fluency (with a mean difference of 2.51). Post-hoc mean differences for letter fluency were not significant.

Discussion

As predicted, all adults produced more responses to the category cue than they did to the initial letter cue. These results replicate earlier findings that people find it easier to generate words for a category than for an initial letter. In addition, old-old adults produced fewer category responses than the young adults and the young-old adults. The age by task interaction obtained reveals that older adults produced disproportionably fewer responses to the category cue than to the letter cue. Even though this outcome is consistent with the more general Fourth Age Hypothesis (Baltes, 1997), it is not consistent with that proposed by the frontal lobe hypothesis.

<u>Neuroanatomical Implications</u>

Old-old adults produced disproportionably fewer responses for the category fluency task than for the letter fluency task. This age by fluency interaction reveals that aging may affect category fluency more than letter fluency. Because previous research suggests that category naming is associated with the left temporal lobe, these results suggest that aging may result in more degeneration in the temporal areas of the brain. Hence, these findings are <u>not consistent</u> with the Frontal Lobe Hypothesis. It is also possible that age-related degenerative changes are similar across both regions but that recruitment processes are more effective in the frontal lobes resulting in reduced behavioral outcomes in those areas (Cabeza, 2002).

<u>Cognitive Aging Implications</u>

Our results highlight two aspects of cognitive aging. First, that precipitous declines may characterize the population of adults older than 75 years of age, as described by Baltes (1997). At present, research pertaining to the nature of and the extent of these declines in old-old adults is scarce, so our results augment this hypothesis. In addition, our findings indicate that, as in adults younger than 75, uniform decline across tasks may not be observed in adults older than 75 years of age.

The second aspect of cognitive aging that is highlighted by these results pertains to the issue of uniformity of age-related neuroanatomical or neurophysiological declines. Our data suggest that temporal areas associated with category fluency may be particularly affected. These results are <u>not consistent</u> with the frontal hypothesis, which proposes that the frontal lobes are affected more by normal age-related degenerative processes.

Previous fMRI research suggests that task difficulty may result in increased recruitment of neighboring neuroanatomical areas, with this research pertaining to frontal tasks (Cabeza, 2002). Taken together, our finding suggest that there are two potential conclusions: (1) that difficult tasks involve some degree of recruitment in adults affected by age-related changes and that recruitment efficiency may be more efficient in left frontal regions than in left temporal regions; OR (2) that age-related degeneration is more characteristic of the temporal than the frontal areas.

Conclusion

In conclusion, our data suggest that there are a number of interesting and unexplored questions in the field of cognitive aging. Among these is the issue of what kinds of changes characterize adults older than 75 years of age – an area of research that could use more attention. In addition, our results highlight the challenge of examining neuroanatomical or neurophysiological decline as it pertains to different areas of the brain. Examining these issues of cognitive aging requires that psychologists use behavioral and imaging approaches and that these studies include samples of adults older than 75 years of age.

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A Time For 'Trans'ition: An Economic Perspective for a Public Health Remedy

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Upon inspection of the ingredient list on many American food products, one can find the words "partially hydrogenated vegetable oil" as a principal ingredient. Most of us are oblivious as to the quantities of these oils in our everyday food products.   This is due in large part to the fact that they are so routinely used to make over 40,000 products in the average grocery chain in the United States, amounting to approximately 40% of the nation's food supply (Severson 1B). Some of the products containing these oils include the following: margarines, butter, all fast food fries, chicken and other deep-fried foods, pancakes, baked goods like cookies, cakes, pie crusts and shortening-based frostings, breads, and doughnuts. With such high prevalence rates of partially hydrogenated oils (PHOs), it is not surprising that most Americans are not avoiding these additives.

The birth of PHOs came with its patent by William Norman in 1903. Norman discovered a hydrogenation process through which he infused healthy liquid vegetable oils with hydrogen atoms to make the resulting fat solid at room temperature, called a trans fat. These extremely inexpensive oils were a blockbuster of the time because they protected against rancidity by extending the shelf life and improving the taste and texture of the foods containing them (Dewey).

The U.S. Food and Drug Administration currently approximates that Americans typically get from between three to thirteen grams day of trans fatty acids in their diets daily (McClellan and Thompson 41444). Dr. Mary Enig, a consultant, clinician, and the Director of the Nutritional Sciences Division of Enig Associates, Inc., Silver Spring, Maryland, has researched that this estimate could be very low. In her interview with Dr. Richard Passwater, Dr. Enig noted that foods including French fried potatoes, cookies, crackers, and doughnuts have averaged about a 45% trans fat composition. In addition, someone who eats a lot of these foods could consume sixty grams of trans fats in one day.

Although this number might seem staggering, the effect of these trans fats is most important in analyzing their dangerous characteristics. The Harvard School of Public Health prefaces these effects of trans fats by first explaining the body's use of low-density lipoproteins (LDL) and high-density lipoproteins (HDL).

[LDL's] carry cholesterol from the liver to the rest of the body. When there is too much LDL cholesterol in the blood, it can be deposited on the walls of the coronary arteries. Because of this, LDL cholesterol is often referred to as the 'bad' cholesterol. [HDL's] carry cholesterol from the blood back to the liver, which processes the cholesterol for elimination from the body. HDL makes it less likely that excess cholesterol in the blood will be deposited in the coronary arteries, which is why HDL cholesterol is often referred to as the 'good' cholesterol. In general, the higher your LDL and the lower your HDL, the greater your risk for atherosclerosis and heart disease.

In their article, "Background and Scientific Review," Harvard researchers, Drs. Ascherio, Stampfer, and Willett quoted a metabolic study from Mensink and Katan to show the connection between trans fats and these lipoproteins. The researchers found that replacement of 10% of energy from mono-unsaturated fat in diets with trans fats caused a 0.34 mmol/L increase in LDL cholesterol and a 0.17 mmol/L decrease in HDL cholesterol. The Harvard professors concluded that with traits like these, it is not a surprise that coronary heart disease became a raging 20th century epidemic.

However, other studies have confirmed that ingestion of trans fat need not be anywhere near sixty grams to do a considerable amount of damage. One of these studies includes the Harvard School of Public Health's Nurses Health Study, performed by Dr. Walter C. Willett. Dr. Willett calculated random trans fat intake through questionnaires filled out by 85,095 women without diagnosed coronary heart disease (CHD), stroke, diabetes, or hypercholesterolemia in 1980. After eight years, Dr. Willett found 431 cases of death from CHD. His study concluded that trans fats were directly related to the increasing cases of CHD in the United States (Harvard School of Public Health). Research since the late 1980s has shown that even a slight increase of only 40 calories from trans fats - about 4 grams - increases a healthy person's risk of heart disease by 93% (Jacobson 20). In 1994, the number of CHD deaths was approximated at 34,000 deaths annually from trans fat consumption. However, in the last decade that number has risen substantially to an area closer to 100,000 (Ascherio, Stampfer, and Willett).

Despite trans fats' detrimental impact on heart health, these toxins also spur other health scares. Dr. Lenore Kohlmeier performed a study of fat cells of 700 women, 300 of whom had breast cancer. He concluded in his analysis of these women that "women who have higher stores of trans fatty acids have a 1.4 times (approximately 55%) higher risk of developing breast cancer" (Dewey). However, research also strongly indicates that trans fats are the culprits in causing "sexual dysfunction, paralysis of the immune system, atherosclerosis [hardening of the arteries], obesity, low-birth weight babies, birth defects, decreased visual acuity, sterility, difficulty in lactation, and problems with bones and tendons" (Fallon and Enig). Dr. Mary Enig sums it up best by stating that, "Your best defense is to avoid [trans fats] like the plague."

The United States Food and Drug Administration finally decided in 2003 to change the nutritional food labels required on all food products after years of petitioning from the Center for Science in the Public Interest. Food manufacturers are now required to declare the amount of trans fatty acids present in foods. The FDA has predicted that this new labeling law, which went into effect on January 1st, 2006, will save between 240 to 480 deaths a year (Jacobson 1).

While many state that this ruling is a victory for consumers, it contains many glaring glitches that most Americans may not fully understand. In an attempt to make the American food supply safer, the FDA has created a false sense of security in regards to trans fats. This open trap contains three loopholes that, if not properly addressed, could continue to wreak financial havoc for our nation's healthcare system. The first is that trans fats will not have a percentage daily value associated with their prevalence in the product itself. The Nutrition Policy Director at the Center for Science in the Public Interest, Margo Wootan, confirms that "The new labels will let consumers compare trans fat content from product to product and that will be a great step forward. It will be hard, though, for people to tell if a given number of grams of trans fat is a lot or a little. Five grams may not seem like a lot, but it is" (qtd. in Corcoran). This is an inherent problem in the United States, which does not widely use the metric system, yet uses that same system to measure the ingredients you put into your body. Without the percentage daily value, the number of grams given is almost as useless as the trans fats they measure. In addition, Pat Martin, a Democrat for the Winnipeg Centre in Canada, addressed this labeling error in his 2004 speech to Parliament. He stated that "there is the added problem that even if a product does say it contains 3.6 grams of partially hydrogenated oil, there are no editorial comments allowed on the label because the only really valuable label in terms of trans fats would be, 'This product contains trans fats. Do not eat it because it will kill you.' We are not likely to see that type of labeling introduced." Martin also stated that 70% of consumers never read labels anyway. He suggests that labeling is not the way to reach uninformed consumers.

The second error of the labeling law is that it doesn't even apply to restaurants. This is very serious because adults consume about 38% of their total fat intake from restaurants (Jacobson 2). In addition, children eat 40% of their meals in fast food restaurants (Severson). With more and more Americans not cooking what they put in their own mouths, the Dietary Guidelines Advisory Committee (DGAC) strongly advised in 2004 that people should consume 1 percent or less, or less than 2 grams of their calories from trans fat daily. However, this task is virtually impossible. Even just one small bag of McDonald's fries cooked in partially hydrogenated oils has 3.4 grams of trans fat, about a day- and-a-half's worth of trans fats (Cronin). The New England Journal of Medicine also concluded that

> [Labels] are not enough. Many fast foods contain high levels of trans fatty acids, are exempt from labeling regulations, and can even be advertised as cholesterol-free and cooked in vegetable oil. For example, the consumption of one doughnut at breakfast (3.2 g of trans fatty acids) and a large order of French fries at lunch (6.8 g of trans fatty acids) adds 10 g of trans fatty acids to one's diet and represents 5 percent of the total energy intake on an 1800-calorie diet, and neither product needs to be labeled (Ascherio, Stampfer, Willett).

Clearly the exemption of restaurants from the labeling law is more than just a technicality; it undercuts the entire purpose of the labeling law on a major scale.

Perhaps the most serious lapse in the trans fat labeling issue is the deception raised by Eric Armstrong in his online posting. The trans fats labels will only indicate the amount of trans fats

for amounts in excess of 0.5 grams. Armstrong details that the percentages on food labels are based on the manufacturer's description of the standard serving size, which can vary greatly. He states that

> manufacturers can play with the standard serving size (making it half a candy bar for example), and as long as that number comes in at less than 20 calories [from trans fats out of a 2000 calorie diet], it's less than 1%. Apparently, the law allows a company to claim 0% in that case. So '0% trans fat' does *not* mean 'no trans fat.' It means that, at 9 calories per gram, the 'standard serving' could still contain slightly less than 2.2 grams of trans fat (2.2 grams x 9 calories per gram = 19.8 calories). Since partially hydrogenated oils are 50% trans fat, a 'standard serving' could have as much of 4.4 grams of partially hydrogenated oils, and still claim '0% trans fat.' Clearly, that kind of labeling is of no value whatever to the conscientious consumer.

Cindy Moore, the director of nutrition therapy at the Cleveland Clinic Foundation, offered an extension to Armstrong's argument to consumers in an article she wrote in 2003 for FDA Consumer magazine. According to Moore, "Because manufacturers will be permitted to indicate zero grams of trans fats if the product has less than 0.5 grams per serving, consumers may see labels that indicate 'trans-fat-free' but won't necessarily know if the product contains some trans fats or none at all. Someone who eats multiple servings of a 'trans-fat-free' labeled product ... could still ingest a considerable amount of trans-fatty acids without being aware of it" (qtd. in Jennings). Moore explains that eight servings of a food with 0.5 grams of trans fats will have the same health effect as one serving of food with four grams of trans fats. It is just this logic for which many critics of the law have chastised the U.S. government, calling it a contradiction of the 403(q)(1) food labeling law that states the amounts of nutrients of public health significance are required to be listed, regardless of the amount (Joseph 10).

With all the weaknesses in the issue of trans fat labeling, it is increasingly apparent that labels alone will not suffice to warn Americans about the unsuspecting dangers of trans fats. With a proposed ban on trans fats, there would be a reduction in the number of deaths from coronary heart disease alone of at least 23,000 annually, with as many as 100,000 lives saved possible (Jacobson 12). The American Heart Association states that there were 494,382 deaths in 2002 resulting from coronary heart disease. With a possible 100,000 reduction to that number from a trans fat ban, there would be a substantial decrease of 20% in the number of CHD deaths. Dr. Michael Jacobson states in his ban-trans-fat petition to the FDA that

> the FDA estimated the cumulative total of the benefits of its labeling rule over 20 years at $13.1 billion to $26.8 billion. The benefits of our proposed ban on partially hydrogenated oils appear to be about 47 times the benefits of the FDA's trans-labeling rule. Thus, a simple extrapolation indicates that the discounted cumulative dollar value (over 20 years) of the benefits of such a ban would save from $616 billion to $1.260 trillion in medical costs, lost productivity and pain and suffering.

With this economical approach, one must always be cognizant of the costs (both direct and indirect) and benefits of any public policy decision – namely, the externalities, or harm imposed on non-consenting third parties. When a consumer purchases a fast food item, she is incrementally increasing her risk of certain diseases. This might be realized as a negative externality to her employer, who must now pay higher health care costs in addition to absorbing that worker's lost productivity. If we were to imagine this worker being employed by one of these same fast food establishments that she herself patronizes, is the company really better off? The company would like to think so; otherwise, they would not use these cheap, unhealthy oils in the first place. An analysis of the costs even further however could bring about an economic trade issue, as in the case of Denmark. Jacobson writes that the Danish Veterinary and Food Administration made an official ban of trans fats on January 1st, 2004 (10). However, special interest groups have since claimed the move is causing unforeseen trade barriers with nations that do not ban the artificial oil. The same problem is brewing between Canada and the United States. The North American Free Trade Agreement (NAFTA) prohibits Canada from banning the use of trans fat unless the U.S. does the same (US-Canada Consultat).

It is clear that the FDA has contradicted its own nutritional labeling requirements. Thus the organization has put in jeopardy many thousands of American lives with artificial fats that ". . . will not be touched by molds, insects, or rodents" (Roubos). Americans should avoid them at all costs through a boycott on these products containing partially hydrogenated oils.   As Pat Martin suggests, "We have doctors telling us that they have 10 year old and 12 year old children coming to their offices with high cholesterol and clogged arteries. Surely, a child's circulatory system at that age should be completely clean and functioning perfectly." It is time for the FDA to finally recognize that trans fats from partially hydrogenated oils should not be "generally recognized as safe" under the Federal Food, Drug, and Cosmetic Act (FFDCA) and ban this most harmful toxin (Jacobson 25).

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THE ARTISTRY OF ROBERT LOWELL

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The work of Robert Lowell is frequently associated with the model of confessional poetry. While Lowell's poems do contain some elements inspired by personal experience, the work of Robert Lowell "is the result not of accuracy but the illusion of accuracy," poetry intended to mimic reality for the purpose of some type of unearthing (Bidart). Lowell's poems are not "'intended to be revelatory' but to be exploratory," and poems such as "Memories of West Street and Lepke", "Man and Wife", and "To Speak of Woe That Is in Marriage" exemplify the artistry of Robert Lowell that is commonly mistaken for confession (Travisano 44). These poems not only challenge the confessional label through movement but also through the artistry employed, illustrated through the changing voice and illusion of autobiographical representation for the purpose of aesthetic effect, not confession.

Confessional poetry, as defined by Diane Middlebrook, has clearly defined characteristics and a distinctive voice that is understood to be the voice of the poet himself.

> [Confessional poetry] investigates the pressures on the family as an institution regulating middle-class private life, primarily through the mother. Its principle themes are divorce, sexual infidelity, childhood neglect, and the mental disorders that follow from deep emotional wounds received early in life. A confessional poem contains the first-person speaker, "I", and always seems to refer to a real person in whose actual life real episodes have occurred that cause actual pain, all represented in the poem. (Travisano, 39-40)

While Lowell's poems frequently deal with such subject matter, the first person "I" is not necessarily representative of Lowell himself. The inspiration drawn from real life events creates "the illusion that the poem is not art but a report on life, that the reader is getting 'the real Robert Lowell'" (Bidart).

The opening of "Memories of West Street and Lepke" seems to be a direct depiction of the genuine daily life of Robert Lowell. Beginning the poem with the illusion of a commentary on the actual life of the poet himself allows Lowell to lay the foundation for regression into a half-invented past, without compromising the appearance of truth, in order to explore a simulated personal history in relationship to the larger political and social movements of the time.

> These are the tranquillized *Fifties*,
> and I am forty. Ought I to regret my seedtime?
> I was a fire-breathing Catholic C.O.,
> and I made my manic statement,
> telling off the state and president, and then
> sat waiting sentence in the bull pen
> beside a Negro boy with curlicues
> of marijuana in his hair. (12-19)

The placement of seemingly personal details within the poem creates verisimilitude and "inject new life" into the poem, allowing Lowell's commentary to posses an air of authority and authenticity (Yezzi).

The poem fluidly moves not only through time but also space. Without a tonal shift, the reader moves out of the time spent "waiting sentence in the bull pen" into the midst of the prison sentence itself (17).

> I was so out of things, I'd never heard
> of the Jehovah's Witnesses.
> "Are you a C.O.?" I asked a fellow jailbird.
> "No," he answered, "I'm a J.W."
> He taught me the "hospital truck,"
> and pointed out the T-shirted back
> of *Murder Incorporated's* Czar Lepke,
> there piling towels on a rack,
> or dawdling off to his little segregated cell full
> of things forbidden the common man. (34-43)

Realism, provided through dialogue, disguises the social commentary contained within the lines of the poem as confession. Because of Lowell's careful representation of reality in the beginning of the poem, the subsequent presentation of events is perceived as truth.
The focus of the passage is not to confide feelings of responsibility for the imprisonment but to call attention to Lowell's perceived hypocrisy of the justice system during the 1950's. Refusal to kill for one's country is considered more of a crime than cold-blooded murder, evidenced by the luxuries Lepke is afforded that the speaker is denied.

Like "Memories of West Street and Lepke", "Man and Wife" challenges the confessional label through the presentation of an allegedly realistic account coupled with unrelenting motion from start to finish. Because "the confessional model carries strong connotations of hierarchy and stasis," the action taking place within the poem should be fixed in time and space in order to accurately be categorized as a confessional poem (Travisano 57). However, "Man and Wife" shifts both temporally and spatially from start to finish. In the opening of the poem, the reader finds the couple in the bedroom, lying in a state of drug-induced motionlessness as life goes on around them.

> Tamed by *Miltown*, we lie on Mother's bed;
> the rising sun in war paint dyes us red;
> in the broad daylight her gilded bed-posts shine,
> abandoned, almost Dionysian.
> At last the trees are green on Marlborough Street.
> blossoms on our magnolia ignite
> the morning with their murderous five days' white. (1-7)

The action taking place between the couple is conveyed through the world around them, and the harsh description of the external world reflects the battle occurring internally between the two characters of the poem. The sun is dressed for battle, and the white of the magnolia blossoms have lost their innocence, paralleling the hostility and loss of love present in the bedroom scene. The external movement in the beginning of the poem gives the reader an indication that something has occurred to change the dynamic of the relationship from one of intimacy to hostility.

The poem continues to move, although the focus of the action shifts from the external world to the internal mind of the speaker.

> All night I've held your hand,
> as if you had
> a fourth time faced the kingdom of the mad-
> its hackneyed speech, its homicidal eye-
> and dragged me home alive. . . . (8-12)

He realizes that she has saved him from himself but seems to have no emotional response to her sacrifice. Despite the fact that the couple is physically close, they are holding hands, there is an emotional distance between them which seems to be the result of the mans repeated episodes of madness. His acknowledgement of her as his savior does not elicit a response of remorse or guilt but propels him back in time through "the partial recovery of a half-forgotten memory" (Travisano 51)

> you were in your twenties, and I,
> once hand on glass
> and heart in mouth,
> outdrank the Rahvs in the heat
> of Greenwich Village, fainting at your feet- (14-18)

The introduction of the memory not only provides further evidence that a drastic change has occurred within the relationship but also serves "as [a] window onto wide-ranging moments across times, cultures, and versions of the self" (Travisano 58). The flashback allows the reader to see the man in another place and time when he was on the verge of falling in love, as opposed to, the verge of insanity. The contrast of the man that was to the man that is demonstrates that there has been a change, illustrated through the movement from present to past and back to the present again, leading up to the thematic significance of the poem as a whole.

The reader is thrust out of the memory when the man was "too boiled and shy/and poker-faced to make a pass" into his present state of despair (19-20). The promise of what the relationship might hold, as conveyed through the memory, is lost, and the implied war suggested through the images of nature in the beginning of the poem is confirmed.

> Now twelve years later, you turn your back.
> Sleepless, you hold
> your pillow to your hollows like a child;
> your old-fashioned tirade-
> loving, rapid, merciless-
> breaks like the Atlantic Ocean on my head. (23-28)

The hostility of the external environment in the beginning of the poem is explicitly stated in the return to the bedroom scene. The return to the present completes the movement of the poem, resulting in a revelation of the larger thematic significance that is the human experience.

In addition to the artistic technique of the manipulation of time and realistic detail, Lowell offers further support of perceived authenticity masking artistry through the management of voice. Lowell presents a female first person speaker in "To Speak of Woe That Is in Marriage," contradicting Middlebrook's assertion that "a confessional poem contains the first-person speaker, "I", and always seems to refer to a real person in whose actual life real episodes have occurred that cause actual pain, all represented in the poem" (Travisano 39-40). According to this definition of confessionalism, "To Speak of Woe That Is in Marriage" does not fit the criteria of a confessional poem. The "I" of the poem is clearly not Lowell, and the implied pain as a result of what is occurring in the poem does not belong to Lowell. While the subject of the poem may fit Middlebrook's criteria for a confessional work, the use of a female speaker illustrates artistry in action as Lowell utilizes experimentation of voice to move away from the "public, prophetic stance" of earlier his writing (Hendley).

'To Speak of Woe That Is in Marriage" does not rely on the "incorporation of guilty personal detail for emotional effect" but rather provides details of a dysfunctional marriage in order to provide commentary on the destructive nature of personal relationships. Lowell's examination of domestic relationships through the voice of a woman is a technique of invention that allows him to safely uphold the idea that "men's and women's roles and prerogatives are radically different," criticizing the reality of gender roles in the 1950's and 1960's (Hendley). The handling of voice serves as a medium for social commentary and allows Lowell to project his "illusion of honesty with seriousness and responsibility" (Yezzi).

Although the work of Robert Lowell is often categorized as confessional, the realism contained within the poems is no more than an "artful simulation of reality" for the purpose of aesthetic effect (Yezzi). Throughout the later poems of Robert Lowell, "'there's a good deal of tinkering with fact'," resulting in an artistic feat that is often mistaken for a form of disclosure but is really an incredible accomplishment of creativity and invention (Yezzi).

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WHEN THE SAINTS GO MARCHING OUT:
CONTROVERSY OVER TRADITIONAL AND CONTEMPORARY SYMBOLISM WITHIN THE CATHOLIC CHURCH

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Religion is a unique institution that affects our lives on a daily basis. It is present in the media, politics, museums, and our own communities. While anthropologists have proposed numerous definitions of religion, I offer the one Morton Klass proposes in his book Ordered Universes: Approaches to the Anthropology of Religion:

> Religion in a given society will be that instituted process of interaction among the members of
> that society – and between them and the universe at large as they conceive
> it to be constituted –which provides them with meaning, coherence,
> direction, unity, easement, and whatever
> degree of control over events they perceive as possible. (Klass: 38)

One way that religion provides the members of society with these elements is through material culture. Material culture is the tangible phenomena of a human group incorporating portable objects, fixed structures, and landscape features (Material Culture). When examining material culture, it is important to analyze not only the object itself but also the context in which it is used. In religion, paintings, statues, masks, altars, and other objects assist in enhancing an individual's and the community's religious experience.

In this paper I examine the controversy regarding the material culture of the post-Vatican II Roman Catholic faith. In order to understand the impact of material culture on how Roman Catholics conceptualize God, I have selected two settings, one contemporary and one traditional. My research methods include participant observation and interviews with the priests and members of both congregations.

The churches are located in Wyandotte and Riverview, two suburbs of Detroit, within an area commonly known as "Downriver." The two cities are very similar; in fact Riverview began as part of Wyandotte and was not chartered as a city until 1959. The populations of Wyandotte and Riverview are 28,006 and 13,272 respectively, and both are approximately 5 square miles and have populations that are 96% Caucasian and predominantly Christian.

In 1959, Pope John XXIII surprised the world by announcing his intention to summon an ecumenical council of the Catholic Church. The purpose, stated by Pope John, was "to increase the fervour and energy of Catholics, to serve the needs of Christian people, and to update the code of cannon law (Huebsch 1: 53)." After three years of preparation the council opened on Oct. 12, 1962 with about 2,500 participants and many non-Catholic observers.

In 1963, Pope John XXIII died and Paul VI was elected the next pope. Paul had been a leading progressive in the first session of the council. After his election, he reconvened the council and guided it to its conclusion. The council met four times from 1962 to 1965 and released sixteen documents: four constitutions, nine decrees and three declarations. These documents instituted many fundamental changes in the Roman Catholic Church. Some of the most notable include: saying Mass in the vernacular, participation by the laity in the Mass, a renewed focus on the Sacrament of Holy Communion, and renewed measures to promote and cultivate interfaith relationships.

Moreover, the Second Vatican Council significantly altered how symbolism, architecture, and the imagery of saints could be utilized within the Roman Catholic Church. Changes were made that include: moving the altar away from the wall so that Mass may be offered with the priest facing the people, making the seats of the ministers and the lectern clearly visible to the congregation, and doing away with lavish displays of imagery in favor of materials displaying simple dignity.

The document that had the most effect on the imagery of saints, along with furnishings and architecture, was the *Sacrosanctum Concilium,* or The Constitution on the Sacred Liturgy. The seventh chapter of the Constitution on the Sacred Liturgy focuses on Sacred Art and Furnishings and maintains that the Church "has a long tradition of appreciating and incorporating fine arts into worship spaces because by their very nature such works give praise to God" (Huebsch 2: 117). However, the Church also maintains that while "placing sacred images may be continued, … their number should be moderate and their relative placement in right order," (Huebsch 2: 118) "for otherwise they may create confusion among the Christian people and foster devotion of doubtful orthodoxy" (Documents).

Revisions are also called for in the matters of "ecclesiastical statues which govern the provision of material things involved in sacred worship" and church architecture. In particular, "laws which seem less suited for the reformed liturgy are to be brought into harmony with it, or else abolished; and any which are helpful are to be retained if already in use, or introduced where they are lacking" (Documents). In terms of material culture, these revisions simply mean that the architecture of new churches may be more contemporary and it is important that statues and images not take away from the rites of the Liturgy.

This cultural change within the Church caused considerable controversy and turmoil. The change was especially hard for those who grew up before 1960. They had been taught that the practices of the Catholic Church were universal and irrevocable, that Protestants were the enemy, and that partaking in communion was a bi-yearly, not a weekly, event. Nevertheless, the Church was changing; the laity were required to participate in Mass, interfaith relationships were encouraged, and the Sacrament of Holy Communion became the focus of Mass. Moreover, up until the Second Vatican Council, the religious life of the laity centered on events and devotions outside of Mass: including the devotion to the saints, the Rosary, the litany of the Sacred Heart, prayer vigils, and a variety of other religious ceremonies. After Vatican II, many of these events were discouraged in favor of a renewed focus on the Mass itself.

What follows is a description of two churches that exemplify the conflict following Vatican II. St. Patrick Church is filled with traditional Roman Catholic material culture, while St. Cyprian Church has architecture and material culture that is more contemporary. The discussions focus on how the imagery of saints, religious symbols, and architecture affect Mass, prayer, and how individual parishioners conceptualize and interact with God.

St. Patrick Church of Wyandotte, Michigan is a beautiful and traditional church that was built in 1873. The high bell tower is visible from a few blocks away and there are gothic arches framing the windows and the entranceway. Inside, you are surrounded by exquisite imagery. Upon entering the narthex, or gathering area, one sees copies of Irish prayers framed and hung on the wall and large statues of St. John the Baptist and St. Therese. When one enters the church itself, the eyes are immediately drawn past the rows of wooden pews and brilliant stained glass windows to the altar and, more specifically, to an enormous mural that adorns the upper wall and ceiling. The mural is a traditional depiction of heaven with Jesus seated at the right hand of God the Father. God is portrayed as an old man with long gray flowing hair and an equally long beard. The depiction of Jesus is traditional, with shoulder length brown hair and a full brown beard. Both are dressed in purple and gold colored robes. Above them floats a lone dove representing the Holy Spirit; below them are the disciples and St. Patrick standing or kneeling before them on fluffy, white clouds. The entire mural is set against a deep blue night sky filled with bright yellow stars. Below the painting and against the wall is the original altar, used prior to Vatican II. Raised up three steps, this altar is made of intricately carved marble and adorned with gold leaf. On either side of the altar, on marble pedestals, is a statue of a kneeling angel.

Set below the original altar, but still raised two steps from the congregation, is the altar used today. It is much smaller than the original altar and is made of wood instead of marble. To its left is the lectern and to its right the sedilla, or priest's chair, both also made of wood. On either side of the altar, set apart by large columns and framed with gothic arches, are two statuary areas. The one to the left of the altar houses Mary with arms stretched out and palms raised, welcoming the congregation. To the right is Jesus of the Sacred Heart, a statue that calls to mind Jesus' love for his people and their love for each other.

Two steps down from the altar is the main floor of the church with an alcove on either side. The alcove to the left contains the vigil candles for prayer and a statue of Joseph holding the baby Jesus: while the alcove to the right contains the confessional. Above the confessional are a large crucifix and a statue of St. Patrick, who is revered for his forty years of missionary work in Ireland.
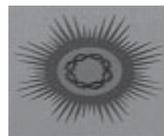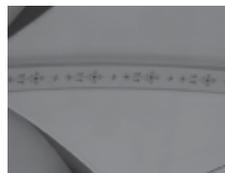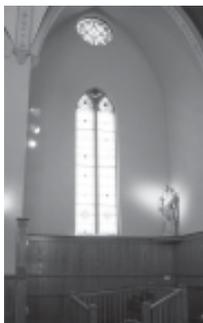
The ceiling of the church is adorned with a series of gothic arches. Each arch is decorated with shamrock, which St. Patrick used to symbolize the Holy Trinity, and between each arch, painted on the ceiling, are twelve saints. Down the middle of the ceiling, directly above the aisle, are sunbursts containing various Christian symbols. Lining the walls are intricately carved stone statues set in elaborate wooden frames, which depict the fourteen Stations of the Cross. Each of the stations represents a stage of Jesus' Passion and death.

I spoke with the priest at St. Patrick Church, Father Raymond Lewandowski, to examine how these images affected his faith, his prayer, and his personal ideas about God. Father Ray believes that the images displayed in his church help to strengthen his faith, guide his prayer, and enhance the messages in both the readings and his sermons. During the Lenten season, he often refers his parishioners to the statues of the Stations of the Cross to remind them of how Christ died for their sins. According to Father Ray "the wooden altar and furnishings provide a feeling of warmth and assist in welcoming people into the church." The statues and the original altar help to focus attention on the new altar. Moreover, the mural of heaven is referenced during funerals to celebrate the soul's journey into heaven and personally reminds Father Ray that "Jesus is welcoming me into the church and into the kingdom of heaven." However, Father Ray also recognizes that images such as the mural can distract people's attention away from the altar, but for the most part he believes that they are more beneficial then detrimental.

In his own personal reflection and prayer, Father Ray finds that the images in the church call to mind the messages of God and depending on the subject of his prayer he will pray to specific saints as well as to God for guidance. Furthermore, he believes that his personal style of ministry is "more conducive to the old style of worship." The parishioners of St. Patrick's that I talked to agreed. Most feel that the material culture gives them a point of reference or focus for their prayer and their faith. Some would even prefer going back to the pre-Vatican II style of Mass.

St. Cyprian Church utilizes imagery and architecture in a very different, but equally effective way. Built in Riverview, Michigan in 1956, this church was originally constructed as a temporary worship space and was ultimately intended as a gymnasium for the school. As time passed and the landscape of the Catholic Church began to change, parishioners decided that a more traditional and elaborate worship place was not necessary and the temporary worship space became the primary one.

While symbolic displays are not as lavish as those at St. Patrick's, St. Cyprian's is certainly not lacking in imagery. Upon entering the church, you are greeted by a large statue of St. Cyprian set against a background of stained glass and surrounded by beautiful plants. St. Cyprian, often called the African Pope, is known for his missionary work with Africans and is believed to be the first African bishop to suffer martyrdom in the name of the Catholic faith.
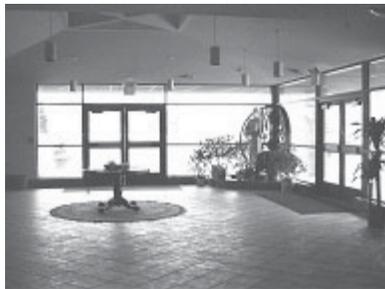
As you leave the gathering area and enter the church, the focus is clearly the altar. As you begin to walk down the main aisle you instantly encounter a shallow baptismal pool large enough, however, to accommodate a full-grown man. Decorative tiles, depicting fish swimming in the ocean, adorn both the inside and outside of the pool. It is used for baptism and is placed near the entrance of the church because it is through baptism that one becomes a member of the church and ultimately enters the kingdom of God.

