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Dedication

George Timothy Barthalmus
(October 27, 1942- May 12, 2011)

We lost our good friend George last spring. He was the inspiration behind Explorations and the State of North Carolina Undergraduate Research and Creativity Symposium, SNCURCS. George was known for his outreach to and support of student researchers- indeed, we feel he was the champion for undergraduate research in our state. We miss his infectious smile and bright, engaging eyes, his energy and excitement. Our hearts go out to his family, and we are glad for the time we shared with him. Volume VI of Explorations is dedicated to the memory of George Barthalmus.

Photo courtesy of http://www.ncsu.edu/faculty-and-staff/bulletin/2011/05/students-colleagues-remember-barthalmus/
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With special thanks and appreciation
to the faculty mentors and volunteer
blind reviewers.
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Submission Process
The response for volume VI of Explorations was overwhelming. We had three times as many submissions this year as the previous two years, and the fourteen papers published in this issue are excellent. They represent a variety of fields of inquiry—from historical analyses to laboratory experiments, from global perspectives to cross-species comparisons.

I think our friend George Barthalmus would have been so proud of these student authors, and it gives me pleasure to reminisce briefly here about George and the beginnings of SNCURCS and Explorations. I remember the first time I met George, as he hosted the Animal Behavior Society meeting in the summer of 1985. I was a new assistant professor at UNCW, one year postgraduateschool, and was scheduled to present my dissertation work at the conference. I recall heading up to NCSU from Wilmington to be there in time for a conference cook-out the night before the meeting officially started. I did not know many people there, and George was immediately friendly and welcoming; it’s a nice episodic memory. When we got to know each other later in our respective roles as coordinators for undergraduate research at our universities in about 2001, it was great to make the animal behavior connection again, and see that we valued the same type of support for undergraduate students. SNCURCS began as an outgrowth of the Triangle Undergraduate Research Symposium coordinated by Ms. Emily Heikamp, a student at Duke University, in 2003, and two years later, George urged the UNC undergraduate research consortium to take on the conference… and expand it. That is what George was about—expanding the scope of undergraduate research and encouraging others to support it. In 2005, the State of North Carolina Undergraduate Research and Creativity Symposium was first held, and educators from all colleges, universities, community colleges, and high schools were invited to participate. Now in its 7th year, SNCURCS offers a venue for undergraduates to present their research and creative efforts. Explorations was the brainchild of the 2005 meeting, and we are thankful that Dr. Michael Bassman and East Carolina University organized and published the first three volumes. Somehow George talked me into moving Explorations to UNCW in time to produce the 2009 volume when ECU reorganized and had to give up the journal. Come to think of it, he also talked me into hosting the SNCURCS conference at UNCW the same year. And I am glad he did. It was hard to say “no, thanks” to George, because you knew he saw the big picture and you knew he was giving 110% himself.

So in the spirit of the excitement that fresh approaches to research and discovery bring, we offer you volume VI of Explorations. I am indebted to my managing editor and layout expert, Ms. Tiffany Strickland, and to the 53 ad hoc reviewers who provided timely and thoughtful reviews of the papers.

Katherine E Bruce, PhD

Letter from the Editor
Biological, Earth, and Physical Sciences
Ultrasound: Autism, Agriculture, and a Future Tool for Treating Neurological Diseases

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The University of North Carolina at Pembroke
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ABSTRACT

Ultrasound has become a ubiquitous and trusted tool of medicine while bioeffects researchers claim that the extent of ultrasound’s side-effects has not been fully assessed. Despite this, nearly every mother in industrialized nations receives at least one fetal ultrasound during pregnancy. It is possible that extensive fetal exposure to ultrasound may have unforeseen developmental side effects. In order to address this hypothesis, experiments exposing various biological models to therapeutic intensity ultrasound are presented. Ten min ultrasound exposures to seeds of Phaseolus lunatus, the lima bean, lead to a 300% increase in germination rate and enhanced growth. It is believed that this is due to ultrasound enhancing the activity of alpha-amylase, a glycoside hydrolase class enzyme. Lysozyme is a similar type of enzyme as alpha-amylase, but is present in animals. Sonication is demonstrated to increase the reaction rate of solutions of pure lysozyme in vitro. These studies should be expanded on using diagnostic parameters in order to investigate enzymes as a potential pathway through which diagnostic ultrasound could affect human fetal development. Further research is necessary to ensure that the maxim of medical ethics, “First, do no harm,” is followed by practitioners.

Abbreviations: Autism Spectrum Disorders (ASD), Food and Drug Administration (FDA), Output Display Standard (ODS), Mechanical Index (MI), Thermal Index (TI), High Intensity Focused Ultrasound (HIFU), Spatial-Peak Temporal-Averaged Intensity (SPTAI), As Low As Reasonably Achievable (ALARA), Control (C), Ultrasound (US), Magnet (M), Magnet + Ultrasound (MUS)

INTRODUCTION

Ultrasound is a cyclic pressure wave with a frequency higher than the typical human ear can sense (>20,000 Hz). A typical ultrasound transducer is composed of piezoelectric crystals[1] that change shape when an electrical current passes through them[2]. Diagnostic and therapeutic ultrasound devices have varying output intensities, frequencies and waveforms in order to elicit a desired effect. The Spatial-Peak Time-Averaged Intensity (SPTAI) of an ultrasound wave is a common unit to measure dosage, and is in units of mW cm$^{-2}$[3].

For diagnostic sonography, ultrasound scanners typically use fast repetitions of short, high-intensity pulses. Computer software integrates the echoes of these waves
into a picture. The SPTAI of prenatal scans may not exceed 720 mW cm\(^{-2}\) due to Federal Drug Administration (FDA) regulations\[3\]. Physical therapists use therapeutic ultrasound machines which produce a wave with an intensity that ranges from 500 mW cm\(^{-2}\) to thousands depending on the aim of treatment. Therapeutic ultrasound units operating at around 1 W cm\(^{-2}\) are used to stimulate regenerative factors in soft tissue\[4\], cartilage\[5\] and bone\[6\]. The mechanisms through which these effects occur are not clearly understood\[7\], and as such the extent of ultrasound’s impact on the human body has not been fully assessed.

The potential for diagnostic ultrasound to contribute to developmental disorders has been considered by researchers since before the 1980’s\[8\]; however, due to modern medicine’s tenuous understanding of developmental physiology, the implications of many observed side effects remain unclear\[9\]. Some studies suggest that ultrasound could possibly have a deleterious impact on neurological development\[10\], and therefore in this study the link between prenatal sonography and the development of autism and Autism Spectrum Disorders (ASD) is explored. More studies investigating potential environmental factors which may contribute to ASD are necessary, as the exponential increase of ASD has become a threat to worldwide human health\[11\].

To investigate the impact that ultrasound has on Eukaryotic growth experimentally, some biologically relevant models are exposed to therapeutic intensity ultrasound and the side effects are examined. The use of therapeutic ultrasound in lieu of diagnostics equipment is due to cost restraints, although the SPTAI of the therapeutic device is estimated to be less than twice as intense as the current maximum SPTAI limit for fetal scans. Diagnostic and therapeutic ultrasound differs in intensity and waveform, yet the proposed experiments are still valid for exploration. It is the primary goal of this study to investigate the side effects of ultrasound on Eukaryotic development, although further studies must be performed using diagnostic equipment before conjecture regarding clinical dangers can be confirmed.

LITERATURE REVIEW

The Increasing Incidence of Autism Spectrum Disorders

In the United States, the incidence of ASD has risen from 1 person in 5000 (0.02%) in the 1970’s to 1 in 110 (0.91%) in 2009\[12\](Fig 1). This exponential increase has resulted in the Centers for Disease Control labeling autism a ‘national emergency’ in 2006\[11\]. No studies to date have conclusively identified the source of the accelerating prevalence. It is commonly argued that the expansion of diagnostic criteria accounts for some, if not all of the increase\[13,14,15\]; however, others claim that there is a genuine pandemic despite this\[16,17,18\].

While it is likely that the increase is at least partially due to changes in diagnostic practices, the fact remains that the incidence has been consistently increasing at an exponential rate for 40 years\[12\] and affects all industrialized nations. In May of 2011, the first study utilizing the entire population of South Korea claims that the incidence of ASD is 1 in 38 (2.64%) children aged 7-12\[19\]. When compared to the 2009 United States ASD estimates of 0.91%\[12\], the 2011 study claiming a 2.64% incidence of ASD in South Korea is staggering. It is imperative for worldwide human health that we determine the source of this accelerating prevalence and handle it appropriately, be it identifying the causative agent or by definitively proving that it is a virtual increase.
Does Ultrasound Contribute to the Rise in Autism?

Ultrasound was first introduced into diagnostics medicine circa 1958. As shown in Fig 2, within 10 years of its inception, diagnostic ultrasound’s use in obstetrics and gynecology became accepted worldwide and commercial research took off heavily (a) [20]. Coincidentally, the incidence of ASD began its ascent within the generation of people born in this time period (b) [21]. Research was necessary before diagnostic techniques using ultrasound could be implemented into medical practice and become widely used, and as inferred from the trends, there is a distinct correlation (c).

To date, diagnostic machines are capable of producing flush 3D images, allowing parents to look closely at their unborn children. Despite scientists claiming to not know the extent of side effects, the responsibility of interpreting the safety of ultrasound exposure is levied upon the individual practitioners [3]. This presents a danger, as bioeffects researchers claim that ultrasound is a possible teratogenic agent [8] – that is, it is capable of leaving a deleterious impact on an embryo.

Despite this, the general trust of imaging practices held by doctors has led to an increase of ultrasounds suggested during pregnancy, and even more for at-risk parents. The FDA does not currently have a limit for the maximum number of ultrasounds prescribed, although the average number for a healthy pregnancy is typically 1 to 3 [22]. Routine fetal ultrasounds are commonly said to be harmless by many doctors, yet the FDA has placed a ban on using diagnostic equipment for fetal keepsake videos [23]. Fetal keepsake videos are high resolution sonography sessions that are performed with a commercial drive for greater clarity of picture [24] rather than the As Low As Reasonably Achievable (ALARA) principle practiced by diagnostic medicine [25]. This ban highlights some controversy, as better imaging is a strong monetary incentive and medicine is not immune to the commercial pressures this presents.

The FDA’s regulations limiting the SPTAI of fetal sonography were raised 8-fold in 1992 to meet commercial demands for higher quality imaging. Prior to this change, there was an SPTAI upper end output limit of 94 mW cm\(^{-2}\) for fetal scans. Currently in the United States there is a limit of 720 mW cm\(^{-2}\) for such scans given...
that ultrasound machines follow regulation Output Display Standards (ODS)[3] and display on-screen estimates of power output in the form of a Mechanical Index (MI) and Thermal Index (TI). These indices can be off by a factor of 2, up to 6 in some situations[26,27]. As well, some studies have shown that there are many practicing radiologists and doctors who do not know how to effectively utilize these indices[25].

As evidenced by the commercialization of ultrasound, the monetary incentive to improve and make available ultrasound technology for public use is powerful. It has by far surpassed the regulation-limited research investigating the side effects. This has led to a situation where this highly novel and useful tool has become ubiquitous in society before its safety could be definitively verified[3]. Similarly, not 30 years ago X-Ray machines were used for fitting shoes properly[28] - a practice that had continued for many years before serious side effects were found. Studies do not suggest ultrasound directly causes cancer[28,29,30] as X-Rays can, but the possibility of harmful impact on fetal development is evident[8]. There are a significant number of trends that make the connection between diagnostic ultrasound and autism worthy of further investigation.

Side Effects of Ultrasound, as Demonstrated by In Vitro and In Vivo Studies

Ultrasound mechanically moves physical matter as it passes through a medium. This movement occurs along with an increase in temperature. Both the physical motion and resultant heat can have an impact on biological systems. Ultrasound side effects can therefore be classified as either ‘Mechanical’ or ‘Thermal’ in nature. Mechanical effects are those which are resultant of the physical interaction of ultrasound with a medium[31]. Thermal effects are those that are distinctly due to the increase in temperature. FDA ODS require that a MI and TI be displayed on the screens of diagnostic ultrasound monitors after 1992. These indices are tools to help estimate the thermal and mechanical impact that the ultrasound exposure will have on tissue[26]; however, interpreting the actual bioeffects is a responsibility levied upon the individual practitioner[3].

The practitioners themselves rely on researchers to inform them of safety considerations. Regulations and ethics issues require that many researchers perform a combination of in vitro and organismal model experiments to draw conclusions from for human health[32]. This raises some difficulty when looking for the subtle side effects of ultrasound. One obstacle is that there are many differences between a human brain and the brain of a rat as an organismal model. There are differences in size, molecular structure and function. These variations in physical makeup and scale make it so that doses which are teratogenic to lab animals or cause effects in vitro may not induce such insults in human tissue[26]. There are similarities, however, and some effects deserve note.

Excess heat has been shown to be teratogenic in animal models[27]. Because of the known pathogenicity of increased temperature on organogenesis, bioeffects researchers are more confident in saying that thermal dose considerations are more critical than the mechanical impact of ultrasound on development[33,34]. Irreversible neurological damage is caused to a fetus when its body increases 4°C above core temperatures for 5 min, or some dosage equivalent. Pulsed Spectral Doppler Ultrasound is a diagnostic sonography technique that requires the transducer to remain stationary, and can cause this 4°C increase in just a little bit over 30 seconds[35].

There is a further possibility that factors which increase the thermal dose of a fetus may compound one another, confounding
estimations of an ultrasound practitioner for utilizing a “safe” dosage of ultrasound. For example, during the third trimester fetal temperatures raise 0.5°C above maternal core temperatures[34], the mother may be ill, have been in hot weather, and it may be possible for a fetus to elicit its own fever response due to pathogenic exposure[36]. Ultrasound machine displays are required to only list a TI based off of a factory standard, giving no real time estimate of actual internal temperatures[26].

Thermal dose is imperative to consider during fetal scans; however, the more subtle mechanical effects may have an insidious impact. The mechanical effects of diagnostic ultrasound are not always obviously pathogenic: there are no exogenous materials presented to the body, and no overt visible physical damage indicative of trauma. Physical therapists utilize ultrasound’s mechanical effects when they report that treatment increases the growth rate of many tissues[6], yet they admit that the mechanisms are not well understood[9]. The extent of which mechanical side effects have on human long-term development is largely unknown[37], and it is difficult to quantify given that mechanical effects are many, varied, circumstantial and medium dependent.

Some discrete side effects have been documented. Mechanical stimulation from ultrasound exposure can cause changes in biochemical reactions[38] and may stimulate the formation of cavitation bubbles[39]. Under appropriate stimulation cavitation bubbles can implode, creating fluid microjets that can reach upwards of 500 atm[40] and 7000 Kelvin[41]—consequently having the potential to be very destructive. These small but powerful implosions can propagate further cascades of thermal and mechanical effects[42,43], damage proteins, induce localized changes in biochemical reactions and so forth[44].

Cavitation may also lead to the production of free radicals[45,46]. Free radicals can be attributed to many types of homeostatic imbalance[47], and ultrasound has been experimentally shown to produce them in vitro[48] and in vivo[49]. What these ultrasound promoted free radicals are capable of doing in the scope of human health remains to be further investigated[50]. This is important to consider, as fetal development is very sensitive to chemical balance[51].

Some studies show that DNA regulation can be affected by diagnostic ultrasound in a variety of ways[52,53,54]. It has also been demonstrated that there are side effects that are detectable across generations in some cell lines. A study performed in 1982 claimed that, in fibroblast cells, diagnostic intensity ultrasound induced a change in motility that was detectable in progeny upwards of ten generations after exposure. Other physical influences such as ultraviolet radiation and heat were able to cause a similar effect, as well[55].

In vitro studies have shown that pulsed ultrasound changes the binding affinity of hemoglobin to various molecules[56]. To what extent this could possibly affect living organisms is uncertain, but it is known that proper gas exchange is imperative for maintaining a healthy internal equilibrium across the placental barrier[57]. Another finding from this study is that insonation can alter blood pH. Given that this study was performed in in vitro conditions, further research is required so that these risks pertaining to clinical settings can be more clearly assessed.

Ultrasound and the Brain

In experimental studies that date back over half of a century, ultrasound has been shown to induce a wide variety of side effects on the brain and central nervous system[7]. There have been experiments detailing selective upregulation or suppression of neurons[58], ways to stimulate or alter sensory signals[59], even techniques to treat symptoms of Parkinson’s disease[60] and
epilepsy[61] using ultrasonic stimulation. A study performed in 1987 showed that diagnostic ultrasound damaged myelin in rat models. A very low SPTAI relative to today’s maximum limits were used, and symptoms were evident 24 h after exposure. The rats in this study were in a stage of development that is similar to that of a human fetus in the second trimester[62]. This is relevant for mental health, as myelination is a critical part of neurological development and the integrity of myelin sheaths are important for mental fitness. Multiple sclerosis[63] and schizophrenia[64] are some disease states that exhibit some myelin related symptomatology.

In 2006, an experiment used radioactive dyes to follow the paths of growing neurons of mice under exposure to high intensity diagnostic ultrasound. It is shown that extended periods of diagnostic ultrasound exposure during organogenesis can cause errors in neuronal migration. This study reports that a statistically significant number of neurons were found at inappropriate locations after exposure to ultrasound, evidence of an impact on neurodevelopment that could have potentially many consequences[10]. A factor that should further be considered about this study is that the resolution of the experiment only detected neurons found outside of a specific zone; any neurites that were displaced but within their expected zones are not discernible. Considering that neuronal connections build upon foundations set by other neurons[65], this small number of displaced connections during early development deserves acknowledgment.

As mentioned earlier, not all effects are overtly pathogenic in nature. With further research it is likely that ultrasound will become a potent neurotherapeutic modality[66]. The treatment of Parkinson’s disease using ultrasonic stimulation in the 1960’s was progressive and novel; however, technology at the time was not able to effectively focus ultrasound through the skull[67] and so the technique was not heavily invested in. That technology is available today, and so the potential for ultrasound to treat many mental illnesses noninvasively is on the horizon[68].

MATERIALS AND METHODS

There is a gap in research investigating how ultrasound impacts the long-term development of Eukaryotes. To address this, these experiments demonstrate that exposure to therapeutic intensity ultrasound to a seed has a lingering impact on the plant’s growth and development. It is thought that this change is due to ultrasound enhancing the chemical reactivity of alpha-amylase[69]. These experiments then make the connection from plant to animal by testing an analogous enzyme which utilizes a similar chemical mechanism but is present in both hens and humans.

The ultrasound machine used in these experiments is a facial cosmetic ultrasound unit operating at 1 MHz with a wave train composed of 5 millisecond pulses, a 40% duty cycle and an intensity of 1.25 + 0.35 W cm². The results of these experiments were not collected using a diagnostic ultrasound scanner, and are expected to exaggerate some possible side effects relative to fetal scans. Regardless, the results should highlight some potential dangers of increasing fetal SPTAI limits any higher and also bring attention to the impact that therapeutic intensity ultrasound can have on Eukaryotic development.

The use of a 0.5 tesla magnet in these experiments was originally motivated by recent studies debating why plants are sensitive to the Earth’s geomagnetic fields[70], which was first suggested by Louis Pasteur. During experimentation, it was observed that there was a deleterious impact on Phaseolus lunatus, the lima bean, when seed treatment included magnets combined
with ultrasound. The use of magnets was included in the methodology of the other experiments as well for exploratory purposes.

I. Brief Ultrasound Exposure to Seeds Induces Lifelong Changes in Plant Development

The seed represents a critical period of development for plants, similar to a fetus for humans. There are many differences between a fetus and seed, but plants and animals are both eukaryotic. All eukaryotes share some biological similarities[71], and as such, plants may serve as a useful model for exploring the effects of ultrasound on development. Magnets have also been reported to have a beneficial impact on plant growth[72], and so an experiment was performed to investigate possible synergism between the two effects.

In this experiment, seeds (n=360) of Phaseolus lunatus, the lima bean, were exposed to various treatments before planting. The seeds were split into 4 treatment groups composed of 30 seeds each [Control (C), Ultrasound (US), Magnet (M), Magnet+Ultrasound (MUS)] over 3 replications. A single group of seeds (n=30) received Constant Exposure (CE) to four 40 kHz ultrasound transducers positioned above them, suspended by c-clamps. The transducers were positioned to give approximately even distributions of ultrasound throughout the tray. Each group was planted in a controlled environment, and received carefully measured amounts of water and minimal additives. All seeds were planted in a double-layered aluminum baking tray, with non-fertilized organic potting soil. Each seed was carefully planted at a similar depth, with one inch of space separating seeds on all sides.

Each group of seeds in each replication was planted in their own individual baking tray. The 4 pretreatment groups’ trays remained side by side on a table in the middle of a laboratory. The CE group was separated into another room, and had its own control group that was positioned several feet away. All groups received an equal amount of light exposure from an incandescent ceiling light for several hours a day relative to their control, although this was not carefully monitored. There were no obstructions that would selectively block light to any of the plant groups. All watering was performed by pouring water into the bottom baking sheet layer, with perforations in the top sheet allowing water to seep into the soil. The amount of water delivered to each group was carefully measured and consistent.

The C groups received no pretreatment. US groups received 10 min of therapeutic ultrasound: first, the US seeds were set on top of a small seat of gel in order to improve coupling between transducer and seed. The seeds were then sonicated in groups of 4 for 10 min each. As each treatment group was not divisible by 4, each final sonication received 2 extra placeholder seeds to ensure similar mass to absorb ultrasound for all treatments. After pretreatment, the seeds were soaked in water for 24 h and then planted.

M groups received 10 min of exposure to a moving 0.5 tesla neodymium magnet. All 30 seeds of each magnet group were placed in plastic bags with the magnet and shaken for 10 min. MUS groups received 10 min of magnet treatment followed by ultrasound. After treatment, the seeds were soaked in water for 24 h and then planted.

The CE group was initially soaked in water for 24 h and then planted. Following, the seeds were exposed to four 40 kHz ultrasound transducers during the entire period of germination and growth.

II. Exposure to Therapeutic Ultrasound Increases Lysozyme Reaction Rate in vitro

It has been demonstrated that ultrasound
enhances the germination rate and observed that there were visual distinctions in plants treated with ultrasound at seed. It is believed that this is caused by, in part, ultrasound enhancing the reaction rate of alpha-amylase, a glycoside hydrolase [69]. An enzyme that is present in animals, lysozyme, is also a glycoside hydrolase class enzyme. As these two enzymes have a similar chemical mechanism, an experiment was carried out in order to investigate the impact of therapeutic ultrasound and magnets on the reactivity of pure solutions of lysozyme.

Sample aliquots of lysozyme and Micrococcus luteus bacteria were prepared according to the Worthington Enzyme Manual assay for lysozyme [73] in 0.1 M solution of potassium phosphate buffer, pH 7.0. Aliquots of lysozyme were diluted to 350 units mg⁻¹ in deionized water. M. luteus was diluted to a concentration of 0.3 mg ml⁻¹ in buffer. Some aliquots of lysozyme were treated with ultrasound, magnets, or a combination of both: the C group received no treatment. The M and MUS groups were placed next to a rotating 0.5 tesla neodymium magnet for 10 min. The US and MUS treatment groups were then placed on top of the ultrasound transducer in a polymer cuvette, with a drop of ultrasound gel to improve coupling between cuvette and transducer and received 10 min of ultrasound.

In each test, the control and treated enzymes both came from the same batch dilution to ensure consistent concentration of enzyme between groups. After pre-treatment of the enzymes 5 and 10 min, the lysozyme was then added to the M. luteus to start the reaction. In the constant sonication experiment, the enzymes were temporarily removed from the ultrasound device in order to take spectrophotometric assay with a Spectronic 20D spectrophotometer at 450 nm.

The absorbance of light through a liquid medium according to the Beer-Lambert Law is described as:

$$ A = \varepsilon \ell c $$

where $A$ is absorbance, $\varepsilon$ is the molar absorptivity, $\ell$ is the path length of light and $c$ is the concentration of solution. The change in absorbance over time is proportional to the rate of enzyme activity in this case, as lysozyme breaks down M. luteus cell walls and allows more light to pass through as the reaction continues.

**RESULTS AND DISCUSSION**

I. Brief Ultrasound Exposure to Seeds Induces Lifelong Changes in Plant Development

Over 3 replications, the data suggests that 10 min application of either therapeutic intensity ultrasound or magnetic field independently to seeds lead to an increase in germination rate and enhanced growth. Combination therapies appeared to negate the positive impact of either treatment individually on the plant’s germination rate (Fig 3). These changes were not statistically significant at a 95% confidence interval due to the small number of replications so far; however, each treatment group visually exhibited distinctly different visual characteristics that were loyally reproduced between each of the replications.

The M group seeds grew healthy and full. US group seeds grew even larger, with increased foliage and size relative to control. Seeds from the MUS group appeared to
exhibit inefficient growth patterns. Not only did the germination rate of the MUS groups drop significantly relative to other treatment groups, the MUS groups’ hypocotyls were very thin and wiry and they exhibited very poor foliage production.

The observed changes are partially enzymatic in nature. Studies have shown that exposure to ultrasound waves promotes the activity of alpha-amylase – an enzyme responsible for breaking down the endosperm of seeds into nutrients for the developing seedling[69]. Other effects likely contribute to the change in development, as extrapolated from the fact that exposure to a magnetic field also increased germination rate but did not alter the catalytic efficiency of pure lysozyme.

A second experiment was performed in order to study plants exposed to constant ultrasound. Several 40 kHz transducers were arranged by clamps above one replication tray, in a separate room from the other experiments and with its own control (Fig 4,5).

Some qualitative observations were made about the CE group: (1) the CE group had the highest germination out of all groups in any single replication (26.6%); (2) all of the seedlings’ hypocotyls in the CE group grew towards the ultrasound transducers (this is a phenomenon that we colloquially refer to as “sonotropism”); (3) the CE group was a more livid and healthy green color than both control and pre-treatment groups.

II. Exposure to Therapeutic Ultrasound Increases Lysozyme Reaction Rate in vitro

After exposure to ultrasound, lysozyme was shown to have an enhanced reaction rate for some duration. Exposure to the ultrasound wave imparts energy that enhances mixing and mass transfer, but the mechanism through which the enzyme reaction continues to occur at an enhanced rate afterwards (Fig 6) is not completely clear. There are theories as to how ultrasound may impact enzymatic reactions; however, studies are inconclusiver regarding proof of mechanism[44].

Fig 7 describes the enhancement of lysozyme chemical reaction rates with ultrasound pretreatment. Sonication of the enzyme prior to adding to substrate appeared to increase the reaction rate in a dose-dependent relationship. This reaction rate
enhancement continued after the solution reached apparent thermal equilibrium.

Treatment 1: 5 min pre-treatment before reaction
A 5 min pre-treatment of lysozyme by therapeutic ultrasound prior to adding the enzyme to substrate increased the rate of enzyme catalysis by 119% (a).