Once past the pool, one immediately notices that this church is not like traditional churches. The wooden pews are arranged in a in a semi-circle around the altar and the floors are carpeted. There is very little decoration surrounding the altar in this church; only a simple wooden cross and some flower pots containing either sand or cacti, which represents Jesus' time in the desert during the season of Lent. The pedella, or altar platform, is raised three steps. The altar itself is a long, wooden, rectangular table and its base is decorated with metal crosses. Above the altar on the wall is a large metal cross, decorated on each end with large pieces of stained glass. During mass the processional crucifix is carried down the aisle and is mounted in the center of this cross for all to see. To the left of the altar is the lectern and toward the back of the pedella, near the wall, is the sedilla. Both the lectern and sedilla are made of wood.

Against the back wall of the church there are stained glass windows, all depicting vines and branches representative of Jesus' teaching that believers derive life and fruitfulness from Christ. In front of each window there is a wooden pedestal, atop which is mounted a small wooden carving. Each of these simple carvings represents one of the Stations of the Cross.

Until 1998, the church only had one small statue set against the far left wall of the church. Now, there are four statuary areas. The members themselves voted on the specific shrines to be displayed. They chose a statue of St. Elizabeth - known for founding the first public Catholic school in the United States, a statue of St. Therese – a young girl known for her "little way" a way of life that relied on small daily sacrifices instead of great deeds, a portrait of the Venerable Solanus Casey - a local man in the first stages of sainthood who is known for his work with the poor, and finally the Holy Couple – a unique statue of Jesus and Mary embracing one another. Surrounding each of the shrines are vigil candles. Interestingly enough, there is no image or picture of God in St. Cyprian Church as there is in the mural of St. Patrick Church.

Father William Promesso is the priest at St. Cyprian Church. Talking with him, I found that images were not important to his faith or to how he views God. In fact, in many situations he finds that they are a distraction. Father Bill sees his work as more conceptual and as such, does not require images. Overall, Father Bill feels that when it comes to imagery in the Church: "Less is more." By not having elaborate displays of imagery Father Bill feels that the focus is drawn to the proper places: the Scripture readings, the Eucharist, and the people.

Nevertheless, he does find that occasionally an image recalls the works of that person and will inspire him in prayer. He particularly likes the way material culture is used at St. Cyprian Church because, while it does not have the elaborate displays of a more traditional setting, it incorporates the three main aspects of imagery that are associated with the Catholic Church: the altar, statues and stained glass windows. When asked how he sees God, Father Bill told me "When I think of Jesus, I see a smiling young man with shoulder-length shaggy brown hair and a short, trimmed beard."

I spoke to some of the parishioners at St. Cyprian's and they agree with Father Bill's opinions concerning material culture. When I asked one woman why she attended this church instead of a more traditional one she replied: "Here there are no distractions, I can focus more on my prayer and be at peace."

After Vatican II, the use of material culture within the Roman Catholic Church was altered. The focus shifted from lavish displays and elaborate rituals, to the Scriptures, the Eucharist and the people. While some churches in the Metropolitan Detroit Area embraced these new changes, others clung to remnants of the traditional style of worship. It is clear that the material culture of St. Cyprian Church and St. Patrick Church reflects and affects the varying styles of worship, individual faith and how Roman Catholics conceptualize God. Additionally, by changing the way that the Church utilizes material culture, Vatican II consequently changed the way many Roman Catholics approach their faith. Material culture, within the context of the Roman Catholic Church, assists in creating a specific ideal in the minds of the individual and within the community and ultimately helps people to express their faith and interact with God.

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INFLUENCES OF MACHIAVELLIANISM AND SOCIOPATHY ON MORAL JUDGMENTS

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Abstract

The present study explored Kohlberg's prediction that an individual's moral reasoning will be consistent when presented with moral dilemmas. Two personality characteristics, Machiavellianism and sociopathy, were expected to influence judgments in hypothetical situations in Kohlberg's Moral Judgment Interview and an individual's propensity to cheat while playing the Prisoner's Dilemma Game. Evidence for personality effects supported some but not all predictions.

Machiavellianism

Jaffe, Nebenzahl, and Gotesdyner (1989) succinctly define a Machiavellian personality as "one who manipulates more, persuades others more, and is persuaded less" (p. 819). Those scoring high in Machiavellianism (Mach) have been identified as being more likely to cheat on their own initiative (Cooper & Peterson, 1980), treat others as objects for their control (Bochner, Di Salvo, & Jonas, 1975), and withhold help (Lamden & Lorr).

Wardle and Gloss (1982) reported that Machiavellianism is not a static attitude but changes with the participants. This finding suggests that testing high Machs in a variety of moral situations will be beneficial to tease out the true Machiavellian as they have been shown to mask their motives in certain situations. Therefore, the present study used two types of moral situations to investigate differences between high and low Machs: the first was a modified version of Kohlberg's moral dilemmas; the second was an iterated prisoner's dilemma game. Hypothesis 1 predicted that as an individual's Mach score increased, they would decrease the amount of blame ascribed to the person performing the "immoral" behavior in Kohlberg's Moral Dilemmas or increase the level of punishment given to the character who caused the "immoral" behavior to occur. Also, it was predicted (H_2) that individuals with higher Mach scores would be more likely to cheat while playing an iterated prisoner's dilemma game when given the opportunity.

Socialization

A sociopath (formerly labeled psychopath) has been defined as one who has low empathy along with behavioral tendencies toward self-promotion, emotional coldness, duplicity, and aggressiveness (Paulhus and Williams, 2002, p. 557). Originally, the California Personality Inventory scale was used to assess social maturity and the ability to judge one's own behavior from other people's point of view (Gough, 1957). When it was incorporated as the socialization scale *(So),* the items on the test were scored so that high values represent greater empathy for others and stronger adherence to social norms and low values represent antisocial tendencies

(Gough, 1957). Because individuals high in socialization are expected to be more empathic of characters caught in a moral dilemma, hypothesis 3 predicted that individuals with higher scores (lower sociopathy) would be more likely to give a lower level of punishment to hypothetical "immoral" characters in Kohlberg's Moral Dilemmas.

Method

Participants and Scales

The sample consisted of 105 undergraduate students (20 males and 85 females) who volunteered for the study to earn credit for an introductory psychology course. Machiavellianism was determined by scores on the Mach V Scale (Christie, 1969), a test that uncovers Machiavellian traits by having participants rate statements culled from *The Prince* and *The Discourses* by Niccolo Machiavelli. Subjects rate 20 sets of 3 statements, indicating one statement that is "most true" and one that is "most false" for them. Scores can range from 40-160 with higher scores indicating higher Mach levels.

Levels of sociopathy were determined by scores on the Socialization Scale *(So)* of the CPI (Gough, 1957). Scores on the *So* scale reflect empathy for others and the degree to which a person accepts and adheres to social norms. Subjects' scores fall on a continuum from highly socialized (highest scores) to highly antisocial (i.e., sociopathic).

Measures

Kohlberg's Moral Dilemmas (Colby et al., 1987) consist of four hypothetical stories about individuals in moral dilemmas and their subsequent behavior. Each story is followed by one question asking about assignment of blame and a second indicating level of punishment that the individual should receive. The Prisoner's Dilemma game (Goren & Bornstein, 2000) requires each subject to choose to either cooperate or not with an opponent in order to maximize points earned. The game was programmed to include a "random" opportunity to cheat.

Procedures

Two participants who had been waiting together for the experiment to begin were led into separate laboratory rooms. They were asked to read and complete a consent form and to write their name and address on an envelope, so that the test results and a debriefing letter could be sent to them. All questionnaires and moral dilemmas were programmed on lab PCs. The first questionnaire asked for demographic information (age, college major, and gender). The Mach V, Kohlberg Moral stories, and CPl-*So* scale were given in a random order, followed by the prisoner's dilemma game. Participants were led to believe they were playing the participant in the other room. This was done using a randomly timed screen that appeared to be waiting for the other player. Additionally, after every game entry, the computer would randomly pause between two and four seconds to give the impression that the other player was selecting an answer. Upon completion, participants were thanked for their participation and excused.

Results

Moral Dilemmas

   Effects for Machiavellianism. Mach scores produced one significant effect supporting hi. The higher the Mach score, the more blame the subject ascribed to Joe's father in Story 3, $r(105) = .202$, $p = .039$. This indicated that those higher in Machiavellianism were less likely to blame Joe for his potentially "immoral" behavior in response to his father's breach of promise.

   Effects for Sociopathy. Hypothesis 3 was supported by results in Stories 1 and 3. As *So* scores increased, the amount of punishment ascribed to the "immoral" character, Heinz (Story 1), decreased, $r(105) = .234$, $p = .016$. Thus, as predicted, individuals higher in sociopathy tended to give more punishment than their more empathic counterparts. In addition, when subjects were grouped by median splits into high and low sociopathy groups, results indicated that for Story 3, high sociopathy subjects were significantly more likely to believe that Joe should select the "immoral" option (not to give his father the money) than subjects low in sociopathy.

Discussion

   Hypotheses 1 and 3 received partial support. Results supported H_3, which predicted that as sociopathy scores increased, more severe levels of punishment would be ascribed to the characters in the moral stories. Thus, individuals with lower levels of socialization (i.e., sociopaths) showed less empathy towards others than individuals high in socialization. Furthermore, individuals in the high sociopathy group were significantly more likely to believe that Joe should select the "immoral" option than subjects low in sociopathy.

   Machiavellianism produced only one significant difference (story 3). I n this dilemma, high Mach subjects gave Joe's father more punishment than low Mach subjects did. The significant effect supporting hi illustrated that individuals with stronger Machiavellian tendencies were less likely to blame an individual for acts of behavior that are potentially immoral. Furthermore, it can be implied that these individuals reflected a fundamental Machiavellian concept of manipulating others' feelings to achieve their own selfish needs.

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AN INTRODUCTION IN THREE PARTS:
EXAMINING THE FIRST THREE POEMS IN ELIZABETH BISHOP'S *QUESTIONS OF TRAVEL*

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Elizabeth Bishop's book of poetry, Questions of Travel is often noted for its careful sequencing. As Thomas Travisano claims, the poems form "a narrative of an observer's growing cultural insight and even identification with what she observed" (Elizabeth Bishop: Her Artistic Development 135). That is to say, the early poems in the sequence dramatize the most cursory, tentative, and broad assessments of the speaker's surroundings; and the later poems are just the opposite: detailed, observant, insightful glimpses into the core of life in Brazil. The placement of the first three poems, "Arrival at Santos," "Brazil, January 1, 1502," and "Questions of Travel," has also gained attention, for the way they compliment each other. Indeed, most critics consider them a trilogy; Travisano describes them as "a three-poem series that asks (and answers) related questions of travel" (135). Yet, the trilogy's subject matter is quite different from the other poems in the book.

This difference in subject matter may be the greatest reason critics read them as a trilogy. Individually, the subject matter of these three poems is different, but they share something none of the following poems have: an emphasis on the speaker. The works that follow express "growing cultural insight" of the observed, striving to illuminate the place and the people residing there. But this initial trilogy is most concerned with dramatizing the *observer's* experience of setting. The reader gains an understanding of how the poet views travel and all the moral dilemmas which arise when one writes about a new place. I propose these "related questions of travel" and their answers are placed at the beginning of the book so we can reserve those answers for the poems which follow.

As such, it is my argument that this trilogy serves not as the first poems in a sequence of "growing cultural insight," but as an introduction to that sequence. This heuristic introduction establishes Bishop's various views and theories on travel writing; they include what constitutes adequate knowledge of a subject, which subjects are most worth writing about, and the danger an author / traveler places on her subject.

Interior Knowledge

The first poem, "Arrival at Santos," elicits the idea of the interior in its final sentence: "We leave Santos at once; / we are driving to the interior" (39-40). It is this line which leads critics such as Angus Cleghorn to claim: "Questions of Travel (1955) is a volume that begins with tentative entrance into Brazil, and moves intermittently and variously into the interior." But what, to Bishop, constitutes the interior?

It is difficult for many critics, as it is for myself, to confront this question without connecting Bishop's "driving to the interior" of the South American continent, to the journey of Joseph Conrad's Marlow into the interior of Africa. Knowledge for Conrad is gained by moving toward the center of a country, yet Bishop's suggestion of the same is put into question by the entire poem which precedes it.

"Arrival at Santos," like its speaker, is in constant movement; the speaker's eye flits from the water to the mountaintops, from building to building. Her attention then snaps suddenly, as if by force, to entirely different topics. This is unusual for Bishop who is best known for the eye that is "looking outside, inside, and around its subjects with an adroitly realized complexity of perspective" (Travisano, Mid-century Quartet 58). The speaker seems to want this depth since she grasps for detail at every possible chance: "Here, after a meager diet of horizon, is some scenery: / Impractically shaped and—who knows?—self-pitying mountains, / Sad and harsh beneath their frivolous greenery" (2-4). As Cleghorn points out, it is as if "the poet is saying, 'yes, those mountains could have emotions for all I know, as ridiculous as such a pathetic fallacy may be.'" The attempts at insight are dismissed as "immodest demands" for immediate and "complete comprehension" (9-10).

As the poem progresses, the speaker lingers the most on those aspects of the location she has had a longer amount of time to observe. For example, the speaker delivers an unusual amount of the short poem to Miss Breen, who she would have gotten to know on the eighteen-day boat trip (20-29). Breen's character is so thoroughly developed that she may have made a good subject for the entire poem, yet her details are broken off by the physical movement toward Customs. As long as the speaker keeps being interrupted she doesn't have a chance to know anything about Santos, but the potential is undeniably present. Jeffrey Grey sees the poem this way:

> One is trapped in a bay, and the promise of access to an "interior"—always a pun in travel writing, since voyages are notoriously journeys to discover oneself—is withheld.

If the interior is the journey "to discover oneself," who is to say this act of self-discovery couldn't have occurred in the foreign land of Santos just as well as anywhere else? I would argue the speaker of "Arrival at Santos" is not plagued by "being trapped in a bay," but instead troubled by her rushed departure from it. Santos might have had the same role as the interior the speaker heads off toward if the stay not been so short. It seems Bishop's interior is not geographical, but a heightened state of understanding.

The tentative assessments scattered through "Questions of Travel" caution against claiming to know anything that does not belong to the interior. The poems that follow still address unfamiliar objects and people, but they do so with full awareness of a tourist's perspective. This poem provides a cautionary tenet for the author and reader to not make assumptions about unknown environments.

The Risk to the Observed

"Brazil, January 1, 1502" is a sharp departure from the lightness in the two poems surrounding it. Immediately the poem is introduced in context of the two sets of visitors to a Brazilian forest: our 20th century tourist, and the 16th century Portuguese settlers. The perspective of the

destructive Portuguese men becomes confused with that of the tourist. The setting is described, but since the first lines state "Nature greets our eyes / exactly as she must have greeted theirs:" (1-2) it has to be assumed these two descriptions are identical. A full thirty lines elapse without any clear distinction of viewpoint until "'one leaf yes and one leaf no' (in Portuguese)" (32). While this makes the Portuguese the clear subject, it is still unclear *when* they became the subject.

The Christians are pursuing Brazil's interior, as they "ripped away into the hanging fabric" (49). Yet they are pursuing the interior only because they are chasing "those maddening little women" who are "always retreating, behind it" in the interest of gaining the "brand-new pleasure" of rape (46-53). Beyond rape alone, these men are "each out to catch an Indian for himself" implying ownership: forceful possession of something not rightfully his (50). By overlapping the actions of the tourist with the Christians, Bishop is also overlapping the questionable morality of their intentions in Brazil. The tourist, presumably a writer, risks the same injustice by claiming ownership of the land, sights, and impressions which are not the tourist's to have or to write about.

By addressing this danger in travel writing, Bishop reassures her readers that she is aware of exactly what she's doing. The book's poems now have more credibility, distinguishing Bishop's poems as more than standard travel writing. They are careful to not assume more than would be possible. Poems like "Manuelzinho" and "The Burglar of Babylon" are excellent examples. Both deal with the character of native Brazilians and their unusual behavior. Yet the writer gives no reasons for why they behave the way they do, and complicates their character to the point that they cannot be seen as good or bad.

Subjects of Worth

The book's title poem, "Questions of Travel," repeatedly takes the tourist's eye to unsuspected places of focus, emphasizing what things the speaker finds to be the most interesting. The conventional objects of beauty, such as lush green hills are described as eyesores that "look like the hulls of capsized ships, / slime-hung and barnacled" (11-12). While most tourists would have reveled in sight seeing, it leads *our* tourist to doubt her reasons for traveling at all. She switches suddenly from the scenery to "Think of the long trip home. / Should we have stayed at home and thought of here?" (13-14). All of the popular tourist attractions are spoken of negatively: watching the sunset is "childishness" the "old stonework" is termed "impenetrable" and "inexplicable" (18-23). In an interview Bishop confirmed her preference for writing topics: "It is easy to write poetry that is merely descriptive, but I want to avoid exactly that element of the 'picturesque' and prefer to write something more abstract" (Bishop 15). But later in the interview she clarifies she does not dislike the "picturesque":

> there are things that irritate me, such as the rank proliferation of horrible
> signs mutilating the beautiful scenery of Brazil... It is a crime, believe me!
> …Is there no way to put a stop to such wanton destruction of this nation's
> heritage? I reiterate that to me it is a crime against nature, against history,
> even against God! (15)

It seems clear that Bishop is not actually bothered by the waterfalls and stonework, but simply does not prefer them for poetry topics.

The speaker becomes convinced of travel's benefits only by turning away from the scenic. The simple trees along the road take on meaning: "But surely it would have been a pity / not to have seen the trees along this road" (30-31). In fact, the speaker goes on to list things which it "would have been a pity" not to have seen, and all of them are cases of the extraordinary in the seemingly ordinary. Among the list are imperfect clogs which emit "the sad, two-noted, wooden tune" instead of the "identical pitch" of any other country, as well as "a fat brown bird / who sings above the gasoline pump" (36-58). If travel writing is to be worthwhile to Bishop it needs to stray from overly documented scenes of typical beauty and capture small details of daily life. In these small things Bishop is most effective at giving a glimpse of a location's culture, what it means to actually live in the region. It is not the waterfalls or the mountains that give this area personality and life; it is small, revelatory details like the priority of a bird's cage over the repair of the station's broken gasoline pump.

After "Questions of Travel" the poems are less concerned with descriptions of landscape and aesthetic beauty. Those poems which do feature landscape describe it with regard to how it relates to something else in the poem, usually one of these small overlooked details. A poem like "The Armadillo," which has striking imagery, is illuminated by the theorizing in "Questions of Travel." Since Bishop has introduced her disinterest in the beautiful for beauty's sake alone, there has to be further reason for the description:

> The flame ran down. We saw the pair
> of owls who nest there flying up
> and up, their whirly black-and-white
> stained bright pink underneath, until
> they shrieked up out of sight. ("The Armadillo" 24-29)

While the image is quite beautiful, it is also a natural image of subdued colors which point to a contrast with the dangerous, bright red of the fire balloons.

It is not my aim to argue with the claim that Questions of Travel functions as a sequence moving toward "the interior." I believe the poems are set up in exactly this way, gaining detail and insight as the poet moves toward the subjects she knows best. I argue instead, if we accept this sequence we have to accept that these initial three, highly insightful poems do not operate within it. The sequence begins with the scant details of "Squatter's Children" which acknowledges little more than a view of "strangers in a play" and moves to the rich details of "Sandpiper" that display a comfortable depth of an area that could more readily be considered home ("Questions of Travel" 16). By reading these first poems as an introduction, their placement and subject matter take the shape of a heuristic trilogy which guides the reader to greater understanding of the poems which follow.

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"She Was Only a Slip of a Thing but She Was as Bold as Brass": Dora as a Strong Woman in Angela Carter's *Wise Children*

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Across the genres of Shakespeare, the male characters are confident in their belief that they hold the social power over the female characters. Since the motto for the Renaissance Era rested within the mindset that women were beneath men, it may be true that the males claimed the social power. However, looking at the female figures in Shakespeare's comedies and tragedies, the women hold the emotional power over the men. This is shown in *Richard III*, as Richard's mother and the other women in the play were strong characters who never succumbed to Richard's wrath. In *Merchant of Venice*, Portia even dresses as a man to gain control. Lastly, in *Hamlet*, Hamlet's mother controlled Hamlet's feelings through her actions of marrying Claudius. The list goes on and on in regards to William Shakespeare's strong, not submissive, manipulative, intelligent female characters. Thus, maybe this is what Angela Carter was trying to support in her writing as she made her female characters the stronger of the two sexes.

The female characters in Carter's *Wise Children* are strong, independent, intelligent women who clearly do not need a man to be successful and happy. Since the book was written in 1991, the feminist contemporary period, it seems fitting that the women be the stronger sex. The women are clearly the dominant group between the two sexes. Nora plays with love and men, Wheelchair feels powerful over Melchoir, Tiffany does not need Tristam to take care of her, Grandma Chance raised Dora and Nora all on her own and she is clearly not intimidated by anyone, Saskia and Imogen's reactions toward Melchoir and Perry influence the men's emotions, and Estella Hazard had a history of sharing a few kisses and leaving her men. The men are the weaker sex, who are never in control and never gain any momentum on the women. Melchoir and Perry are both scarred by their mother's death, Tristam is clearly a "mama's boy," and the various men that Nora and Dora take advantage of and leave are either used as mere play toys or are too attached to their mothers for the women to want the men any longer than what they need them for. However, Dora is the strongest, boldest, most manipulative woman in the novel. With Dora's character, Carter successfully switches the traditional male/female gender roles. Dora is very bold in her actions and speech, and sheds her womanly skin and portrays herself as a man. This is shown in her "naughty" dialogue, her bold actions, and she and Nora's mirrored actions of each other; for, both sisters separate actions bring them together as a whole.

Dora's dialogue is not one of a female; her words sound as if they are being spoken by a "man." She speaks extremely naughtily. There is clearly no bashfulness in Dora Hazard, "We can still lift a led higher than your average dog, if called for" (2). She has no desire to speak candidly; she is very bold in her speech, "Nora is fluxy; me, constipated" (5). Even speaking of her god-child, she throws in some raw dialogue, "She smiles a lot, shows her tits…five minutes was enough , I can tell you; then we

adjourned to the boozer" (9). Dora does not even sound like a woman talking; she speaks of drinking, bodily functions, women's private parts, and is quite open about sex, "Old Charlie Hung like a horse" (26) and "I always preferred foreplay, too. Well, not always" (54). If one were to listen to her speak, they would think she was a man with an identity crisis, "But we were all a tremble, all anxiety; what the f*** was going on?" (10) and "It was pissing down with rain" (34). She is extremely bold and funny all in one mix, "Not many people can boast a photo of their grandmother posing for kiddiporn" (13) and "Tony, Tony, macaroni, show us all your big baloney. Pardon me, vicar" (117). Even as she speaks of her own creation, she holds no boundaries in her speech, "…although whoever it was who contributed the actual jism, no child need ever have been ashamed of either contender" (21) and "I did piss myself when I saw him, in fact, but only a little bit, hardly enough to stain the sofa" (72). Although Dora is a woman, it is almost as if she puts on a front of a man; kind of like the "carnivalesque" concept in the novel. She masks her identity and true feelings with her vulgar language, quick wit, and sexual innuendos, "If I don't get drunk tonight, I'll kill myself" (153) and "One little sperm out of a million, swims up the cervix…whose emissions sparked off our being" (174). Dora's speech is extremely bold and not lady-like, "A hand on my breast, even if I cannot recall precisely whose hand" (195), as are her actions throughout the novel.

Dora's actions throughout the novel depict her as not-the-typical-woman. She is bold, sexual, and does not care what others think of her. As Nora told her about her quick fling with a soldier, Dora replies, "I was only doing my bit for the war effort" (3). Dora is very sexual and care-free in her choices; she acts like a man who does not have any feelings, just the need to have sex. She has no emotional attachment with any of the men, "He gave me the confidence to use a word like "philanthropic." In return, I broke his heart. Fair exchange is no robbery" (13). Dora uses Nora's man, because she wants him, that's all, "If it was only the once and if I keep my mouth shut…he is as innocent as asparagus, his heart as pure as Epps' cocoa, poor lamb. Why should he guess? Nora, I want him so" (83). Dora, again, takes up with a boy that thought she was Nora, "We hid behind the feathers we kissed, and kissed, and kissed until by unspoken mutual consent we ducked under the tablecloth…I only had to speak, to say, 'Not Nora, but Dora'" (99-100). She also has her way with an older man, Irish, whom she uses just for pleasure, "'God you're lovely,' he said, when he turned to look. I knew he'd say that. Id known in advance, I wouldn't be able to return the compliment…My first old man…He was a burned-out old case. I knew I must be very gentle" (119).

Dora does not even take the concept of marriage seriously, she allows Mrs. Khan to marry Genghis and act like her, "I offed that diamond bruiser as if it were a burning coal…'Here, shove it on. You go marry him'" (156). Lastly, Dora sleeps with Perry, her uncle, "…because not since the change had your truly felt such a sudden rush of blood in that department, down there," (208). She and Perry had sex in the upstairs at Perry and Melchoir's birthday party, "Even in old age it was easy to see why Peregrine had always had such success with women" (219). Even while she was having sex with Perry, she was visualizing her other lovers throughout her life, "…but Peregrine wasn't the only one dear man, tonight, but a kaleidoscope of faces, gestures, caresses…the curtain call of my career as lover" (221).

Thus, Carter made Dora the epitome of a man, according to the feminist period; she used men for pleasure and fun. It was as if Carter used Dora to throw men's actions back into their faces; as a type of "ha-ha, we can do it too," kind of tone of her character. Women do not have to be perfect, because they are not perfect. According to Carter, they burp, swear, and act goofy too; women are human, and

women are strong enough to care for themselves, without a weak man. Although Dora acts as the ring-leader for the ornery women, Nora's actions compliment Dora's as well.

Dora and Nora continually claim that as separate beings they are nothing, but once they are together, they are strong and desirable, "On our own, you wouldn't look at us twice. But, put us together…" (77). It is as if the two sisters are mirrored images of each other; good versus bad. However, it does not work that way. Both sisters are strong, independent, and ornery; what is good in them is the fact that they are strong and determining, not weak like the men. Even in their old age, the women are ornery and sexual, "The habit of applying warpaint outlasts the battle; haven't had a man for yonks but we still slap it on" (6). It is especially interesting here as Dora says "a man," for both her and her sister's usage, much like the way they would trade a man back and forth for fun and pleasure.

Even when they were younger, the girls acted in sexual ways; not the typical pure, chaste, quiet women that they should be, "We were *wet* for it, I tell you! Such a rush of blood to our vitals when we started to dance" (61) and "Nora and I were only girls, never seen a man without his trousers on although Grandma had drawn us pictures, and, I must say, we were quite keenly curious so we craned forward eagerly" (67). There is no blushing and giggles with these twins; they are curious and interested.

Nora, just like Dora, had her way with men, "He was the one she wanted, warts and all, she *would* have him, by hook or by crook" (81); kind of like how Dora begged Nora for a chance with her young boy, she had to have him as well. In addition to Dora's acting as a man, Nora could hold her own as well, "Nora was so angry she never shed a tear but broke his jaw" (161) and "'I like to sink my teeth into a nice juicy sausage, too!' Nora confided lasciviously" (191).Both the girls/women, Nora and Dora, were not dependent on men, but on each other, "'Look on the bright side,' I counseled her, 'I've got you and you've got me'" (189). Even wheelchair joined their "ganging up" on the men, especially Tristam, "We all three glowered at him. He cowered" (44). This excerpt even shows how the women's strength and power reigned over the men; they made them all emotional and cowering.

All the women in Angela Carters', *Wise Children*, are strong, intelligent, manipulative, and powerful. They all have a great control over the men, and the men, in turn, are dependent on the women. Nora is strong, Wheelchair is strong, Tiffany is strong, and the rest of the women in the novel are strong. However, Melchoir is weak, Tristam is weak, and almost all of the men in the novel fall to Nora and Dora's sexual control. Dora is the most powerful, bold, intelligent, and manipulative of the women. Carter uses Dora to skew the traditional gender roles of men and women; for, Dora acts much like man in her mannerisms. Carter makes Dora shed her womanly exterior, and "dresses" her as a man. This is shown in her dialogue, actions, and through Nora's actions that mirror Dora's actions; for, the sisters are two separate girls, but put them together and they make for a strong, domineering woman, "Nobody could say that the Chance girls were going gently into that good night" (6).

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THE ROLE OF LANGUAGE AND CULTURE
IN THE INTERNATIONAL BUSINESS WORLD

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It is difficult to develop and maintain successful working relationships with business colleagues from foreign countries or have access to new ideas and developments from abroad without certain basic language and cultural skills. In the global business world of the twenty-first century, Americans are increasingly involved in international business relationships and yet continue most often to rely on the English language and culture skills of their foreign colleagues as they have done in the past.

The objective of the present project was to conduct an unscientific survey of business people working in the automotive industry in Oakland County, MI, to assess their attitudes towards the role of language and culture in today's international business world. We were interested to see to what extent their employers were addressing the need for foreign language and cultural competency within their company. The project was conducted through questionnaires and on-site interviews. In addition, we attended two conferences in Oakland County for local business people on the subject of diversity: Breakfast of Nations, and Leveraging Diversity for Business Success.

The observation that Americans need to increase their language and culture competency in order to succeed and be more competitive is not new. In 1982, Penny Schoonover, Associate Professor of German at Boise State University, conducted an unscientific survey of four large companies in Idaho: Simplot Company (one branch of which is Famous Potatoes for McDonald's) with interests in Japan, western Europe, Argentina and Canada; Hewlett-Packard with projects in 22 countries; Boise Cascade, a paper and wood-products firm doing business in Canada, Japan, France, German, Holland and Austria; and a major construction company doing business all over the world. At the time, the state of Idaho was working to increase the exports of Idaho agricultural products. For example, there was an $11.1 million grain deal with the Republic of China, and Idaho was sending three to four thousand metric tons of poultry to Belgium per month (ADFL Bulletin, 13, no. 4 (May, 1982), p. 17).

Professor Schoonover interviewed representatives of these companies to assess how these companies had dealt with the difficulties associated with doing business with clients who spoke different languages and were from countries with different cultural values. One executive pointed out that his company would do better if his employees had a better grasp of foreign language and culture, "simply because we would have people with an appreciation for the thoughts, feelings, culture, habits, customs and speech of those we deal with. Being a true international businessman is more than just knowing the language" (p. 17). Schoonover referred in her interviews to Paul Simon's book, Tongue-Tied American. Mr. Simon's thesis is that an important reason that Americans lack foreign language skills is that in the past, Americans had

had the luxury of doing business 'at home', whereas in the present world they no longer had that luxury. She asked interviewees if they agreed with this. One computer firm executive responded that he would now rather have the language skills first, and learn accounting later.

Although the need within the companies for employees with language and culture skills was obvious, surprisingly, companies were meeting this need in a very random manner. Some thought, for instance, that one year of language at the university level should be sufficient, or a crash course at a company such as Berlitz. Professor Schoonover observed that whereas nobody would expect it would be possible to develop sufficient skills in other fields in two semesters, that is what they expected of foreign languages. She concluded that the general lack of foreign language capabilities that she encountered lead to a general lack of confidence within the global market on the part of the American companies that she surveyed.

Ten years later, Geoffrey Voght and Ray Schaub at Eastern Michigan University pointed out that "leaders in many professions now realize that fluency in foreign language and cultural sensitivity are essential in their fields if the United States is to participate effectively in this global community" (CAL Digest, September, 1992, page 1). They proclaimed the need for the inclusion of foreign language and culture study in the educational system of the USA, but noted that "most college students do not develop the expertise to understand even one foreign language and culture" (page 2). They found the United States to have been less well-equipped than other countries, such as Japan and Western European nations, to take an effective role in the international community in the past because of the lack of attention given to incorporating global perspectives and language and culture study in American educational curricula. They found that the realization of this need had already led to reforms in higher education and public schools throughout the USA. Professors Voght and Schaub were optimistic about this trend for the future.

Our project was thus along the same line of thought as these other two. We were testing our perception that although there is as great a need as ever for language and cultural competency in the global community, Americans still are not competitive with their international business partners in this domain. We agree with Governor Jennifer Granholm who observed in 2004 that "in order to keep Michigan competitive in a global economy, we must continue to focus on the importance diversity plays in growing our economy…Promoting diversity makes good business sense and will help position Michigan as an economic power house in the 21st century" (Oakland Press, September 22, 2004).

Our interviewees included business people from various educational backgrounds and holding a variety of positions, including, for example, executive assistants, director of purchasing, senior workplace development specialist, business managers, engineers, human resource development specialist, director of marketing and communications. The companies (names withheld) dealt with international fluid transfer systems, electronic protection and fastening equipment, automotive supplier for heavy duty trucks, automotive pain supplier, a 'big three' company, cross-cultural communication training service, and a Japanese car company. The educational backgrounds of the interviewees included undergraduate degrees in finance, marketing, engineering, and human resource management. One interviewee had an MA in marketing, and one had an MA in French language and literature. The foreign language background of the

interviewees was generally very limited (ranging from none at all, to two years of German at the university level, to competence resulting from five-year work-related stays in Japan and Mexico). One interviewee was presently taking French through private lessons in the company so that she could communicate more effectively with her French counterpart in France. She is employed by a French company. Another said that his company offered Spanish to employees, but he had not taken advantage of this opportunity. All of the interviewees regularly did business with international clients from around the world, including Japan, China, Mexico, Eastern Europe (Romania and Slovakia), Western Europe (France, Portugal, Spain and Germany), South America (Argentina and Brazil), Morocco, Turkey and the Philippines.

One universal response by interviewees was that they wished they had begun to study languages at an early age as their foreign counterparts had done. This reflects an American cultural bias against the importance of foreign language study. Those who did not know a foreign language bemoaned the fact that it was of daily importance in their work lives. An engineer said that to have capability in a foreign language prevents confusion by not having to rely on a third party for important communication and preparation of important documents. In addition, the cultural knowledge can prevent confusion in foreign markets about products. Engineers said that they have daily contact with the nationals with whom they are working, both here and abroad, but very few American engineers have the language skills to speak in any other language but English. A number of interviewees pointed out that a significant amount of business is done by phone conferences in today's world, but it was noted that often communication breaks down due to both language and culture barriers.