Treatment 2: 10 min pre-treatment before reaction
Ten min of ultrasonic pretreatment prior to adding the enzyme to substrate increased the rate of enzyme catalysis by 160% and 142% respectively (b).

Treatment 3: Constant exposure during reaction
The groups that were insonated while the reaction took place catalyzed over twice as many reactions compared to control. The efficiency of enzyme catalysis was increased 210% in both cases (c).

Some heat studies were performed. It was concluded that although heat does increase the reaction rate of lysozyme, ultrasound appeared to have a larger impact. As well, ultrasound appeared to leave a lingering effect that continued to enhance the rate even after the solution cooled down. Solutions of pure buffer raised 12.2°F, or 5.1°C over 10 min of constant ultrasound exposure (Fig 8).

Over several experiments, exposure to magnets did not change the reaction efficiency of lysozyme. Similarly, the MUS groups exhibited activity similar to US alone groups, suggesting that magnetic fields have no distinct change for solutions of pure lysozyme.

III. Comprehensive Discussion
Some studies have shown there to be a positive correlation between the prevalence of ASD and socioeconomic status[74], suggesting that ASD is more likely to affect people who have better access to medical facilities[75]. It may be that more well-to-do families are more likely to report a case of autism; however, it is also important to not dismiss possible factors that would selectively target these populations, such as medical practices.

As ultrasound has been shown to impact organismal physiology in measurable ways, extensive exposure during critical periods of development for humans could feasibly cause unintentional side effects. Environmental teratogens are thought to trigger the development of ASD in some cases[16], with genetic predisposition playing a large role in whether a person is susceptible or not[76]. If ultrasound itself is
a direct contributor to autism symptoms or not has yet to be proven, but the fact that ultrasound is such a prominent medical procedure adds weight to how important it is to better understand its side effects.

There is a large bit of undue trust in the medical industry regarding the potential side effects of ultrasound. Modern medicine is struggling to make sense of human biology and neurodevelopment, and our medical practices are still in an infantile state. Radiologists and ultrasound practitioners should definitely give respect to the instrument where it is due, however. Ultrasound is a powerful tool, and learning how the machines work is a very important part of understanding ultrasound itself. In light of research articles that claim a deficit in appropriate training with ultrasound equipment[25], a greater emphasis should be placed on technical studies in order to master the equipment.

Even for practitioners that are well learned, there is a lack of epidemiology studies on developmental side effects of diagnostic ultrasound. If a radiologist were to study the bioeffects of diagnostic ultrasound in depth, he or she may be unduly comforted by the lack of solid scientific data investigating the mental fitness and health of populations later in life who had been exposed prenatally. Because of this gap in research, there is insufficient data to draw upon to determine whether diagnostic ultrasound is truly safe or not. Further confounding, there would be many complications in epidemiological data analysis given the wide breadth of variables between ultrasound sessions such as location, environmental conditions and genetic differences between patients. Even the angle at which a practitioner holds the transducer at any given time during a session will alter the delivered dosage to a fetus[77].

Despite the lack of studies arguing for the safety of ultrasound, society is fairly comfortable with the idea of it. With fetal scans being a common day occurrence, a market has opened for the sale of ultrasound for personal vanity purposes. One such device, the ultrasonic “wrinkle remover” that was used in our experiments, may have unforeseen consequences of its own.

These hand held devices operate at therapeutic intensities and their intended use is direct application to the face wherever wrinkles are present. Ultrasound “wrinkle removers” are advertised to fight wrinkles by stimulating collagen production[78] to rejuvenate skin. Therapeutic ultrasound can penetrate inches into soft tissue; and although the skull has high impedance[79], direct application of therapeutic intensity ultrasound to it may in some way affect the brain[7]. Reason suggests that any product that willingly exposes the brain to therapeutic intensity ultrasound should be heavily scrutinized.

We conducted a preliminary study in collaboration with the Bahr laboratory (The University of North Carolina at Pembroke), where combination therapeutic ultrasound and magnetic fields were applied to organotypic rat hippocampus slice cultures. Ex vivo slices of rat hippocampus[80] were exposed to combined ultrasonic and magnetic stimulation for varying times, and several tests for synaptic markers of neurological toxicity and changes in myelination were performed. It was found that synaptic markers synaptophysin, GluR1 and myelin proteolipid protein were unchanged after up to 1 min 30 sec of exposure. All treated samples became thick and whitely colored 24 h after treatment, although the nature of this is unclear.

IV. Sources of Error

Obtaining the actual output intensity of the ultrasonic “wrinkle remover” unit has proven difficult without sufficient equipment funding. The reported intensity of 1.25±0.35 W cm⁻² is based off of an estimation using an advertised intensity output
from a similar model that performed closely in some tests. It was not clarified in the instruction manual if this is Spatial-Peak/Average Temporal-Peak/Average Intensity, although the trend is for companies to report their SPTAI.

Our zero point for the enzyme studies were off in some of the enzyme data sets presented here due to solution settling or drawing from incompletely mixed dilution aliquots. This should not dramatically affect the reported outcomes.

Due to the small number of replications, statistical analysis cannot prove that the enhanced germination rate is statistically significant at the 95% confidence interval. New studies will be performed to confirm the results of these experiments and to improve statistical analysis.

CONCLUSIONS

The incidence of ASD began to exponentially increase during the time when ultrasound came into use in diagnostics medicine. Correlation is not causation, but further investigation is warranted. If diagnostic ultrasound is not a contributing factor to ASD specifically, further study into its side effects is still necessary to ensure that the actual risk is better known.

The presented experiments were performed using therapeutic intensity ultrasound, estimated (with this particular device) to have an SPTAI roughly 130-175% the maximum limits of fetal scanning. The waveforms are also different, and without further investigations using a modern diagnostic scanner it cannot be definitively claimed that diagnostic ultrasound indeed produces this same effect.

Two glycoside hydrolase class enzymes have been identified that are upregulated by sonication. This has been demonstrated to alter the development of plants, and may be relevant to human organogenesis as well. This hints at a possible mechanism through which ultrasound may impact metabolic biochemical cascades. Further studies on how ultrasound interacts with biologically active enzymes should be performed using diagnostic equipment. Further, ASD is believed to have a heavy genetic basis[76], and how diagnostic sonography affects both gene regulation and the physical structure of the involved molecules deserves to be further studied.

On a positive note, magnets appear to improve plant growth. Further studies should be performed in order to investigate the potential of this to improve major crops. Using magnets would be a green, cost efficient way to enhance plant yield without the use of exogenous additives.

There are many questions still to be answered. Above all, the presented material is meant to provoke thoughtful consideration.

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ABSTRACT
The purpose of this experiment was to study the effects of hypoxic environments on two main enzymes in Leiostomus xanthurus (spot). The spot were placed in containers containing low dissolved oxygen contents for varying time periods. Soon after, tissue samples were taken to study lactate dehydrogenase (LDH) and sodium-potassium ATPase (i.e., sodium potassium pump) activity. Our results showed quite a bit of inter-individual variation among samples. Regarding LDH activity, enzyme activity appeared to increase initially in muscle tissue, but it did not remain elevated over time. In gill tissue, LDH activity decreased over time, possibly due to a shut-off of metabolic activity after low oxygen exposure. ATPase activity also showed an increase in activity in liver tissue, but like with LDH activity in muscle, this did not maintain over time. Overall, this experiment was successful in studying the effects of hypoxia on enzyme activity in spot, however, more experiments should be conducted in order to decrease the inter-individual variation we found.

INTRODUCTION
Aquatic environments can pose a variety of stresses to resident organisms. A major stress that aquatic organisms often encounter is hypoxia, or a reduced dissolved oxygen (DO) concentration. A hypoxic environment is defined as one containing less than 2 mg/L DO (1). Estuarine fish who live in the regions between rivers and oceans encounter the lowest dissolved oxygen concentrations when temperatures are high (during the summer) and at nighttime. Given that hypoxia is a major stress to estuarine organisms, we are interested in how it affects their physiology, specifically metabolic respiration. We chose to look at spot, Leiostomus xanthurus, because like many estuarine organisms, they are moderately hypoxia-tolerant (1).

Anaerobic respiration can be measured by an enzyme known as lactate dehydrogenase (LDH). LDH catalyzes the conversion of pyruvate (the product of glycolysis) to lactate with concomitant conversion of NADH to NAD⁺ (nicotinamide adenine dinucleotide), which can be measured spectrophotometrically. It is therefore hypothesized that lactate dehydrogenase activity will increase after prolonged exposure to hypoxic conditions. In fact, one study performed in vascular smooth muscle cells of rats concluded that cells exposed to hypoxia
for 24 hours had a two-fold increase in LDH activity (2). Another study performed in liver tissue of the killfish Fundulus heteroclitus also concluded a two-fold increase in LDH activity, this time after two days of hypoxia (3). In this study we report an initial increase in LDH activity, but this increase is inconsistent over time.

Adenosine triphosphate (ATP), the major energy currency of the cell, is hydrolyzed by Na⁺/K⁺ ATPase, otherwise known as the sodium potassium pump. This membrane-bound enzyme uses energy from ATP hydrolysis to pump three Na⁺ ions out of the cell and two K⁺ ions into the cell. These gradients are necessary for sustaining membrane potential, cell volume, and secondary transport of solutes. The Na⁺/K⁺ pump alone accounts for approximately 30% of ATP consumption in the cell (4-6). It was therefore hypothesized that the activity of this pump is decreased with prolonged exposure to hypoxic conditions to preserve ATP concentrations within the cell. Using ouabain-sensitive Na⁺/K⁺ ATPase, the absorbance of p-nitrophenol produced from the reaction of the ATPase with p-nitrophenylphosphate was used as indicator of ATPase activity. Previous experiments have shown the activity of Na⁺/K⁺ ATPase to decrease after acute deoxygenation, particularly in hepatocytes (liver cells) and alveolar epithelial cells (4), while others show only a decrease in Na⁺/K⁺ ATPase activity in alveolar epithelial cells after prolonged exposure with no response to acute hypoxia (6). In this experiment, we report an initial increase in Na⁺/K⁺ ATPase activity after 24 hours of exposure, followed by a decrease at 48 and 72 hours in liver samples.

PROCEDURE
For each of three experiments, eight eleven-liter tanks were filled with water containing Instant Ocean® to 5.7% salinity. A mixture of nitrogen and air was introduced into six of the tanks via a gas mixer to a dissolved oxygen concentration of ~2 mg/L or 25% oxygen saturation. These tanks were to serve as experimental tanks. Air was introduced into two of the tanks to a concentration of 8-9 mg/L oxygen (100% saturation) to serve as control tanks. Three fish were placed in each of the six experimental tanks. Sizes and weights were similar between fish used. One fish from each tank was removed at periods of 24, 48, and 72 hours, dissected, and gill, muscle, and liver tissue removed for homogenization and assay analysis. Three fish were placed in each of two control tanks and removed at the same time periods. In addition, six fish were removed from the holding tank at time zero.

Tissues were suspended in 50 mM Tris-HCl buffer with 0.1% Triton, 0.1 mM phenylmethylsulfonyl fluoride (PMSF) and 0.5 mM EDTA (pH 7.5). The tissues were placed in homogenization tubes and homogenized on ice with a Virtishear Cyclone I.Q. homogenizer. After homogenization, the samples were centrifuged in an Eppendorf microcentrifuge at 11,250 revolutions per minute for thirty minutes and then a protein dilution of each supernatant was made. Supernatant and protein dilutions were then frozen at -80°C for future use.

For LDH analysis, homogenized muscle and gill samples were thawed and centrifuged for five minutes to clear. Ten-fold dilutions of muscle and five-fold dilutions of gill were made in 50 mM potassium phosphate buffer pH 7, 2.5 mM EDTA and kept on ice. A small amount of homogenate (between 5-20 µL) was combined with 0.4 milliliters of 50 mM imidazole/1.0 mM potassium cyanide (pH 7.5) along with 0.5 milliliters of 50 mM Imidazole/0.15 mM NADH. Absorbance was recorded in triplicate to serve as the control. Next, 0.1 milliliters of 5 mM pyruvate was added to each solution and change in absorbance over a
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one minute time frame was immediately recorded. This rate was then converted to LDH activity by multiplying by a factor of -0.1660 based on the extinction coefficient of NADH (7). Dilutions and sample volume were then used to determine LDH activity per milliliter of sample. Protein activity of each tissue sample, which was previously calculated, was then used to find the LDH activity per milligram protein.

For Na+/K+ ATPase analysis, homogenized liver samples were thawed and centrifuged for five minutes at 13,000 rpm to settle fat from the samples. Five-fold dilutions of liver were made in 1.0 M Tris-HCl buffer pH 7.5, and kept on ice. The assay consisted of two solutions, A and B. Solution A, which contained 50 mM Tris-HCl pH 7.5, 5 mM MgCl₂, 10 mM p-nitrophenylphosphate (p-NPP), and 25 mM KCl was used to determine the total ATPase. Solution B, which contained 50 mM Tris-HCl pH 7.5, 5 mM MgCl₂, 10 mM p-NPP, and 3 mM ouabain was used to measure total ATPase minus Na+/K+ ATPase. Twenty microliters of the diluted liver homogenate were pipetted into the appropriate wells in a Microlite® plate, followed by 120 microliters of solution A or B. The reaction between each homogenate sample and each solution was carried out in triplicate. After incubating at 25°C for ten minutes, the reactions were stopped by the addition of 80 microliters of 1 M sodium hydroxide (NaOH). The absorbencies of the samples were then taken using a SpectraMAX 250 microplate spectrophotometer running SOFT MAX Pro 2.1 Alias software. Blank NaOH absorbance was subtracted from the total absorbance to give absorbance of p-nitrophenol. The formation of p-nitrophenol from p-NPP during Na+/K+ ATPase activity was the basis for absorbance. The ouabain in solution B inhibited the reaction. Therefore, the p-nitrophenol absorbance of the reactions with solution B were subtracted from the p-nitrophenol absorbance of Solution A, giving the Na+/K+ ATPase activity reported in nmoles min⁻¹ mg⁻¹ of protein. The absorption coefficient of p-nitrophenol is 13,200 M⁻¹ cm⁻¹.

RESULTS AND DISCUSSION

LDH Analysis in Muscle and Gill
When oxygen supply is low, many organisms switch from aerobic metabolism to anaerobic metabolism in order to maintain their function. Because LDH is an enzyme used under anaerobic conditions, we expected that the LDH activity in muscle would increase after being exposed to hypoxic conditions. Data were evaluated using ANOVA statistical analysis and graphs are shown below. The exposed fish can be compared to the time-zero fish. It appears that LDH activity initially increases after 24 hours and then decreases after 48 and 72 hours (shown in panels A and C). We concluded that spot exposed to hypoxia show an initial increase in the activity of LDH (and possibly other enzymes) in muscle tissue, but activity level does not remain elevated after 48 hours.

Panels D through F show the average LDH activity occurring in the gill tissue of spot. The LDH activity in gill tissue is significantly lower than the activity in muscle tissue (approximately 1/10 the activity). In panels D and E, it appears that LDH activity decreases over time, specifically after 24 and 48 hours. One hypothesis is that there is a shut-down of specific metabolic activities in gill after hypoxia exposure.

Due to a large amount of inter-individual variation among the spot, we were unable to come to a significant conclusion regarding LDH activity in muscle and gill tissue of spot.

LDH Analysis in Pooled Muscle Tissue
Muscle tissue samples were pooled for analysis. In the pooled tissue analysis, we
expected an increase in LDH activity as we expected in the muscle and gill tissue. We hypothesized that the pooling of samples would decrease the inter-individual variation originally present. Panels G-I show the average LDH activity occurring in the pooled muscle samples of spot that have experienced hypoxia for various time intervals. In Experiment 1 and Experiment 3, it is very evident that the amount of LDH activity in fish exposed to hypoxia is much greater than that of time zero fish. In addition, control fish do not change over time. However, because the individual samples were pooled, statistical analysis could not be carried out to determine any significant differences.

Panel J shows the average of pooled sample data of Experiments 1 through 3 in muscle tissue. The LDH activity of the time zero fish and control fish seems to remain at a constant level of approximately 3 units/mg protein. The fish exposed to hypoxia, however, have an average activity of close to 6 units/mg protein after 24 hours of exposure. The LDH activity in fish exposed to hypoxia are almost double that of fish who experienced no hypoxia. Error bars are not shown in this graph because n=3, therefore any trends of significant difference are not able to be determined. Therefore, it can be suggested that hypoxic conditions increase anaerobic respiration in spot, but more data need to be gathered to confirm these results.

Lastly, the pooling of samples seems to decrease the effect of inter-individual variation. As shown in panel J, the control and time zero fish seem to remain at a constant LDH activity level. The fish that experienced hypoxic conditions for either 24, 48, or 72 hours also seem to remain at a constant LDH activity level. This suggests that the pooling of samples decreases the variation originally present in individual samples.

ATPase Analysis in Liver

Hypoxia-tolerant organisms typically down regulate their major ATP consuming pathways when presence of oxygen is low. Na+/K+ ATPase uses a large amount of ATP, and it was expected that spot would down regulate this pathway after being exposed to hypoxia. The results that we found did not match those that were expected. Panels K through M show the average ATPase activity occurring in the liver tissue of spot. In all three experiments, it appears as if the ATPase activity initially increases (after 24 hours) from time zero, and then drops after 48 or 72 hours. This initial increase, which also occurred with the LDH activity in muscle, may be the result of an increase in enzyme activity after being exposed to hypoxia, but the increase was not maintained after 48 or 72 hours.

Overall, this experiment was successful in comparing both LDH activity and ATPase activity in various tissues of spot that were exposed varying levels of hypoxia. Future experiments are needed in order to determine more significant differences between tissue samples.

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GRAPHS

Graphs shown below are separated by tissue analysis (muscle, gill, liver) as well as enzyme studied (LDH versus ATPase). Letters above the bars represent statistically significant differences (unlike letters, such as a and A) or no significant differences (similar letters, such as A and A).

Panels A-C: Average LDH activity occurring in muscle tissue in exposed, control, and time-zero fish

Panels D-F: Average LDH activity occurring in gill tissue in exposed, control, and time-zero fish (Exp 1)
Panel J. Average LDH activity occurring in pooled muscle samples (Exp 1-3) of spots that have experienced hypoxia for various time intervals.

Panels G-I. Average ATPase activity occurring in liver samples of spots that have experienced hypoxia for various time intervals.
Panels K-M. Average LDH activity occurring in pooled muscle samples of spot that have experienced hypoxia for various time intervals.
Correlation Between Fluoride Ion Levels in Harnett County Drinking Water and Students' Dental Health

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ABSTRACT
North Carolina ranks forty-fifth in the nation in total number of dentists per capita. With 0.45 dentists per 1000 residents, this value is dramatically lower than the national average of 63.6 dentists. Since dentists typically concentrate in urban areas, residents in rural counties such as Harnett have limited access to quality dental care. As a result, most rural US counties fluoridate their drinking water. However, studies indicate that the benefits of drinking fluoridated water may be outweighed by other sources of fluoride, such as toothpaste and mouth rinses. Elementary and high school students (n=383) in Harnett County were surveyed about their oral hygiene, including: participation in fluoride rinse programs, number of oral cavities, and brushing habits. Fluoride ion standards were prepared using sodium fluoride and Total Ionic Strength Adjustment Buffer (TISAB). Household water fluoride levels were sampled and measured using a fluoride ion selective electrode (ISE), and the resulting fluoride levels were determined using a calibration curve of the standards. Results indicate no correlation between fluoride levels in public drinking water and number of cavities in these students. Also, there was no significant difference in the number of cavities regardless of participation in the school’s fluoride rinse program.

INTRODUCTION
Since the early twentieth century water has been publically fluoridated; however, its widespread use was not put in place until the 1950s. Public fluoridation of water in America is believed to play a vital role in the maintenance of dental health, which is especially important to rural communities, such as Harnett County, that have less access to dental healthcare. Fluoride acts on the enamel, which is primarily composed of a molecule known as hydroxyapatite. Figure 1 is an x-ray crystallograph of this molecule that shows its 3D structure. Normally, hydroxide ions can degrade over time when protons (such as those found in sugars) bind, and water molecules are formed. Fluoride, however, acts on the enamel by trading places with hydroxide ions, located on the outer edges of the molecule. Therefore, when fluoride builds up on the enamel the formation of water molecules does not occur as often. In other words, fluoride forms a protective barrier on the tooth’s enamel. It is predicted that individuals who drink county fluoridated water (as opposed to bottled water or well water) will have better dental
health, thus yielding fewer cavities.\(^1\)

With only 0.45 dentists per 1000 residents, Harnett County ranks as a prime example of a target rural community for the use of public water fluoridation.\(^2,4\) The effects of fluoridation in the rural county of Harnett have never previously been studied in detail. This project initially began as a survey that was sent home to the parents of students grades K, 3\(^{rd}\), and 5\(^{th}\). The survey was completed by 146 students. Due to the fact that dental health has many contributing factors, students were asked questions regarding their brushing habits, type of water consumed, frequency of dental cleanings, and more.\(^5\) In addition to drinking county water, it was predicted that students who have healthy dental habits, such as regular tooth brushing and dental cleanings, will have fewer cavities than their classmates who do not drink county water or have healthy dental habits.

Elementary school students in Harnett County and across the state also have access to a weekly fluoride rinse program. Since this is a program that costs North Carolina about five dollars per year per child, or roughly $376,805, according to an e-mail from Bonnie Johnson who is a public health dental hygienist in North Carolina,\(^6\) its effectiveness was included in this study.

Furthermore, in order to rule out the contributing factor of genetic makeup and its effect on dental health, the study looked at a potential correlation between a child’s parent cavity history and the child’s incidence of oral cavities. It is predicted that students whose parents have a greater number of cavities are also likely to have a greater number of cavities.

Economic trends were also studied. According to the 2010 United States Census, the average annual household income for Harnett County was $35,105.\(^7\) Additionally, 17% of children ages 18 and under in Harnett County live below the poverty line.\(^7\) Because of the low access to dental health in Harnett County mentioned previously, it is predicted that students who live in low income households are also at greater risk for cavity formation. This too masks the effects of the consumption of household fluorinated drinking water.

The average fluoride ion concentration (in ppm) was also determined from the student’s home water samples in order to determine if the average met the recommended U.S. Public Health Service level of 0.7-1.2 ppm.\(^1,5\) According to the 2009 Harnett County Water Quality Drinking Report, the fluoride level in drinking water was found to be 0.66 ppm;\(^8\) however, a representative of the Harnett County Regional Water Treatment Plant ascertained that the

Figure 1- Crystal Structure of Calcium Hydroxyapatite

![Crystal Structure of Calcium Hydroxyapatite](image1)

**Figure 1- Crystal Structure of Calcium Hydroxyapatite**

![Crystal Structure of Calcium Hydroxyapatite](image2)

**Figure 2- Household Fluoride Ion Concentrations for Harnett County Middle/High School Students and Total Number of Cavities for Each Student**

![Household Fluoride Ion Concentrations for Harnett County Middle/High School Students and Total Number of Cavities for Each Student](image3)
average level of fluoride in drinking water is 1.00ppm. As a cost effective measure and in response to the rising levels of fluoride available to children via toothpastes, mouth rinses, and fluoride supplements, the US Department of Health and Human Services (HHS) has recently announced that the recommended level of fluoride be changed from the current range of "0.7-1.2ppm" to a single value of 0.7ppm. The HHS believes that this lowered fluoridation level will be cost saving yet high enough to maintain oral health among the population. Since this topic is of great interest to a rural area such as Harnett, it was important for the fluoride levels in the drinking water to be analyzed in this study.

Several of the trends in the initial survey were not as expected, which was assumed to be due to small sample size. For example, there was no definite correlation between either the school fluoride rinse program or the consumption of county water on dental health. Therefore, the survey was extended to middle and high school students, as well as modification of the wording of a few of the questions for clarification purposes (Figure 3). Additionally, the surveys were coupled to individual water samples from the student’s home water supply, which were tested for their fluoride content. In this manner, the exact concentration of fluoride in the student’s water could be compared to the student’s dental health, creating a more direct correlation.

Based off the surveys alone, the consumption of county drinking water was not shown to have a correlation with dental health despite the fact that the average fluoride ion concentration level was near the recommended 1.00ppm level recommended by the ADA. This was an unexpected result; however, it further confirmed the earlier results from the first set of surveys. Additionally, students who participated in the fluoride rinse program were not shown to have an improvement in dental health. Students who were from low income families, as indicated by their participation in the free/reduced lunch program, were shown to have a greater number of cavities, as expected. Furthermore, this study proved that students whose parents had an increased number of cavities were more likely to have increased cavities.

MATERIALS AND METHODS

Surveys were distributed to an elementary school in Harnett County to all kindergarten, third, and fifth grade teachers to be distributed to the parents of the students. The middle and high school surveys were sent to one of each school type in the county to the science teachers to be completed by their students. (All surveys available from the author or faculty mentor.)

In addition to the survey, the middle and high school students were given a sample collection bottle (disposable plastic scintillation vial) with a bottle number that matched the student’s survey number. Teachers were asked to instruct the students to collect water from drinking water in the home, ideally the kitchen, and to rinse the water through the vile prior to filling the vile thoroughly. Rinsing a collection vile prior to its use is most important when using glassware; however, it is also advised for sampling plastics as well. Also, uniformly instructing students to collect samples from the drinking water faucet of the home
Bethany Starnes helped ensure validity of this research. For example, if students collected samples from a faucet in their home not used for drinking, such as the bathroom sink, the results would not be as applicable as that of the kitchen sink, and this could introduce some sample bias.

Several acceptable methods are plausible for measuring fluoride in water samples, however, the following method using an Accumet® fluoride combination ion selective electrode (ISE) was employed due to its cost effectiveness and the fact that the department had access to fluoride ISEs, as opposed to other equipment, such as an ion chromatograph. Furthermore, the limit of detection of a fluoride ISE is on a range of $10^{-6}$M to 1M. The lower limit of detection was an acceptable concentration, due to the fact that the fluoride samples were expected to have a concentration of about 1.0 ppm based on previous studies of Campbell University’s water conducted earlier over the course of the project.

Seven sodium fluoride standards of known fluoride ion concentration, ranging in even increments from $1.5 \times 10^{-5}$M to $1 \times 10^{-6}$M were prepared in Total Ionic Strength Adjustment Buffer (TISAB), and the mV reading of the standards was measured using a fluoride ISE. A calibration curve of the standards was created by plotting the log of the fluoride ion concentration versus the mV reading. Water samples were prepared by diluting the sample in a 10mL volumetric flask up to a 20% (w/v) solution in TISAB. The mV reading of the samples was measured using a fluoride ISE. A calibration curve of the standards was plotted, and the NaF concentration of the samples was interpolated from the graph.