To underline the gap that exists between Americans and their international counterparts, it was observed that plant managers in Mexico (in this case, French expatriates) spoke both English and Spanish, whereas American plant managers and engineers in Mexico still rely on interpreters. Although the use of foreign language and culture was acknowledged by everyone as crucial to the international business relationship and success of business endeavors, it is also the case that American companies do not specify that knowledge of language is necessary for job applicants—the reason given being that it was feared there would not be applicants. Language skills are thus considered to be 'preferred', but not required (even if the prospective applicant would be sent abroad for the company).

The commonly held notion that English is the international language of business was repeatedly tested by comments from the interviewees. For instance, one business manager did a recent project in Brazil where the workers spoke only Portuguese and Italian, but not English. He had to rely on an interpreter. One interviewee commented that when outsourcing, his company looks for people with bilingual or multi-lingual capabilities. He observed that most often, if his company has people with foreign language capabilities, it is most often because they come from homes where languages other than English are spoken. All interviewees said that if a business meeting is conducted in English, that does not mean that all other interactions are also conducted in English; after the meetings, important opportunities to communicate with foreign clients in more social settings, are often lost to Americans without language skills. A CEO from one of the big three car companies who is a native German speaker recounted an experience that he had while traveling to the rapidly expanding business market of China where he addressed a large audience of Chinese students. He observed that he was able to make his presentation in German.

Chinese students regularly had as much as 20 hours per week of intensive language study as part of their formal study. This CEO pointed out that it would be impossible for him to do such a presentation in his native German in the United States for business students.

Our conclusion, based upon our interviews with members of the international business community in Oakland County, was that Americans do not seem to have kept up the pace with people from foreign countries in terms of placing their value on cultural and language acquisition. Foreign language and cultural expertise play an important role in daily business, and everyone recognized this. However, changes must occur within the educational system of the USA, as well as within the culture. If the geographical isolation of the USA has allowed Americans in the past to live without feeling the need to learn foreign languages, the USA is no longer as isolated as it was. The undervaluing of foreign language and culture skills is represented by making this knowledge 'preferred' and not mandatory for people applying for jobs in international companies. There is still a heavy reliance on interpreters. The outside perception of Americans may be that we do not need foreign languages to survive or succeed, but our contact with the people from the business community of Oakland County revealed that the need for foreign languages is real and urgent, along with the technical preparedness that is already recognized as essential for success.

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THE EFFECTS OF INTERNET DEPENDENCY
ON INTERPERSONAL COMMUNICATION

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Introduction

The Internet was originally developed, in the 1960s, by the U.S. Department of Defense as a means of improving the transmission of information between universities, industry and defense-related companies. Over the past decade, however, the Internet has quickly become a necessity of everyday life. With one click, the World Wide Web opens and admits us to new dimensions of business, academics, politics, medicine, sports, entertainment, and much more.

In addition to the accessibility the Internet has to offer, socializing online has become an even easier way to connect with friends, family and others across the globe. Various online social networks such as Facebook, Myspace, and AOL Instant Messenger (AIM), provide students with a convenient and inexpensive way to reach individuals on a social, as well as romantic, level. In fact, as one researcher notes, the Internet has helped increase social involvement, much as the telephone did in earlier days. (Reed 3).

However, in spite of the benefits that the Internet brings to college students, some studies also raise concerns about the excessive number of hours students spend on line. This form of computer-mediated communication may result in Internet Dependence, and also leads researchers to question how it will effect interpersonal, face-to-face communication.

In order to determine if Internet Dependency was an issue at the University of Michigan-Dearborn, and if students actually use the Internet as a means of avoiding face-to-face communication, a survey was developed and administered to 100 students, ages 18 – 25, in a classroom setting. Following the surveys, interviews were conducted with a randomly selected subset of the sample to determine their reliance on Internet communication, in lieu of face-to-face contact, in a variety of social circumstances: personal relationships, work environments, school context, and family.

Our research probed suggested that the college-age generation of Internet users show tendencies of avoidance in interpersonal situations when computer access became a viable default mechanism. Projected results, although speculative, imply that these heavy Internet users will have difficulties in interpersonal relationships, be they friendships or partnerships, and more than likely will experience inadequacies in the work place due to their lack of human communication skills.

Method

The sample for this study was comprised of 103 students – 44 males, 59 females – registered at the University of Michigan-Dearborn. They were recruited with the assistance of several professors who agreed to allow me to administer the instrument in their classrooms.

The age of the participants ranged from 17 to 25, with a mean age of 20.71. The breakdown of their collegiate rank was 24 freshman, 22 sophomore, 40 juniors and 15 seniors. Those sampled were self-selected, in that they answered the survey on a completely volunteer basis.

Stage One – The Questionnaire: The survey used in this study was a non-standardized instrument, constructed by the author. It was a paper-and-pencil questionnaire consisting of 45 items. Several items collected demographic information pertaining to the participants. The remaining question focused on the students' Internet usage. For the purposes of this research, Internet use was defined as time spent on any of the following activities: sending/receiving Email; using AIM (AOL Instant Messenger); socializing on Facebook or MySpace; school-related research; shopping; downloading entertainment (such as music, movies, or games); playing online video games; gambling or viewing pornography.

All participants we asked to indicate how many hours per day they engaged in Internet activities. They were also asked to indicate the number of hours per day that they deemed to be "excessive."   In addition, each person was asked to specify the locations where they accessed the Internet.

The first of two open-ended questions focused on a student's perceived need to be connected with others via the Internet or cell phone. The second inquired as to whether or not they preferred Internet communication as opposed to face-to-face interactions.

A seven point Likert scale asked participants to rate their attitudes regarding the Internet's effect on personal relationships, as well as its potentially addictive nature. The final question instructed participants to rank-order their Internet activities by order of importance.

Stage Two – Interviews were conducted with a randomly selected subset of the sample to determine their reliance on Internet communication, in lieu of face-to-face contact, in a variety of social circumstances: personal relationships, work environments, school context, family.

Results

The qualitative data analyzed in Stage Two suggested a gender trend in Internet dependency and interpersonal avoidance in specific areas, rank ordered by personal relationships relating to partnering, school context, work environments, and family. The data also revealed some interesting trends in how the Internet is used.

Table 1 (at right) illustrates the percentage, in descending order, of the sample that uses the Internet for various purposes. While nearly 100% of those sampled use the Internet to communicate by email, only a little over half use engage in communication via Facebook. This was lower than expected given personal observation of fellow students in classrooms settings.

Cross tabulations revealed that more females were involved on Facebook than male participants, and also that involvement tended to decline as the students moved up in class rank. While there were more freshman and sophomores who acknowledged using Facebook, there were more "no" responses among junior and seniors. Conversely, the results show that juniors and seniors favor AIM (AOL Instant Messenger) over Facebook for keeping in contact with others.

Percent	Usage
99%	Email
94.2%	Research
67%	Downloading Entertainment
66%	Shopping
55.3%	Facebook
35.9%	Gaming
33%	AIMing
11%	Pornography
1.9%	Gambling

Table 2 indicates the number of hours per day thatparticipants make use of the Internet. While the survey did not require that individuals specify how   much time was devoted to a particular activity, one very significant finding did result from this data. The nearly 20% who claim to be on the Internet for five or more hours per day correlate with 22% who, on the Semantic Differential Scale, believe that the Internet is addictive. Therefore, by their own definition, approximately 20% of those sample could be said to suffer from Internet Dependency.

Hours of Internet Usage	Percent of Sample
0 – 1	29.1%
1 – 2	13.6%
2 – 3	21.4%
3 – 4	16.5%
5+	19.4%

Table 3 illustrates the results of the Semantic Differential Scale which was designed to determine how sampled students would describe theInternet. The first pair of descriptors – Linking and Isolating – were related to the user and whether, for them, the Internet was a convenient form of communication, or if they felt it isolated them from

Linking	1	2	3	4	5	6	7	Isolating
	22%	19%	22%	24%	8%	2%	3%	
Connecting	1	2	3	4	5	6	7	Anonymity
	18%	23%	25%	26%	3%	1%	2%	
Beneficial	1	2	3	4	5	6	7	Addictive
	20%	18%	16%	25%	10%	8%	4%	

social interaction. The next pair – Connecting and Anonymity – questioned whether the students see the Internet as a way to reach people, or if they used it as a means to avoid interpersonal communication. The final pair (as depicted on the MURF poster) – Beneficial and Addictive – sought to establish whether or not participants felt that the Internet had the same negative potential associated with other forms of compulsive behavior, such as gambling.

Crosstabulation of the data in the Semantic Differential Scale, by gender, indicated that the majority of both men and women saw the Internet as more of a linking tool than something that isolated them. In terms of connecting versus anonymity, by which we meant that one could shield themselves from face-to-face contact, only a small number of both men and women felt that the Internet provided a form of anonymity. However, when interviewed, more men that women admitted to using the Internet as a means of avoiding personal contact in some instances.

When it came to beneficial versus addictive, more women than men felt that the Internet had addictive potential. Conversely, more women than men also believed that the Internet is beneficial. From this, one could speculate that the majority of those, in our sample, who seem to suffer from Internet Dependency are males, the instrument was not specific enough to verify this. (See Appendix C for the Crosstabulation data.)

Table 4 (see below) displays the result of asking participants to rank order – in order of importance – the ways in which they use the Internet.

The first category – Information Accessibility – correspond not only to high percentage (94.2%) of students who indicated that they use the Internet for research, but also reflects the comments of those who, during interviews, repeatedly

1	Information Accessibility
2	Email
3	Socializing (Facebook, AIM, Blogs, Journal)
4	Social Anonymity (avoid face-to-face)
5	Developing romantic relationships

remarked on the Internet's ease of use and rapid access to news, weather, sports, health information, etc.

As mentioned earlier, almost everyone surveyed uses the Internet to communicate via email, which here is listed as the second most important item on the list. In third place is socializing via web sites such as Facebook and MySpace. This middle ranking is consistent with that of the 55.3%, as shown in Table 1, who indicated that this type of activity was moderately important to them.

The item ranked number four on the scale corresponds to the Internet's ability to afford users a certain level of anonymity. When asked if they preferred to communicate via the Internet, as opposed to face-to-face contact, only a few men said yes. However, several others did state that they liked the anonymity that the Internet provides; one man offered the reason that he found this type of interaction "less intimidating."

When responding to the same question, the majority of the women surveyed said that they did not prefer the Internet, with several commenting that they find it "impersonal." In addition, several women did say that it depended on who they were talking to, but when it came to what both genders identified as "important issues," they both preferred face-to-face communication. This, of course, is corroborated by the fact that romantic relationships is the last thing on the scale shown in Table 4.

In addition to the items covered by Table 4, the other advantages of the Internet that people mentioned included the ability to multi-task while online, the ease and affordability of communicating over distances and, in one, the ability to think before responding.

Conclusion

Sample findings suggest that females find the Internet to be more beneficial and socially linking than men, because it allows them to connect to friends, family, romantic partners and others in online communities. Additionally, the females sampled recognize the Internet to possess addictive properties that may draw people away from face-to-face communication.

In terms of Internet addiction or dependency, the actual data collect showed that an equal number of males and females spend between three to five hours, or more, on the Internet per day. However, when interviewed, more of the men sampled indicated that they spend excessive amounts of time on the Internet, and equally interesting is the fact that only men mentioned that being anonymous was something they appreciated about the Internet.

While I could speculate as to why these men answered this way, the instrument was not specific enough to provide any reliable data concerning the reason behind their desire for anonymity. Thus, one of the most important things that I learned while analyzing the data I did collect, was that a survey, or instrument, needs to be specific, or focused, and the terms it contains need to be as clear as possible. For example, in my Semantic Differential Scale the terms "linking" and "connecting" are perhaps too similar, and may have confused some of those who responded.

Another thing that I realized while processing the data was that the instrument was too focused on Internet usage and lacked attention to participants' face-to-face interactions. Most of the questions that were asked pertained to the amount of time that respondents spent online, but similar questions should have been developed to determine if this online activity had a negative impact on face-to-face communication.

If I was to further this study, I would like to focus on those individuals who are Internet Dependent. I find this subculture to be very interesting and would like to know more about how their Internet usage affects their daily lives.

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Effects of an Insulated Boundary on Propagation of a Wave Front in Cardiac Tissue

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Abstract

A wide range of factors affect the propagation of wave fronts in the heart. Knowledge of the electrical properties of cardiac tissue is essential to understand heart arrhythmias. This study concentrates on the anisotropies of cardiac tissue and their effects on the electrical wave front as it propagates along an insulated boundary. Propagation is simulated numerically using a mathematical model. Cardiac tissue is represented by the bidomain model, with different anisotropies in the intracellular and extracellular spaces. The Ebihara-Johnson model describes the active sodium channels that underlie the action potential. Conclusion: The fiber geometry can impede propagation, but the effect depends on the angle the fibers make with the boundary.

Introduction

In the study of the human heart, direct measurement of the membrane voltage below the heart surface is not always possible. Thus, researchers often cut the heart and expose the tissue deep within the heart wall. In the paper "Mechanism for polarization of cardiac tissue at a sealed boundary," Roth (1999) proposes that when cardiac tissue fibers approach a sealed boundary at an angle, a strong shock causes polarization of the tissue near that boundary. The goal of this paper is to examine the analogous effects different fiber orientations may have upon wave front propagation.

Methods

The cardiac tissue is described as a 2D sheet. The electrical properties of the tissue are expressed by the bidomain model (Roth and Langrill Beaudoin, 2003)

$$\nabla \bullet [(\sigma_i + \sigma_e) \nabla \Phi_e] = -\nabla \bullet (\sigma_i \nabla \Phi_m), \qquad (1)$$

$$\nabla \bullet (\sigma_e \nabla \Phi_e) = -\beta [J_{ion} + C_m \frac{\partial \Phi_m}{\partial t}], \qquad (2)$$

where σ_i and σ_e are the conductivity tensors (S/m), Φ_e is the extracellular potential, Φ_m is the transmembrane potential, β is the ratio of membrane area to tissue volume (1/m), J_{ion} is the membrane ionic current (A/m^2), and C_m is the membrane capacitance (F/m^2).

The x direction is parallel to the insulated tissue boundary, and the y direction is perpendicular to the boundary. The fibers approach the boundary at an angle θ with respect to the x-axis (Fig. 1). Conductivities parallel to the fiber direction (longitudinal) have a subscript "L", and conductivities perpendicular to the fiber direction (transverse) have a subscript "T". The four

bidomain conductivities (σ_{iL}, σ_{iT}, σ_{eL}, σ_{eT}) as well as other tissue parameters are given in Table 1. The conductivities in the x-y coordinate system are related to the conductivities in the fiber coordinate system by (Roth and Langrill Beaudoin, 2003)

$$\begin{pmatrix} \sigma_{xx} & \sigma_{xy} \\ \sigma_{xy} & \sigma_{yy} \end{pmatrix} = \begin{pmatrix} \sigma_L \cos^2\theta + \sigma_T \sin^2\theta & (\sigma_L - \sigma_T)\cos\theta\sin\theta \\ (\sigma_L - \sigma_T)\cos\theta\sin\theta & \sigma_L \sin^2\theta + \sigma_T \cos^2\theta \end{pmatrix}. \qquad (3)$$

The active sodium channel membrane kinetics are described by the Ebihara Johnson model (Ebihara and Johnson, 1980)

$$J_{ion} = C_m \frac{\partial \Phi_m}{\partial t} + G_{Na}\, m^3 h\, (\Phi_m - \Phi_{Na}) + G_l (\Phi_m - \Phi_l) , \qquad (4)$$

where m and h are dimensionless first order variables that vary between 0 and 1.

At the sealed surface the y-component of the current density is zero. Because the fibers approach the surface at an angle, this boundary condition is not equivalent to the normal gradient of the potential being zero.

Consider a rectangular strip of tissue, 5 mm x 1 mm with 800 x 161 nodes, having its upper and lower edges sealed (Fig. 1). Initially, the tissue is at rest, -85 mV. The transmembrane potential along the left edge is raised to +35 mV, and an action potential wave front propagates to the right. The bidomain equations are solved using a finite difference approximation, with time step of 0.1 μs and space step of 6.25 μm.

Table 1: Bidomain Parameters

Membrane capacitance	C_m	0.01 F/m^2
Surface to volume ratio	β	0.3 μ m^{-1}
Intracellular longitudinal conductivity	σ_{iL}	0.2 (S/m)
Intracellular transverse conductivity	σ_{iT}	0.02 (S/m)
Extracellular longitudinal conductivity	σ_{eL}	0.2 (S/m)
Extracellular transverse conductivity	σ_{eT}	0.08 (S/m)

Results

Figure 2 shows phase plane plots (Φ_m versus $\partial\Phi_m/\partial t$) of the action potential at the locations marked "a", "b", and "c" in Fig. 1. The maximum rate of change is different between the upper ("c", 287 V/s) and lower ("a", 267 V/s) edges. The time constant of the foot of the action potential, τ_{foot}, can be found by fitting the initial rise (from -79 to -69 mV) of the action potential to an exponential. In a phase plane plot, an exponential increase appears as a straight line. The foot of the action potential along the upper edge ("c", 0.22 ms) is smaller than the time constant along the lower edge ("a", 0.29 ms).

The results depend on the conductivities of the cardiac tissue. When the conductivities were adjusted so the tissue had equal anisotropy ratios (σ_{iL}=0.2, σ_{eL}=0.2, σ_{iT}=0.032, and σ_{eT}=0.032 S/m), the differences between the two edges disappeared. The results also depend on the angle that the fibers make with the boundary. Angles from 0 to 90° were simulated, with 75° showing the most significant effect. Finally, the behavior is different between the upper and lower edges. When a vector pointing from the sealed boundary into the tissue along the fibers makes an obtuse angle with the direction of propagation (like on the top edge), the rate of rise of the action potential is faster, and the time constant of the action potential foot is smaller, than when such a vector makes an acute angle with the direction of propagation (like on the bottom edge).

Discussion

The rate of rise of the action potential, and the time constant of the action potential foot, are sensitive to boundary effects. Previous studies (Roth, 1991; Roth, 2000) have shown that a conducting bath perfusing the tissue surface can affect the action potential upstroke. This study finds similar results for a sealed boundary with fibers approaching the surface at an angle. The effect disappears when equal anisotropy ratios are present or when the fibers are parallel or perpendicular to the surface. The changes in the action potential are not large, but may be detectable in experiments using a "wedge preparation", in which the heart wall has been cut and the transmembrane potential is recorded on the cut surface (Akar and Rosenbaum, 2003; Fast et al., 2002).

Acknowledgements
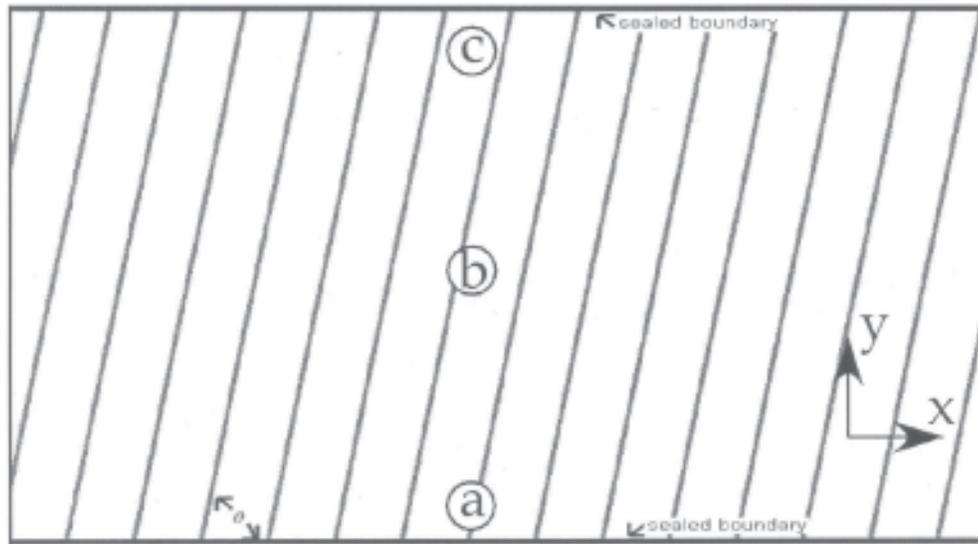
Figure 1. A schematic diagram of the tissue. The upper and lower boundaries are sealed. The slanted lines indicate the fiber direction. The wave front propagates from left to right. The points "a", "b", and "c" indicate the locations where the curves in Fig. 2 are calculated.
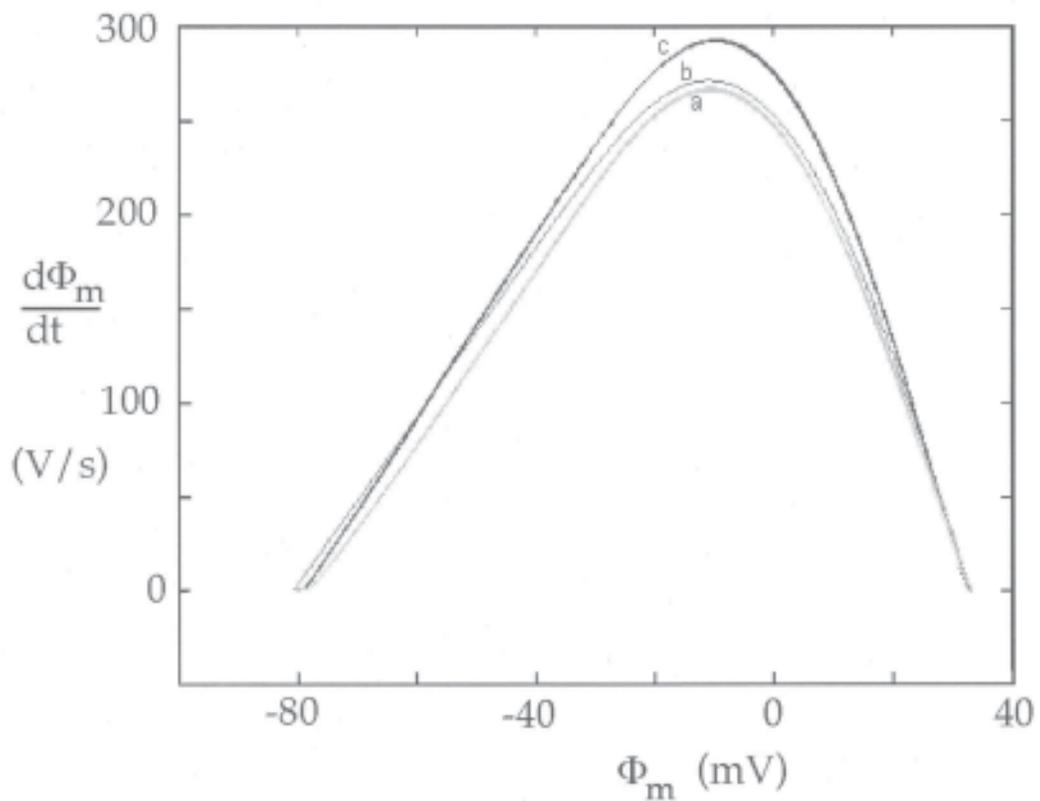
Figure 2. A phase-plane plot of the action potential at locations, "a", "b", and "c" in Fig. 1. $\theta = 75°$.

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Theoretical Investigations on Adsorption of NO_x on Copper Exchanged Zeolite (Cu-ZSM-5)

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Abstract

Adsorption of NO_x (X = 1, 2) on copper exchanged zeolite (Cu-ZSM-5) is investigated using *ab initio* methods. Cluster models, ranging from 1T to 10T (T is silicon or aluminum), are used to represent the structure of zeolites. Equilibrium structures are calculated at the HF and DFT theory levels. Relative energies among different adsorption complexes are calculated.

Introduction

"Acid rain" (or so-called acid deposition) is a broad term used to describe both wet and dry ways that acid falls out of the atmosphere. Acid rain has received worldwide attention during the past thirty years, since it deteriorates our environment and leads to serious health problems.[1,2,3,4] Wet deposition refers to acid rain, fog, and snow, while dry deposition refers to acidic gases absorbing on surfaces and particles settling out.

NO_x is one of the major sources of acid rain. Its primary source is from the exhaust fumes of millions of automobiles.[2] This accounted for 53% of the NO_x emissions in the United States in 1998, and the total emissions of NO_x was 5.11 million tons in 2000.[1] It is necessary, therefore, to develop a powerful catalyst capable of selectively reducing NO_x, thereby reducing the damage caused to humans and the environment.[5,6,7,8]

Zeolites are crystalline materials consisting of a large number of TO_4 units (T is primarily silicon with a small portion of aluminum) connected to each other via oxygen to form three-dimensional cavities and channels. The crystalline framework supplies a high internal surface area and active sites, which make zeolites good adsorbents and catalysts.[9,10,11] Recently, the medium-pore ZSM-5 has attracted much attention. Because of its small pore size and its uniform distribution, the internal surface developed by the orous channels is much larger than the external surface. The higher ratio of internal to external surface area (about 4:1) leads to its higher activity and selectivity.[12,13]

Due to the existence of the aluminum in the TO_4 unit, oxygen atoms adjacent to the aluminum show the partial negative charges, which can be balanced by external cations. Copper exchanged zeolite (Cu-ZSM-5) is the most active catalyst for the direct decomposition of NO_x to date.[14,15] The adsorption properties of Cu-ZSM-5 are similar to those of ZSM-5.[12] However, the ratio of internal surface area to external surface area is even larger than that of ZSM-5. The study of pore size distribution demonstrates that Cu-ZSM-5 represents a well-defined distribution with main micropore size at 0.7 nm and a limit of 2 nm. Experimental studies have shown that Cu-ZSM-5, as opposed to ZSM-5, or naked copper cation, exhibits high activity in decomposing NO_x into N_2 and O_2 (major components of the air).[16,17] However, detailed mechanisms for this reaction remain unknown from experimental studies.

The computational tool is an alternative and/or support to the experimental research, but theoretical studies of bulky zeolites are limited by computer resources. With the recent development in theoretical methods, the cluster model can be used to represent the interaction between the adsorbed molecules (adsorbate) and the zeolite fragments.[18,19,20,21,22]

The mechanism of adsorption-decomposition of NO_x on Cu-ZSM-5 is complicated and involves many steps.[22] This study focused only on the initial adsorption of NO_x – the first step in the adsorption-decomposition process. Only chemically bonded adsorption complexes may be stable enough to allow subsequent decomposition reactions. There are 5 possible NO_2 adsorption complexes and 3 possible NO adsorption complexes. *Ab initio* calculations of the structure of these complexes were performed to determine possible stable adsorption complexes and energy barriers.

Approaches

A cluster model was used to simulate zeolite structures in this project. Zeolite is treated as a small neutral cluster cut out of the bulky crystal structure. Hydrogen atoms terminate the resulting dangling bonds at the boundary.[23] Two types of clusters are examined – hydrogen terminated and hydroxyl terminated. The hydrogen terminated clusters result from the cluster being cut at the Si-O bond and terminated with hydrogen (Si-H end group). The hydroxyl terminated clusters result from the cluster being cut at the O-Si bond and being terminated with hydrogen (Si-O-H end group).

Since the cluster model takes only a very small part of the zeolite structure, two important deficiencies exist.[24] First, the cluster model is different from the zeolite structure, because atoms near the cluster boundary, arbitrarily terminated by hydrogen/hydroxyl groups, are in different electronic environments. The second is potential deficiency. A potential is generated from the long-range electrostatic forces between the cluster model and the zeolite framework, which is missing in cluster calculations.

Results obtained from cluster model investigations may give us a chance to examine the usage of the embedded cluster model. A recently developed embedded cluster model method can be used to avoid/alleviate aforementioned problems without significantly increasing the computational costs.[25,26,27]

Computational Details

Full optimizations of cluster models, from 1T to 10T models (Figure 1), were performed at the Hartree Fock (HF) and then the Density Functional Theory (DFT) levels with the 6-31G(d) basis set using the *ab initio* suite of GAMESS package.[28] Additionally, MacMolPlt, a 3D visualization package, was used to view the optimized geometries.[29] This work was partially supported by the National Center for Supercomputing Applications under CHE060031N and utilized the Copper and Tungsten systems. All other calculations were performed on a Mac Power cluster.

1T   **3T**   **5T**

10T
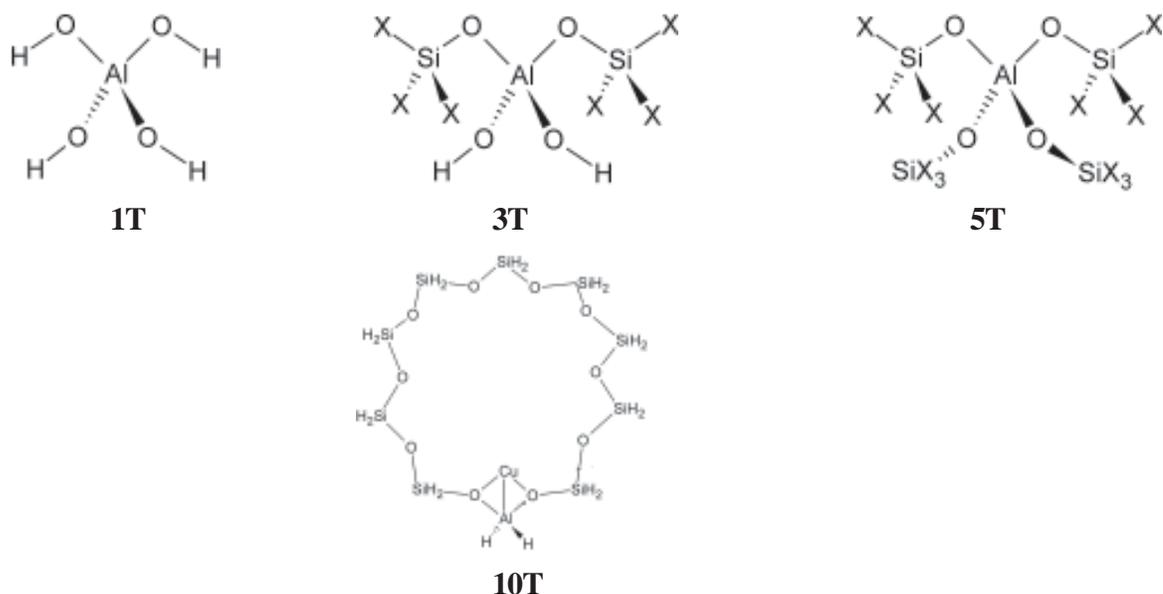
Figure 1: The cluster models (X = H or OH)

Results

There are five possible ways for NO_2 to adsorb on Cu-ZSM-5 (Figure 2). The first possibility is for nitrogen to bind to copper (**A**). Another possibility is for one of the oxygen atoms to bind to copper (**B** and **C**). In the **B** structure the second nitrogen is in line with the Cu-O bond, while in the C structure the second oxygen is located 90ˆ from the Cu-O bond. Another possibility is for both one of the oxygen atoms and the nitrogen to bond to copper forming a Cu-O-N ring (**D**). Finally the last possibility is for both of the oxygen atoms to bind to copper, thus forming a Cu-O-N-O ring (**E**). Since NO_2 is a polar molecule and the dipole moment points to N from O, different binding types should affect the bonding in NO_2 and the relative stabilities of the different adsorption complexes.

The HF method was used to obtain an initial optimization of the geometry and orbitals for each adsorption complex. To include the correlation effects, optimizations at the DFT level were then performed using the HF results as a starting point. The optimized DFT geometries are listed in Table 1 and the relative energies are listed in Table 2.

Although there are five possible structures, only 2 or 3 (depending on the cluster size) are stable adsorption complexes, ie. they represent local minima on the potential energy surface. The DFT results indicate that the **E** structure is the most stable adsorption complex regardless of the cluster size. The **A**, **B**, and **D** structures occur as local minima, though never all three with the same cluster. The **C** structure, however, never occurs as a local minimum. This is because the lone pairs of electrons on oxygen in this structure are in orbitals, whose orientation is not favorable for this complex. If the **C** structure were to exist, there would be a large strain on the Cu-O bond. If this strain were relieved by the reduction of the Cu-O-N bond angle, then the other oxygen in NO_2 would nearly overlap with an oxygen atom in the zeolite. Both of these situations are energetically unfavorable. Thus the **C** structure cannot be a stable complex.
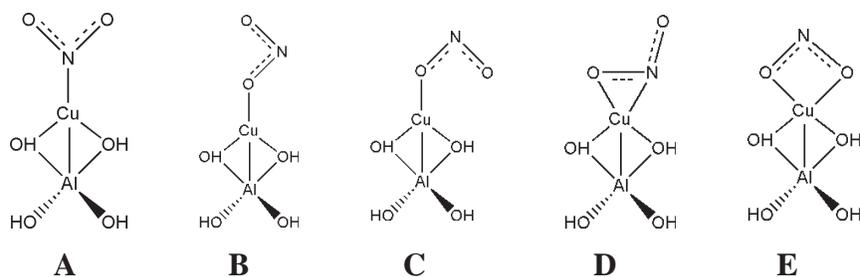
Figure 2: Five possible NO_2 adsorption complexes

Table 1: Optimized geometries of the NO_2 adsorption complexes

Adsorption Type	1T			3T -H			3T -OH		5T –H	
Distance (Å)	A	B	E	B	D	E	B	E	A	E
Al-Cu	2.8288	2.8485	2.8630	2.7785	2.7934	2.8012	2.8111	2.8019	2.7510	2.7864
Cu-N	1.8253	-	-	-	1.9130	-	-	-	1.8278	-
Cu-O	-	1.7778	1.9594	1.7745	1.9565	1.9615	1.7695	2.0006/ 1.9501	-	1.9597
(Cu)O-N	-	1.3708	1.2717	1.3703	1.3002	1.2713	1.3738	1.2672	-	1.2714
(Cu)N-O	1.2293	-	-	-	-	-	-	-	1.2278	-
N-O	1.2293	1.1905	1.2717	1.1887	1.1986	1.2713	1.1873	1.2672	1.2278	1.2714
Bond Angle (degrees)										
O-N-O	126.3	113.8	109.0	114.0	123.1	109.3	113.9	110.1	126.8	109.8
Cu-O-N	-	115.4	92.9	119.8	-	93.0	123.2	92.1	-	93.1
Cu-N-O	116.9	-	-	-	-	-	-	-	116.6	-
O-Cu-O	-	115.2/ 165.8	108.8	118.4/ 159.0	114.2	107.2	122.0/ 156.3	107.3/ 110.6	-	107.0
O-Cu-N	139.7	-	-	-	124.7	-	-	-	138.0	-
Dihedral Angle (degrees)										
O-Cu-NO_2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.2	0.0	0.0

Table 2: Relative Energies ( ) of the NO_2 adsorption complex

	1T	3T -H	3T -OH	5T –H
HF				
A	41.59	24.23	17.69	26.04
B	17.63	0.0	0.0	-
E	0.0	96.90	99.94	0.0
DFT				
A	27.62	-	-	26.04
B	16.26	16.22	36.04	-
D	-	10.75	-	-
E	0.0	0.0	0.0	0.0

The N-O bond lengths also show a significant trend. The N-O bond nearest copper is consistently shorter than the other N-O bond. This is due to the fact that the partial negative charge on oxygen in the zeolite framework is balanced by both Cu and N.