Samples were re-calibrated on a daily basis prior to measuring test samples, or every two hours if samples were tested over greater than a two hour range in a single day. This calibration procedure follows that of the manufacturer of the fluoride ISE, and ensures standard “drift” does not skew the results. Furthermore, the manufacturer indicates that a slope of -54 to -60mV indicates “correct electrode operation.”

In order to ensure proper function of the electrode, the slope was checked daily when the calibration was performed to ensure that it fell within the accepted range.

The data from the samples collected from the students, as well as the survey results were tabulated in an Excel spreadsheet, and Systat software was used to analyze results. To determine if two numerical variables were correlated, a Pearson Correlation test was used. A linear regression line was applied to each correlation to test for significance. To test for significant differences across categories, a Studentized T-test was used (for two categories), or an ANOVA was used (for more than two categories). An alpha=0.05 (95% confidence interval) was used to determine significant differences between categories.

DISCUSSION OF RESULTS

Excluding well water samples, the average fluoride concentration in Harnett County was found to be 0.999 ppm with a standard deviation of 0.52 ppm (N=91); this value is within range of the suggested daily intake of 1.00 ppm set by the ADA. Our study aimed to analyze if the fluoride levels in the drinking water were significant enough to reduce cavities among the students surveyed. Figure 2 shows a Pearson Correlation for number of dental cavities and household fluoride ion levels. As shown in the graph, most of the fluoride ion levels center around the 0.7-1.2 ppm range; however, there are a few outliers that may be due to student sample collection error. The $R^2$ value of the regression was found to be 3.3, which means that only 3.3% of the variation in cavities can be explained by the household water levels. Furthermore, the P-value (slope of the line) is not less than 0.5; therefore, fluoride levels.
in the student’s homes are not correlated to number of cavities.

A total of 381 surveys were completed by school age students in grades K-12, 146 of which were completed by students in grades K-5. As observed in Figure 3, there is a direct linear correlation between students who brush their teeth regularly, visit the dentist regularly, and use a fluoride rinse weekly (aside from the fluoride rinse program at school). These results are as predicted; however, this graph only serves the purpose of showing some trends in student’s habits and cavity numbers. ANOVA tests were performed to determine if these trends were statistically significant.

Figure 3 does not clearly indicate a trend between participation in the fluoride rinse program at school and a lowered incidence of cavities; therefore, an ANOVA was performed, and the use of the fluoride rinse program was not shown to have a significant difference in reducing cavities. Figure 4 compares the responses of middle and high school students to their participation in the fluoride rinse program and their proclaimed number of dental cavities. Although it can be determined from Figure 4 that the fluoride rinse program did lower cavities among those surveyed, the ANOVA test yielded a P-value of greater than 0.05; therefore, the two groups, cavities and participation in the fluoride rinse program, are not different from one another.

The correlation between student’s household income level and dental health was also observed in this study. It is expected that students from lower income households will have a greater incidence of cavities due to a lack of exposure to quality dental care. Household income level was analyzed by student’s participation in the free/reduced lunch program, which is set-up for students who are categorized as being from low income homes. As apparent in Figure 5, low income students have a higher cavity incidence than non low income students. The ANOVA test yielded a P-value of 0.026, which means that the two groups, cavities and income level, are not different from one another.

This trend is similar to that of parent’s history of cavities and students incidence of cavities. Students whose parents had greater than 15 cavities were found to have significantly more cavities than that of
their fellow classmates. Figure 6 shows the ANOVA for this category, in which the y-axis indicates the student’s number of cavities. The error bars for the two groups do not overlap (the P-value is less than 0.05); therefore, there are significant differences in cavities across the parent cavities category.

CONCLUSIONS
This multi-layer study was successful in analyzing many factors contributing to the dental health of school-aged students in Harnett County, yet there is still much work to be done. Although the fluoride ion levels in Harnett County have been shown to meet the recommended guidelines for good dental health, the consumption of the drinking water is not shown to have an impact on cavity levels. Many factors that could mask the true effects of drinking county water, such as diet, amount of water consumed daily, and the onset of cavities, were not analyzed in this study. Therefore, we still do not have a good grasp on the true effects of drinking water on Harnett County school student’s dental health.

This needs to be taken into consideration when conducting future work on this project because the HHS’s suggestion to lower the recommended fluoride ion concentration necessary for good dental health from 1.00 ppm (Harnett County) to 0.7 ppm would mean a possibility for a significant reduction in daily fluoride consumption for these students. This is of special interest to the rural county of Harnett. This study has suggested that the low-income students in Harnett County do indeed have a higher incidence of cavities than that of their peers. Thus, the reduction of fluoride ion concentration in the drinking water could mean these students would potentially develop even poorer dental health.

The study has also suggested that the fluoride rinse program in Harnett County is ineffective. A careful look needs to be taken at how the fluoride rinse program is being administered to the students. It is fact that this program costs the school system a significant amount of money each year, and if it is being used improperly, coupled with the fact that it has been shown to be ineffective, than the money spent is to no avail. Furthermore, the study suggested that students whose parents have a greater incidence of cavities are likely to also have more cavities than that of their peers. With this knowledge, it would be suggested to put in place a program to monitor these students dental health in order to reduce their risk of cavity development.

Fluoride consumption in drinking water and the incidence of cavities in school-aged children has many contributing factors. However, with the knowledge gained from this study, its results could be used to help modify practices in rural counties similar to Harnett, and also help educators and county leaders make important decisions about water treatment with fluoride, as well as school dental programs. Through this study, fluoridation of drinking water has been shown to play a role in reducing the incidence of cavities, but this in itself will not make a change; parents, educators, and students need to be informed about the effects their diet and dental health habits play on their dental health so that students’ dental health can improve county-wide.

Future research would include some revisions to the procedure, as well as a change in the surveying process and questions asked, in order to gain more accurate and pertinent results. For additional samples collected, samples will be stored in a controlled refrigeration environment. The laboratory used during this project is now equipped with a refrigerator, but was not at the time of the experimentation. Furthermore, additional studies would look at factors not studied in this project, such as that of race, dietary habits, and outstanding dental issues. Race and “history of dental problems” were asked of the
participants in this survey; however, there was such little feedback to these questions that their results were not useful to include in this paper. For example, many students wrote down several races in the blank “indicate your race,” did not answer the question at all, or wrote and erroneous race, such as “brown.” Also, many students did not answer the very last question regarding history of dental problems. These factors, as well as that of dietary habit would be good to study in the future in order to obtain a better grasp on the issues surrounding cavity numbers in school aged children.

Another issue that would need to be addressed is that of self-reported cavity numbers. With a limited budget for this project, the simplest and cheapest way to obtain an indication of a student’s dental health, as related to cavity numbers, was to simply have the students self-report the number of cavities the student had in his/her lifetime. This of course could have led to an issue of under-reporting values, but also, it is possible that some students could have never visited a dentist and would not have a way of knowing how many cavities he/she had. This issue could be addressed by gaining access to a student’s dental record, which would take a great deal of time and may bring some legal question into consideration, or by having a dental exam conducted on each student to be surveyed, which would increase the cost of the project itself.

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Humanities and Fine Arts
First Hand Accounts of December 7, 1941 in Pearl Harbor

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ABSTRACT
This project involves researching and writing a narrative combining the first-hand accounts of sailors in the United States Navy at Pearl Harbor, Hawaii on December 7, 1941. The goal of the project is to gather the personal accounts provided in oral histories and to synthesize those into a narrative describing the emotions of that morning. This has been accomplished by examining the oral histories provided by five men who graduated from the United States Naval Academy in 1941 and survived the Japanese attack. A sixth account is provided by Lt. Alexander B. Coxe, Jr., who was the executive officer aboard the U.S.S Breese. Each individual perspective provides a different angle to the horror that surrounded Pearl Harbor on December 7, 1941. The research highlights the raw emotions as the Japanese planes flew above and the destruction and death surrounding these men.

On the morning of December 7, 1941, the naval and aerial forces of the Japanese Empire secretly attacked the United States Navy at the naval base of Pearl Harbor, Hawaii. For over two hours, twowaves consisting of over three hundred Japanese aircraft destroyed the Pacific Fleet of the United States Navy. Every ship along Battleship Row either took significant damage or sank during those early morning hours. Thousands of sailors in the United States Navy witnessed in horror as the Japanese bombed and destroyed their ships. These men, including Charles Merdinger and John Landreth of the U.S.S Nevada, Archie Kelly of the U.S.S West Virginia, Richard Wright of the U.S.S Tennessee, Joseph Spitler of the U.S.S Oklahoma, and Alexander Coxe, Jr. of the U.S.S Breese, witnessed the events of December 7, 1941 and provide a glimpse into that tragic morning by documenting their memory of the attack. Each of these men graduated from the United States Naval Academy in 1941 with the newly bestowed rank of Ensign, except for Lt. Coxe. These men would begin their naval careers with the defining moment of Pearl Harbor. This group held a special bond as recent graduates of the academy and a new bond as survivors of December 7, 1941. Archie Kelly noted that a battleship is a “world in itself. You can be in the bow...and I can be in the stern and write down an entirely different history of what is going on.”1 By piecing together these first-hand accounts, it is possible to gain a better understanding of the surprise attack and discover the emotions.

feelings, and events that American sailors experienced at Pearl Harbor.

The prelude to the events at Pearl Harbor that began in 1937 as a standoff between the United States and the Japanese Empire took place over national interests in China. The Japanese advanced into northern China and Manchuria, breaching the long standing open door policy in China held supported by the government of the United States. If the government maintained the open door policy by providing the Chinese with significant financial help, it would lead to further escalation with Japan. The other possibility involved the government of the United States allowing Japanese aggression, maintaining its neutral status, but also risking all property and rights invested in China.

The government of the United States remained undecided between these two options as late as the end of 1937. Members of the government were unwilling to challenge an ever-growing Japan, but refused to forfeit all interests in China. In October of 1937, President Roosevelt announced a recommendation that “peace-loving states isolate aggressor states” in an attempt to limit possible Japanese advances. The decision to avoid immediate relief to the Chinese would have possibly appeased the Japanese long enough to avoid armed conflict. Instead, President Roosevelt refused to invoke the Neutrality Act and Secretary of State Cordell Hull announced that “the existence of serious hostilities anywhere in the world affected the interests...of the United States.”

This policy towards the Japanese aggression was necessary for the United States as the Japanese planned to exploit northern China for its expansive reserves of natural resources. Japan officially acknowledged in November 1938 that it would “not give assurances to the preservation of the open door.” This allowed for the Japanese to be “self-sufficient” and immediately decreased American trade in both China and Japan. The American government refused to allow Japan to become increasingly powerful with the capture and exploitation of Chinese resources. While this hardening of Far East policy was clearly taken with the risk of future war, the concern for American interests in China resulted in the government of the United States requiring the open door policy to remain open, therefore aggravating an already frustrated Japanese Empire.

For over one hundred years, the United States adhered to the Monroe Doctrine, which interprets any attempt at colonization in the Western Hemisphere as an attack on the interest of the United States, requiring intervention. In the beginning of the twentieth century, the Japanese Empire wanted to adopt this same form of continent monopolization on the Asian continent. Due to personal interests in China, the United States refused to allow the Japanese to have free reign over the Pacific, in fear that the Japanese would become too powerful. While the government of the United States gave themselves free reign in the Western Hemisphere, eventually extending their reach to the Pacific, they refused to give this same power to the Japanese Empire. The United States wanted to “claim an ‘open door’ in China, while maintaining a ‘closed door’ in the Western Hemisphere.”

Stanley Hornbeck, the head of the State Department’s Far

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3 Ibid., 75.

4 Ibid., 92.

5 Ibid., 77.

East Division, refused to acknowledge any form of a Japanese Monroe Doctrine by “dismissing any parallels between United States policy in the Americas and Japanese policy in Asia...” The Japanese recognized this immediate double standard resulting in a defensive posture from the Japanese Empire with increased aggression and hostility against the United States.

The Japanese began to develop a strike force in late 1941 to annihilate the Pacific Fleet of the United States Navy. While the United States tracked Japanese naval movements and anticipated a Japanese attack, it was impossible to know the date or time of the attack. The United States Navy used radio intelligence to track the activities of the Japanese military in 1941. Radio intelligence officers focused their efforts with the use of cryptanalysis, naval traffic analysis and intelligence reporting to gain knowledge of Japanese tactical plans. While many of these decoded messages revealed that “a strike force had been formed,” no exact data ever surfaced. The United States Navy continued to track the strike force’s movements, but the date of attack was unpredictable. Many Americans assumed that war with Japan was inevitable, but had no way to guess the date and time of a Japanese attack. Without knowing the precise moment of the attack, these intelligence reports were useless to naval commanders. The Japanese struck swiftly in the early hours of December 7, 1941, preventing the American sailors from being fully prepared for the bombardment. This attack would forever change the lives of American sailors as they were suddenly shaken from sleep and thrown into the hellish morning of December 7, 1941.

For Charles Merdinger, the events of Pearl Harbor served as a brutal entry into the United States Navy. Merdinger

graduated from the United States Naval Academy in 1941 and immediately took residence aboard the U.S.S Nevada as an Ensign. His post on the ship was in the fire control division that “basically did the calculations for firing the main battery.” This kept Merdinger in the bottom of the ship while the Japanese sprang their attack. Merdinger was still in his bunk as the bombardment began, so he went to his station in his bedroom slippers. He struggled in the bottom of the ship until three in the afternoon, relaying messages, keeping communication lines open on the ship.