The HF results do not indicate a clear trend. However, inclusion of the correlation energy from the DFT method provides much clearer results. The **E** complex is consistently the most stable adsorption complex. Additionally, it is always present as a stable structure regardless of the cluster size. The **B** structure is a stable complex only with small cluster sizes. It's energy ranges from 16.22 – 36.04 $kcal/_{mol}$ higher than the **E** structure. Based on this the **E** structure is the most likely adsorption complex.

The adsorption complex that results from adsorption of NO on Cu-ZSM-5 has three possible structures (Figure 3). The first possibility involves the formation of a bond between Cu and N producing the **F** structure. Alternatively, a bond between Cu and O could form to give the **G** structure. The last possibility is for Cu to bond to both N and O to make a three-member ring structure (the **H** structure) similar to the **D** structure described earlier. Geometry optimizations at the DFT level are presented in Table 3, and the relative energies are listed in Table 4.

Complex **F** must have a shorter Cu-O bond length than **G** because the partially negative charges on O in **G** are shared between Cu and N. As a result, the N-O bond strength is decreased. Complex **H** displays the longest N-O distance because Cu forms bonds to both N and O. Because both N and O share Cu in complex **H**, it is expected that the Cu-N bond would be weaker than that in complex **F** but stronger than that in complex **G**. At the DFT level, molecular NO was calculated to have a bond length of 1.1589 Å. DFT results in Table 3 show that the N-O bond length in complex **F** is closest to that of molecular NO, while that in complex **H** is about 0.08 – 0.09 Å longer.

From Table 3 it is also found that, with the increase in cluster size, geometrical parameters of the cluster framework (*e.g.* Cu-Al distance) may change drastically. A similar observation is found when a different terminal group is used. Compared with the change inside of the zeolite framework, changes in bonding between zeolite and the adsorbate are smaller (usually less than 0.02 Å) but not neglected.

HF results showed that the optimized geometries had C_{2v} or C_s symmetry since the dihedral angle was always zero. Compared with the DFT results, HF can predict the conformations of **G** and **H** qualitatively correctly, though the bond lengths are always overestimated. However, the **F** complex displayed a quite different dihedral angle near 90° in HF and DFT studies: in small clusters, DFT results support an out-of-plane structure with C_1 symmetry. With the increasing size of the cluster models, such stable structures vanish. This may suggest that in this study both the cluster size and electron correlation are important factors.

The Cu-N-O bond angle is near 150°. This bond angle occurs in conjunction with the 90° dihedral angle in these structures. However, this bond angle becomes 180° when the dihedral angle is 0.0° in the larger clusters. The variations of the Cu-N-O angle and the dihedral angle always occur together. Therefore, when C_{2v} or C_s symmetry is broken, it is because oxygen from NO lies roughly 30° outside the C_s plane.

F **G** **H**
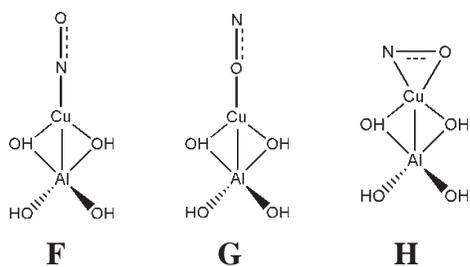
Figure 3: Three possible NO adsorption complexes

Table 3: Optimized geometries of the NO adsorption complexes

Adsorption Type	1T			3T –H			3T -OH		
Distance (Å)	F	G	H	F	G	H	F	G	H
Al-Cu	2.7793	2.8323	2.7706	2.7898	2.7763	2.7706	2.8186	2.8082	2.8010
Cu-N	1.7191	-	1.8351	1.7241	-	1.8351	1.7095	-	1.8395
Cu-O	-	1.7589	1.8625	-	1.7667	1.8625	-	1.7683	1.8629
N-O	1.1777	1.1880	1.2421	1.1759	1.1862	1.2421	1.1723	1.1839	1.2397
Bond Angle (degrees)									
Cu-N-O	149.8	-	71.9	149.2	-	71.6	180.0	-	71.5
Cu-O-N	-	180.0	68.6	-	180.0	69.2	-	180.0	69.4
O-Cu-N	123.5	-	114.9	139.0	-	115.5	139.6	-	116.0
O-Cu-O	-	140.3	126.2	-	138.8	122.3	-	139.4	123.0
Dihedral Angle (degrees)									
O-Cu-N-O	88.5	0.0	0.0	93.8	0.0	0.0	0.0	0.0	0.0

	5T –H			5T -OH			10T		
Distance (Å)	F	G	H	F	G	H	F	G	H
Al-Cu	2.7851	2.7702	2.7755	2.7968	2.7619	-	2.8198	2.8090	-
Cu-N	1.9387	-	2.0237	1.7493	-	-	1.7145	-	-
Cu-O	-	2.1052	1.9978	-	1.7726	-	-	1.7759	-
N-O	1.1184	1.1294	1.1516	1.1743	1.1826	-	1.1703	1.1826	-
Bond Angle (degrees)									
Cu-N-O	180.0	-	72.1	144.7	-	-	180.0	-	-
Cu-O-N	-	180.0	74.6	-	180.0	-	-	180.0	-
O-Cu-N	139.7	-	119.5	135.9/140.7	-	-	139.0	-	-
	-	139.4	126.0				-	138.8	-
O-Cu-O				-	136.9/139.4	-			
Dihedral Angle (degrees)									
O-Cu-N-O	0.0	0.0	0.0	77.0	0.0	-	0.0	0.0	-

The relative energies of the NO adsorption complexes at the HF level show little variation among all the clusters (Table 4). There seems to be an anomaly with the 5T –OH HF energies. Looking at the DFT results, complex **H** is not a stable structure. Therefore the energy difference between complexes **F** and **G** is in the same range as the rest of the clusters. The calculated energies at the HF level indicate that complex **F** is the most stable and, therefore, the most likely adsorption type. The **G** and **H** complexes are relatively closer in energy. DFT energies, however, differ significantly from the HF energies. Most of the clusters still indicated complex **F** as the most stable, and **G** is significantly higher in energy than **H**. The substantial differences in energies at the DFT level demonstrate the importance of electron correlation in the calculations. The 5T –H cluster provides contradictory results, though. The trend continues, however, with –OH termination. This seems to indicate that hydrogen termination is not as accurate a model of zeolite as the hydroxyl terminated clusters. Given the DFT energies, complex **G** is clearly the least stable of the adsorption complexes. The cluster size also makes the difference in the DFT calculations. In general, the cluster models indicate that the **F** complex is the most stable, followed by the **G** complex. When the cluster size reaches 5T and 10T, the **H** structure can no longer be obtained. This indicates that the **H** structure is not a minimum on the potential energy surface. As such, this might be a reasonable initial guess for a transition state, though that is not the focus of this study.

Table 4: Relative Energies ($kcal/mol$) of the NO adsorption complex

	1T	3T -H	3T -OH	5T -H	5T -OH	10T
HF						
F	0.0	0.0	0.0	0.0	18.41	0.0
G	5.52	4.27	3.94	3.86	21.96	3.06
H	4.56	6.34	7.99	6.77	0.0	-
DFT						
F	0.0	0.0	0.0	4.45	0.0	0.0
G	28.49	24.89	25.06	19.46	21.39	22.33
H	6.55	4.89	4.96	0.0	-	-

Summary

The most obvious conclusion from this data is that the cluster size has a significant impact on the energies of the complexes as well as on the geometries. The **H** complex is a local minimum with smaller clusters but not in the large clusters. The 5T–H cluster provides results that are contrary to the general trends. This data displayed the **H** complex as the most stable, while **F** was the most stable in all other cases. Additionally, the NO_2 complexes are also greatly influenced by the cluster size. The **A**, **B**, and **D** complexes occur with certain clusters and not with others. The reason for this is as yet unclear. In all cases, though, the DFT calculations indicate that the **E** complex is the most stable NO_2 complex.

In addition to the effects of the cluster size, the level of theory also impacts the results. Electron correlation from the DFT calculations contributes to a large increase in the relative energy of the **G** complex. From HF energies alone, it is not clear whether the **G** or **H** complex is more stable. DFT results, however, show a clear difference in energy between these two adsorption complexes. Complex **G**, then, is clearly the least stable complex, while **H** is not a local minimum, and thus not a stable adsorption complex, in the large clusters. The HF energies also do not clearly indicate the most

stable NO_2 adsorption complex. However, inclusion of the electron correlation energy in the DFT calculations clearly differentiates the **E** structure from the others.

The optimized geometries also indicate a difference between hydrogen and hydroxyl termination. Though two clusters may have the same number of tetrahedral units, the type of termination used still impacts the results. Changing the cluster from hydrogen termination to hydroxyl termination can greatly affect the electron distribution in the zeolite framework and, further, change the binding of the adsorbate.

At this stage the **F** complex is clearly the most stable NO adsorption complex. The **E** complex currently seems to be the most stable NO_2 adsorption complex, but results from the 5T –OH and 10T clusters may provide a clearer description of the relative stability of the NO_2 complexes. Thus, though the NO_2 data is still incomplete, this study provides insight into the method of adsorption of NO and NO_2 on Cu-ZSM-5.

[1] http://www.epa.gov/acidrain

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INVESTIGATION OF SUBSTITUTED CYCLOOTATRIENES AS A POSSIBLE TAXOID FRAMEWORK

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Abstract:

Paclitaxel, with a complex diterpene structure consisting of a 6-8-6-4 membered, fused ring system (termed the "taxoid" backbone), was the first of a group of compounds found to promote the polymerization of á- and â-tubulin subunits into microtubules. The taxane family of compounds has proven to be synthetically challenging targets, involving numerous steps and low overall yields. Substituted cyclooctatrienes were synthesized using a novel [2+2] photocycloaddition to serve as a surrogate paclitaxel B ring. Previous studies already showed that the tubulin-bound paclitaxel has the uncollapsed conformation with certain distances between C2 and C3' phenyl rings and the C2 phenyl and C3'-benzamido phenyl ring. Therefore, it is reasonable to assume that the substituted cyclooctatrienes with similar conformation and distances may have the same biological activity. In this study, molecular modeling was used to predict the conformations and the geometries were optimized using semi-empirical methods at the PM3 level with Spartan program. Based on theoretical investigations, a large number of possible compounds can be prescreened to narrow down to a small number of possible candidates for experimental investigations.

Introduction:

For the treatment of breast and ovarian cancer and more recently non-small cell lung cancer and Kaposi's carcinoma, Paclitaxel is commonly used [1,2]. Paclitaxel belongs to the taxane family of compounds and inhibits disassembly of microtubules during mitosis by polymerization of á- and â-tubulin subunits. This prevents cell division during the next stage of mitosis and subsequently slows or stops tumor growth [3,4].

The biological activity of paclitaxel results from several structural features found with paclitaxel. First, the distance between the centers of the phenol rings is the governing factor for activity. A previous study determined that for paclitaxel the distance from C3' to C2 is 11.6Å and C3'-benzamido to C2 10.1Å (Figure 1) [5]. Furthermore, the 6-8-6-4 fused ring backbone structure ("taxoid backbone") of paclitaxel is essential for the biological activity [6].
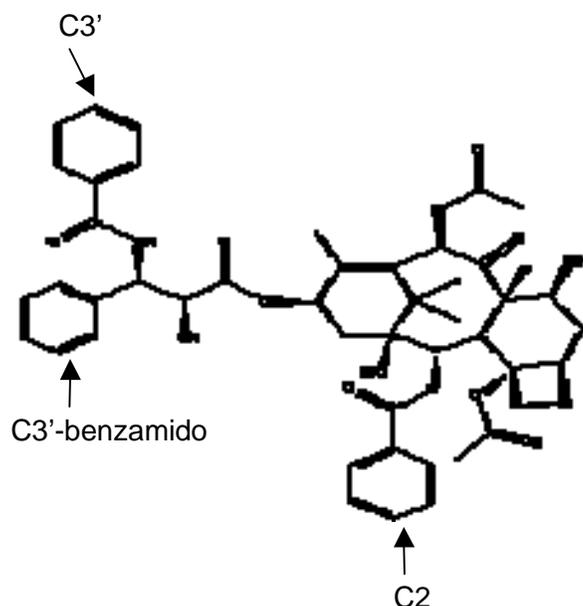
Figure 1. Structure of paclitaxel

Although very useful, paclitaxel is challenging to synthesize. The first method used the bark of the Pacific Yew Tree, *Taxis brevifolia*[7]. A huge demand for the drug was created when the FDA approved paclitaxel for treatment of breast and ovarian cancer. Unfortunately, the Pacific Yew tree is endangered and it would take six 100 year old trees to synthesize enough of the drug for one patient[8]. Today, the best method used starts with isolation of a compound from the leaves of the English Yew Bush, *Taxis baccata.* Still the synthesis proves to be extremely challenging and costly involving as many as 40-50 steps and a yield is as low as 0.015%-0.8%[7]. In addition to this problem, paclitaxel will cause severe side effects due to it being cytotoxic and non-specific to which cells it affects and with a lengthy treatment, there is also the appearance of resistance to the drug. Paclitaxel has very poor solubility making it difficult to use clinically[9]. Therefore, it is necessary to find an alternative to paclitaxel.

A total of five analogs known as 26, 27, 28, 29 and 30 (Figure 2) were proposed with either a 5-8-6 or 6-8-6 taxoid-like backbone. One feature of the proposed analogs is the possible substitution of a heteroatom, either O or NH, in the A ring. It is believed that the heteroatom could increase the ability to hydrogen bond and add polarity to the system and therefore increase the solubility of the ring system. From a previous study it was determined that the proposed backbone can be achieved by using a novel [2+2] photocycloaddition producing a taxoid-like backbone. This photochemical reaction can reduce the number of steps and increase the yield of the overall synthesis. A higher yield from fewer steps makes the use of any of the analogs more feasible due to the reduced cost of production[10].

As seen in figure 2, each of the analogs has three stereocenters labeled 1,2 and 3. In this study only four combinations of these stereocenters were investigated for each of the analogs. Also, there are two sites marked x and z that were replaced with different group to determine the effect of heteroatoms on the system. For each of these sites there were 3 possibilities. For X, CH2, O, and NH were the choices and for Z, CH2, O and CO were used. Therefore, for each analog there

were 9 possibilities from the X and Z combinations that were investigated for each of the 4 stereocenter combinations giving 36 structures for each analog. In total 180 structures were analyzed.

In this study, computational methods were used to optimize the stable conformations for each structure. From the optimization data the relative positions and distances of the phenyl rings were calculated. Preliminary results allow the 180 possibilities to be prescreened to determine which of the analogs had the possibility of biological activity.
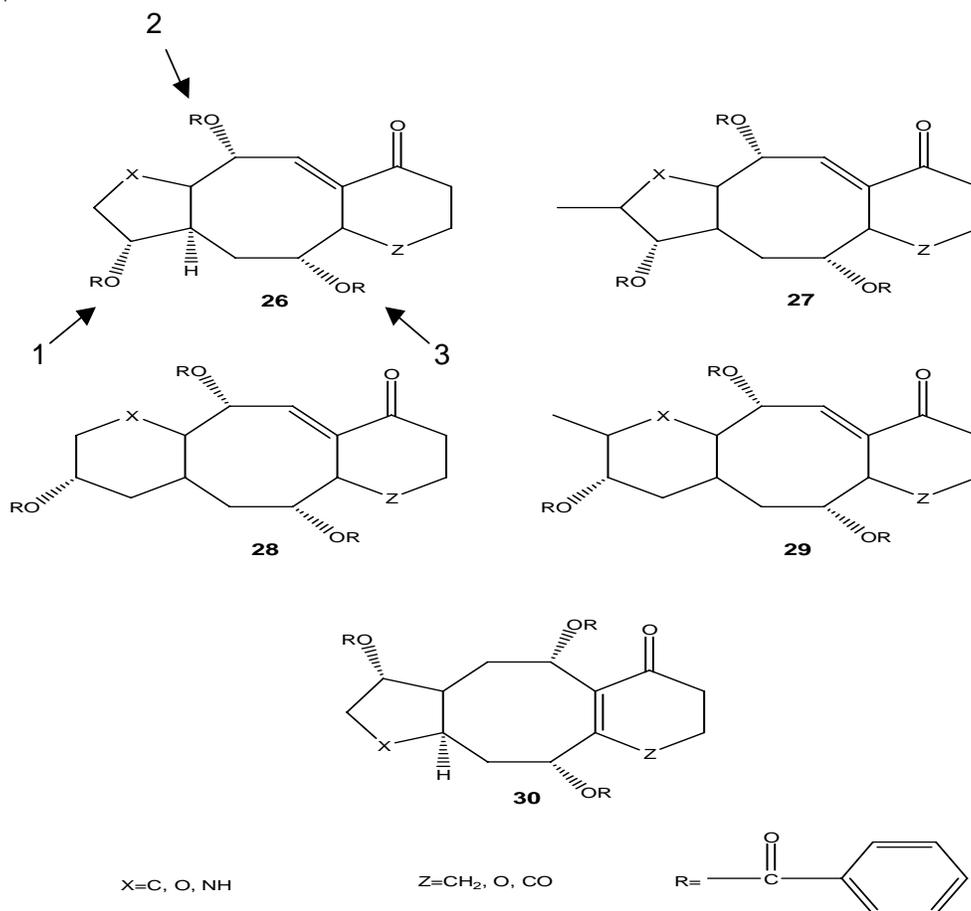
Figure 2. Proposed analogs of paclitaxel

Computational Details:
   The geometries of the analogs were optimized with semi-empirical methods at the PM3 level using Spartan. All calculations were performed on a PIV1.8 PC.

Discussion:
   Through theoretical modeling, the optimized geometries of the analogs were calculated. Then by analyzing the distances between the phenyl rings discussed above, the possibility of biological activity for the models was determined. It was discovered that 6 analogs had the proper distance to have the possibility for biological activity. The distances between the rings are listed below. Examples of the structures that had distances similar to that found in paclitaxel are shown in

Figure 4 below. These results of the theoretical study will then be used to determine which of the analogs will be studied further. Those analogs that are similar to paclitaxel will be synthesized and the actual biological activity will then be discovered.

Table 1: Selected Phenyl Ring Distance Calculation Results

Analog	X	Z	Stereochemistry	1-3 Distance (Å)	2-3 Distance(Å)
26	O	CH_2	RSS	NA	8.4
26	O	CH_2	SRR	6.7	8.8
26	O	CH_2	SSS	NA	8.4
26	O	CO	SSS	5.6	NA
26	O	O	RSS	NA	8.5
26	O	O	SSS	NA	8.4
26	NH	CH_2	SSS	NA	8.3
26	NH	CO	RSS	NA	8.8
26	NH	CO	SRR	6.1	NA
26	NH	CO	SSS	NA	8.8
27	O	CH_2	RSS	8.4	NA
27	O	CO	RSS	NA	8.4
27	O	CO	SRR	7.7	NA
27	O	CO	SSS	NA	8.3
27	O	O	RSS	8.5	NA
27	O	O	SSS	7.4	8.6
27	CH_2	CH_2	RRR	NA	8.6
27	CH_2	O	RRR	NA	8.5
27	CH_2	O	SRR	8.5	NA
27	NH	CH_2	RSS	NA	8.4
27	NH	CH_2	SRR	5.7	NA
27	NH	CH_2	SSS	NA	8.4
27	NH	CO	SSS	NA	8.7
27	NH	CO	RRR	7.6	NA
27	NH	CO	RSS	9.1	NA
27	NH	O	RSS(1/3)	7.9	8.4
27	NH	O	SSS	NA	8.4
28	O	CH_2	SRR	6.3	NA
28	O	CO	RSS	NA	8.9
28	O	CO	SSS	NA	8.9

28	O	O	RSS	NA	8.6
28	O	O	SSS	NA	8.6
28	CH_2	O	SRR	6.6	NA
28	CH_2	CO	RRR	NA	8.6
28	CH_2	CO	SRR	NA	8.7
28	NH	CH_2	RRR	10.9	NA
28	NH	O	RRR	11.1	NA
28	NH	O	SSS	10.4	NA
28	NH	CO	SSS	10.3	NA
29	O	CH_2	RSS	9.8	NA
29	O	O	RSS	NA	8.8
29	O	O	SSS	NA	8.7
29	CH_2	CH_2	RRR	NA	8.7
29	CH_2	CH_2	RSS	9.8	NA
29	CH_2	CO	SRR	NA	8.6
29	NH	CH_2	RRR	10.8	NA
29	NH	CH_2	RSS	9.4	NA
29	NH	CH_2	SRR	8.0	NA
29	NH	CH_2	SSS	9.0	NA
29	NH	CO	RSS	NA	8.7
29	NH	CO	SSS	NA	8.7
30	CH_2	CH_2	SSR	8.1	NA
30	CH_2	O	RRS	5.1	NA
30	CH_2	O	SSR	8.9	NA
30	CH_2	CO	SSR	11.1	NA
30	O	CH_2	RSS	8.9	NA
30	O	CH_2	SSR	NA	8.4
30	O	O	RRS	7.1	NA
30	O	O	RSR	9.3	NA
30	O	O	SSR	NA	10.2
30	O	CO	RRS	7.2	NA
30	O	CO	SSR	9.8	NA
30	NH	CH_2	RRS	9.9	NA
30	NH	O	RRS	6.1	NA
30	NH	CO	RRS	NA	10.1
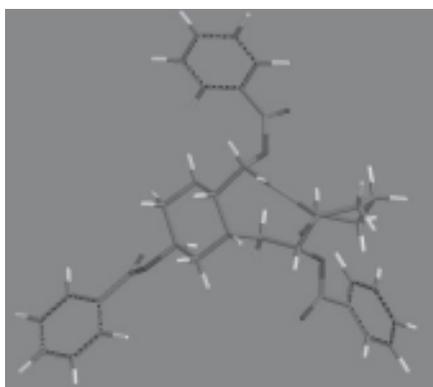
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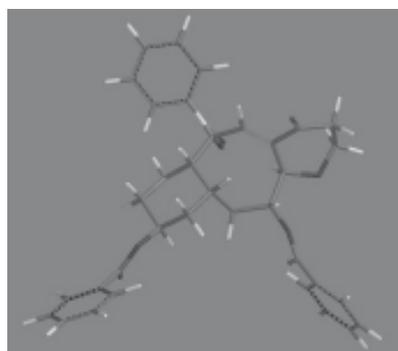
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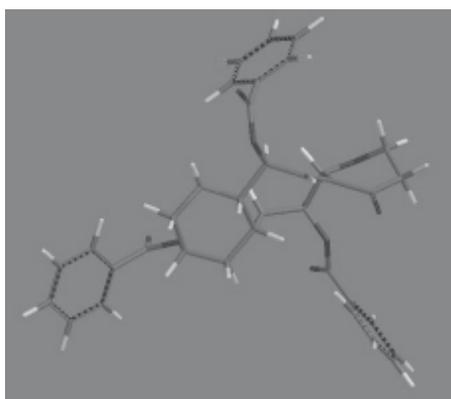
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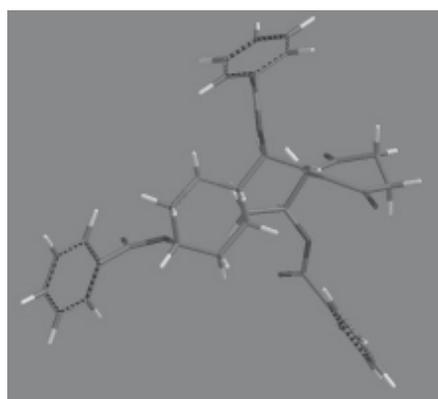
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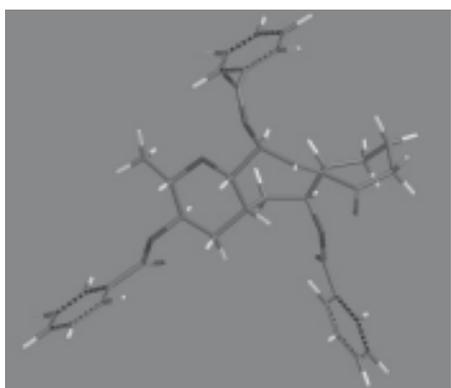
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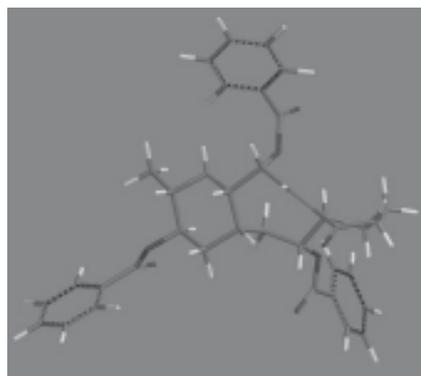
F

Figure 4. Analogs with possible biological activity
A: 28 X=NH Z= CH_2 RRR
B: 28 X=NH Z=O RRR
C: 28 X=NH Z=O SSS
D: 28 X=NH Z=CO SSS
E: 29 X=O Z=CH_2 RSS
F: 29 X=NH Z=CH_2 RRR

As seen from the distance data above, it is possible that there is a collation between the backbone of the structure and the distance between the rings. The structures that had similar ring distances to paclitaxel were either analog 28 or 29 therefore, seems to be a preference for the 6-8-6 backbone to achieve a similar ring distance.

By comparison of 28-NH-CH$_2$-RRR and 29-NH-CH$_2$-RRR from above it could be concluded that the additional methyl group on 29 makes no difference in determining the distance between the methyl groups. 28-NH-CH$_2$-RRR has a distance of 10.87Å and 29-NH-CH$_2$-RRR has a distance of 10.77Å. Therefore, the additional methyl group is not necessary for the molecule to have a similar ring distance.

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CELIA: BLOSSOMING INTO MATURITY

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In Shakespeare's <u>As You Like It</u>, the character of Celia is portrayed as the repressed daughter of the crooked Duke Frederick. So much so that her every move is carefully performed in his presence and her true personality is hidden deep inside her. Only in the private company of Rosalind are Celia's feelings and genuine self revealed. Rosalind appears to be Celia's sole friend and confidant, besides Touchstone, and so her devotion to Rosalind becomes unmatched, as demonstrated by her decision to follow her cousin into exile. Though Celia maintains a rather mature manner, she lives in the shadow of Rosalind; that is, until Oliver arrives and Celia begins to live her own life. Antoni Cimolino's interpretation of <u>As You Like It</u>, while maintaining her repressed character, portrays Celia as a naïve and immature young girl, far too undeveloped for her age, by the use of costuming and stage business as well as blocking. As her father represses her and determines her life, the lack of knowledge and experience fuel her immaturity. Thus, her immaturity continues as long as she lives in Rosalind's shadow, but when she attains freedom in the forest and Rosalind begins unintentionally abandoning her, Celia's experiences and lack of companionship press her towards maturity. At the arrival of Oliver, Celia seizes the opportunity and suddenly blossoms into a young woman.

When we first see Celia in Act 1.2, her immature and repressed personality is quite easily perceived as she enters wearing a reserved, private school uniform under a frumpy, inside-out sweater. Accented by a large afro of curly hair and geeky glasses, Cimolino reveals Celia with a gawky and nonsexual appearance. Her school uniform is not accidental but in fact carefully selected to represent Celia's repressed character. But yet unlikely her cousin Rosalind who wears her uniform neatly with a tie, Celia retains an untidy and scruffy guise that symbolizes her childishness. At this point, Celia overtly plays the role of a repressed, puerile teenager who still is unripe and cares not about attire or men. However, Cimolino contrasts Celia's expected age and her acted age in order to carefully warn the audience not to mistaken Celia as a little girl and allow her actions to fool them. As Rosalind sits thinking about her banished father in the beginning of Act 1.2, Celia enters the scene drunk and carrying a wine bottle. She takes a couple of swings before straddling Rosalind from behind and offering her some alcohol. Thus, it is obvious that Celia is not very young in age as her childish actions might suggest. Yet, Celia isn't to blame since no mother figure is there to teach her; her mother is absent throughout the play and never even mentioned. In addition, her straddling of Rosalind brings about another interesting issue. In the beginning, Cimolino's Celia is one that is repressed and rejected by all except Rosalind. Even with Touchstone who would seem a close friend, seeing that Celia herself later states "he'll go along o'er the wide world with me" (1.3.130), no close relationship is apparent onstage. So as Rosalind becomes her only friend, Celia loves her so greatly that she becomes almost infatuated with her. Though she maintains a normal distance with everyone else, the blocking of Celia relative to Rosalind is always very close if not too close at times, and she

continually touches her and plays with her hair in a peculiar manner. After discussing the banishment of Rosalind's father in a light manner, Celia quickly transforms the serious conversation into a silly chase, which becomes a common, asinine act of hers.

But before long her lofty, 'honorable' father appears with the rest of the court, and suddenly a dramatic conversion in Celia's behavior is observed. Instead of free moving across the stage, Celia freezes in her spot, holds her hands together, and looks down at her toes while rolling her ankles. She speaks only when spoken to and responds with diffidence and modesty. Furthermore, she trails behind her father like a dog trailing his master always standing either behind him or to his side. Celia terribly fears her father and conceals her personality, thus proving Duke Frederick's astonishing control over Celia. Soon after, Duke Frederick finds out Orlando's identity and in his outrage banishes Rosalind. In Act 1.3, while Duke Frederick storms around, Celia is seen standing close if not in the downstage with her mouth wide open as if she had something to say but yet fearfully suppressed her thoughts. Not until Rosalind defies Duke Frederick by saying "my father was no traitor" (1.3.58) does Celia, fearing for her cousin's disposition, speak out. Running up to the upstage, she stands between Rosalind and her father. Even though this marks Celia's first outcry against repression, Celia does so with caution. She confronts him when he turns his back towards her and utters "I did not then entreat to have her stay/It was your pleasure and your own remorse" (1.3.64-5), but the instant the duke turns to face her, her face contorts in fear as she shifts the blame onto herself, "I was too young that time to value her, but now I know her" (1.3.66-7). Duke Frederick makes an interestingly comment before leaving when he shouts "she robs thee of thy name/And thou wilt show more bright and seem more virtuous/When she is gone" (1.3.75-7). In other words, Rosalind is overshadowing your presence, and once she is gone, then you, Celia, will live in no one's shadow and get more attention as your character shines. It is quite ironic since her personality will not truly surface as long as he remains and represses her, even if Rosalind leaves. Duke Frederick and his lords storm out, leaving the two together. Celia once again changes and as Rosalind begins her serious contemplation and mourning, Celia's immature approach to problem solving is repeated. After touching and caressing her cousin, she suggests they escape to Arden and suddenly becomes giddy. Celia overlooks the dangers of running away until Rosalind mentions them together with wise solutions. Rosalind appears to have insight and look at matters with maturity while Celia lives in a dream world, caring only about enjoyment and overlooking reality. As darkness engulfs the stage and thunder and lightning fill the background, something wrong about the situation is felt. Rosalind notices this and clings to Celia with a worried face while Celia absentmindedly grabs an umbrella with a light and cheerful mood and dashes across the stage.

In the forest, Celia appears wearing many colorful layers of thick clothes in Act 2.4 as she, Rosalind, and Touchstone arrive at Arden. Her choice of clothes is unreasonable in the fair weather of the forest, and like a little child she whines about being tired and hunger, uttering "I pray you bear with me. I cannot go no further" (2.4.7). Touchstone, who is carrying all the bags, looks down upon her with a stern face and tells her that "I'd looks at rather bear with you than bear you" (2.4.8). She uncaringly lies down to sleep whereas Rosalind takes it upon herself to find lodging. Once Rosalind succeeds in finding some land for sale, Celia gets up and makes a foolish comment. Obviously, though her freedom and expression have increased, her maturity remains low.

When Celia appears again in the forest in Act 3.2, she isn't wearing either the school uniform or the layers of thick clothes. Instead, Celia's costume is more expressive and now consists of a colorful pink plaid dress with matching plaid converse shoes, resembles the dress of a little girl. Yet, Cimoloni carefully selects the dress to act as the transition stage between girlhood and womanhood, and it is here in the forest where Celia finally notices her need for love and companionship. Although she begins to change, Celia remains a nonsexual, gawky girl and in Act 4.1 carries a big book, reading it as Orlando and Rosalind converse. At this stage, Celia is like a giddy, middle school girl that sexually starved but excited and intrigued by sexual topics. Through this curiosity to learn, Celia begins to develop her mature self. After Celia enters Act 3.2 reading Orlando's poem and meets Rosalind, she becomes excited and teases Rosalind about the identity of the poem's author. Like a middle school girl, she skips around Rosalind with a huge grin on her face and not after pestering her cousin for a while does she reveal Orlando's identity. Since she is sheltered, Celia has never encountered a romantic atmosphere, let alone interacted with young men. Thus, when Rosalind introduces her to Orlando, Celia, hiding downstage, comes out shyly waves while looking down and retreats to her refuge. Furthermore, as she is exposed to romantic scenes of Orlando and Rosalind, Celia with curious and wide-eyes watches the couple. But when Rosalind invites Orlando to their cottage "go with me to it, and I'll show it you" (3.2.381), Celia expresses her shock by putting her hand on her mouth before coming out and behind Orlando's back trying to signal her objection to Rosalind's invitation. Celia is scared and uncertain about the invitation since she has never before experienced a similar situation.

In Act 4.1, Celia takes another step to maturity by stepping out of Rosalind's shadow and speaking her own opinion. After Rosalind converses about the flaw of women, Celia reproaches her by saying that she has wronged and for that they must strip and expose her. "You have simply misused our sex in your love prate. We must have your doublet and hose plucked over your head and show the world what the bird hath done to her own nest" (4.1.174-7) Though no action is taken, the words are strong. Then, for the first time Celia doesn't follow Rosalind, but instead retires, saying "and I'll sleep" (4.1.190).

As Act 4.3, Celia appears wearing a shorter, light green dress. However, Cimoloni retains her glasses and pink tennis shoes, revealing that although Celia has developed a great deal, she is not fully mature. Nonetheless, aware that Rosalind will soon leave her, Celia commences to search for companionship. Not only that, but her blocking relative to others becomes closer as she develops into a more social and caring person. As Silvius sits in upstage and mourns his failure to win Phoebe's love, Rosalind interestingly stands downstage, instead of her usual upstage position, and insults Silvius. Celia stands upstage and frowns upon her cousin and with a caring manner, characteristic of a mother rather than an immature girl, tries to comfort Silvius, "Oh, you poor shepherd!" (4.2.66). To assure her words have reached the grieving shepherd, Celia runs over to Silvius and touches his shoulder, an act only expressed to Rosalind in previous scenes. Suddenly, Oliver enters the scene and by his mere presence provides the last piece of hay to break the camel of Celia's immaturity. Celia stands enthralled by his looks before quickly taking off her glasses and hiding them. After Rosalind faints, Celia is the one to invite Oliver to their cottage this time, for experience and past observation put Celia at ease. "Good sir, go with us" (4.3.178). Hand in hand, Celia and Oliver prance away.

In the last scene, Act 5.4, the transformation is complete, and Cimoloni has Celia appear as a beautiful and tidy young woman. She still wears her green dress, but her tennis shoes are replaced with complementing green heels. Her actions are no longer suppressed, and as the music fills the stage, she dances freely with her new husband. When Hymen faces Oliver and Celia and weds them with "your hearts are together" (5.4), Celia passionately embraces and kisses her new husband. Like a traveler dying of thirst in a desert would drink from an oasis he has stumbled upon, Celia drinks love from Oliver after years of a loveless and sheltered life.

Cimolino's interpretation of Celia's character is superb as he portrays the several stages that lead to her maturity. At first, Celia lives a sheltered life in the presence of her oppressive father and in the shadow of her cousin Rosalind. Thus, she inadvertently resumes an immature personality. Not until she achieves freedom in Arden and feels a need for companionship besides Rosalind does Celia begin to discover the world, and love in particular, on her own. As she gains knowledge, Celia understands her role in society and slowly starts maturing. When Oliver enters the scene, every aspect of Celia's character is ready for sudden change. And thus, Oliver enters the scene and acts as the switch that changes Celia into a mature, beautiful woman.

POWER OF SPEECH IN MEDIEVAL WOMEN

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Modern woman has achieved many things that were previously thought unimaginable. Women today work in every possible domain that was once reserved for men. They are not limited to being homemakers like before. This is not to say that women do not care to be homemakers but what is impressive is their readiness to achieve a better status in society. Several decades ago one could not imagine being a woman doctor or a pilot. These were jobs for men and women were absolutely discouraged even to think about these kinds of professions. Despite man's resistance, women have regained their lost territories. This was not the case in the Middle Ages when women's role in society was very limited. Even though there were exceptions with some women wanting to change the society they lived in, they were primarily considered inferior to men. The writers of Antiquity did not have anything positive to say about women. The general idea at that time was that women were weak both intellectually and physically and that women diverted men from the righteous path with their seductive powers. Nevertheless, there is one area where women excel is the use of language and speech. It is speech that makes women more powerful than men.

In this paper I am going to talk about several female literary characters from the medieval period, among them, Yseut, from Beroul's The Romance of Tristan, Enide from Chrétien de Troyes' Erec and Enide and some of the female characters from Christine de Pizan's The Book of the City of Ladies in order to prove that despite their social condition as women, they had power through speech. It was the power of speech that allowed Yseut and Enide to save their loved ones. In the case of Christine de Pizan, her female characters used speech to attain spiritual salvation for their families and society.

During the Middle Ages, young women were often married to older men for money and power. When women were unhappily married they tended to seek happiness in a lover by having adulterous affairs. These young men were mostly warriors and knights. This practice was called *fin' amors* or courtly love. There were certain rules even in this game. Both lovers had to be of noble birth. Even though women had adulterous affairs, they would never leave their husbands. The lovers meet discreetly leading a painful life. In The Romance of Tristan, Yseut marries King Marc, who is also Tristan's uncle. After a war, Tristan brings Yseut to King Marc, but during their voyage, Brangien, the maid serves them a magic potion prepared by Yseut's mother to ensure her happiness with King Marc. By mistake Tristan and Yseut drink this potion and fall in love even before she could get married to Marc. The effect of this potion lasts three years during which they see each other in secret. The barons in Marc's court are aware of this and they complain to Marc who decides to catch them in the act. He climbs a tree and waits for Tristan and Yseut to confess their love. But Tristan and Yseut both see his shadow in the water below and act as if they were friends to make Marc believe in them. This is when Yseut's feminine ruse comes in to play. By manipulating her speech she saves herself and Tristan from execution. The readers know that

Tristan was the one who had her before she got married but Marc believes that he was the one and repents doubting his wife and his nephew. After some days the lovers get caught, but this time they elope to a forest. With the help of Ogrin the hermit, they reconcile with King Marc, but the barons would not allow them to live in peace. She confesses that the magic potion made them commit adultery, but still they prosecute her and demand that she swear her innocence before the people of Cornwall on holy relics. Yet again she manipulates her language and plans her victory. When the day comes, all the people are gathered to hear her oath and they all have to cross a muddy marshland. Yseut asks Tristan to disguise himself as a leper and wait for her. She asks the leper to carry her to the shore and to do so the leper had to carry her on his back. When everything is ready, she makes her oath. She places her hand on the relic and swears "I swear that no man ever came between my thighs except the leper who carried me on this back across the ford and my husband King Marc" (142). The judgment was passed in her favor thereby saving Tristan and Yseut because of her power of speech.

The same power saves Erec in Chrétien de Troyes' Erec and Enide. In this novel, one can see that Enide's speech, though negative at the beginning, turns to prove positive at the end. It does trigger hatred in Erec's heart, but finally her speech saves Erec from death and also restores peace in their lives. The couple faces a crisis triggered by Enide's accursed speech "oh, woe is me" (de Troyes l-2492). After their marriage Erec, who used to be the best knight, spends his time loving his wife. He completely forgets chivalry. She sighs uttering these four words when he sleeps. He wakes up hearing this and asks her using the same four words in the form of a question: "why say, oh, woe is you! to me?" (l.2517). After pronouncing these four fatal words she says " now you are mocked by one and all/ the young and old and great and small/ all say you are recreant" (l. 2549-51). She denies at first but then blames herself for what people are saying. She says "I'm grieved to be the one all blame/ for having caused your loss of fame" (l.2558-59). In fact, the whole story revolves around these four words. One can assert that without these four words, Erec would not exist as a hero. When he leaves his town with Enide to prove his worth, he demands that Enide never speak again, but being a loving wife she breaks the rule every time Erec's life is in danger. Her warnings always save him, proving her power of speech. Her speech helps him prove his bravery by inciting him to fight many battles under dangerous conditions and also restores peace and love in the couple's life.

Both Yseut and Enide prove that their speech saved the lives of their loved ones. In the third romance, The Book of the City of Ladies, Christine de Pizan once again confirms that "God endowed women with the faculty of speech" (28). Christine is sad after reading a misogynist work by Matheolus which "inclined to express both in speaking and treatises and writings so many wicked insults about women and their behavior" (4). The fact that so many philosophers and moralists had a very narrow view of women distresses her. Book after book, she finds that men insult women. After all this reading, she starts to think that perhaps the men are right to think that women are vile creatures. Now she feels ashamed to be a woman and laments to God saying " alas, God, why did you not let me be born in the world as a man so that all my inclinations would be to serve you better, so that I would not stray in anything and would be perfect as a man is said to be" (5). It is at this precise moment that three celestial ladies appear from heaven with a mission to console Christine and also to make her understand the power of women. With their help, she was to build a city, an allegory for a romance, which will shelter all

virtuous women. Christine will ask questions and their responses will help her get a clear picture of women. She asks Lady Reason, alluding to a latin proverb which states "God made women to speak, weep and sew" (27) to clarify if it was true. Upon discussion, Christine finds that God has given this boon to women to spread his good words. Lady Reason gives examples of two such women who with their power of speech, have accomplished miraculous feats. The first example she gives is that of Mary Magdalene to whom Jesus first appeared to spread the word of his resurrection to other apostles on the day of Easter. He did not choose a man but "desired that a woman carry such lofty and worthy news" (28).

The second example is of a Canaan woman "who was so great a talker" (29) she confronted Jesus with the request to heal her daughter. Jesus did not get annoyed but "took pleasure in the many words pouring from the mouth of this woman ever perseverant in her prayer" (29) so that he healed her daughter. With her power of speech, this Canaan woman has given life to her daughter. Thus, Christine de Pizan makes the readers understand that even though women are physically weak, they have this unique power of speech and that "God has truly placed language in women's mouths so that he might be thereby served. They should not be blamed for that from which so much good and so little evil, for one rarely observes that great harm comes from their language" (30).

For centuries, women have suffered atrocities at the hands of men. This situation has not changed even today. Women are trying to surpass men in all possible ways. One might think that men and women are equal in developed countries. This is a utopian idea and never can a man and woman be regarded as equals. One way or the other, men will see to it this never happens. Laurence Enjolras speaks of modern women saying "in their approach or rather appropriation of women, men have a subjective and traditional view of women making them objects of their desire and enclosing them within the veil of certain mystery, giving them predetermined sentiments according to social practices they consider valid"(32) (translation mine) . Today our world promises a better future for women. It still remains to be seen if the future generation will implement equality among men and women and give them the respect they have always deserved.

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GLOBAL ADOPTION AND SOCIAL IMPACT OF
LATIN AMERICAN TELENOVELAS

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Abstract

The cultural imperialism theory of cultural globalization routinely accuses global media conglomerates, which are often based in the U.S., of 'homogenizing culture' due to the vast amounts of popular forms of media they export annually. However, Latin American telenovelas, first cousins to the U.S. soap opera, have become one of the most popular forms of media in the world. This has taken away much of the U.S. media conglomerates' market share of exported popular culture. The phenomenon has been referred to as "reverse cultural imperialism", showing that countries with less developed media production capabilities also have been able to distribute their locally-produced media worldwide.

Introduction

Hollywood is often criticized for its ability to capture and cash in on global audiences by exporting U.S. popular culture to countries with less developed media production capabilities. The cultural imperialism theory of cultural globalization routinely accuses global media conglomerates, which are often based in the U.S., of 'homogenizing culture' due to the vast amounts of popular forms of media they export annually. With this in mind I decided to look at another world region that is known for being a cultural exporter: Latin America. This region has produced a type of popular cultural media called the telenovela, a first cousin to the U.S. soap opera that has become widely accepted in countries all around the world. Consequently, the telenovela has taken a large amount of the market share away from these U.S. media conglomerates, resulting in what some academics call "reverse cultural imperialism".

Explanation of Telenovelas

The Latin American telenovela originated in Cuba, where tobacco factory workers with a passion for dramatic interpretation read aloud from books by European social realists such as Charles Dickens, Victor Hugo, and Honoré de Balzac (Martinez). This oral tradition continued with the invention of the radio, where serial dramas were acted out over the airwaves, unfolding and unwinding as long as enough people wanted to continue listening. Finally at the dawn of the television era the radio dramas began to take on a visual form, based on the soap opera format of the U.S. radio and TV dramas. In 1959 Fidel Castro rose to power, scattering the Cuban television producers and other exiles from the Cuban Revolution, who took their talent with them to various Latin American countries. Due to this widespread production base, the telenovela has been in the "export genre" for most of its existence (Martinez). The telenovela has a couple things in common with the U.S. daytime soap operas that preceded them. First of all, on any

given day one could observe a cheating spouse, sexual encounters, illegitimate children, violent behavior, financial ruin, and twists and turns in the plotline. You will also see over-dramatized scenes that embellish these situations; drawing the story out slowly so that one is always left wanting to find out what happens in the next installment.

It is important to understand that telenovelas and daytime soap operas from the United States have more differences than they have similarities, however. First of all, telenovelas are generally aired at all times of the day, whereas the U.S. soap operas begin around noon and end before 5pm, targeting mainly women who do not work outside of the home, at least not during the day. Telenovelas are targeted at the whole family:

> To watch them is a family affair; mothers, fathers, sons, daughters, aunts,
> uncles, and grandmothers gather before the television for the daily half-hour or
> hour segments….Young and old alike find ones that beckon them to return the
> following day in search of what happens next. (Barrera)

Another characteristic particular to telenovelas is the length of each series. Unlike US soaps that have been on the air for decades, telenovelas have a definite beginning, middle and end. They generally run about 200 episodes, airing six days per week for about 4-6 months, depending on the length of each episode (Razdan). The most important difference between the two formats is the inclusion and treatment of real social and political issues within the context of the program. Telenovelas often deal with real struggles such as unemployment, inflation, abuse, diseases, social mobility, and the importance of education for one's own future (Martinez). U.S. soap operas may sometimes touch on some of these issues, but they are peripheral to the focus of the storyline.

Description of Global Adoption

Telenovelas are now one of the most popular forms of television programming in the world with about 2 billion viewers worldwide (Martinez). These viewers are not just casual consumers of Latin American soap opera drama, but rather avid fans who emotionally connect with the characters and the situations they encounter. Beginning in the late 1980's, telenovelas began to cross language barriers as well as international borders. During this time period the telenovela became the number one cultural export for Latin America, representing nearly two-thirds of the exported programming for the region (Barrera). Evidence of the exportation of this form of popular culture can be seen in regions all over the world, but most specifically in the United States, China, Russia, Eastern Europe, and Africa (Andaló).

In the United States, where the number of Spanish-speaking individuals gets larger every day, there are two main Spanish-language networks; Univision and Telemundo. The success of Univision as the United States' largest Spanish-language network is due to the English-speaking networks' neglect of the needs and interests of the large Spanish-speaking community (Barrera). Studies have found that when Latina women watched telenovelas they felt more connected with their heritage than they did when watching local programming. Viewing these programs also helped them stay connected with their language, which they felt began to get "rusty" from lack of use in an everyday context (Barrera).

Other countries that do not list Spanish as a national language are very significant consumers of this cultural export. For example, about 450 million Chinese viewers followed the Brazilian "La esclava Isaura", while 70% of Russians watched "Los ricos también lloran" regularly. Russians also watched the Venezuelan telenovela "Cristal", which follows the life of a young rural woman who tries to establish herself in the city (Andaló). After the fall of communism in Eastern Europe there was very little local media production, since the now-defunct Soviet government had previously handled all public broadcasting. The Latin American production companies seized this opportunity to export their product, at a greatly reduced price, to these countries in need as they recovered from economic crisis (Martinez). Lastly, according to Martinez, mosques in Ivory Coast actually issued the call to prayer early so that the primarily Muslim population wouldn't miss an episode of "Marimar".

At first glance it may seem a little odd that countries that are so far away geographically would be interested in programming that isn't in their native language, but there are theories why these telenovelas may have become so popular in these countries. The characters in Latin American telenovelas are often represented as working-class, non-affluent, or even poor. This is a theme that resonates globally, especially in other developing countries, and it makes the audience comfortable enough with the character that his or her nationality or ethnicity makes no difference in how the viewer can relate to the story. There are also common themes shared among many telenovelas, such as women's struggles in society or poverty and government instability, which are universal in nature. Even if a viewer's situation is exponentially better than the situation of the lead character in the story, there is almost always some aspect of the program that a viewer will be able to relate to. "These shows offer some insights on how to deal with the pain of life, and we can laugh at those who do not handle them particularly well", notes Lisa Peñaloza, a marketing professor at the University of Colorado at Boulder (Pena).

Analysis of Implications of Global Adoption

When media is exported to another culture it is embedded with values and messages that come from the exporting country's culture. Some critics of telenovelas believe that they have too many Western ideals interwoven into the storylines, including consumerism, the embellishment of class conflicts, and other capitalist themes (Bilstereyst). Another concern is that the US sponsorship of some telenovelas will further the problem of cultural imperialism in cultural globalization. Such sponsored telenovelas have been bitterly described as "agents for the creation of a capitalist and consumerist global village…engineered by the US and US-allied interests" (Martinez).

Other problems have arisen as a result of the exportation of telenovelas in their original, unmodified forms. In Indonesia the series "Esmeralda" was pulled off the air because one of the characters, named after the Prophet Muhammad's daughter, had a devilish streak that was incompatible with her moniker (Martinez). The Australian Media Entertainment and Arts Alliance pointed out another problem with cultural exportation in a study regarding free trade in Malaysia. According to this study, telenovelas exported from Latin America into Malaysia had become so popular that the government considered banning them altogether. To divert the viewers' attention away from the telenovelas, the local production companies began to offer local versions of the programs (Australia).

Many countries have taken Latin American telenovelas and adapted them to fit the local cultural norms. For instance, many countries purchase only a block of 40 episodes, which are edited down from the original 200 episodes that aired in series' home country (Jaspar). There is also the issue of censorship in countries such as China, where editing must be done to change the content of the programs to meet government regulations. In a process called co-production, the Latin American production companies often work with local Chinese companies to facilitate the process and come up with a more authentic product (Jaspar). Another type of co-production, known as licensing, was used in India by Sony's Hindi channel. A local version of Colombia's "Betty la Fea" ("Betty the Ugly") is seen in India using local talent and local adaptations on the original themes. Another example of licensing is the Russian "Poor Anastasia", which was loosely based on "Betty la Fea" (Martinez).

Telenovelas have a very strong influence on the people who watch them – a fact which can be considered positive or negative, depending on the cultural context. Paula Andaló explains:

> Telenovelas' larger-than-life story lines may be exaggerated renditions of real life dramas, but many viewers see their own lives reflected in those of their favorite stars. They identify themselves and others they know with various characters and are drawn in by the compelling twists and turns of overwrought plots. Thus, modeling a behavior they see on screen is almost natural.

In recent years the production companies in Latin America realized that they could use this opportunity to promote social change to an already captive audience, leading them to insert messages about health, abuse, women's issues, drugs, alcohol, AIDS, and trying to live a better life in general. Since many telenovelas deliver messages about sensitive topics, some countries find the material unsuitable for local viewers and must edit this content. Research conducted in Latin America, however, has shown that issues presented in telenovelas inspired people to make changes for the better in their lives. For example, in the Peruvian series "Simply Maria" a rural Peruvian women moves to the city and falls on hard times, finding herself betrayed by a lover who leaves her to raise their child alone. She turns her life around by overcoming obstacles such as illiteracy and lack of marketable skills by taking classes. Research conducted during this time reported a marked increase in the amount of sewing and literacy class enrollment as a result of seeing how Maria was able to improve her life situation (Andaló).

Analysis of Theoretical Models of Cultural Globalization
    The concept of cultural imperialism is described as a type of cultural domination by powerful nations over weaker ones. Because Latin America is considered a developing region, the dissemination of its popular culture on such a grand scale isn't often described as being "imperialistic" or "dominant". However, telenovelas are becoming so popular and influential worldwide that they are being banned, adapted, or emulated by local production institutions. Their success shows us that globalization has a "back channel", where there is room for surprise in a world dominated by the American entertainment industry (Martinez). This success has been called "reverse cultural imperialism", or more humorously, "Montezuma's revenge" (Martinez).

In a world driven by profits, it is no surprise that this reverse cultural imperialism is already being capitalized on by the US media conglomerates. Telenovelas may be a product of Latin America, but it doesn't mean that the United States won't try to emulate the format of the wildly popular form of culture in the Spanish language. While the largest US Spanish-language network, Univision, purchases telenovelas from the Latin American production companies, its closest competitor, Telemundo, creates its own dramas using a similar format. This has increased international competition because the cultural flows in this case are moving North to South instead of South to North, thereby reversing the "reverse cultural imperialism" (Martinez).

The network, or cultural flows, model sees globalization as "a process that is increasing international dialogue, empowering minorities, and building progressive solidarity" (Crane 9). Telenovelas are produced in several countries from the same region, but the programs are exported to over 100 countries worldwide that do not even necessarily speak Spanish. As the elements of telenovelas are taken in by other cultures, they are often modified and adapted to suit the needs of that culture. This process is seen as cultural hybridization, rather than the cultural homogenization seen in the cultural imperialism theory (Crane 4). In this respect no culture is "dominant", but rather everyone is able to share in a form of media that people can relate to and are interested in viewing. According to Crane, "the increasing importance of regions as producers of and markets for their own media provides support for a network model of cultural globalization" (Crane 7).

Lastly, according to the cultural policy strategies model proposed by Crane, nations form strategies that protect local culture while still allowing cultural imports. Examples of these strategies include protection, positioning, local competition to balance the amount of cultural imports, and global localization. According to this model there is no orderly process to cultural globalization, but rather chaos of competition and conflict (Crane 4). We have seen such strategies in practice in countries that adapt the telenovelas to suit local needs, such as in China and India. We have also seen positioning and protectionism in Malaysia where too much fervor over the Latin American programming is alarming to the government, which lead to the creation of local programming in an effort to distract viewers. Lastly, global localization refers to genres that are adapted to local audiences, leading not to cultural homogenization but rather a widespread diffusion of a cultural form that originated in one region but has become part of local culture in many countries around the world (Crane 17). The telenovela has become a global cultural product with universal themes that apply to just about everyone, with or without local modification.

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MUTE HEROINES

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By the end of the nineteenth century, the fairy tales collected by the Grimm brothers were already recognized for their pedagogical value. They do not only entertain us, but also teach us how to behave in many situations; that challenge our courage, character, and values. Jack Zipes explains, in his book, "Fairy Tales and The Art of Subversion":

> Reading as a physical and mental process involves identification before an internalization of norms and values can commence, and identification for a child comes easily in a Grimm's fairy tale…Thus, direct identification of a child with the major protagonist begins the process of socialization through reading (57).

The recurring themes in the tales are those of fearless heroes and princesses in distress. But what happens when girls and women read these tales? If fairy tales teach us about how to behave and about values and morals, then isn't it strange to want our female children to identify with a passive and powerless female hero? The Grimms' tales too often prescribe gender roles, and only rarely challenge them. Maria Tatar confirms this, in the following excerpt from her book "The Hard Facts of the Grimms' Fairy Tales":

> Wilhelm Grimm felt obligated to stamp the tale's actors with his own character judgments and thus shaped this reader's views of them. That we are forever coming across wise monarchs, compassionate heroes, toiling beauties, and proud princesses has something to do with folkloric plot patterns, but it also has a great deal to do with Wilhelm Grimm's preconceived notions about sex, class, and character (30).

The fairy tales "The Twelve Brothers" and "The Goose-Maiden"; at first sight seem to present some very women-friendly, even feminist tendencies, but under closer scrutiny they reveal a much different side. Both portray female protagonists, but in neither tale does the protagonist take on an active role; in deciding over her fate. The "evil", ironically, is in both tales represented by female characters, although the first glance does not necessarily reveal the factual situation. Another theme connecting the two tales; is the silencing of the two characters; Bottingheimer states that one hardly needs scientific proof to prove the annoyance that men have with women who talk. She observes that in one of the most famous fairy tales about the siblings "Hansel and Gretel", the brother's first words to his sister are, "Quiet, Gretel". Hansel also speaks more often, and for a longer time than Gretel (51). The two tales discussed in this essay support this theory: The sister in the "Twelve Brothers" can only release her brothers from a magic spell; by not making a sound for seven years. And the goose maiden is threatened with death; if she speaks about the theft of her identity. Communication through language forms a large part of what

differentiates human beings from animals, and serves as the primary medium for expressing will and desire; however, such expression is repeatedly denied to the Grimms' heroines. I intend to show that what has passed as "women-friendliest" scarcely deserves that praise.

The heroine in "Twelve Brothers" is born as the thirteenth child, a number that is, according to the church, unlucky. One must ask oneself, if this can be merely coincidence? Her father, the King has twelve coffins made; in the case that his next child is a girl, he wants to kill his twelve sons, in order to leave all his riches to her. Luckily the queen warns her sons, enabling them to run off into the woods to save themselves. The sister lives out her childhood in ignorance of her male siblings, but leaves the comfort of her castle to find her lost family members, when she gets older. Unfortunately, she becomes bad-luck for the brothers for a second time: She accidentally turns them into ravens, when she picks twelve enchanted flowers outside of their house.

The sister can only return her brothers to their original state by remaining silent for seven years. She does not depart on an adventure to save her brothers, and learn a life-lesson along the way, as is typical for romantic fairy tales; instead she climbs up a tree with intentions of staying there, and spinning until time is past. Shortly thereafter, her beauty captures the attention of a prince, who marries her. However, the prince's mother mistrusts the sister because she is not even allowed to laugh. The Queen, who is described as an evil woman, thinks that the sister is up to something wicked, and discusses this with the king, in the following passage:

> "If she is mute and can not speak, the least she could do is laugh, but someone who doesn't laugh, must have a bad conscience." The King at first would not believe it, but the old woman pushed and blamed the sister for so many evil things, for so long, that the king finally let himself be persuaded, and had the sister sentenced to death (KHM, 36).

The sister is sentenced to die at the stake. However, she can not even defend herself, for in doing so she would break the condition of silence forced upon her. Although she is the heroine of the story, her heroic deed lies simply in keeping her mouth shut. Once again the message to young girls is: "Girls are to be seen and not heard".

One must attach great significance to the fact that she is supposed to be burned at the stake: this practice exists in some cultures to this day. Burning women is supposed to restore lost honor; the fire supposedly "cleansing" the world of the woman's so-called sins. Fire carries a strong symbolic value; for without fire we would not have civilization. Keeping the fire alive was in the early days, seen as a crucial job. Thus, fire becomes a symbol of civilization itself, and a means of controlling nature. Through women's association with the earth and nature, a basic symbolic reading of this barbaric practice is that women, like nature, can be controlled through fire, and that women, being one with nature, are the opposite of culture and civilization. This idea is confirmed again and again in fairy tales: Fire only helps the male heroes, to cook, to warm themselves, or to keep animals away; while female characters are often thrown into the flames to die, as is the king's intention in "The Twelve Brothers."

Fortunately, the seven years are over at the same moment the flames are about to engulf the young heroine, and the brothers, in the form of enchanted ravens, fly over and save *her* out of the flames. The *evil* queen has to die in a barrel full of boiling oil and poisonous snakes. The king, however, is not punished for his behavior. Presumably because he was talked into it by his wife,

he is innocent of his decision to have the sister burn alive. Not only does he not take any responsibility for his decision, but he blames and punishes his wife with death. The other king, the father of the sister and twelve brothers, is also not punished, although he is so evil that he wants to have his own twelve sons killed. The double standards are clear.

The second tale, "The Goose-Maiden" is described by Bruno Bettelheim as "the ultimate tale of powerful womanhood." (53) However, in it, the Grimms treat the female central figure in a similar fashion. The heroine, is sent by her mother, the single-mother/queen, to another kingdom for marriage. The beautiful princess has to leave her home in order to learn a lesson, like many romantic characters do. For company, she rides a talking horse and a chambermaid accompanies her. On the way to the castle, the reader finds out what kind of person the princess is: discover that she is beautiful, rich, and humble. However, in the next description it is revealed that she is weak and powerless, because she loses a cloth that was supposed to protect her on her journey. The descriptions hardly sound like those of a heroine who is about to embark on a life-changing adventure.

When the chambermaid orders her to get on the weaker horse, give her the nice clothes, and not to speak about any of it, the princess is not allowed to defend herself, or say much of anything in return. The princess' identity is stolen, but the Grimms do not let her speak, the exact opposite is true: according to the Grimms, "she must take it" (KHM 551). The princess was only raised by her mother, who since her husband's death, had to rule the kingdom on her own. One can safely assume that it must be a strong woman who rules a kingdom, and that she would raise her daughter into a strong young woman. Yet the Grimms do not even give her a voice with which to defend her identity, as a male main character surely would have done.

The chambermaid marries the prince, and has the talking horse killed, out of fear that he may speak about what happened on the way to the castle, not anticipating that he will be able to speak even when dead. She lets the princess stay alive, and even gets the king to keep her busy herding geese; that is how confident she is in the princess' silence. In the face of injustice, the heroine is denied even one of the most basic human rights to self-defense through speech. The tale further deceives the reader into believing that the princess holds her fate in her own hands, when she requests that her horse's head be hung up in the doorway, through which she passes each day. However, upon closer scrutiny, it becomes clear that she asks for that, not because she has a plan, but rather "so that she could see him more than just once." The Princess simply lets things happen to her, and waits for her fate, in the meantime herding geese together with a boy, as the king had ordered.

Every morning as she and the boy pass through the gate, the horse sings a song about how terrible her situation is. Through the song the reader is informed that the princess is a virgin, an essential, repeatedly expressed attribute common to most of the Grimms' heroines: Her virtue and beauty are later recognized by the prince she was supposed to marry, but this only after he knows who she really is and who he actually married. Not only is the heroine at the mercy of fate itself, but while herding geese in the field, the poor girl is at risk of becoming a victim of the boy's curiosity: every time she brushes her hair, the boy wants to pluck some of them out; Being that a woman's hair is often recognized as a symbol of her sexuality, this is easily interpreted as, a clear case of unsolicited sexual attention. Once again the princess is completely powerless, and

has to beg the wind to help her. The Grimms' morals as pertaining to women are clear: the heroine is a virgin, she comes from high social standing, is dependable, predictable, and completely powerless in regards to anything going on around her, because in reality there is no wind coming to help; and she is surely not going to let a goose-herder seduce her.

The boy grows so angry at what he sees to be prudish behavior, that he punishes the princess by not speaking to her. It is only one sentence in the tale, and yet one has to wonder about its meaning and consequences. Communication, the essential tool needed to feel like one is in control over their life, fate and environment is taken away a second time. Speech allows the speaker to be recognized by the listener, and affirms human existence. When the boy denies conversation with the princess, he also denies her existence.

The young boy is so upset by the princess' behavior, that he does not want to work with her anymore, and tells the king about the strange things occurring around her. The King encourages her to tell her story to an oven, because as she explains she is not allowed to tell a human. By eavesdropping the king finds out the truth, and saves the day. Once again indirectly and passively, the princess escapes from her distress. It is one of the supposedly most feminist tales by the brothers Grimm, and yet is it the king who saves the girl in the end. The false princess is sentenced to death, and the others live happily ever after. Interestingly, the false princess is able to decide about her own fate, even if merely by accident, when asked what someone who commits such an act as hers deserves as punishment.

As we have seen, neither main character, the sister nor the goose maiden, has control over her own fate, which seems to disqualify them as heroic characters. Jack Zipes criticizes the brothers for having changed the tales to support their bourgeois agenda, and gender roles as prescribed by society are a large factor in keeping the bourgeois *status quo*. Literature is an art form that can educate, civilize and entertain us, and fairy tales are among the first works of literature that children hear or read. While gender roles are not only prescribed by fairy tales, we do recognize and praise them as a tool for the learning of values, ethical principles and morality. That we internalize fairy tales is easily shown by the observation that young women still seek their "knight in shining armor".

The Grimm's supposedly strong female figures are repeatedly portrayed as weak, passive, and easily manipulated. Their right to a voice to express their will is continuously and systematically denied. The heroines are left mute and defenseless against evil women and men; they have to rely on coincidence and men to save them, rather than taking their fate into their own hands. The themes of enduring in silence, marriage as reward and the powerless heroine are present in most the Grimms' fairy tales, which have a female main character. So while the importance of their fairy tales for German Romanticism is undeniable, their feminist values are difficult to find. Rather, the tales become vessels for misogynist values, perpetuating the degrading thought that woman's internal heroine will surrender and find her place in the patriarchal, bourgeois world.

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Apocalypse, When?

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The apocalypse has always had religious connotations. It conjures images of four dark horsemen, death, fiery pits of damnation, Armageddon, and the Book of Revelations in the Bible. The apocalypse signals the end of the world as we know it. It is God's way of clearing the earth from all that is sinful and making way for a bastion of purity and grace. Robert Lowell, a poet during the post-Modernist era, clung to the ideas of the biblical apocalypse and made it his own. His interest in the sacred coupled with his obsession with the secular drove him to create poetry that reflected his absolute certainty that the political strife and wars that were unfolding in America would lead to a religious apocalypse. Especially during his early poetic career, Robert Lowell focused on utilizing a prophetic voice to convey his view about both the religious and secular. His apocalyptic discourse was at its peak when he published the book <u>Land of Unlikeness</u>, leveled off in <u>Lord Weary's Castle</u>, and tapered down with <u>Life Studies</u>.

Lowell managed to become a prophet of sorts and his medium was his poetry. He clung to largely Christian ideals that helped him make sense of past, current, and future events. He wanted to warn people of the imminent danger of war and un-Christian behavior. His exposure to both religious and classical discourse made him rationalize that both can go hand in hand. Images of Moby Dick alongside the images of military ships and the Virgin Mary were common in Lowell's poetry. Steven Gould Axelrod states in the Introduction to <u>Robert Lowell: Essays on the Poetry-</u>, "Lowell allied himself with the Christian poetics of Eliot….The basic concept goes back to Saint Augustine: Secular history is but an aspect of God's design and has a preordained, redemptive end. Responding to the cataclysmic violence of World War II, Lowell wrote as if that end were now at hand" (Axelrod 18).