As the Japanese fighters gunned down American sailors on the top deck, Merdinger sent half of his men to man the anti-aircraft guns. These sailors faced a horrific dilemma because “the people who were going up thought they were going to get shot, and the ones who stayed thought they were going to get drowned.” Merdinger’s men were incredibly disciplined and immediately answered his call to replace their fallen comrades. The remaining men continued to work the lines of communication despite loss of power, flooding, and loss of oxygen in the lower deck.

At three in the afternoon, long after the Japanese planes left the island, Merdinger and his men realized they had to evacuate. The metal plates surrounding the men began to buckle to water pressure and the remaining oxygen supply quickly became exhausted. Merdinger relayed the dramatic situation to the executive officer, informing him that his crew could “hold it about five more minutes” and requested permission

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7 Ibid., 512.
8 Wilford, 38.
10 Ibid., 53.
11 Ibid., 49.
12 Ibid., 50.
to come to the surface.\textsuperscript{13} The men abandoned their stations with discipline as they would in a normal drill. As they climbed to the surface, the magnitude of the day’s events quickly dawned upon them.

Merdinger faced the conflict of smelling “the most wonderful air” and looking across to see the harbor aflame due to the massive leakage of oil.\textsuperscript{14} He witnessed hundreds of dead bodies covered in oil littering the waters of Pearl Harbor. As he witnessed the horror, he accepted the fact that he survived while thousands of others did not. An ironic thought struck Merdinger as he stood in awe of the “perfection” in which the Japanese executed their brutal attack.\textsuperscript{15} He also witnessed the anxiety of the naval forces on the island as American planes attempted to return to the island, but were shot down in the assumption that these were Japanese fighters returning for another attack.

One of Merdinger’s comrades on the U.S.S. Nevada was John Landreth. Landreth, also a member of the United States Naval Academy class of 1941, specifically asked for a commission on the Nevada due to its fame as a great ship for wrestling. Landreth was a wrestler at the Naval Academy, so this ship was a perfect fit for him. In the summer and autumn preceding the attack at Pearl Harbor, Landreth and the other members of the crew held wrestling tournaments on board as a means of friendly competition and a way to stay fit. Wrestling became part of Landreth’s official duties on the ship as he was the wrestling coach for the other sailors.

Ensign Landreth was the eighth junior officer in the Sixth Division of the anti-aircraft unit aboard the Nevada on the morning of December 7, 1941. Like many of the sailors that morning, Landreth was on his way to breakfast as the alarm on the ship sounded. He thought this to be a “low blow, having a fire drill (on) Sunday morning.”\textsuperscript{16} The Nevada conducted numerous drills in the weeks before December 7 and he assumed this to be yet another drill. As Landreth “half-heartedly loped up” the hatch to the main deck, machine gun fire assaulted the deck.\textsuperscript{17} When he heard the firefight taking place above him, he quickly rushed to his post at the anti-aircraft guns. As he commanded his station, he caught his first glimpse of the horror that surrounded him. Landreth stood witness from his post as the U.S.S. Oklahoma capsized and the U.S.S. Arizona exploded directly in front of him.

Japanese dive bombers began to attack the Nevada as Landreth took his station on the anti-aircraft guns. Commander Robertson, leader of the Nevada, ordered that all ammunition boxes remain completely filled and guns remain in the ready position as he sensed the imminent attack. This order, although against Navy regulations, allowed Landreth and the other gunners to return fire faster than any other ship on the island. While the dive bombers began to swarm the ship, they dropped their bombs with little accuracy. Landreth survived these close encounters as two bombs missed the Nevada with a third hitting the ship, landing “eleven inches away” from him inside the protective deck of the ship.\textsuperscript{18} While one of his friends on board congratulated him for being “cool under fire” by turning to adjust a setting in the ship’s director, Landreth insisted that he only turned to “keep from watching that thing hit me.”\textsuperscript{19}

\textsuperscript{13} Ibid., 52.
\textsuperscript{14} Ibid., 53.
\textsuperscript{15} Ibid.
\textsuperscript{17} Ibid., 24.
\textsuperscript{18} Ibid., 26.
\textsuperscript{19} Ibid., 27.
As the Nevada attempted to escape the harbor, Landreth was clueless as to any movements the ship made. Landreth was on the port side of the ship while any landmarks to identify movement were on the starboard side. He also did not give any meaning or importance to the movement as “all (he) was doing was looking up at planes” as he attempted to shoot any Japanese fighter out of the sky. In Landreth’s opinion, if the Nevada remained in the harbor, and stayed under the cover provided by the smoke from the Arizona, Japanese dive bombers would not have seen the Nevada. Instead, the ship took numerous machine gun hits and absorbed many casualties, before running aground at Hospital Point, as a result of the attempted escape.

Archie Parmalee Kelley had a family history of service to the United States Navy. His uncle, Bruce Kelley, graduated from the Naval Academy in 1925 while Archie graduated in 1941. They were both stationed in Pearl Harbor with Bruce serving aboard the U.S.S. Arizona and Archie aboard the U.S.S. West Virginia. Bruce Kelley switched duties the night of December 6, so he could be with his wife since she was also on the island. This type of switch was quite common while ships were in the harbor. The sailor who switched with Bruce Kelley died on December 7, leaving Bruce with incredible guilt for the rest of his life.

At 7:45 on the morning of December 7, calls of “Away, fire and rescue party” rang from the top deck as bombs burst on Ford Island, presenting the sailors with their first encounter with the beginnings of war. The “away, fire and rescue party” call informed the sailors that there was fire on a nearby ship. Ensign Kelley was an assistant damage control officer on the lowest deck of the West Virginia. Kelley and the rest of his shipmates viewed the call with skepticism. Immediately, a second call came, saying “General Quarters. Man your battle stations. No [expletive]!” This use of language was necessary as the call to man battle stations occurred throughout the summer to initiate drill sessions and this was no drill.

Kelley rose quickly and hurried to his battle station. His job was to make sure that all watertight doors were closed to prevent further flooding in the ship. The West Virginia, like the other battleships, received seven torpedoes and three bombs. The ship did not sink because of the quick reaction to close the watertight doors below deck. Kelley made this quick decision because, as soon as he reached his post, he discovered the compartment on the opposite side of his post flooding rapidly.

As Kelley closed the watertight seal, he immediately noticed four men entering the compartment. These men attempted to undo Kelley’s work by opening the watertight door, but could not because of the many sailors locking it in place on the opposite side. Kelley faced a horrific moment away from the machine gun fire and bombs on the upper deck. He looked at his commanding officer with “the unspoken question of ‘Shall I open the door?’” Commander Harper looked at Kelley with a face that implied he wanted the door to remain shut. Kelley then heard the torturous sounds of the men screaming as they frantically fought for their lives.

Although the decision to shut the door was a bloodcurdling choice, Kelley made the correct decision. This watertight door was the only available door to the central station of the lower deck, so it was necessary to keep that area from flooding for as long as possible. Kelley also had forty

20 Ibid., 30.
21 Ibid., 27.
22 Kelley, 9.
23 Ibid.
24 Ibid., 10.
25 Ibid., 12.
men under his command in the central station. If he had attempted to save the four trapped men, the rapidly moving waters would have killed all of the men in the lower deck. These men were then able to escape, one at a time, through an escape tube to the top deck. They remained in the lower deck for an hour until the flooding water and oil reached their shoulders, forcing them to search for an escape. Drawing from the discipline instilled in him by the Naval Academy, Kelley made the difficult, but correct decision for the greater good of the men under his command.

After the men in his command reached the surface, Kelley and his crew immediately began fighting fires on board the ship. The U.S.S. Tennessee docked directly beside the West Virginia in the harbor. This location prevented any damage to the Tennessee, keeping its water supply clean. Kelley and his men attached hoses to the ship from the Tennessee to provide clean water for all firefighting efforts. They continued to battle the flames onboard the West Virginia until Commander Harper issued a call to “Abandon Ship” at 1:30 in the afternoon.

For Kelley, life in Pearl Harbor was never the same after the events of December 7, 1941. The island soon went under martial law with all cargo ships being used for military purposes. The government delivered gas masks and required people to have one with them at all times. As for the younger members of the island population, they “soon removed the mask and used the carrying bag for swimming trunks and towels.” As citizens with Japanese heritage on the island disappeared in fear of internment, fear of a possible Japanese invasion swept the island in the days following the attack. The beaches of Hawaii resembled the famed beaches of Normandy with “barbed wire fences and landing craft obstacles.”

Kelley held the responsibility of continuing the logbook of the West Virginia. For normal log records while at sea, the writer would start with “steaming as before…” but in the case of the West Virginia, Kelley had no other choice but to write “sunk as before.”

Joseph Spitler reported to the U.S.S Oklahoma with the rank of Ensign after his graduation from the United States Naval Academy in 1941. Before going to Pearl Harbor, the ship took station in San Francisco, California for a holiday trip. The ship then proceeded to Pearl Harbor, arriving just before December 7. Spitler went ashore on December 6 and passed by the impressive sight of every battleship in the Pacific Fleet docked in the harbor. Spitler received an eerie order on December 6 to attack “any unidentified submarine,” suggesting that “somebody knew something.”

As the Japanese bombardment began, Spitler walked to his living quarters after being relieved from working his early morning duty. Before Spitler could get settled, the call to man battle stations rang over the ship. As in the case of Archie Kelley, a few expletives from the division officer explained the severity of the situation to the sailors. Spitler hurried to his post in the fourth division in the number four turret. As he raced past the junior officer’s quarters, he noticed that many of them were still asleep, ignoring the call to battle. A few moments after he ran past these quarters, a torpedo ripped through the room producing many casualties. This was a mistake in the Japanese attack plan resulting from a failure in reconnaissance. The Japanese used a scout plane to investigate whether

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28 Ibid.
29 Ibid.
the American carriers were docked at Ford Island. The signal used to tell the attack squadron became compromised as one of the flares used as a signal “went into the clouds.” 

The Japanese, under the assumption the carriers were at Pearl Harbor, attacked Ford Island, providing a small warning to the men on Battleship Row. In his sprint to his post, Spitler noticed the Oklahoma beginning to turn over. The Japanese torpedoes were pummeling the forward section of the ship because this was the only section of the ship open to the harbor channel. As he ran, Spitler could feel the ship “jump up a bit” with each successive torpedo strike. As Spitler finally reached his post in the turret, the water level had already reached the middle of the deck and the commanding officer gave the order to abandon ship.

As he escaped from the capsizing Oklahoma, Spitler faced numerous close encounters with death. As he jumped in the oily water, he turned to look over his shoulder and saw the gigantic ship directly over his head. Spitler cleared the ship’s edge by a mere ten feet. Once he passed this threat, he noticed Japanese bombers flying overhead preparing to drop bombs on them as he swam away. Luckily for Spitler, the Japanese did not drop any bombs then, as they “lost their point of aim.” As Spitler finally reached land, the Japanese began to fire machine guns at survivors, but he escaped injury.

Once the Japanese attack ceased, Spitler and others returned to the Oklahoma; but due to the ship capsizing, they walked onto the hull of the ship. As Spitler and the other sailors walked, they heard tapping from inside the hull. Sailors, trapped inside the hull, and cried to be rescued. The sailors could not use the typical cutting torch due to concern for setting the oil in tanks and surrounding the ship on fire. They began to carefully cut a hole into the metal to prevent the hole from flooding and drowning the sailors. The sailors then took a large sledgehammer to knock the plate out and create an opening to rescue the trapped men. As the plate broke, five men immediately “popped out of the shaft.” The men had been trapped in the hull of the Oklahoma from Sunday morning to Wednesday afternoon. Spitler and the crew rescued thirty men from the horror of being trapped inside the capsized ship.

Richard Wright graduated from the United States Naval Academy with less than stellar marks. He struggled academically while at the Academy and was a “very ordinary midshipman,” graduating with a 2.7 grade point average. Wright graduated in February 1941 and went to serve on the U.S.S. Tennessee with the rank of Ensign. Despite his academic struggles, he was more than adept as a sailor because “class standing did not have much to do with what you did afterwards.”

On the morning of December 7, Wright awoke from sleep as the alarm rang at 7:55. Wright was furious that the alarm would sound so early because the Navy was not allowed to hold drill sessions on Sunday mornings. As he arose from bed, he heard the first explosion, informing him that this was a real attack. Wright sprinted to his battle station, but passed by the anti-aircraft battery and noticed there was no officer on duty. He then took this post, as it was vital to the defense of the ship and the harbor. As the Japanese planes swarmed the harbor, Wright realized that

31 Ibid., 14.
32 Ibid., 11.
33 Ibid., 12.
34 Ibid.
36 Ibid.
there "was no time to analyze" and that he had to do "what seemed like the right thing to do." Wright and the other sailors of the Tennessee had no warning of the events unfolding around them. The sailors had a "general sense...that a war with Japan was inevitable." Wright was not surprised that the Japanese attacked, but date and location of a possible attack had remained unknown.

As Wright climbed to his spot on top of the anti-aircraft battery, the reality of the war’s beginnings dawned upon him. From this post, he watched as the Arizona exploded, the Oklahoma capsized, and the West Virginia sank. Wright, beside the Tennessee. As the West Virginia sank, it wedged the Tennessee against the concrete pylons anchoring the ship. These pylons eventually had to be destroyed to allow the Tennessee to escape the harbor. While at his battery, Wright and other sailors fired back at the Japanese dive bombers, hitting many planes, with some being shot down. Wright gained incredible pride from the fighting spirit of his crew as he never noticed a sense of panic "or even fear.”