In <u>Land of Unlikeness</u>, the apocalypse was a daunting and apparent theme. In <u>Lord Weary's Castle,</u> due to Lowell's abandonment of Catholicism, his poetic voice became less apocalyptic and damning. His poems still retained religious morals from both Catholicism and Calvinism, but they were distinctively mellower. As Selim Sarwar declares in his article <u>Robert Lowell: Scripting the Mid-Century Eschatology</u>, "There is, undoubtedly, a significant change in tone and focus in Lowell's poetry in the 1950's. Several crucial personal events with momentous implications for his poetic precepts and practice intervened …. At one level, the angry voice of the visionary is tuned down to the tired confessional musings of a convalescent. The apocalyptic, however, is transmuted rather than abandoned" (Sarwar 120). From this setting, -<u>Lord Weary's Castle</u>'s backdrop developed.

<u>Lord Weary's Castle</u> was written in 1946 and contains in it poetry that supports the idea of a Lowellian apocalypse. It is the book that best proves that although Lowell abandoned Catholicism during this period, he was still a very eschatological poet. This paper will focus predominantly on poems in <u>Lord Weary's Castle</u> such as "The Quaker Graveyard in Nantucket" and "Where the Rainbow Ends." It will end with the poem "Beyond the Alps" found in <u>Life</u>

Studies. "Beyond the Alps" was the poem that signified Lowell cutting off official ties with the Catholic Church. Lowell lowered the decibel of his eschatological voice in his next book, Life Studies.

Lowell, in his early years, was raised as an Episcopalian Protestant although in Ross Labrie's article "Reassessing Robert Lowell's Catholic Poetry," Labrie states that Lowell's family was largely agnostic. He later converted to Roman Catholicism due to his mentor Allen Tate's influence and clung to it fiercely. Labrie further mentions, "More of an Augustinian than a Thomist, unlike his Catholic friend and mentor, Allen Tate, Lowell was unvarying in perceiving the world as a dark and unredeemable place" (Labrie 118). Even with this heavy Catholic influence, he was still influenced by very Puritan ideas. Selim Sarwar further states that "Lowell's early poetry, manipulating the imagery of violence generated by the on-going war, presented a strident indictment of what he himself called the 'New World eschatologies' – the Puritan messianism and its current manifestations" (Sarwar 114). Labrie expands by saying Lowell incorporated into his poetry a hybrid theology. The Lowellian theology included fusions of Roman Catholic, Puritan, and Calvinist ideologies.

"The Quaker Graveyard in Nantucket" is one of the central poems in Lord Weary's Castle that evokes the idea of Lowell as an eschatological prophet. It is set in Madaket, an island of Nantucket. This poem is first and foremost an elegy for Lowell's cousin, Warren Winslow, who died at sea. He was a soldier in World War II. In truth, it was uncovered that Winslow had died in a ship docked in New York Harbor. The death was an accident but for Lowell, it was perhaps an opportunity to talk about the repercussions of war. An objective of the poem is to give his proper farewells to Warren Winslow, but Winslow also becomes representative of the deaths due to WWII. He then interweaves this with other dramatic images from Herman Melville's Moby Dick, Christianity, Greco-Roman gods, as well as shipping activities in New England.

Lowell's poem starts off with a striking image: "The corpse was bloodless, a botch of reds and whites, / Its open, staring eyes / Were lusterless dead-lights" (lines 8-10). It sets up the dark atmosphere of the poem and it strengthens Axelrod's theory that although Lowell was a pacifist, he delved in more aggressive and violent images in his poetry to convey his sentiments about the war. Axelrod claims in his essay, "Robert Lowell and the Cold War," that Lowell was a complicated poet. He declares, "Lowell's 'pacifism' was never an abstract good in itself but always constructed in relation to political issues and events unfolding at the time. A further complicating factor is that his 'pacifism' was doubled, in both his life and his texts, by a fascination with aggression and violence" (Axelrod 340). The violent images certainly lend themselves fully to the apocalyptic aesthetic Lowell utilizes.

The poem takes a turn putting the focus on Captain Ahab and his obsession with the white whale in Moby Dick. The allusions to Moby Dick in this poem are likened with Captain Ahab's obsession to spear the whale with America's fanatical idealism. Statewide paranoia is a theme that is also explored. As Captain Ahab is obsessed with catching the "pure" white whale, so is the America engulfed in paranoia about the outside world.

Lowell's energetic diction connects his cousin's death with Ahab's obsession. The poem states:

> Seaward. The winds' wings beat upon the stones,
> Cousin, and scream for you and the claws rush
> At the sea's throat and wring it in the slush
> Of this old Quaker graveyard where the bones
> Cry out in the long night for the hurt beast
> Bobbing by Ahab's whaleboats in the East. (39-44)

The hurt beast is the white whale, America's obsession. The bones of the dead in the graveyard are vocally denouncing this voyage of extermination. Even nature is responding to the oncoming slaughter.

Part III switches back and forth from Ahab's bobbing whaleboats to warships. The shipwrecked Quaker pass implied 1940's present landscape. The white whale reappears and essentially represents Jesus with " … had fabled news / Of IS, the whited monster … " (61-62). IS is Iesus Salvatore which means Jesus the Savior. Even though doom is the only end result for the battling Quakers, they are still convinced that they are right.

> I see the Quakers drown and hear their cry:
> "If God himself had not been on our side,
> If God himself had not been on our side,
> When the Atlantic rose against us, why,
> Then it had swallowed us up quick." (64-68)

They believe that God would not have asked the Atlantic to swallow them up as quick if they were not right in their actions. This perhaps parallels Lowell's view of a nation's stubbornness and irrationality when it should accept that its actions were wrong.

This is an apocalypse unto itself with the Atlantic rising up and the sea swallowing the bodies. It. is interesting to note that as the Quakers end their journey through this way, it is also the "end of the whale road" and the end of the whale.

This paves the way for Lowell to transcend beyond the ordinary human self and speak as a prophet. The quality of Lowell's language marks this change. As Albert Gelpi states in his essay "The Reign of the Kingfisher:" "The Lowell of Land of Unlikeness and Lord Weary's Castle did indeed take the prophetic as 'the highest conception of the poet's task'" (Gelpi 54). The prophet voice strengthens after the whale's death:

> The bones cry for the blood of the white whale,
> The fat flukes arch and whack about its ears,
> The death-lance churns into the sanctuary, tears (95-97)

This invokes the images of the Land of Jehoshaphat and the land of last judgments. The dead are there to be judged for their sins. They cry out and are in tears. This section closes as the ship's world comes to an end signaling damnation.

Part VI of the poem introduces Lady of Walsingham. The Lady of Walsingham is the Virgin Mary. As the scene unfolds, the Virgin Mary is an eerily expressionless observer.

> Our Lady, too small for her canopy,
> Sits near the altar. There's no comeliness
> At all or charm in that expressionless
> Face with its heavy eyelids. As before,
> This face for centuries a memory,
> *Non est species, neque décor,*
> Expressionless, expresses God: (117-123)

Translated, "Non est species, neque décor" is expressionless expresses God lifelessly much like a corpse. She watches, as the antithesis of human expression, while the world crumbles. She knows what God knows, and that "Now, and the world shall come to Walsingham" (126). When the world realizes its mistakes and misdeeds, humanity must repent by going back to God or by a pilgrimage to Walsingham.

Ultimately, the poem serves as a possible scenario that could occur if the man continues on his path of obsession and vengeance (more specifically Americans at that time period). It is a warning that actions have their respective consequences and religious morality will dictate that the punishment would be eschatological in nature. "The Quaker Graveyard in Nantucket" though ends on a message of free will. "The Lord survives the rainbow of His will" (143). Man can choose whatever path he takes, but must be aware of his act and the corresponding results.

"Where the Rainbow Ends" is also prophetic in nature. Although it does not convey the same caveat of violent war images as the prior poems, it offers more subtle references to biblical damnation. The location shifts from the real city of Boston to a nether world like Boston. The poem starts off with the image of Boston in winter. Winter becomes this destructive force and it seems to represent a war that is occurring. "I saw the sky descending, black and white, / Not blue … " (1-2). This immediately presents readers with the image of the sky falling. A black and white sky also carries an ominous note that something is not quite right. Tones of famine, death, and plague come in quickly with the images of:

> And Hunger's skin-and-bone retrievers tore
> The chickadee and the shrike. The thorn tree waits
> Its victims and tonight
> The worms will eat the deadwood to the foot
> Of Ararat: the scythers, Time and Death,
> Helmed locusts, move upon the tree of breath; (4-9)

Anything that is alive faces the hunger, the scythe, and a plague of locusts.

Judgment has finally come to the land with:

> I saw my city in the Scales, the pans
> Of judgment rising and descending. Piles
> Of dead leaves char the air-
> And I am a red arrow on this graph
> Of Revelations. Every dove is sold   (14-18)

The apocalypse has come and as with the souls in the Valley of Last Judgment, the speaker watches as his city is put under the microscope. Judgment is finally meted out on earth. Doves are symbolic of peace. Any chance of peace has been sold.

Judgments have been made as to who is sinful and who is innocent. However, the poem ends with a message of peace containing wisdom. In the concluding line, there is a message of hope with "The dove had brought an olive branch to eat" (30). There is still a chance to rectify past mistakes with a blank slate. As Noah received an olive branch from the dove to signify that a new land has surfaced after the Great Flood, so does a new people emerge with wisdom from experience.

After Lord Weary's Castle, Lowell lowers his apocalyptic voice but does not abandon it completely. As Sarwar writes, "During his mid-career, the apocalyptic in Lowell came to function as part of a different poetic strategy. The apocalyptic imagery in the poems of his Life Studies phase went undercover so to speak and manifested itself in brief but chilling flashes" (Sarwar 120). Eschatology was still palpable although Lowell reached for more confessional and secular themes. Lowell also shifted his political activities from World War II to opposition of Communism. He later became involved in full blown activism against the Cold War and the Vietnam War.

"Beyond the Alps" is an important poem in Life Studies because it proclaims his abandonment of the Catholic Church and, in retrospect, desertion of big apocalyptic ideas. It was written on a train trip from Rome to Paris in the year 1950. It is the reader's voyage from the bosom of Catholicism to another type of dogma. The speaker is physically on a train trip that started in Rome and ends on top of the Alps. This poem is both a religious cleansing as well as an internal inquisition. There is a level of hesitation and apprehension about leaving Catholicism. "Life changed to landscape. Much against my will / I left the City of God where it belongs" (7-8).

The narration demystifies the church through its representation of the Pope with the quote, "The Holy Father dropped his shaving glass, / and he listened. His electric razor purred" (17-18). The highest official of the church who serves to be the holy messenger of God is depicted engaging in mundane earthly activities. The act of shaving undermines the pope's holiness. The narrator also puts into question why people should leave science and reason behind by believing in the church's decree regarding Mary's Assumption.

> The lights of science couldn't hold a candle
> To Mary risen – at one miraculous stroke,
> angel-wing'd, gorgeous as a jungle bird!
> But who believed this? Who could understand? (20-23)

This is certainly the point where the Catholic Church loses all credibility in the speaker's eyes.

In the end, does Lowell's apocalypse really occur? A worldly apocalypse most certainly never does. Lowell's emphasis on eschatology wanes off after his religious dependency on Roman Catholicism shatters. The voice returns on and off in such books as For the Union Dead and History, but the prophet in Lowell never is as strong as it was in Land of Unlikeness and Lord Weary's Castle. Lowell's prediction did somewhat come true though, but it wasn't as global as he predicted to be. Instead, it was a personal apocalypse that occurred within him. As Sarwar quotes Lowell from an interview in the Observer, "I thought the civilization was going to breakdown, and instead I did" (Sarwar 121).

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RELIGION AS A MANIPULATIVE TOOL IN EARLY MODERN LATIN AMERICAN LITERATURE

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The most distinctive quality of the human race is curiosity. The likelihood of you even considering this statement so to ponder and either accept or negate it is evidence of our analytical nature. It is from this tumultuous depth of our intellect that concept and theory are born. For this reason, religion manifests as a reflection of social construct and as a viable representation of the human psyche. The influence of religion on humanity directly correlates to this intimate relationship. Certainly such a powerful bond could not have been neglected in an ultimately inquisitive world. Early Modern Latin American authors recognized the hypnotic effect of religion on society and frequently employed it as a manipulative tool within their works.

The very first Early Modern authors of Latin America were the men who conquered it. Each image they penned served as a brief glimpse into a foreign world. The combination of exclusive perspective and religious appeal fostered commanding narratives constructed to serve individual goals. The pattern of religious rhetoric in the Americas begins with the first witness to an "undiscovered land." Christopher Columbus arrived on the Caribbean shores in 1492, opening up a world of opportunity and wealth to Europe. The inspiration for this investment came from the words of its discoverer. Within his *Diario*, Columbus's words evoke the possibility of economic enterprise veiled with spiritual sentiment. This material obsession within his diary was surely intended to appease his royal investors, King Ferdinand of Aragon and Queen Isabel of Castille. As Tzvetan Todorov points out in *The Conquest of America*, "signs of the presence of gold must appear on every page" (9). While it would be illogical to assume that a man who envisioned himself as a "divinely inspired fulfiller of prophecy" was not sincere with regard to his religious intentions, his enticing descriptions of a potentially lucrative land and labor supply shift the focus of his work from faith to finance (Watts 99, Todorov 10).

His desire to "increase the wealth and position of himself and his family" is integrated into his detailed account of the people he sought to convert (West 255). Through the juxtaposition of indigenous vulnerability to domination and their preparedness for conversion, Columbus softens the grim reality of this greed. He explains in the entry from October 11, 1492 in his *Diario* that "they were people disposed to submit themselves and to convert to our Holy Faith much more readily by love than by force." Yet, the descriptions that follow this idyllic vision emphasize the defenselessness of the natives and even seek to degrade them into an animalistic subjugated status. Columbus initially takes notice of the lack of clothing worn by the natives, which, from a European perspective, symbolized a lack of culture (Todorov 34-35). He illustrates their well made, naked bodies crowned with coarse, horse-like hair, alluding to their capacity as laborers and predicting their servitude when he announces that "[t]hey would make good and industrious servants." Columbus is also sure to point out that "[w]eapons they have none, nor are they acquainted with them." Then, lest we should forget his holy purpose, he writes, "they would very

readily become Christians; it has seemed to me that they belong to no religion." The incredible proximity of these details encourages the domination of a defenseless people for the sake of religion.

This seemingly self-contradicting concept was prevalent within Europe at the time. Such a conflict of values can be attributed to the transitory nature of these opposing principles. Todorov explains that "the Spanish conquistadors belong, historically, to that transitional period between a Middle Ages dominated by religion and a modern period that places material goods at the top of its scale of values" (42). Thus, Spaniards mingled God with gold. Delno West points out the various aspects that played into popular culture including the legendary promise of "wealth and glory to the person who boldly sought the mysteries of lost biblical sites, fabled islands, and exotic peoples" which was further fueled by an "apocalyptic desire to extend the Christian empire to the farthest ends of the earth" (263, 266). In the messianic nature of his mission, Columbus was devoted to delivering Christianity to the Indies. However, Columbus's concoction of religion and economic foresight surely invoked a rush of greed and adventure that could be civilly presented as a spiritual concern.

As further exploration of the Americas augmented the possibility for obtaining wealth and power, the nature of political persuasion morphed. However, the unwavering religious element would maintain its status as a key player in the justification of conquest. Hernan Cortes, the conqueror of Mexico, masterfully implanted religious devices within his letters in order to manipulate Emperor Charles V. Before one can truly see Cortes's attempt to control his reader with subtle spiritual psychology, it is imperative to understand his deceptive capabilities with regard to religion. Cortes directly relays to his ruler that the Aztecs believe the Spanish soldiers to be representatives of their long awaited god, Quetzalcoatl. He writes of his encounter with the Aztec leader, Moctezuma, "I responded to everything he said to me[*], as I thought most fitting, especially in making him believe that Your Majesty was he whom they were expecting." He then further explains the luxuries afforded to him under this pretense.

Historically, these actions play an integral role in his conquest of Mexico. The indigenous populations sought to identify the Spaniards with that which was culturally available. Todorov explains this adoption of the foreigner by arguing that: "Instead of perceiving this fact as a purely human if unprecedented encounter – the arrival of men greedy for gold and power – the Indians integrate it into a network of natural, social, and supernatural relations, in which the event thereby loses its singularity; it is somehow domesticated, absorbed into an order of already existing beliefs" (74). Upon observing this reaction, Cortes recognizes the power that such misperception confers, and further contributes to the obscurity of his origin. He even goes so far as to have his horses buried at night after a battle so to fuel the prevalent uncertainty of their mortality (Todorov 111). With the aid of Cortes's inconspicuous persuasion, the Indians hesitate to defend themselves against foreign conquest and are thus preemptively defeated. His description of this stratagem proves that he is fully aware of his ability to mislead people through spiritual fallacy.

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* This is my translation.

With a sense of his mastery of strategy, the embedded religious devices within his *Segunda carta de relacion* become much more apparent. Cortes uses inconspicuous statements to degrade the Aztecs into an unchristian enemy of the crown. He begins his religious commentary through a supposedly sympathetic description of those conquered by Moctezuma, a man who "rules them by force and tyranny, and takes their children in order to kill and sacrifice them to their idols[*]." He later mentions the "monstrous" paintings within their temples, and then refers to Moctezuma as being "unfaithful." Collectively, these simple interjections imply a pagan denial of Christianity among the Aztecs and therefore mark them as believers in false gods. Cortes illuminates a clash of ideologies which Todorov attributes to the fact that, "Christianity is, fundamentally, universalist and egalitarian. "God" is not a proper noun: this word can be translated into any language, for it designates not *a* god – like Huitzilopochtli or Tezcatlipoca, though these are already abstractions – but *the* god. This religion seeks to be universal and is thereby intolerant" (105). It is through the negation of the indigenous ideologies that Cortes and the Spaniards find justification for their lapse in decency and morality. As Glen Carman explains in "The Means and Ends of Empire in Cortes's *Cartas de Relación*": the conquistadores see the war against the infidel as a war against false beliefs. The ideological justification for Spanish imperialism, not surprisingly, is based on the stable opposition between truth and falsehood" (118). Thus, the task of conquering an innocent society is readily transformed into a war on the nonbeliever. Cortes uses religious belief to degrade the indigenous people to an inhuman status so that the brutality of their subjugation may be carried out shamelessly.

Yet, during this era, not only are the Indians persecuted by subversive religious rhetoric, but they are also defended by it. One of the Indians' greatest champions, Fray Bartolome de Las Casas, a Spanish priest who rallied for their rights and protection, used religious references within his works to trigger strategic moral associations. Las Casas applies biblical comparisons, most predominantly the wolf and the lamb, in order to force his reader to make biblically implied judgments about the Spaniards' and the Indians' moral standing. Such language appears often subtly, but has a strong influence on the devout reader of the time. In Las Casas's, *Historia de las Indias*, the horrific events of the massacre at Caonao in Cuba are relayed with care to portray through metaphor the Indians as lambs and the Spaniards as wolves. Las Casas writes, "Then the whole hundred drew [their swords] and began to rip open the bellies, to cut and kill those lambs – men, women, children, and old folk, all of whom were seated off guard and frightened" (536). The Indian is directly identified as the lamb by which the Spaniard's role is implied. Frequently, Las Casas is even more direct in his judgment of the Spaniards, describing their acts as Satanic or guided by the Devil. Statements like, "A Spaniard, in whom the devil is thought to have clothed himself," or, "since the devil, who inspired the Spaniards, furnished them with the whetstones with which they sharpened their swords" initiate a pattern of thought within Las Casas's work where the judgment of the Spaniards is continually reiterated and reinforced by bold comparison (536).

After the Europeans had solidified their hold on the colonies, religion appeared less as the crux of a crusade and more as a reflection of a society's daily struggles. Thus, religion as a psychological device gains a wider spectrum of use. Sor Juana Inés de la Cruz, the seventeenth-

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[*] This is my translation.

century Mexican prodigy, mastered the defensive faculty of religion, using it to protect her feminine right to a profound and independent intellect. From an extremely young age, Sor Juana's insatiable hunger for erudition consumed her being. While her genius served to entertain the court of the Viceroy during her adolescence, there was little application for her knowledge as a grown woman in seventeenth-century Mexican society because by the end of the seventeenth-century women had to enter either the confines of marriage or those of the convent. In "Stratagems of the Strong, Stratagems of the Weak: Autobiographical Prose of the Seventeenth-Century Hispanic Convent," Electa Arenal and Stacey Schlau examined the social dynamic that led women to religious dedication in place of assuming the domestic role. They explain how women "submitted to external control by the Church, but won for themselves self-knowledge, pleasure, independence, and recognition that secular women never achieved…Union with the divine husband released female mystics from earthly submission and erasure" (30-31).

Sor Juana wrote of this pivotal choice that "with the total negation I had toward marriage, it was the least disproportionate and most decent [option] I could elect" (*Introducción* 53). She pushed forward with her investigation until one day she was called upon to defend herself. A highly critical letter denounced her "profane" studies and rejected her intellectual freedom. Her response was to write the autobiographical letter entitled "Respuesta de la poetisa a la muy ilustre Sor Filotea de la Cruz." There, religion serves as a safe haven where she may hide her true passion- knowledge. The greater part of the work focuses on her fervent pursuit of understanding. However, occasionally a spiritual shield appears to remind us that her choice to assume that pious position had great meaning to her. She actually attributes her "inappropriate" scholastic behavior to God, writing of this "natural impulse that God put in me: His Majesty knows why and for what; and he knows that I have asked him to turn off the light of my understanding leaving only that which is necessary to guard his Law" (*Introducción* 51). By asserting that she is the recipient of God's will, she also implies that one who criticizes her nature criticizes the choice of God. Only through her erudition does she feel that she can serve God. Interestingly enough, she does not seem to praise religion, but instead focuses on the splendor of her studies, mentioning religion only as it pertains to her education. The relative significance of the two is made quite clear within her letter. In a subtle, humbling way, Sor Juana Inés de la Cruz uses religion to defend her scholastic pursuits against the restrictions of social convention. She nestles her feminine right to a passion for knowledge in the arms of God where no one may contest it.

By embedding inconspicuous images and ideas into a writing which the reader will surely identify with and assimilate into his/her comprehension of an issue, authors not only harness *what* information is presented, but also *how* the reader will digest it. During the period in which Early Modern literature was being written in Latin America, religion bore immense influence in both colonial and European societies. Due to its power over the popular psyche, a writer could have no greater weapon than religion to arm his/her cause. Christopher Columbus, Hernan Cortes, Fray Bartolome de Las Casas, and Sor Juana Inés de la Cruz used religion as a manipulative tool, by which they were able to wrench the minds of their readers into acceptance of their ideas. Through the invocation of spiritual sentiment, Early Modern authors masked their own motives and appealed to the most personal human experience – belief.

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A Study in Impurities: The Late Style of Philip Guston

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> I do not see why the loss of faith in the known image or symbol should be celebrated as a freedom. It is this loss we suffer, this pathos that motivates modern painting and poetry at its heart. (Leydier 38).
>
> Philip Guston

Philip Guston was chiefly considered an abstract expressionist into the late 1960's, working in the immense scale, energetic style, and intellectual foundation that one came to expect from the movement. While he began his career as a prominent social realist under the WPA Federal Art Project earlier in the century, he became best known for the meditative, shimmering abstractions that were unique amongst the Action Painters (Greene 56). Remote from the sublime transcendentalism of Newman and Rothko and withdrawn from the intense technical bravura of Pollock's automatism, Guston was a deeply personal artist whose abstract work is a somber, fragile testament to the visceral and spiritual struggle to purge painting of representational content.

Although Guston's insistence upon analyzing this dearth of subject-matter separated him from the other abstract expressionists, nothing could prepare the art world for the radical shift in his work first witnessed in the Marlborough show of 1970. Eschewing the intensely contemplative abstractions that had dominated his work for twenty years, Guston created a series of figurative images painted in a roughhewn, cartoon style. Stout, hooded figures, smoking fat cigars and brandishing planks of wood, wandered a phantasmagoric dreamscape of abandoned streets and dimly lit cellars. Ominously threatening yet ironically comical, the hoods became Guston's primary symbol and a shocking harbinger of the artist's return to allegorical figuration. However, the show was venomously received by art critics and artists alike, who lambasted Guston for betraying the austere, sacred spires of abstraction for the vulgar recesses of symbolism. Every major critic – with the exception of Harold Rosenberg – reacted with hostile invective, with Hilton Kramer of the *New York Times* famously labeling Guston "A Mandarin Pretending to be a Stumblebum" (Millon 350). Stung by the acrimonious reception, the artist stated, "Some painters of the abstract movement, my colleagues, friends, contemporaries, refused to talk to me. It was as if we'd worked so hard to establish the canons of a church and here I go upsetting it, forgetting that that's what good artists should do." (Japel 23).

Although initially received as the crudely self-indulgent shibboleths of an artist who had strayed from the begotten path, burgeoning support from select critics coupled with Guston's overwhelming need to explain his work led to a reevaluation and eventual celebration of the late paintings. Guston's late style demonstrates his most deeply rooted doubts and anxieties by unveiling his career-spanning struggle to reconcile his preternatural instinct for image-making with the Modernist impulse to purge painting of narrative and recognizable forms. Drawing upon autobiographical references and an encyclopedic knowledge of art historical precedent, Guston

constructed a visual lexicon aggressively informed by this volatile and intensely personal encounter of artistic antitheses. For rather than painting his late images, Guston built them; he built them from paintings studied, novels read and artistic battles savagely contested. And finally, once he had gathered all his many and often disparate sources, the artist gave them form through "colored dirt" – his sly but insightfully appropriate dysphemism for the painter's medium (McInnes 11).

The two years of 1966-67 were a period of struggle for Guston. He had spent the last twenty years of his life perfecting a style which celebrated the lack of literal subject-matter in painting, yet he had never completely adhered to it. Even in his most abstract works, a shadow of a form arose, teasing the viewer with its wraithlike tangibility while remaining just outside the realm of visual definition. Above all, as a painter, Guston sought to communicate, and he found the medium of abstract expressionism too limiting in that respect. "American abstract art is a lie, a sham, a cover-up for a poverty of spirit, a mask to mask the fear of revealing oneself," he once exclaimed (Krauss 90). Later, once he had become completely exasperated with the movement, he said, "I got sick and tired of all that purity! I wanted to tell stories!" (Spike 96). Guston's return to figuration was less a matter of stylistic preference than of expressive necessity. Fleeing the "emotion of ambiguity [that] sticks to me like seaweed," Guston saw representation as a vehicle for direct statement (Welish 153).

During 1966-67, Guston completed hundreds of drawings in ink and charcoal on paper, waging a rapacious artistic conflict that would result in the paintings of the Marlborough show. Guston recalled the period of cathartic evolution:

> I remember days of doing "pure" drawings immediately followed by days of doing the other – drawings of objects. It was two equally powerful impulses at loggerheads. I would denounce the pure drawings as too thin and exposed, too much "art," not enough nourishment, and as an impossible direction with no future. The next day… back to doing the pure constructions and to attacking the other. And so it went, this tug-of-war, for about two years. (Ashton 155).

Ultimately, the magnetic draw of Guston's objects became too much for the artist to resist. In 1968 he began to produce a series of small panels, painting what he referred to as "common objects." (Ashton 155). Beginning with books, Guston would continue through many of the symbols that would occupy him for the rest of his career, including shoes, bricks, light bulbs, and the truncated, maladroit hoods. With these tiny compositions, Guston gave birth to the cast of grotesque characters that would populate and energize his emergent drama. It is not without irony that the panels retained the naïve yet unrestrained line of Guston's beloved funnies, that most unabashed of visual burlesques that had so enthralled him as a young child. Seeking the most direct, emotional mode of visual communication, he found it in the bluntly exuberant draftsmanship of George Herriman, Cliff Sterrett, Bud Fisher, and Frank King. Recalling his childhood fondness of comic strips, Guston once commented:

> Of course since youth I've loved *Mutt and Jeff* – Bud Fisher was the best draftsman –
> *The Gumps* – *Polly and Her Pals*, Cliff Sterrett did the best furniture. Also Frank
> King's *Gasoline Alley* – the backyards porches, screen doors, litter on the steps,dogs,
> old cars being fixed, dismantled. I used to dream of having my own strip one day.
> (Berkson 57).

Although Guston's metamorphosis was intensely personal, it was hastened by historical circumstance (Jarvis 57). The year 1968 saw numerous campus demonstrations against the Vietnam War, many of which spun into fevered mania and mass hysteria. The Democratic convention in Chicago only added to the mood of national delirium, broadcasting images of mindless violence and riotous bedlam. The mounting chaos had left Guston with a sense of growing malaise and insecurity concerning whether his abstract work had any useful application in an increasingly turbulent world. Imprisoned within an artistic vernacular foreign to the times, Guston sought an idiom more attune to his true feelings. The artist knew he could not achieve this wholeness through straightforward didacticism. As a social realist in the 1930s, he had painted massive, radically left-wing murals which trumpeted the virtues of the common man as an unassailable emblem of patriotism. Titles such as *The Struggle Against Terror*, *Work the American Way*, and *Maintaining America's Skills* characterized the tone of these works, which were unyielding in their socialist jingoism and bereft of emotional ambiguity. "A return to the fervent but thin pieties of such juvenilia… held little interest for him," Andrew Graham Dixon writes. "He had acquired a distrust of overtly political art, realizing that it carried the threat of just another form of emptiness." (Graham-Dixon 43).

Equipped with a burgeoning visual language and the emotional impetus to put it to use, Guston began his first large-scale paintings in late 1968. Adopting a spontaneous working style that allowed him to improvise his visual stories, Guston had found a suitably narrative form of expression that eschewed the pedantic lecturing of social realism. "From 1967-69 I painted like mad," he commented. "The pictures came so fast I had to make memos to myself at a table drinking coffee. 'Paint them.' I felt like a movie director. Like opening Pandora's Box, and all those images came out." (Ashton 162). Sometimes his inspiration would arise from aged memories, sometimes from actual objects that he had meticulously amassed during his afternoon journeys through the countryside – ancient kitchen utensils, discarded tools, railroad spikes, corroded tin cups. Then his characters would arrive – bands of hooded figures, smoking cigars, expounding upon the present situation with mad gesticulation. They are seen within barren alleys and claustrophobic cellars, pantomiming with pudgy red hands, sometimes critiquing paintings that are in fact paintings of themselves. Stalking the sinister yet barren landscape within their clumsy black cars, they brandish planks of wood, threatening the deserted void. Andrew Graham Dixon described the theatrical yet prostrate hoods as "implicitly malevolent but also more than slightly pathetic. They bluster but seem ultimately no more threatening than plumped pillows, which they faintly resemble." Soft, gelatinous buildings dot the landscape, resembling pulpy pink honeycombs. Even in their finished forms, Guston's objects remain malleable, exaggerated, and gossamer – a technique acquired from Herriman's cartoons.

Guston's Klansman paintings often seemed smothered in primal terror – a sense of a narrative informed by hidden yet potent malevolence. The works suggested countless mindless atrocities committed without provocation, an implication bolstered by the reiteration of objects, characters, and environment. The hoods were not meant as actual representations of the Klan, but as mythical figures emblematic of inhumanity, wickedness, and blind cruelty. Guston never identifies a specific target for the hoods' malice, evoking the stupid, unfocused viciousness that he saw in many events of the 1960s. The hoods drive through town in their cumbersome autos, body parts spilling from their trunks as they search for more victims. Accusing fingers indict

them as the hoods plot their next transgression, severed limbs strewn at their feet like unpleasant reminders of past sins. They dawdle in dusky basements lit by bare light-bulbs, musing over atrocities committed or simply waiting for the chance to commit them again. Guston's repetitious presentation could suggest the frames of the cartoons and funnies he loved as a child, once again recalling Herriman's *Krazy Kat* (Graham-Dixon 46). But while Herriman's work arises from comic absurdity, Guston's implies something much more sinister. Through cartoon-like repetition, Guston seems to suggest that mankind is doomed to commit the same mindless atrocities that he has committed in the past.

Although the hoods symbolize man's more sinister side, there is more to the clumsy hooligans than senseless bullying. In many of Guston's pictorial dramas, the hoodlums become artists and art critics, creative individuals in the midst of intellectual agonizing and scholarly repartee. Some of them actually paint pictures, while others observe and ruminate upon the meaning of the piece. Their obese, elephantine hands point and gesture wildly, as if they are arguing an especially critical aspect of the painting. Guston predicted the critical lashing he was likely to receive for abandoning his solemn, elegant abstractions, and was wont to deflate his detractors' arguments through his art rather than lectures. His paintings suggest that the high art infrastructure of artists and critics is sometimes tantamount to authoritarianism, aggressively eulogizing one artistic approach at the expense of all others. Dixon describes Guston's approach, writing:

> [By] enlisting painters and people who write about painting into his cartoon goon squad, he may have meant to sharpen one of the messages behind his iconoclasm. It was his way of reminding his audience that artists and critics can be members of the thought police too, sometimes without even knowing it. (Graham-Dixon 47).

One of the most telling paintings from this period, *The Studio* (plate 3), shows a hood, smoking a stogie with one thick, clumsy hand and painting a self-portrait with the other. He silently regards his handiwork through the slits of his hood, abandoning the histrionics so characteristic of his henchmen. Isaac Babel, a writer Guston admired greatly, was a Russian Jew who concealed his heritage to avoid persecution. During the Russian Revolution, he rode alongside the Cossack Red Calvary, eventually writing about his experiences in numerous novels (Corbett 53). Like Babel, Guston was donning a shroud, taking on the guise of a hood to paint allegorical self-portraits. "I perceive myself as being behind a hood … The idea of evil fascinated me, and rather like Isaac Babel, who had joined the Cossacks … I almost tried to imagine that I was living with the Klan. What would it be like to be evil? To plan and plot?" (Danto 136). The artist's disguise was an exercise in moral and artistic impersonation.