After the Japanese bombardment ended, only three of the eight battleships in the harbor remained usable. The Tennessee, along with the Maryland and the Pennsylvania, left the harbor and sailed to San Francisco, California and Bremerton, Washington for minor repairs. Once receiving all necessary repairs, the ships sailed aimlessly, or so it seemed, through the Pacific until 1943. As Wright realized that the Tennessee was not getting close to the action of war, he requested a transfer to a submarine division. While Wright did not want to have a war, he decided that "if there was going to be one, a professional wants to be in it.”

While the ships on Battleship Row received most of the notoriety following the attack, there were many other ships in the harbor. Pearl Harbor was the home of the Pacific Fleet of the United States Navy, so there were many other ships present that morning besides the battleships. One of the ships was the U.S.S. Breese, a light minelayer. Alexander Coxe, Jr. was the Executive Officer of the USS Breese on Dec. 7, 1941 and wrote a detailed report of the actions of the Breese.

Coxe called “away fire and rescue party” five minutes after eight on December 7, 1941 after seeing a loud explosion on Ford Island. After watching another bomb explode, he sounded the general alarm and the Breese began to return fire at the Japanese planes at approximately 7:57 that morning, the first ship to return fire in the harbor. As he observed the events occurring in the harbor, Coxe estimated seventy or eighty Japanese planes engaged in the bombardment. The Japanese planes were painted with white underbellies to blend with the white clouds of the harbor, making them virtually invisible to the anti-aircraft batteries. Coxe watched as three Japanese planes burst into flame alongside the Breese because of the anti-aircraft fire. One of these planes took a direct hit and burst into pieces in mid-air while another plunged violently into the water directly in front of the ship. The third plane, still flying despite fire protruding from the body, enacted kamikaze tactics by intentionally flying into the side of the U.S.S. Curtis.

While the attack continued from the air,

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37 Ibid., 7.
38 Ibid.
39 Ibid., 8.
40 Ibid., 10.
41 Alexander B. Coxe, Jr., [Report on Japanese air raid], 9 December 1941, Alexander B. Coxe, Jr. Papers. East Carolina Manuscript Collection, Special Collections, Joyner Library, East Carolina University, Greenville, NC 27858 USA. #194.3b.
42 Ibid.
William Brown

the Breese received reports of a Japanese submarine in the channel of Pearl Harbor. The Breese and the destroyer Monaghan immediately left their post in search of the submarine. The Monaghan attempted to ram the submarine while it was above the water, but as the ship approached, the submarine submerged before contact could be made. A barrage of depth charges was then dropped in the area, but did not result in sinking the submarine. A PT boat then informed the Breese that the submarine escaped to a different area. The ship sailed to this location and its sonar operator quickly discovered the location of the submarine. The Breese proceeded to drop five depth charges in the area, resulting in a massive amount of debris rising to the surface, implying the charges struck the submarine.43

The interviews of these five men and the report from Lt. Coxe provide just a glimpse into the horrific Sunday morning of December 7, 1941. The Japanese strike force bombarded Pearl Harbor for over two hours, crippling the Pacific Fleet of the United States Navy. Increased hostilities between the United States and the Japanese Empire, beginning in 1937, culminated in the brutality unleashed on the Pacific Fleet and its sailors. While the United States held the ability to track the Japanese fleet and decode their communications, these sources proved to be unreliable. The intelligence reports provided by the radio intelligence crew did not give a clue as to the date or the time the Japanese force would strike.

These six interviews allow for a greater understanding of the personal experiences of American sailors during the attack on Pearl Harbor. The overwhelming feeling of surprise forced the sailors to immediately rely on their disciplined training in order to survive. Their individual stories, from Archie Kelley making the gut wrenching decision to close the watertight doors to Joseph Spitler rescuing thirty men from a watery grave on the Oklahoma, are captivating. Nearly seventy years later, these stories provide incredible insight into that terrifying day and serve as a reminder of the events that took place at Pearl Harbor. Each of these young men were newly graduated Ensigns from the United States Naval Academy in 1941. Their rigid training and preparation at the Academy allowed for their individual survival and their excellent response in the face of the enemy. These green ensigns set an example for American warriors to follow as they held, then forced, the Japanese tide to recede. Without these first-hand accounts, the true experiences of American sailors would be lost and the world would never know the true terror of the horrific events that took place on December 7, 1941 in Pearl Harbor, Hawaii.

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Some Things Never Change: 
Attitudes about the Foreign in *Y tu mamá también* and *Rudo y Cursi* 

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ABSTRACT 
This paper examines representations of foreign elements as part of modern, or post-Revolutionary, Mexican national identity in two recent Mexican films, *Y tu mamá también* and *Rudo y Cursi*. While the filmmakers succeed in presenting modern realities about the pervasiveness of the foreign in Mexico, traditional attitudes prevail throughout. To facilitate interpretation of the films, the paper begins with an historical framework that includes a brief history of modern Mexican national identity, highlighting contributions by traditionalist scholars Vasconcelos and Paz as well as modern critics Bartra and Monsiváis. While Mexicans have historically denied foreign influence, going as far as to do so by legal means, the realities of globalization have made its removal from the country impossible and lend weight to the idea of a Mexican identity in transition. While both films demonstrate this reality, suggesting an inevitability of the impact of the foreign, the overall treatment of such elements suggests a negative, traditionalist outlook, alluding to Mexico’s reluctance to adopt progressive attitudes in the face of its changing cultural landscape.

In various interviews, Alfonso and Carlos Cuarón, the filmmakers behind *Y tu mamá también* (*And Your Mother, Too*) and *Rudo y Cursi* (*Rude and Tacky*), have signaled their intention to accurately reflect Mexico’s national identity. In highlighting aspects such as a unique relationship with death, a cynical view of politics, and a appreciable mestizo (mixed European and indigenous) cultural influences, the Cuaróns perpetuate a carefully constructed idea about mexicanidad (“Mexicanness”) that has been cultivated since the Revolution of 1910. To whatever extent they succeed in presenting these ideas as accurate reflections of mexicanidad falls outside the scope of this paper, however, as this study exclusively examines the role of foreign influence in Mexico as presented in each film. The analysis establishes that while the films do appear to reflect a changing Mexican identity in a general sense, they fail to let go of traditional sentiments with regard to the foreign.

This paper focuses on the foreign as a
key element to the presentation of Mexican national identity each film. While some scholars (e.g., Hind, Acevedo-Muñoz, Saldaña-Portillo) have alluded to this facet of identity in their studies of *Y tu mamá también*, such consideration has yet to be given to *Rudo y Cursi*. Further, while extant analyses of *Y tu mamá también* tend to focus on a broader picture of national identity or on combinations of more well-known themes (e.g., sex, class, gender roles), this study exclusively considers the lesser-acknowledged but foundational role of the extrinsic and its representations in each film.

A general understanding of the role of foreign influence in Mexico’s modern, or post-Revolutionary, national identity is vital to best interpret such representations. As such, this paper first provides a brief historical overview, citing contributions made by leading Mexican cultural figures Vasconcelos, Paz, Bartra and Monsiváis and focusing their opinions about the foreign that have helped shape this vital feature of *mexicanidad*. This historical framework, as well as a brief introduction to each film that includes critical and popular reception, makes way for an informed analysis of how foreign elements are presented in each film and whether such representations take a traditional or modern view.

Just after the Revolution of 1910, in the early 1920s, Mexico’s ruling elite identified the need to unify the country as a means of preventing further uprisings. To accomplish this, they set to constructing a new national identity that would give the country a shared sense of history and culture, incorporating the country’s attitude toward the foreign as a major component. Since the Conquest, Mexico had always been influenced by external forces, first as a Spanish colony for 300 years and then as an independent nation greatly influenced by Western Europe and the United States. During the century between Independence and the Revolution of 1910, Mexico welcomed foreign investment, and its elite maintained a long-standing tradition of sending their children to be educated in Europe and the United States. Under dictatorial president Porfirio Díaz, in power from 1876 to 1911, the government opened up large parts of Mexico to foreign investment, a major contributing factor to the Revolution. After thirty years of dictatorship and seeing their rights diminished and their lands stripped in favor of foreign investment and industrialism, Mexico’s working classes revolted.

By the time the Constitution was ratified in 1917, the power elite had recognized a shared distrust of the foreign as a way to help unite the country. A common resentment toward the foreign would translate into a political rejection of it, a cause Mexicans of all races and cultures could embrace, despite their differences on socio-economic and other levels. Excerpts from the Constitution of 1917, as published by the Organization of American States, illustrate the effort:

...Only Mexicans by birth or naturalization and Mexican companies have the right to acquire ownership of lands, waters, and their appurtenances, or to obtain concessions for the exploitation of mines or of waters... Under no circumstances may foreigners acquire direct ownership of lands or waters within a zone of one hundred kilometers along the frontiers and of fifty kilometers along the shores of the country... (art. 27)

...Mexicans shall have priority over foreigners under equality of circumstances for all classes of concessions and for all employment, positions, or commissions of the Government in which the status of citizenship is not indispensable. In time of peace no foreigner can serve in the Army nor in the police or public security forces... (art. 32)

...Foreigners may not in any way participate in the political affairs of the country.
Sheila Casalett

Long since rid of Spanish imperialism and now also free from the foreign influence of the more recent past, Mexico would stand on its own for the first time.

To help lead the transition of the new national identity from idea to policy, Mexican philosopher and educator José Vasconcelos was appointed head of the Secretariat of Public Education (SEP) in 1924. As head of the SEP, Vasconcelos oversaw not only the nation’s education system but also the national arts and libraries, making him the de facto minister of culture. Perhaps the single most influential person in Mexico when it came to forming a nationally recognized cultural identity, Vasconcelos’s philosophy about Latin American cultures became foundational to the SEP’s work. This philosophy – outlined in his highly influential work *La raza cósmica* (The Cosmic Race) – touted Mexico as a standalone culture that was to reject “white” ways. North Americans, as Vasconcelos saw it, were “mere continuators of Europe in the region of the continent they occupied” (21). By contrast, Latin Americans were creating an entirely new race and culture inspired from within.

Under the direction of Vasconcelos, the SEP built schools, printed books at astonishing rates, implemented literacy programs among the poor and indigenous, started the Mexican Muralist movement, and initiated a revival of indigenous arts and music that ultimately flourished. In school, children were taught Mexican songs and dances while they learned about the great indigenous contributions to their culture and the mestizo leaders who helped shape their country into the sovereign nation it had become. Apart from acknowledging the Conquest and colonization, little mention was made of the tremendous foreign influences that had shaped the country in reality, making it seem as if Mexico’s national identity were being re-discovered rather than created.

The dissimulation on the part of Mexican elites vis-à-vis their personal involvement with foreign education and business went unchecked at the time, and the new national identity began to flourish. The lasting effects of this cultural re-invention can easily be spotted today in the murals that adorn public buildings, the “native” Mexican handicrafts that fill tourist markets, and the structure of Mexico’s educational system. Much of the credit for this goes to Vasconcelos and the ideas set forth in *La raza cósmica*. Decades later, another work would come along that would prove instrumental to sustaining post-Revolutionary ideas about *mexicanidad* through the twentieth century.

By the time Mexican Nobel laureate Octavio Paz first published his influential set of essays *El laberinto de la soledad* (The Labyrinth of Solitude) in 1950, he was already a well-known author, poet and culture critic. Today Paz’s work – like that of Vasconcelos – figures into the education of all Mexican students in one form or another, indicating how influential these two men’s ideas still are. The essays that comprise *El laberinto* examine different aspects of Mexican culture, all of which Paz asserts are influenced by an underlying sense of inferiority to white cultures that has been in the works since the Conquest. The “labyrinth of solitude” that gives the collection its title refers to a complicated and lonely history in which Mexican notions about culture have always been at odds with those of European-descended cultures, what Paz calls the “white” or “Western” cultures. Throughout, Paz demonstrates that the Vasconcelos-inspired, post-Revolutionary push to distance Mexico from the foreign other has had a lasting impact.¹

¹ In his chapter “The Day of the Dead,” for example, Paz distinguishes between attitudes about death in New York, London and Paris versus those prevalent in Mexico (57-58).
Among the several passages reinforcing the idea of Mexico as a stand-alone culture is Paz’s exploration of the legacy of Malinche. Her legacy, argues Paz, is twofold: she is the traitorous tramp who betrayed her own people by interpreting for Cortés and living as his lover, and she is the betrayed mother-figure used and abused by her Spanish oppressors. The Mexican word malinchipista also comes from the legend of Malinche. An insult for a person who prefers foreign things, malinchista labels Mexican xenophiles as little more than traitors, exhibiting an us-or-them mentality that again echoes Vásconcelos’s ideas of separateness.

Mexican policy has also been arguably hostile toward the foreign since the Revolution, always giving preference to the internal over the external, in an effort to restrict outside influence. Some provisions have changed over the years, but many policies are as strictly adhered to today as they were in 1917. In May 2002, for instance, seventeen American college students and their professor saw their visas revoked and were on their way home one day after attending a political demonstration (Eskenazi). Though they insisted their interest in the demonstration was purely academic, the government quickly acted under the authority of Article 33 of the Constitution, which bars foreigners from participating in politics in any way and for any reason. Such cases of visa revocation and visitor expulsion make clear Mexico’s continued take-no-chances approach to foreign influence in political matters and underscore Revolutionary Mexicans’ effectiveness in making it a permanent part of the country’s national identity.