Guston saw an artistic and intellectual companion in Babel, who like the painter was simultaneously an insider and an outsider. While on the forefront of abstract expressionism for over two decades, Guston was now disdained for defying an artistic tenet long-considered to be a historic necessity. Recalling a speech that Isaac Babel had made to the Soviet Writers Union, Guston paraphrased, "[Babel] ended his talk with the following remark. The party and the government have given us everything, but have deprived us of one privilege. A very important privilege … That of writing badly." (Storr 56). Guston had grown tired of the exhaustive formal self-critique inherent in Modernist painting. His strategy was to discard formalist concerns and to rely solely upon personal events, drawing from his own life to escape the hermetic chamber of abstract expressionism. Combining the artistic techniques of grotesquery and caricature and the literary precedent set by Babel, Guston had allegorized the struggle that compelled him to abandon his modernist roots.

While the political motivations – artistic and historical – underlying Guston's late work are significant, there is another, more mythic impulse at work within his shift to figuration. Earlier in his career, Guston had a number of discussions with Morton Feldman about what it would be like to be the final painter of a tradition – what he referred to as "the last painter." (Krauss 91). The statement suggests the anxiousness of the period, when artists like Rauschenberg and Johns were first challenging Modernism's monolithic grasp upon the art world. But by the 1960s, Guston's situation had changed. Exhausted with abstract expressionism and its endless intellectual proselytizing, the painter was searching for a way to instill his work with some unpolluted invention. Consequently, in conversations with Harold Rosenberg, Guston capsized his original statement: "I imagine wanting to paint as a cave man would, when nothing existed before. But at the same time one knows a great deal about the culture of painting…I should like to paint like a man who has never seen a painting, but this man, myself, lives in a world museum." (Krauss 91) His goal wasn't to paint in a primitive style, but to compel himself beyond the narrow confines of the art world that controlled his reaction to unforeseen possibilities unsullied by past disciplines. "In this condition of not knowing," Guston explained, "you arrive not at a state of ignorance but at a state of knowing only the thing you know at the time – and that is what is concrete." (Storr 60).

Guston wanted to give form to this concreteness in his late paintings. At the time when recognizable forms began to emerge from his abstraction, the artist made a reference to the Jewish legend of the Golem. Central to Guston's work of the 1970s, the legend describes the creation of a living human statue. Molded out of red clay, the Golem was animated by a band of Cabalistic rabbis who sought to emulate the power of god. Attempting to recreate and honor the conception of Adam, the rabbis believed their work to be a devout offering. However, since the holy men acted without divine knowledge, their effigy was inherently flawed. Therefore, the Golem's creation was seen as a gesture of failed piety resulting in heresy (Delong 49).

Allegorically, Guston's shift to figuration is a parallel rebellion against the formalist boycott upon recognizable imagery. Striving to debunk the myth of pure painting, Guston bemoaned Modernism's self-critical distillation of form. However, the dilemma facing Guston was not whether it was feasible to portray the human form, but whether such a form, molded from "colored dirt," could retain the visual bravura and emotional repercussions of an abstract painting. The painting could not only be aesthetically arresting, but also vibrant. Shortly before Guston's reintroduction of imagery, he commented: "The strongest feeling I have…is that when I leave the studio, I have left there a 'person,' or something that is a thing, an organic thing that can lead its own life, that doesn't need me anymore." (Storr 60). Nevertheless, Guston's insistence upon painting as genesis carries the same caveats as the rabbis' Golem. The clay effigy, both a concrete representation of man's supremacy and graven proof of his capacity for hubris, embodies man's binary nature. Guston's tumultuous shift into figuration came only after a revelatory moment of self-realization – that in order to wield the entirety of his creative power, he would have to face the terrifying possibilities of his own imagination. Recalling an oft-repeated ritual during his bitter struggle with figuration, Guston once said, "People complain that it's horrifying. As if it's a picnic for me, who has to…see them first thing. But what's the alternative? I'm trying to see how much I can stand." (Roth 68). He played the role of the avant-garde painter in the most literal sense, pushing past tradition and wrestling with his own limits.

The motivation behind Guston's return to representation can only be understood in the light of his consuming and career-spanning fascination with the history of art and his quixotic and often combative appropriation of its visual patterns. Describing the artist's tenebrous relationship with artistic convention, Morton Feldman wrote, "Guston is of the Renaissance. Instead of being allowed to study with Giorgione, he observed it all from the Ghetto… Due to circumstances, he brought that art into the diaspora with him. That is why Guston's paintings are the most peculiar history lesson we have ever had." (Storr 93-4). Challenging the increasingly dogmatic schools of abstraction that were predominant during the 1960s and 70s, Guston recapitulated the recognizable image not to destroy what came before but to start anew. He once commented that "to paint is always to start at the beginning again," and his late style represents an attempt to break the magisterial shackles of Modernism and allow art the freedom to change (Storr 99). Through reintroducing his own creative idiosyncrasies spliced with a palpable sense of historic tradition, Guston defied artistic finality with his sometimes contradictory, often controversial, but always profoundly singular vision.

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LANGUAGE ACQUISITION: A PARADOX OF CONCORDANCE

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We are surrounded by creatures who cannot tie their shoes but who know how to interpret complex grammatical structures (i.e. children), and yet few of us marvel at this.

Perhaps the most interesting implication of the above claim is that it applies both to linguists and laypersons, alike. Is this surprising? No, actually, once the reasons for such commonality are explored. Non-linguists observe language acquisition happening all around them each and every day; both the common nature of this development, and the extreme intricacies involved, place this subject well beyond the consciousness and therefore marvel of them. Can this be said of linguists, however? No. They too, fail to express wonder regarding language acquisition. It is this point which is worthy of further dissection.

When the four-minute mile was broken for the first time, the athletic world was agog. Moreover, this fascination and sense of awe quickly spread to non-athletes. What could this have to do with the language acquisition paradox? It shows the difference in awareness and expectations found within humans. When a physical record such as running, is set, human kind marvels, precisely because they understand what is involved, having themselves experienced the difficulties of this kind of exercise. Even rather sedentary people, out of breath from a short jog to the car, easily conceptualize the problematic nature of pushing themselves in this manner. They too, may dream about some day having the will power and drive to accomplish such a lofty goal themselves -relying on the notion that it is repetitious practice and drive that enables one to do such a thing. This sense of accomplishment through human action is why we marvel when children do eventually achieve early motor skills.

We can use this example as a mirror with which to view the quite opposite understanding we have about language development. Because we grasp that language development is not attached to willpower, drive, or any other sense of individual achievement, we assign it to the commonplace. It becomes for us no more noteworthy than the appearance of clouds in a sunny sky, or rain in the spring. Since we hold no control over any of these phenomena, it is simply the expected, the standard, and there is nothing special about the situation, nor about those who are part of the situation.

Again, this has to do with our vision of continuums of life. Seemingly, the more complex the basic version of the task, the less marvel we attach to it. Let us use shoe tying as an example. As in the above example of the four-minute mile, this is a learned, teachable, repeatable task; as a result, we can picture ourselves doing it. Moving forward to a more difficult version of this concept, we can understand knot tying in general; variations on the standard overhand exist, and even more complex arrangements do as well. With each successive move upwards along this line of developments, we attach more and more fascination. When it comes to the intricate figure eight and sailor's knots required to attach more than one rope and/or equipment together, we

marvel. It is precisely because we understand how to learn and accomplish the simpler tasks of this activity that we can grasp the difficulties of the more advanced ones, and we begin to view knot-tying professionals with awe and reverence, if not outright hero-worship! We somehow know that these proponents have pushed themselves farther than we have, that they "earned their abilities", and we accord them honors. What of language? It is a different concept altogether. No one instructs us to coo, to babble, and to expound (Jackendoff, "How Children Learn Language", 102). The sense of awe is gone as we understand that it is just a matter of time for these abilities to "surface", and that this is no special skill within children that they will demonstrate, allowing them to shine above the rest. It is all about conscious awareness - we are aware of the difficulties involved in physical activity, but not of language acquisition, and so we fail as laypersons to marvel.

Surely, however, linguists are filled with wonder when language development is exhibited? Interestingly enough, here is where the paradox is strengthened, and furthered. Linguists are no more amazed at language acquisition than are laypersons -and for exactly the same reason as in the preceding paragraphs. As researchers find more and more reasons to point to specific biological developments that allow for language acquisition, they sense how it occurs independent of any human control, concurring with German linguist and psychologist Eric Lenneberg (Brown, 19). Simply put, a human cannot interfere with this process in any proactive manner. It is analogous to the laypersons stating that this (language development) is not a practicable behavior like the four-minute mile, or knot tying. Certain linguists have hypothesized that language is innate for the reason that it is attached to brain structure development (Jackendoff, "The Argument for Innate Knowledge", 29). Paraphrased, this argues that as the brain develops, and grows more complex physiologically, language is acquired in stages. A fully mature brain will, therefore, result in fully mature language. What is there to marvel at here? It is simply a reality, and there is certainly nothing special about any individual that thus demonstrates language acquisition. Imagine loudly proclaiming, "Congratulations on sitting there long enough for your brain to develop language!" Preposterous!

In conclusion, then, the paradox of language acquisition is explained by both linguists and laypersons in a pragmatic fashion. Both parties understand that there is nothing noteworthy in a person's ability to acquire language. It requires no special individual qualities, nothing to admire within a person. Though the nuances are different - many linguists opine that physical development alone accounts for this, while laypersons see it as beyond the scope of humans' responsibilities - the result is the same: we do not attach marvel to the fact that though children cannot accomplish simple human tasks, complex grammatical structures flow easily from their mouths.

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Gunther von Hagen's Gestalt Plastinates:
The Convergence of the Modernization of
Art and Science - Recreation of Man as Art Object

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Gunther von Hagen developed the process of Plastination during his tenure as an anatomist at Heidelberg University in Germany between 1977 and 1995. The revolutionary process is a medical preservation technique that (in simplest terms) stops the decomposition processes of organic tissue for exhibition purposes. The specimen is extracted of bodily fluids and fat and cured with acetone. The acetone is replaced with plastic polymer and then either heat cured to create a hard/transparent slice or gas hardened and infused with silicone rubber to create a plastinate study. Although, this commercial technique was originally created for specimen preservation for medical facilities and scientific research, it has also led to the creation of gestalt whole-body plastinates which are essentially deceased human beings in a preserved state.

As explained by Dr. von Hagen in the exhibition catalogue for his *Body Worlds* exhibition, "Plastination creates beautiful specimens as a sensuous experience that are frozen at a point between death and decay."[1] This macabre description does not begin to quantify the experience of confronting a plastinate; however, it does allude to the intended evocation of the perception of the objects. Generally, plastinates are donated via a program developed by the Institute for Plastination (IfP) in Heidelberg, Germany of which Dr. von Hagen is the Founder and Scientific Director.[2]

Dr. von Hagen is also the owner of a private corporation known as BIODUR. His commercial company funds scientific research for medical organizations as well as *Body Worlds* and other experimental work. He possesses a number of U.S. patents for the plastination process in the Unites States and is also the Director of the Plastination Research Center at the State Medical Academy in Bishkek, Kyrgyzstan.

Dr. von Hagen's reputation precedes him from his creation of gestalt plastinates and other live performances. In 2003, Dr. von Hagen performed the first live public autopsy in London since 1830. An eccentric persona, complete with signature fedora hat, Inventor, Physician and Plastinator are just a sampling of his self conceived titles. Interestingly, in contrast to the Unites States, in many Eastern European countries Dr. von Hagen promotes himself as an avant-garde artist.

The proposed purpose of the exhibition (as the plastination process itself) is rooted in medical education. The "de-mocratization of the body", as Dr. von Hagen has termed the experience,

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[1] Von Hagen, Gunther and Angelina Whalley. *The Anatomical Exhibition of Real Human Bodies.* Heidelberg: Institute for Plastination, 2004.

[2] Von Hagen boasts that over 6,000 people have expressed interest in the body donation program sponsored by the IfP.

allows the general viewing public to liberate themselves from their "artificial world" and peer into the private interiors within the human body. Dr. von Hagen is quick to shy away from the overt admittance that plastinates are art; however, he clearly recognizes the synergies between form and creation. He explains in his publication, *Grim and Gruesome Corpses, Posed Plastinates and Mandatory Burial*, "The public debate on the artful character of gestalt plastinates has demonstrated their communicative function, which has turned them in a cultural happening. The gestalt plastinates do not serve any artistic purpose; however, they can certainly comply with artistic criteria. Like works of art, well-executed plastinates possess aesthetic appeal and emotional worth."[3] By directly affirming that *Body Worlds* exhibitions are a Happening, regardless of where he chooses to exhibit his work, Dr. von Hagen slips into the canon of art history.

References to Leonardo da Vinci and Andreas Vesalius[4] encompass the central theme of the Body World exhibitions. The premise of historical precedence saturates the compositional aesthetic of the exhibit. Scarlet red banners adorned with silk-screened plastinates appear alongside inspirationally contemplative quotes from Kant, Plato and da Vinci, among others. The props cultivate an heir of historical contextualization that serves to legitimize the use of the human body in this way.

Exhibiting an omniscient self awareness, in a statement characteristic of postmodern analysis, Dr. von Hagen explains in *Donating Your Body for Plastination* how he, like innovators before him, is destined for immortality. Von Hagen states, "(P)reparing a whole-body plastinate is an intellectual and sculptural achievement that requires the plastinator to have a mental picture of the results before even beginning the project. Viewed from this perspective, creating a plastinate can be compared to the work of an artist who sculpts a figure from a block of stone or who prepares a clay mold for a cast bronze statue."[5] This extrapolation of history and alluded intent provide an indication of the convergence between art and science that is central to the *Body Worlds* exhibitions.

Carefully crafted (limerick-like and circular based) theories surrounding the artist's intentions cloud the atmosphere between art and science. Dr. von Hagen is hyper -aware of the controversy surrounding his work, often personally addressing such issues through press releases on his *Body Worlds* website. The fact that previous anatomists and artists employed their skills for the purpose of collective prosperity and not for the advancement of their personal gain is a key issue seemingly overlooked as Dr. von Hagen reshapes and literally re-classifies human beings into plastinated art objects.

The permanent[6] preservation of human beings into "a variety of unusual poses" contrasts with the harmony of the scientific enlightenment that is central to Dr. von Hagen's theme. Many poses

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[3] Von Hagen, Gunther and Angelina Whalley. *Grim and Gruesome Corpses, Posed Plastinates and Mandatory Burial.* Heidelberg: Institute for Plastination, 2004.

[4] Flemish Anatomist, *De fabrica humani corporis,* c.1543

[5] Von Hagen, Gunther and Angelina Whalley. *Donating Your Body for Plastination.* Heidelberg: Institute for Plastination, 2004.

[6] According to von Hagen, plastinated specimens, including whole-body plastinates, retain composition for at least 2,000 years.

are borrowed directly from the visual canon of art history. Full body plastinates, such as *Whole Body Plastinate with Skin* (Fig. 1); a realist portrayal of Michelangelo's flayed depiction of St. Bartholomew in *Last Judgment* (Fig. 2); *Rearing Horse and Rider* (Fig. 3); a classical equestrian motif reminiscent of Jacques-Louis David's *Napoleon Crossing the Alps* (Fig. 4); and *Reclining Woman in the 8th Month of Pregnancy*, an odalisque/reclining nude (Fig. 5) are examples of von Hagen's ambition to replicate others' formal achievements. The attempts made by von Hagen to contextualize the plastinates within established historical art monumentality, while legitimizing the 'artistry' of the work, can be construed as disparaging to the canon and satirizing the art object.

Fig. 1   Von Hagen,
Whole Body Plastinate with Skin

Fig. 2   Michelangelo,
Detail of the *Last Judgment*, 1541

Fig. 3   Von Hagen,
Rearing Horse and Rider

Fig. 4   Jacques-Louis David,
Napoleon Crossing the Alps, 1801

Fig. 5   Von Hagen,
Woman in the Eighth Month of Pregnancy

Although superficial formal comparisons can be made between the historical precedents set by Leonardo da Vinci and Vesalius, the intentions of the creators and von Hagen could not be more opposed. The commercial successes of IfP (contracts with many universities and training facilities) as well as *Body Worlds* exhibitions and merchandising far exceeds the potential sought by either preceding artist. The commercial success of von Hagen's exhibitions is significant. *Body Worlds* boasts that an excess of 16 million visitors[7] worldwide have flocked to see the unique spectacle of bodies on display. However, the monetary benefit for Dr. von Hagen isn't limited to exhibition admission costs. Merchandising,[8] publishing workbooks for school children, plastination literature, sponsorship with national corporations[9] as well as holding multiple, unique exhibitions in logistical proximity to each other add to the monetary success of von Hagen's *Body Worlds*.

The central and most dire issue with the conceptual vision of Dr. von Hagen's work is that whole body plastinates, intended for public viewing, are conceived as **avant-garde art**. This convergence of art and science has resulted in innovative creations that meet aesthetic and universal standards of beauty. It is arguable that the pure form of the human body is the epitome of our species' criteria for things which are beautiful.

Plastinates have the potential to become as infamous as Andy Warhol's repetitious Campbell Soup compositions. Tolstoy prophesied in his essay, *What is Art?,* the culmination of this phenomenon,

> "In our society the difficulty of recognizing the real works of art is further increased by the fact that the external quality of the work in false productions is not only no worse, but often better, that the real ones; the counterfeit is often more effective that the real, and its subject more interesting. How is one to discriminate? How is one to find a production in no way distinguished in externals from hundreds of thousands of others intentionally made precisely to imitate it?" [10]

Contemplation of Dr. von Hagen's plastinates suggest moral ambiguity in opposition to most art, rather than focus on the objects uniqueness, the plastinates are celebrated for their universal uniformity. This sentiment is amplified by Dr. von Hagen's recent endeavor to build multi-million dollar facilities in Dalian, China and Poznan, Poland with the goal of building machinery to manufacture whole-body plastinates.

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[7] This estimate is according to www.BodyWorlds.com, as of March 27, 2005 and does not include current Body Worlds exhibitions currently on display in three locations in the United States (Chicago, IL and Cleveland, OH).
[8] Among the merchandise available from www.BodyWorlds.com are materials seemingly unrelated to Dr. von Hagen's scope of plastination services. For example, handmade traditional slippers from Kyrgyzstan are available for 18.50E.
[9] Bally's Total Fitness is currently is sponsoring a sweepstakes in conjunction with Body Worlds and The Chicago Institute of Science and Industry. The Hyatt Corporation in Cleveland is cooperating with Body Worlds, The Great Lakes Science Center and the Rock and Roll Hall of Fame to offer discounted luxury rooms and package tickets to both facilities.
[10] Tolstoy, Leo. *What is Art? and Essays on Art*, 138.

In general, science museums do not regulate the morality of the science, technology or advancements which they promote with the obvious exception of infectious disease. In an interview, an employee of The Great Lakes Museum of Science and Industry in Cleveland where *Body Worlds 2* was on display, I cheerfully discussed the familiar perspective recycled from von Hagen's own mantra, that the exhibit was an extension of the achievements of past anatomists. She also confided that she likes to ask the children visiting the exhibit if they eat chicken; she then makes an association between the muscle tissue of the plastinates and fried chicken. While this may be an accurate comparison, it illustrates the lax attitude on the part of the organizations hosting Body World's to formally educate their staff or address the substantial impact on the children who are visiting the exhibit.

In the audience of the Chicago *Body Worlds* exhibition during the day of my visit the majority of participants were children's groups. Dr. von Hagen's IfP produces workbooks geared toward non-biology instruction at the elementary, middle and high school levels. The concepts of von Hagen's work, while inarguably valuable in the field of scientific medicine, are a labyrinth of ethical and aesthetic distinctions. The debate, widely ignored in the artistic community, is seemingly being predetermined in the minds of the visiting youth of today's exhibitions.

In Associated Press Reports, the practice of Plastination is denounced by Lutheran and Catholic Church officials[11]. However, in a press release written by Dr. von Hagen on his *Body Worlds* website on April 8, 2005 entitled "*Thoughts on Pope John Paul II Being Plastinated*",[12] he claims to have worked preserving relics for the Catholic Church (albeit the church denied the opportunity for Dr. von Hagen to plastinate the Pontiff's heart).

As an artist, one wonders if von Hagen feels there is any obligation to the art itself. If so, at what price does he achieve this? The rate of demand for von Hagen's Plastination exhibitions make it is plausible to consider the commercial value of the plastinates as art objects themselves. This argument raises multiple ethical ambiguities such as the valuation of monetary worth[13] of the plastinate and the notion that these art objects could be sold to a public audience based on their popularity.

Von Hagen and Angelina Whalley, the Managing Director of the IfP, indirectly address these issues in their pamphlet, "*Donating Your Body for Plastination.*" An individual interested in donating his/her body for plastination is required to complete a consent form. While it implicitly states that the IfP does not "give" human specimens to private individuals, the IfP reserves the right to sell the plastinated body/portions thereof to "educational establishments to finance the work of the IfP."[14] The concept of funding private research or for development of a plastinate museum, as stated on the consent form, raises the notion of the infallibility of the corporation as well as von Hagen.

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[11] Scislowska, Monica. *"German Who Turns Corpses into Art Raises Deep Suspicion in Poland."* Associated Press, March 1, 2005.

[12] For additional information see, "*Thoughts on Pope John Paul II Being Plastinated*", April 8, 2005, *www.Bodyworlds.com/en/pages/Presse.asp.*

[13] Initial study suggests that under The Freedom of Information Act any citizen of the Unites States has the right to review the importation documents for commercial entities of materials entering the country. For U.S. Customs purpose display, exhibition materials are subject to duty and thereby require a commercial value for assessment purposes.

[14] Von Hagen, Gunther and Angelina Whalley. *Donating Your Body for Plastination.* Heidelberg: Institute for Plastination, 2004.

Along with the consent form, the IfP solicits a yes/no survey asking the body donors questions pertaining to particular applications of their plastinate. One such statement completely absolves all right to the donor's body ("I agree for my body to be used for any purpose…").[15] While another question directly addresses the issue of the re-creation of man in Dr. von Hagen's image,

> "The body donor's own identity is altered during the anatomical
> preparation. The process gives both face and the body a new appearance on
> the basis on their internal anatomy. Therefore, a plastinated specimen
> could not be recognized for its external features – that would require
> complex reconstruction techniques." [16]

This statement would suggest that it is plausible to consider that body parts (such as lips, eyelashes/brows, fingernails and other formal details which are affixed to the Plastinate) are not exclusively organic to the donor's body. Plastinates such as *Orthopedic Whole Body Plastinate* (Fig. 5) is enhanced with surgical advancements and prosthesis that transforms the human specimen into a bionic man. This illustrates that it is not beyond von Hagen to transform the human body by utilizing artificial mechanisms to reach a subjective formal composition.

Surprisingly few American media sources have explored the controversy surrounding Dr. von Hagen. However, recently, European press sources report serious, if not heinous, crimes against humanity in the name of artistic and scientific creation. Since 2003 Dr. von Hagen has been under a cloud of suspicion by Novosibirsk prosecutors for his involvement in the exportation of approximately fifty anatomical specimens to his IfP facility in Heidelberg without the knowledge or consent of the families of the deceased.[17] The trial of the shipment of remains has primarily focused on Vladamir Novosyolov, the chief of the regional forensic bureau who shipped the specimens to Dr. von Hagen's facility and is currently being debated in district court.

Trafficking issues have also plagued Dr. von Hagen's reputation in Kyrgyzstan where he has raised interest to create a plastination museum in Bishkek. BBC Monitoring reported in 2003 that MP preparations were being undertaken to investigate potentially illegal shipments of specimens into Germany (IfP) from Bishkek.[18] Dr. von Hagen adamantly denies his involvement in any illegal trafficking and cleverly assigns blame to the exporter of the specimens. By acting as a consignee to the shipments, authorities have little recourse but to prosecute the shipper of the plastinated materials.

In addition, recent developments in Poznan, Poland have caught the attention of the European media. A façade of celebrity achieved by the notoriety of von Hagen's work in Eastern Europe has made him a worthy adversary of investigative reporters. A published report by the Associated Press claims to have uncovered suspicious activities relating to the use of a facility in Sieniawa Zarska, similar to Dr. von Hagen's ambitions in Dalian, China.[19]

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[15] Von Hagen, Gunther and Angelina Whalley. *Donating Your Body for Plastination. 3.*

[16] Ibid.

[17] Manenkov, Vasdim. "*Medic May be Jailed for Sending Piece of Dead Bodies to Germany.*" ITAR-TASS News Agency, September 15, 2003.

[18] "*German Doctor Says Relations with Kyrgyz Plastination Centre Legal.*" BBC Monitoring International Reports, October 22, 2003.

[19] Scislowska, Monica. "*German Who Turns Corpses into Art Raises Deep Suspicion in Poland.*" Associated Press, March 1, 2005.

The report suggests that war-crimes prosecutors are investigating Dr. von Hagen's father, Gerhard Liebchen, for his involvement with the SS Nazi police during World War II. Liebchen, who is being accused of sending 60 Poles to concentration camps, was managing the development of the plastination factory in Poznan. Dr. von Hagen denies any knowledge of his father's role in any SS deportations and claims that he has always believed his father was a cook during the war.

Another curious result of the creation of whole body plastinates is that pirated imitations of von Hagen's concepts appearing in exhibits throughout the world. In an exhibit called *The Universe Within* currently at the Nob Hill Masonic Center in San Francisco, authorities were called to address potential health concerns when fluid was seen leaking from imitation whole body plastinates. The creator of the exhibit, Gerhard Perner, once a manager of von Hagen's Body World exhibit, claims he is working in conjunction with Beijing Medical University. However, recent investigations by KGO-TV, an ABC-television news team in San Francisco has revealed that Beijing University denies any connection to *The Universe Within* exhibit.[20]

While it remains to be seen if Dr. von Hagen or the IfP is in any violation of international law, there is no denying the moral ambiguity that surrounds the nature of whole body plastinates. The merit of the preservation technique for educational purpose is truly a remarkable achievement by any standards. However, the departure between Dr. von Hagen's role in medicine and his visionary artistic grandeur create a manipulated context in which plastinates do not belong. By issuing statements that attempt to deny the artistic foundation of his work, von Hagen creates a caricature that repels serious medical or artistic scholarly criticism. The absence of discussion on the topic of whole body plastinates creates a void in the canon that art itself exists to preserve: the dignity and historic conscience of mankind.

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[20] Further investigation by KGO-TV of "The Universe Within" can be found at htttp://abclocal.go.com/kgo/news/iteam/.

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Data Mining in Bioinformatics: Using Routines to Ascribe Identity to Peptide Sequences and Proteins

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The broadest definition of bioinformatics is "any use of computers to handle biological information" (Counsell). A more specific definition of bioinformatics is "the mathematical, statistical and computing methods that aim to solve biological problems using DNA and amino acid sequences and related information" (Counsell).

Bioinformatics is not a new field. In fact it has been in existence for quite a while, but it has begun to develop rapidly in recent years. This field combines the skills of multiple areas, including computer science and biology. The importance of computers in bioinformatics is such that the data handled is more complex than anything previously handled by computers in other areas. "Until now, the most complicated data handled by governments, industry, and research was measured in terabytes (a trillion bytes). But bioinformatics will soon become the first industry in which researchers measure their data in pedabytes (a quadrillion bytes)" (Fischer).

Early experiments in the field of bioinformatics were driven by computer scientists who were interested in artificial intelligence. One of these early experiments was known as DENDRAL. DENDRAL was able to determine the likely molecular structure of organic chemical compounds by using known chemical analyses. DENDRAL combined the skills of three fields: chemistry, genetics, and computer science. This important collaboration opened scientists' eyes to the many valuable tools that could be developed through interactions with computer scientists. For many years DENDRAL was the topic of numerous papers in chemistry literature. While it is no longer the topic of academic research, the newest version of DENDRAL is being used by Stanford University. After the success of DENDRAL, techniques used in the project were applied to many different biological situations. Computer science and biology began to collaborate more extensively. In 1977 the relationship between the two fields became serious when the first DNA genomes were sequenced. Computer programs that already existed to work with DNA sequences were improved to detect more complicated patterns.

Early research papers written on bioinformatics topics, such as DENDRAL, had no official publishing home and drifted between journals focused on one of their two parent fields. The majority of these papers were published in biology centered journals. Today there are many journals dedicated specifically to this evolving field such as *Bioinformatics* and the *Journal of Computational Biology*. These journals publish papers focusing on current research in the field of bioinformatics, new discoveries, and emerging technologies.

Despite the development of bioinformatics-specific journals, this field still faces the challenges that are common to interdisciplinary research. Interdisciplinary articles suffer not only from not having a specific journal for publications, but also from a problem referred to as the expert fallacy. When two scientists from separate fields attempt to collaborate, it is often tempting just

to assume that the other expert does not know anything except in direct relation to his or her field. Junhyong Kim gives an excellent example of this in her article called, "Computers are from Mars, Organisms Are from Venus." published in IEEE Computer. "If a computer scientists comments on the molecular mechanisms of carcinogenesis, or if a biologists makes a remark about Lambda calculus, our first instinct is to wonder if this person knows what he or she is talking about – an extremely unfortunate situation given that such insights from outsiders can lead to important breakthroughs." Scientists in the field of bioinformatics have learned, for the most part, to get by this hurdle, an important step for a new field where everyone was at one time a specialist in something else.

The union of technology and biology first became truly important when it was implemented in the Human Genome Project that began in 1990. With the assistance of supercomputers and new software programs the Human Genome Project finished its mapping of the human genome five years ahead of its estimated schedule. In the short time since the Human Genome project has been completed the data it generated have already become invaluable tools in the field of medicine. After the completion of the human genome project databases and software programs continue to be extremely beneficial and necessary in the field of biological research. The Human Genome Project generated large amounts of data that now must be sorted through to be made useful. This particular aspect of bioinformatics has become especially important in the area of drug development.

Bioinformatics utilizes computer programs to take pieces of newly discovered DNA and match them up with already sequenced pieces of DNA to reduce both the time and cost of the steps to discover a new drug. When new sequences are matched up with already sequenced pieces of DNA using computer programs, it is sometimes possible to predict the protein that will be created from that particular piece of DNA. Once the protein that will be created is identified then scientists can begin generating drugs that will act on that protein to cure or prevent the disease that the protein causes.

The Human Genome Project has also been especially helpful in the area of cancer research. Using the data generated by the Human Genome Project and microarray analysis, cancer researchers are able to detect mutations in a cancer patients DNA. The completion of the human genome is helping researchers to detect mutations in these already studied genes, as well as helping them to locate other genes and proteins that are altered in cancer. The discovery of such markers to diagnose cancer can be life saving since early detection of cancer is the most likely way to ensure survival.

Among the many technologies that have become connected to bioinformatics one of the most interesting is supercomputing. Supercomputing facilities are sometimes required to process the massive amounts of data that bioinformatics programs can analyze. A supercomputer is a "computer that performs at or near the currently highest operational rate for computers…typically used for scientific and engineering applications that must handle very large databases or do a great amount of computation (or both)" (Computers and Computing Glossary). These computers are expensive to construct, making use of multitudes of the very best processors (over 1000 processors), several gigabytes of memory, and terabytes of disk storage. As an example of the hardware possessed by a supercomputer one can examine a supercomputing site located in New

Zealand, which was ranked 77th in the top 500 supercomputing sites. Weta Digital in Wellington, New Zealand recently made this supercomputer used for computer generated graphics in the Lord of the Rings films available to the scientific community.

Numerous universities and centers in New Zealand place a strong emphasis on bioinformatics research. Several institutes have been formed to support the rapidly developing field of bioinformatics in New Zealand. These institutes are managed by universities, and their professors frequently populate the staff of the institutes in addition to specialists. Not only does this situation provide the professors of universities with research opportunities but it also allows students access to the growing body of research in the field. Two major institutes, the Bioinformatics Institute of New Zealand and the Allan Wilson Centre for Molecular Ecology and Evolution, represent the level of support given to bioinformatics across the country of New Zealand.

Like several universities across the country, Victoria University in Wellington, New Zealand is conducting extensive research in the field of bioinformatics. Victoria University is one of the five partners with the Allan Wilson Centre, and it offers several bioinformatics courses to its student population. Dr. T William Jordan, my off-campus advisor, is one of the professors teaching these courses. Dr. Jordan not only teaches the courses, but also runs his own laboratory on campus that researches various projects with proteomics and bioinformatics connections.

In the summer of 2004 I traveled to Wellington, New Zealand, to work with Dr. T. William Jordan and Alexsandar Stojmirovic on a program to identify peptide sequences and proteins that do not already have homologs in the sequence databases. Alexsandar Stojmirovic designed and constructed the program as a part of his PhD thesis. He was kind enough to allow me to participate in a small portion of the program development. My involvement with FSIndex was to document the code that Alexsandar had already written. Once I had acquainted myself with the program my task was to add comments to the Python code explaining what each section of code was accomplishing. The explanations were to be fairly general and understandable to the wide variety of people who may wish to view them. In the field of bioinformatics, where a biologist may operate with little computer knowledge, it is important to have sufficient documentation for the uninformed biologist to use as guidance when working with a program. This extra bit of information is especially important for those who enter the field of bioinformatics from a biology based background.

Bioinformatics is a rapidly expanding field that requires skills in not only biology but also technology. It has grown from a haphazard union between computer science and biology into an entirely new field that has generated numerous publications of its own. Through my research in New Zealand I have obtained new insight into the field of bioinformatics as well as an introduction to some of the work conducted in the field. I look forward to one day becoming an integral part of this intriguing field. As one bioinformatics scientist is quoted, "'Part of me hopes that the most interesting questions are yet to come, that there will always be plenty of science to be done,' … 'But another part hopes that I will live to know all the answers.' For the first time in history, such a hope actually seems plausible" (Fischer).

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THE JENSEN LANDSCAPE AT HENRY AND CLARA FORD'S HOME: AN EIGHT-YEAR COMPARISON OF CANOPY VEGETATION

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Abstract

The initial inventory in 1998 of the canopy trees >10 cm diameter in the Jensen landscape at the Henry and Clara Ford Estate on the University of Michigan-Dearborn indicated that Jensen's vision of a mesic forest characteristic of southeast Michigan was fulfilled. A slightly more extensive inventory in 2005 found 60 species. Sugar Maple (*Acer saccharum)* at 17.5%, Silver Maple (*Acer saccharinum*) at 8.8%, White Ash (*Fraxinus americana)* at 8.2% with most dead due to the Emerald Ash Borer (*Agrilus planipennis*), Boxelder (*Acer negundo)* at 8.1%, Hop-hornbeam (*Ostrya virginiana)* at 5.4%, Red Oak (*Quercus rubra*) at 5.3% and Black Walnut (*Juglans nigra*) at 4.8% create the canopy. Analysis of numbers of trees in 10 cm size categories indicates recruitment of new trees into canopy status is occurring except with Red Oak, indicating a perpetuation of the mesic forest.

Introduction

The University of Michigan-Dearborn was founded in 1959 with a generous gift of 196 acres from the Ford Motor Company. Its Board of Regents dedicated more than 70 of these acres to be maintained as a natural and historical area for education and research. This land along with the 225 acres of the adjacent land owned by Wayne County is one of the largest natural areas in metropolitan Detroit. Preserving cultural identity and history to the Motor City, the Henry Ford Estate, home to Henry and Clara Ford and a National Historic Landmark, is also located on the University of Michigan-Dearborn campus. The Ford's had a great appreciation for the natural world. Jens Jensen, a landscape architect, was appointed to create a mesic forest landscape out of a farm field located north of the estate.

Jensen had a strong belief in the renewing powers of nature. His work reflected this view through the use of native plants. The signature of a Jensen landscape consists of open meadows surrounded by forest habitat, which provides for extensive ecotone habitat. Jensen's basic design has remained unchanged as a natural area to the present time. This study compares the canopy vegetation of the Jensen landscape as surveyed in 1998 and 2005 with Jensen's original plans and seeks to determine if Jensen's vision of a mesic forest was achieved and makes predictions for the future composition of the forest.

Methods and Materials

The trees <10cm of the canopy vegetation of the Jensen landscape were inventoried during July 2005. The landscape, a total of 21 acres, was divided into smaller sections using

topographic features (Fig. 1). Tree species were identified (Barnes and Wagner 2004) and the circumference measured with a fabric tape at chest height (137cm). Each tree was marked with chalk to prevent duplicate measurements. The measurements were recorded into field notes and later transferred to a database where the diameter and basal area for each tree was calculated.
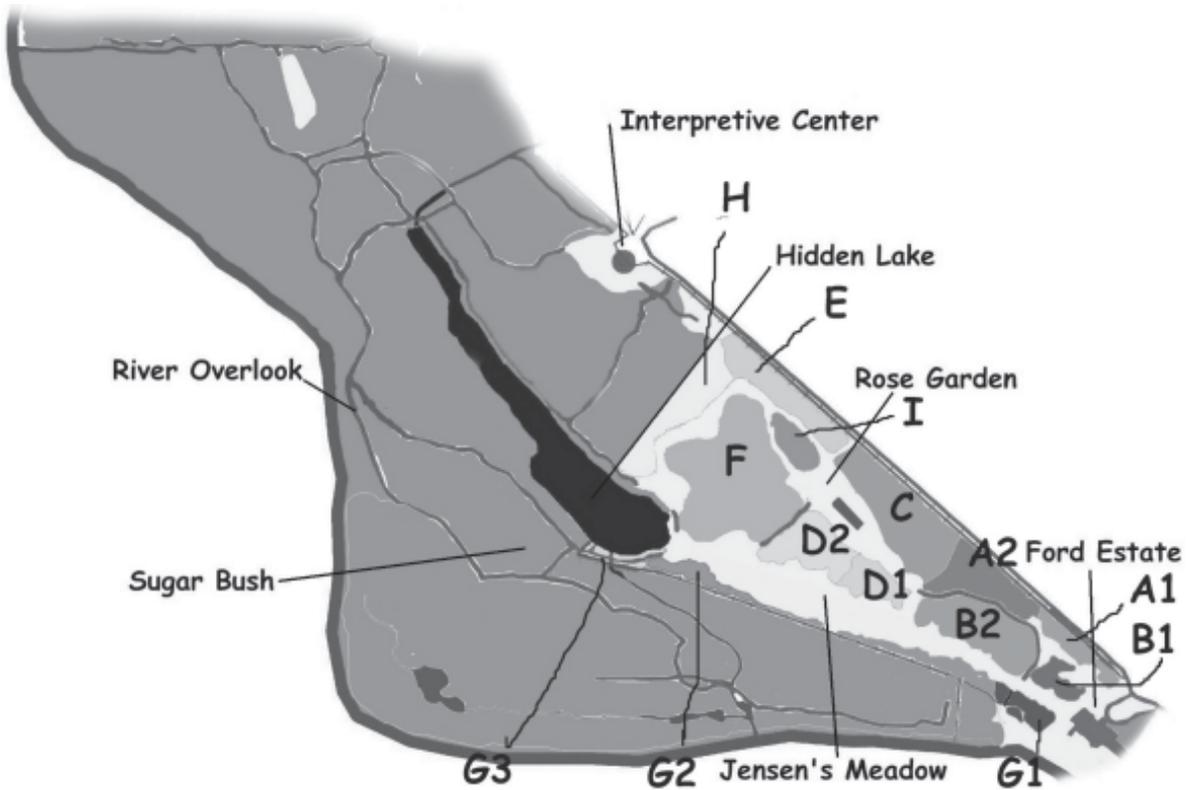
Figure 1. Jensen landscape surrounded by the forested land of the Rouge River floodplain on the south and west, remnant forest to the north, and Fair Lane Drive and the University of Michigan-Dearborn campus to the northeast. The Jensen Landscape is divided into subsections based on the separation by meadows and trails for more detailed analysis.

   In 2005, areas G1, G2, G3, H, and I were included in the survey but were not included in the 1998 survey.

Results and Discussion

   A total number of 2088 trees were surveyed in 2005 compared to 1326 trees surveyed in 1998. The top species in 2005 and 1998 was Sugar Maple (*Acer saccharum)* (Tables 1 and 2) an increase of 105 trees, due primarily to the addition of areas G1, G2, and G3.   50% of the Sugar Maple trees are in the 10-20 cm diameter category (Fig. 2), which indicates they will be the dominant tree for many dacades (barring disease, pestilence or other catastrophe.) The majority of the Sugar Maples are found in section G.2 (Fig 3) located next to the Rouge River floodplain which is dominated by Sugar Maple (Fig. 1). In the six-year interval between 1998 and 2005, the

number of Boxelder trees increased by 55 trees with an increase of 50 trees in the 10-20 cm size class in the area surveyed in 1998 and 2005.   80% of the 171 White Ash are dead due to the Emerald Ash Borer infestation, which will impact have the greatest impact on Sections F and G.2 by opening the canopy. Black Walnut added 69 trees to the area surveyed in 1998 indicating a rapid growth rate of the saplings of this species.   Hop-hornbeam, a slow growing tree increased by 9 trees during the six-years interval.

Of the 111 Red Oaks, only 18 are smaller than 40 cm which indicates that the population will eventually die out. With the exception of the low number small Red Oaks and the demise of the White Ash, the area known as the Jensen landscape will continue as a mesic forest.

Table 1. Summary of top 20 species in 2005 inventory of Jensen landscape

Common Name	Scientific Name	Number of Trees	Total Basal Area (cm^2)	Percent of Total Trees
Sugar Maple	*Acer saccharum*	366	224300	17.5
Silver Maple	*Acer saccharinum*	183	391009	8.7
White Ash	*Fraxinus americana*	171	201578	8.1
Boxelder	*Acer negundo*	169	64175	8.0
Hop-Hornbeam	*Ostrya virginiana*	112	43639	5.3
Red Oak	*Quercus rubra*	111	342130	5.3
Black Walnut	*Juglans nigra*	100	92177	4.7
Red Maple	*Acer rubrum*	97	80958	4.6
American Elm	*Ulmus americana*	94	66211	4.5
Red Mulberry	*Morus rubra*	84	55456	4.0
Basswood	*Tilia americana*	82	31779	3.9
Black Cherry	*Prunus serotina*	74	61401	3.5
Black Alder	*Alnus glutinosa*	62	19411	3.0
Eastern White Pine	*Pinus strobus*	52	40817	2.4
Northern Hackberry	*Celtis occidentalis*	45	13389	2.2
Slippery Elm	*Ulmus rubra*	31	11515	1.5
Hawthorn	*Crataegus sp.*	30	12830	1.4
Eastern Hemlock	*Tsuga canadensis*	26	5112	1.2
Redbud	*Cercis canadensis*	19	3427	1.0
Totals		1925	1790833	92.1

Table 2. Summary of top 20 species in 1998 inventory of Jensen landscape

Common Name	Scientific Name	Number of Trees	Total Basal Area (cm^2)	Percent of Total Trees
Sugar Maple	*Acer saccharum*	261	157580	19.7
Red Maple	*Acer rubrum*	134	113230	10.1
Red Oak	*Quercus rubra*	104	270810	7.8
White Ash	*Fraxinus americana*	96	121717	7.2
Silver Maple	*Acer saccharinum*	94	241205	7.1
Hop-Hornbeam	*Ostrya virginiana*	91	41922	6.9
Boxelder	*Acer negundo*	75	23995	5.7
American Elm	*Ulmus americana*	72	52620	5.4
Red Mulberry	*Morus rubra*	65	41415	4.9
Black Maple	*Acer nigrum*	49	14852	3.7
Black Cherry	*Prunus serotina*	45	31097	3.4
Hawthorn	*Crataegus sp.*	38	15861	2.9
Black Walnut	*Juglans nigra*	29	1976	2.2
Flowering Dogwood	*Cornus canadensis*	21	2376	1.6
Eastern White Pine	*Pinus strobus*	19	24013	1.4
Redbud	*Cercis canadensis*	16	4947	1.2
Northern Hackberry	*Celtis occidentalis*	13	3749	1.0
Basswood	*Tilia americana*	13	9868	1.0
Black Locust	*Robinia pseudoacacia*	11	21392	0.8
Eastern Hemlock	*Tsuga canadensis*	8	1725	0.6
Totals		1254	1196351	94.6
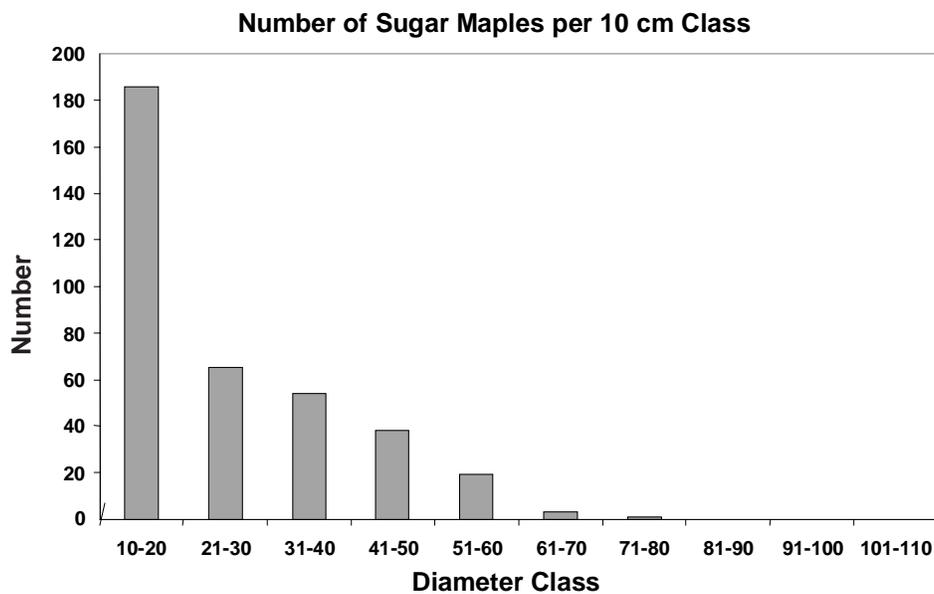
Figure 2. The distribution of Sugar Maples in 10 cm size categories with 50% of the total number of trees occurring in canopy status are in the 10-20 cm size classification.
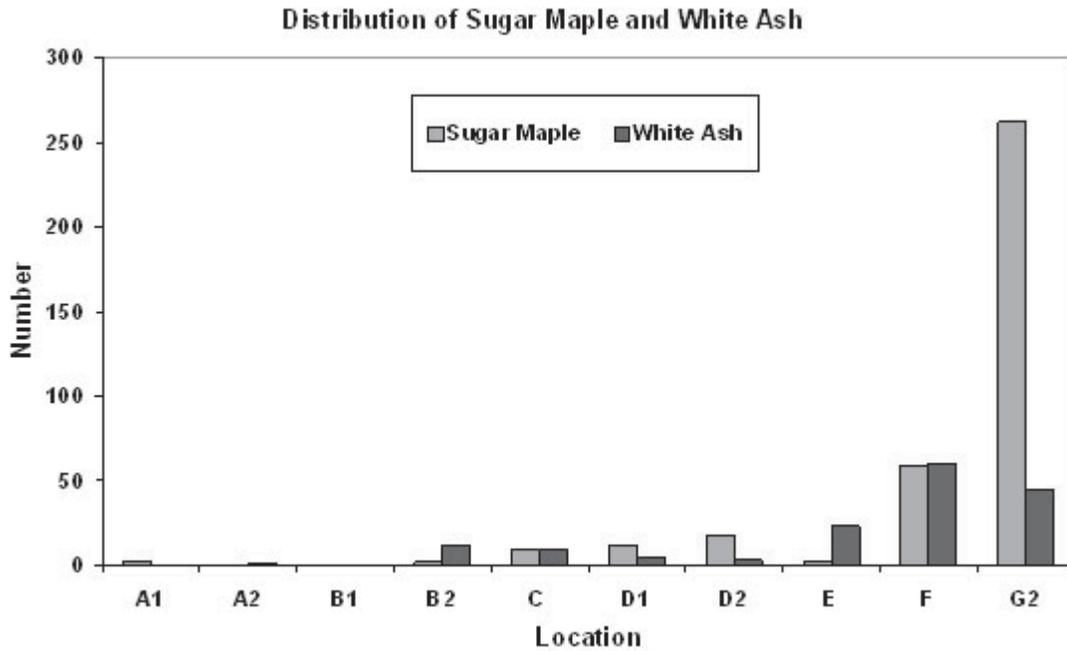
Figure 3. The distribution of Sugar Maple and White Ash within the Jensen Landscape.

Conclusion

Was Jensen's vision full filled and still thriving?

The original Jensen landscape blueprints identify eighteen species of trees (Table 3). All of these species were found in the landscape except Sourgum (Nyssa sylvatica), Tamarack (*Larix laricina*), and Butternut (*Juglans cinerea*) indicating that Jensen's vision of a mesic forest typical of southeastern Michigan was fulilled and continues to thrive. Future analysis of the landscape will prove which species utilized the opening within the canopy due to the decline of White Ash population, most notably in sections F and G.2. Additionally, if Sugar Maples thrive to obtain canopy status within this vacancy (Fig. 3), the future education and production of maple syrup will remain for generations (Berry 2006).

Table 3. Original species included in the landscape blueprint of Jens Jensen.

Red Maple (*Acer rubrum*)	Black Walnut (*Juglans nigra*)
American Beech (*Fagus grandifolia*)	Basswood (*Tilia americana*)
White Oak (*Quercus alba*)	Hawthorn (*Crataegus sp.*)
Swamp White Oak (*Quercus bicolor*)	Juneberry (*Amelanchier arborea*)
Red Oak (*Quercus rubra*)	Flowering Dogwood (*Cornus florida*)
White Ash (*Fraxinus americana*)	
Red Ash (*Fraxinus pennsylvanica)*	SPECIES NOT PRESENT INCLUDE:
Hop hornbeam (*Ostrya virginiana*)	Sourgum (Nyssa sylvatica)
Blue beech (*Carpinus caroliniana*)	Tamarack (*Larix laricina*)
Sycamore (*Platanus occidentalis*)	Butternut (*Juglans cinerea*)

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THE EFFECT OF RETINOIDS ON REGENERATION AND LIMB INDUCTION IN RANA PIPIENS

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The following research was started in Biology 311, Embryology, and continued for two terms as a research project. Past researchers have provided evidence that amputated amphibian tails treated with retinoids may cause homeotic transformation. *Rana pipiens* at stage levels IV-VII were treated with 10 IU/mL of all trans-retinol palmitate or cis and trans retinyl palmitate. We further tested the effects of re-amputation at the same site of previously amputated tails. We hypothesized that treatment with retinoids will result in homeotic transformation of tails into limbs. Whole animals were stained for cartilage and bone to verify any possible limb induction at the regenerated tail. Interesting tail ends were cut and stored to section and stain. No limbs developed at the tails. However, abnormal growths resulted and were examined. Stained slides showed pigment, notochord, mesenchyme, neurons, skeletal muscle, epithelium, and possible neural tubes. No cartilage or bone was found.

INTRODUCTION

Retinoids are vitamin A derivatives that are efficient in provoking homeotic transformation in amputated tails of *Rana pipiens* [Maden and Corcoran, 1996]. Retinoids are already present in regenerating tails or limbs in amphibians essential in normal growth and differentiation [Maden, 1998]. However, increasing concentrations can play an alternate role in tail regeneration. Retinol palmitate (all trans) and retinyl palmitate (cis and trans) are examples of the many retinoids. In this research, we anticipate that using either of these forms of retinoids will not result in any differences.

Maden (1993) reported that amputating tails at the midpoint of *Rana temporaria* and treatment with retinoids could induce up to nine hind limbs. We attempt to replicate procedures carried out by Maden with the species *Rana pipiens,* since *Xenopus* species have been found unsuccessful in these efforts. Effects of concentration, duration of treatment, amputation level, and stage dependency were researched by Maden (1993) to find that late stages do not induce limb induction, treatment for less or more than 2-3 days are less effective, and finally that retinoic acid concentrations of 10 or 20 IU/mL work best to induce homeotic transformation. These procedures were followed when conducting our experiments in attempting to keep death rates low and limb formation high. We demonstrate that ten IU/mL of a retinoid for three days results in abnormal tail regeneration and potential limb development at the amputation site in *Rana pipiens.*

Thyroxine is a hormone secreted by the thyroid glad. It is formed by combining the amino acid tyrosine with iodine. Thyroxine is the metamorphic hormone in frogs used in this experiment to shorten the time to metamorphosis.

MATERIALS & METHODS

Tadpoles from fertilized eggs of *Rana pipiens* adult female frogs were used. All tadpoles were staged under microscopes (Leica Zoom 2000 Model number Z30V) according to Stages in Metamorphosis of *Rana pipiens* [Taylor and Kollros, 1946]. Several experiments were carried out, and are named accordingly. In Experiment #1, tadpoles were anesthetized individually with 1 mL of 0.1% Ethyl-3-aminobenzoate methane sulfanate salt (Sigma-Aldrich A5040) for approximately 30 seconds to one minute or until movement began to slow down. Next, tails were immediately amputated on a glass plate using a scalpel at the halfway midpoint. This was followed by placing two tadpoles in each glass bowls (two or three per bowl) with 200 mL of bubbled water (see Table 1 for total count). Two bowls served as experimental bowls in which 10 IU/mL of all trans-retinol palmitate (Sigma R-3750) was added to the water. Control animals were not treated. Lights were then turned off in the lab at time of treatment and bowls were covered with aluminum foil. Treatment was discontinued after approximately three days by changing the water in the bowls. The tadpoles in the remaining bowl served as control animals.

In experiment #2, the same procedure of treatment and amputation of tails was the repeated for this experiment as it was for experiment #1 with the exception of using a slightly more diluted anesthetic. In experiment #5, the same procedure was repeated. As an extension of experiment #5, four animals (3 experimentals and 1 control) were taken from experiment #5 after two weeks and had their tails re-amputated at the same halfway midpoint, but were not treated. The procedure was also repeated for experiment #8 with the exception of amputating at the 2/3 point towards the proximal end. Experiment #9 was done the same way as experiment #1. Experiments #11 and #12 were a repeated procedure of experiment #9. However, in experiment #12 one week after treatment, 0.25ug/L of thyroxine was added to the water. The same amount of thyroxine was added every time bowls were cleaned.

Stage	# Started	# Followed
IV	139	78
V	166	129
VI	55	47
VII-VIII	21	12

Table 1: *Rana pipiens* Larvae Numbers, Stages, and Treatment. Data also includes animals from experiments in Biology 311.

All animals were cleaned and fed boiled lettuce twice a week. Water temperatures were kept between 19-21 ℃ except during the spring semester when temperatures rose to 24 ℃ at one point. Photographs of results were taken using a digital camera (Nikon 995). Animals of interest were stained after being anesthetized to death or after dying naturally. Interesting tail tips were cut off, stored in Bouins solution, prepared for sectioning, and finally sectioned. The remaining bodies of animals were stained for bone and cartilage (Lufkin, Thomas et al., 1992).

To section tissue, tail pieces previously stored in Bouins solution were set in melted paraffin in cardboard cubes, or "boats". Tissues are hardened by replacing water with paraffin and later

deparaffinized in xylene. After the assembly was solidified, a microtome (a machine designed for cutting uniform sections of specimens) was used to make thin, even slices ten micrometers thick. As tissue slices were placed on slides, heat was used to fix them on. Next, slides were dipped in alcohol solutions to rid of the paraffin to be able to stain in water, and then are ready to be stained. After being stained and allowed to dry, a cover slip was placed. Slides are now ready to be viewed under the microscope.

RESULTS

In experiment #1, treatment with all trans-retinol palmitate resulted in a 17% survival rate (one survivor out of the six tadpoles). The surviving experimental tadpole regenerated an abnormal tail, suggesting possible limb induction at the sight of amputation. The tadpole survived until it developed normal stage VII legs. Pigment was fully restored prior to death. Further testing and staining could not be carried out to confirm actual limb induction because the animal did not reach metamorphic climax before death.

Experiment #2 showed a higher survival rate of 80%. Eight out of sixteen tadpoles (including controls) developed abnormal tails [Fig.1, A-D]. Some of the abnormally developing tails appeared as if they were beginning to develop a limb branching off the bulb at the tip of the tail [Fig.1, A]. Controls developed normal, symmetrical tails, and were observed to regenerate much faster than tails of experimental tadpoles. Normal formation of legs was observed for all tadpoles in experiment #2.

A

B

C

D
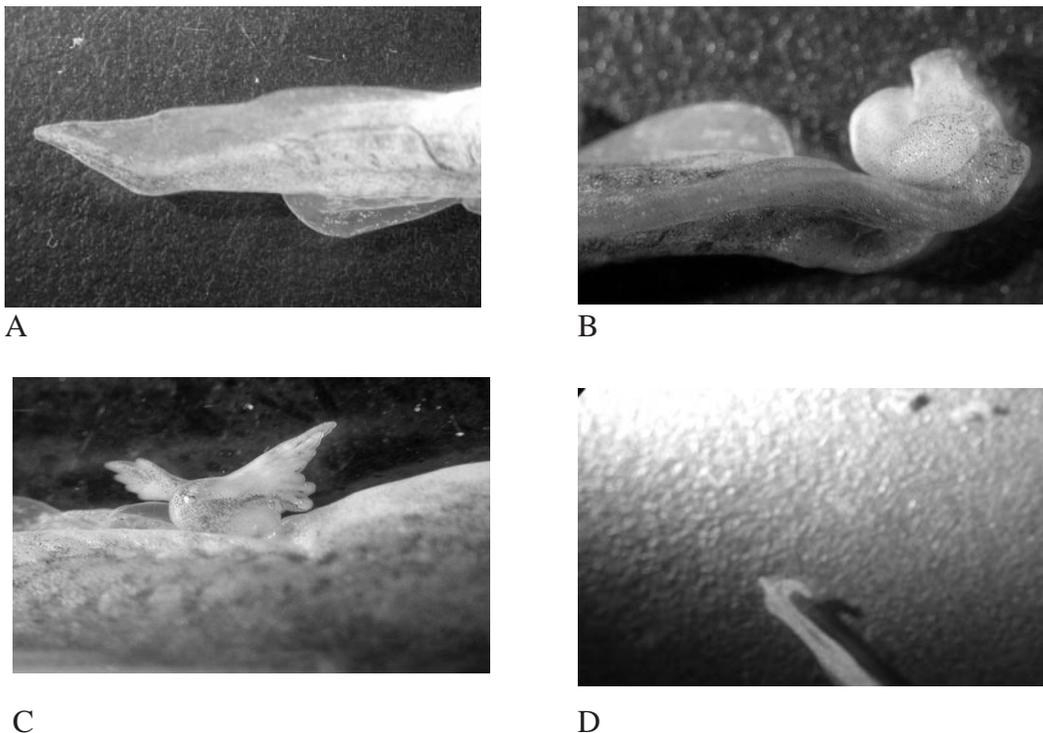
Figure 1 Examples of abnormal growths and shapes of regenerated treated tails. **A:** (Exp #2) Bent shaped tail. **B:** (Exp #3) bulb/knot growth at end of tail. **C:** (Exp #4) odd growth; two legs on one side. **D:** (Exp #5) End of tail is split.

In experiment #5, treatment of cis and trans retinyl palmitate resulted in a 93% survival rate (13 out of 14 survived, excluding tadpoles that were upgraded to experiment #4). Six out of thirteen tadpoles (including controls) developed abnormal tails. Additionally, as in experiment #2, faster regeneration of the control animals' tails than the experimentals' tails was observed. In addition, one of the experimental tadpoles resulted in a split of the regenerating tail tip [Fig.1, D]. All tadpoles survived in the extension of experiment #5, in which all tadpole tails were re-amputated at the same half way midpoint. Two out of the four experimental displayed abnormal tails. All legs formed normally, however. Furthermore, re-amputation of tails showed no additional irritation or unique abnormality. The control tail regenerated faster than experimental tails.

In experiment #8, all animals except one died within the first week. To test why this happened, four control bowls were added to the experiment. After returning in three days, we found that all except for one have died. Our conclusion was that this was due to the concentration of the anesthetic since the one animal that survived was not anesthetized. The one remaining tadpole from experiment #8 regenerated an abnormal tail, almost limb-like. Pigment was fully restored and the tail regenerated so that the cutting line was no longer visible.

In experiment #9, only two tadpoles survived. As in experiment #8, these animals were not feeding as well as animals in previous experiments. However, both animals regenerated abnormal tails. Pigment was fully restored to one of the remaining animals, while the other died before restoring pigment.

In experiment #11, only two of the eight died within the first couple of weeks. Controls regenerated normal tails, while experimentals regenerated abnormally. Pigment also restored completely. All sorts of shapes of tails were formed.

Experiment #12 tadpoles had the best survival rate. All of the tadpoles survived long enough to be followed. All experimentals regenerated abnormal tails, some more irregular than others. The two controls regenerated what appeared like normal tails. All animals fully restored pigment. Interestingly, the animals in the two bowls in which thyroxine was added regenerated much quicker. The thyroxine controls regenerated normal tails in contrast to the unusual tails of the experimental tadpoles.

All survivors of experiments #8, #9, #11, and #12 that had abnormal tails were whole-body stained. We found several interesting results that demonstrated possible limb induction. Figure 2 shows interesting whole body stained tadpoles. Interesting tadpole tails had their tips removed and sectioned. Sections exhibited interesting details. In experiment #9, muscle, epithelium, notochord, and a flattened nerve tube were found [Fig. 3, A]. In experiment #11, mesenchyme, pigment, epithelium, and possible notochord were visible [Fig. 3, B]. A good sign of possible limb induction was found in experiment #12. Neural tube, notochord, pigment, epithelium, mesenchyme cells, skeletal muscle, and nuclei were observable [Fig. 3, C-D].
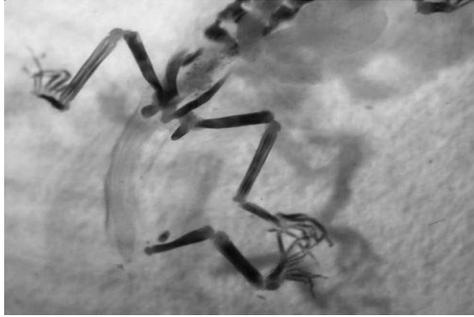
A
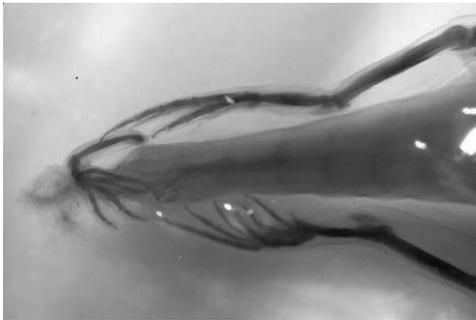
B

C

Figure 2 Photographs of tadpoles stained for cartilage and bone to verify limb formation (red=bone, blue=cartilage). **A:** A whole-stained animal by Biol 311 class (1997) showing a complete limb growing out of the tail, illustrating the ability of *Rana pipiens* to undergo hometic transformation. **B:** A stained whole animal obtained from experiments done by a previous class (Biol 311, 1999) showing hind limbs plus a small limb on tail. **C:** Stained hind legs from experiment 3, no limb induction at the tail. Endogenous limbs show abnormal development (irregular digits).
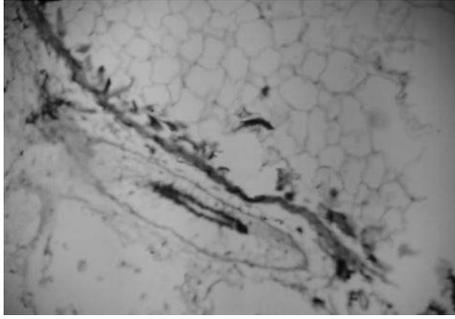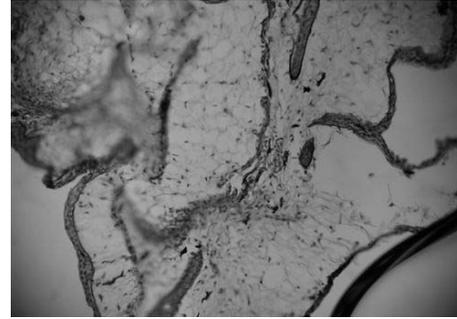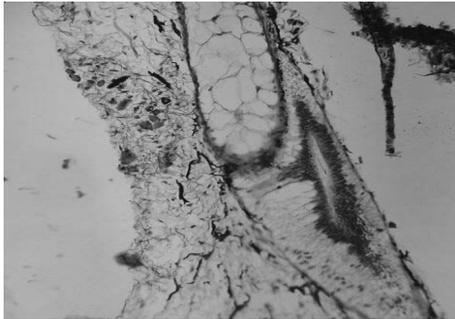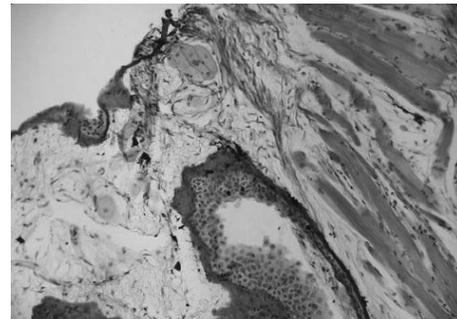
Figure 3 Sections of end-of-tail tissue with structures showing unorganized growth that is atypical in a normal regenerating tail. **A:** (Exp #9) Muscle, epithelium, notochord, and a flattened nerve tube are apparent. **B:** (Exp #11) visible structures include mesenchyme, pigment, epithelium, and possible notochord. **C:** (Exp #12) Neural tube, notochord, pigment, epithelium, mesenchyme cells, skeletal muscle, and nuclei. **D:** (Exp #12) this section includes lots of muscle, a good indication of possible limb induction. Also shows visible neurons, mesenchyme, and epithelium.

DICUSSION

Maden has stated that tadpoles from the species *Rana pipiens* do not show homeotic transformation after tail amputation. We have shown that by using the retinoids all trans retinyl palmitate and cis and trans retinyl palmitate, most *Rana pipiens* tadpoles regenerated abnormal tails and showed possible limb induction. These two forms of retinoids resulted in similar effects on regeneration and limb induction in *Rana pipiens*. Both treatments resulted in tail abnormalities and possible limb formation. Maden (1996) used three different retinoids (retinyl palmitate, all-trans-retinoic acid, and TTNPB) in which he concluded TTNPB to give the highest result of limb induction as it is a more potent form. This could be one reason as to why our experimentations did not yield high rates of limb formations.

We have shown that retinoids have the potential to alter normal development and regeneration in *Rana pipiens*, but only at certain duration of treatment, concentrations, and metamorphic stages. Maden (1993) reported that, ideally, 2-3 days is best; shorter or longer amounts of time resulted in less observed tail regeneration, and high fatality rates, respectively. Treating with 10

IU/mL retinoids is the best concentration; higher or lower concentrations resulted in high mortality rates, and low tail regeneration, respectively. Furthermore, Maden reported that limb induction would form during stages of hind-limb development (stages V-VI). Before or after this range of stages, no limbs to low frequency of limbs were induced. We found that within the range of stages IV-VI, there were no major differences in development. Finally, Maden also stated that proximal to midpoint level of amputation gave the best results, which is also what we have observed. When amputated at the proximal end, only one animal survived. In addition, re-amputation at the same midpoint did not show us any significant differences. There were no unique abnormalities compared to analogous experimental animals.

Maden (1993) found that even if tails were not induced to form limbs, they would be inhibited to regenerate. In contrast, all tails in our research regenerated whether normally or abnormally. Additionally, Maden found that although limbs that were induced in the place of amputation were normal, the legs of tadpoles were abnormal [Maden, 1996]. We have shown that most tadpoles appeared to have normal formation of legs, but some were indeed abnormal. One formed two legs on one side, for example [Fig. 1, C].

Adding thyroxine illustrated somewhat faster regeneration, although results were limited since we only had only one thyroxine-experimental group. In addition, there were no unique abnormalities as a result of adding thyroxine.

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