Owing to more recent changes in Mexico’s policy about land ownership, opinions vary about whether this effort will see continued success, but it is clear that Mexico did see a significant decline in foreign investment between the Revolution and the 1990s and that Mexican identity is still closely associated with indigenous influences. The doubts that come into play regarding Mexico’s continued cultural sovereignty primarily come from two significant changes that have taken place since the 1990s. In 1992, the government enacted constitutional reforms intended to increase foreign investment, and two years later saw the ratification of NAFTA, the North American Free Trade Agreement. The combination of these two events continues to have a marked impact on Mexican culture. According to modern culture critics, these changes have led to a national identity in transition, lending weight to what scholars call a hybrid culture—a mix of urban and rural, traditional and modern, internal and external.

NAFTA has been cited as a major contributor to these changes in the Mexican cultural landscape and to the idea of an emerging hybridity, as much of Mexico’s economy has become NAFTA driven, not to mention the accessibility of foreign goods such as fashion, music, movies and other cultural instruments. As María Josefina Saldaña-Portillo points out, NAFTA has “radically altered… the character of Mexican sovereignty,” a key component of Mexican national identity extending back to the Constitution of 1917 (753). Two of Mexico’s foremost modern culture critics, Roger Bartra and Carlos Monsiváis, bolster this perspective.

Bartra, Mexican sociologist and anthropologist, argues that what was presented in the first half of the twentieth century as a unified Mexican identity cannot exist organically. Regional and cultural differences throughout Mexico make the idea of a unified, monolithic Mexican culture nothing more than a constructed myth, what

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2 The chapter “Sons of La Malinche” discusses the legacy of Malinche, a legendary (but real) indigenous woman best known for her role in history as interpreter and lover to Spanish conquistador Hernán Cortés.
he refers to as “un espejismo,” or “mirage” (Moore 498). Instead, he points to what he calls the “post-Mexican condition,” summed up by Josh Kun as a “post-NAFTA reconsideration of the basis of Mexican identity and re-visioning of Mexico as a multicultural constellation of multiple traditions that do not necessarily add up to a singular, integrated whole” (273).

Monsiváis, Mexican writer and culture critic, also promotes the view of a Mexican identity in transition toward hybridization. He argues that long-held ideas about Mexican identity have been broken down thanks in large part to globalization and a greater awareness of the plight of indigenous Mexicans, often calling attention to the whitewashing of history for which the education system under Vasconcelos is now criticized. In a 1999 interview with The Journal of American History, he asserts that the old ideas of nationalism ignored contemporary indigenous groups in favor of a unified Mexican front that rejected Americanization and idealized an indigenous past. Now, says Monsiváis, young Mexicans want the internet, technology and American fashions: “Youngsters are fed up with tradition… all of this is transforming and eroding what we used to know. And that is unavoidable” (qtd. in Thelen 618).

Given this background, there are currently two dominant, contrasting schools of thought regarding Mexican national identity, both of which are examined here in the context of the films Y tu mamá también and Rudo y Cursi. The words “traditional,” “modern” and “hybrid” are applied throughout to describe the dominant points of view. For the purpose of this analysis, “traditional” refers to a Vasconcelos-Paz model of Mexicanidad that rejects the foreign and views foreign influence in a negative light, while “modern” or “hybrid” synonymously refer to recent ideas about hybridity and an identity in transition that is more accepting of the foreign, as supported by Bartra and Monsiváis.

Written by brothers Alfonso and Carlos Cuarón, and directed by the former, Y tu mamá también was released in Mexico in 2001 to critical acclaim and commercial success. Nominated for more than 40 awards – over half of which it won – today Y tu mamá también holds the distinction of being one of Mexico’s top-grossing films of all time. The basic plot centers around two Mexican best friends – Julio and Tenoch – and Luisa, the Spanish wife of Tenoch’s pretentious cousin. The boys, each about 18 years old, see their girlfriends off to Italy for the summer, and a few days later they meet Luisa at a family wedding. Because Luisa is new to Mexico, the three make small talk about things for her to do while her husband goes to a conference. In trying to impress the alluring 30-year-old, Julio and Tenoch tell her they know of an idyllic beach that hardly anyone visits and that she should join them on a trip there. A few days after this conversation, Luisa’s husband confesses infidelity by telephone, and the next day she desperately accepts the boys’ false invitation. Stunned by her sudden acceptance, they scramble to put together a road trip to the fictitious beach and the three take off in a matter of hours.

A couple of days into the trip, Luisa has sex with Tenoch, and Julio catches them in the act. He becomes terribly jealous, threatening his lifelong friendship with Tenoch. The next day, Luisa decides to even the score by also having sex with Julio, and the boys tell one another that they have slept with each other’s girlfriends. In the end, they discover that the fictitious beach they were looking for is actually real, the three participate in an alcohol-saturated ménage à trois, the boys discontinue their friendship, and Luisa is out of the picture for good, having died of cancer. Throughout the film, the boys’ relationship is tested and some recurrent Mexican themes of
sexuality and masculinity come into play. Such a reductive summary substantiates the popular view of the film, which includes descriptions of it as a “lighthearted, risqué romp” (Puccio) and a film featuring “frivolous exploration of sexuality” (Keller). Other critics, meanwhile, deride it as little more than soft-core pornography, with one reviewer suggesting that potential viewers “skip this mild stuff and rent some honest-to-God porn” (Scribbs). These perceptions notwithstanding, Mexicanists view the film as a treasure trove of mexicanidad, as it showcases well known Mexican themes as a prevalence of death, challenging gender roles, and the cultural disparities between urban and rural Mexican populations. Also notable in the film, as this paper examines, is the role of foreign influence on the characters and on Mexican culture in general.

Rudo y Cursi, released in Mexico in 2008, was written and directed by Carlos Cuarón, co-writer of Y tu mamá también and also opened to critical acclaim and commercial success. According to Cuarón, the ideas that would become Rudo y Cursi began to develop during promotional tours for Y tu mamá también (El Meikin, Cuarón). Because the films share several cast and crew members, as well as a few basic themes, Rudo y Cursi is often referred to as the follow-up film to Y tu mamá también. In this regard, the viewer experiences the main themes of the brothers’ love-hate relationship and their rise and fall from working-class rancheros to top-seeded soccer stars and ultimately back to rancheros. Also prevalent in this film, however, are the marked influences of the foreign over the characters, the story and Mexico itself.

Throughout both films, representations of foreign influence are evident, beginning with the character of Luisa in Y tu mamá también. Luisa’s symbolic connection to the Conquest in Y tu mamá también becomes clear almost immediately from the time she is introduced. Best friends Julio and Tenoch first meet her at a wedding held in a bullring, “[emphasizing] her Spanishness and the Mexican nation’s cultural heritage” (Acevedo-Muñoz 42). In a Pazian fashion that recalls the “labyrinth” that is mexicanidad, Luisa is presented throughout the film as a symbol of two seemingly oppositional roles: that of the Spanish conquistador and that of Malinche-as-mother. Luisa’s representation as Spanish agent of conquest lies in her Spanish nationality and surname of Cortés, which she shares with Spanish conquistador Hernán Cortés, famous for leading the conquest of the Aztec empire as well as for being Malinche’s lover.

It is Luisa who seduces the boys and captivates their imagination, sparking the actions that will ultimately destroy their friendship. In this regard, she is associated with the Spanish conquistadors whose aims were not initially understood by the Aztecs but who eventually toppled their
empire. This same explanation can be used to justify Luisa’s representation of Maliche-as-mother: “she is the one who shows the boys their true desire… she is the one who births their consciousness…” and brings together old world and new (Kemet). And just as historically it is difficult to separate Cortés from Malinche – or Spain from Mexico – so is it difficult to separate them in the character of Luisa. Her death and the disintegration of Tenoch and Julio’s friendship, however, create a final separation, suggesting Mexico’s independence from Spain. Her influence does last, however, as the boys never speak again, indicating Spain’s lasting impact on Mexico even after Independence.

That Luisa has had cancer throughout and later dies from it alludes to what Emily Hind calls the “contaminated character” whose removal is necessary to facilitate a “return to order” (108). This suggests the foreign influence that has helped shape modern Mexico, but whose interference has been halted, allowing for Mexico’s own return to order, just as the framers of the Constitution of 1917 and identity architects like Vasconcelos sought to guarantee. In this case, a complete break has been made not only from Mother Spain, but also from the United States and the “contaminating” influence they exerted, allowing for an “independent national identity” (Hind 108). This sets Mexico free to stand on its own and, as writer-direct Alfonso Cuarón would say, to grow up.

In the case of another foreign character, this time from Rudo y Cursi, no such break is made, though his end also suggests a negative view of foreign influence on the protagonists. The character of Darío “Batuta” Vidali enters Rudo y Cursi for the first time some ten minutes into the film as his cherry red Corvette has a blowout just outside the town where Rudo and Cursi are headed to a soccer match. Here the narrator, none other than Batuta himself, says, “… and this… is where I enter into this story.”

Leaning on the car next to Batuta is a younger, voluptuous woman, who soon finds out is one of his many female companions. Throughout, he is featured with no less than six such women, all noticeably younger than he, all of different races, and all seemingly uninterested in anything deeper than being seen with him in public. Batuta’s entry with the red Corvette is the first time any bright color is featured, an intentional move on the part of the filmmakers, as pointed out by Artistic Director Eugenio Caballero in the film’s DVD making-of featurette. This classic American status symbol, and its noticeable contrast to the color scheme, serves to emphasize the excitement and modernity of the foreign. His many women, on the other hand, point to a fast-and-loose foreigner who lacks stability and takes advantage of the land in which he inserts himself.

At their first encounter, the blue-eyed Argentine – smiling enthusiastically and donning an aloha shirt and a straw fedora – asks the brothers for help, using decidedly Argentine vocabulary to explain that he has a flat tire. He uses the word goma for “tire” – which Mexicans use for “chewing gum” – so when Batuta asks if there is a gomería (“tire shop”) where he can get the tire repaired, Rudo asks if he is planning to fix it with gum, as a gomería in Mexico would be something akin to “chewing gum store.” He chuckles at the thought as he asks, but it is also clear by his face that he does not understand the stranger’s real meaning. Batuta explains himself and, with ample cash in hand, offers to “pay well” for their help, though unnecessarily. Cursi has welcomed his presence from the beginning.

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3 This phrasing borrows from Cuarón’s comparison of Mexico to an adolescent looking for its identity, as noted in the opening quote of this paper.

4 Throughout this analysis, all of the English quotes from dialogue and narration in the films come directly from the films’ subtitles on their respective DVDs.
Batuta’s appearance alone draws an obvious contrast between the well-to-do foreigner and the homely Mexican rancieros. The difference suggests a poorer, less-educated Mexico in comparison with a tantalizing, worldly foreigner. The mere foreignness of Batuta, underscored by the verbal exchange between the characters, also speaks to the difference between the protagonists and their new acquaintance. Batuta’s noticeable Argentine accent and use of colloquialisms – and the brothers’ failure to understand them – serve to emphasize Batuta’s otherness and the cultural distance between Mexico and the foreign.

In the cases of both Luisa and Batuta – white outsiders⁵ – the foreign characters lead the characters down a path of self destruction. In both films, a desire to experience their respective journeys already exists in the protagonists, but it is the foreign characters that help make these journeys possible and act as enablers for their behaviors. In Y tu mamá también, Luisa encourages the boys to experience their fantasies of having sexual relations with her while in Rudo y Cursi, Batuta opens the door to professional soccer for both men. In both cases, however, things turn out badly for the protagonists as well as for the foreigners. Julio and Tenoch are so embarrassed over their experience that they never speak again, and Rudo and Cursi end up back on the banana plantation, minus half a leg in Rudo’s case. Luisa dies of cancer and Batuta loses everything, including the red Corvette – suggesting long-term negative consequences of foreign influence on Mexico. But in contrast with Luisa in Y tu mamá también, the Rudo y Cursi character of Batuta will repeat his actions, perhaps several times.

Luisa, like Mother Spain and the Conquest, will continue to have a psychological impact on those whose lives she affected, but her death precludes the possibility of her repeating her actions, making her future direct influence limited in comparison with that of Batuta, who is alive and well. Luisa’s influence – not unlike Spain’s – remains strong, but at least she cannot not build upon it or continue with her actions in an active capacity. In Luisa’s case, Mexico can begin to heal and move on while living with her memory. Batuta’s influence, however, may continue actively and repeatedly for years to come, leaving Mexico to struggle with his continued presence. The last couple of scenes of Rudo y Cursi provide a final comment on this future.

While Rudo and Cursi stand peacefully on a beach singing Cursi’s ranchera cover of “Quiero que me quieras” (“I Want You to Want Me”), Batuta is shown driving the countryside in a red Volkswagen Beetle that looks to be a 1980s model or older – still red, but definitely not the status symbol of the Corvette. The age of the car and its ubiquity in Mexico could be interpreted as a humbling of the foreign character, but its color and the events to come render it more a statement about the persistence of the foreign. Here Batuta-as-narrator explains that though he lost everything, he is still “gallivanting around” looking for “diamonds in the rough.” The last scene shows him looking on with interest at a rural soccer field, not unlike the one where he found Rudo and Cursi, asking another onlooker who two of the players are. Upon being informed that those are the Morales twins, the best players in the state, Batuta looks directly into the camera with a mischievous

⁵ Though Luisa and Batuta are part of the Hispanophone world, it is worth noting that Luisa is wholly European and Batuta, while South American, is European descended, as indicated by his physical appearance and Italian last name. While both characters speak the same language as the Mexican protagonists, the two foreigners are part of what the Vasconcelos-Paz model of mexicanidad would call “white” or “European-descended” cultures.
smirk and raised brow, shrugging his shoulders as if to say, “Hey, what can I say?”

From this action, we instantly infer that Batuta will repeat his actions at least once more – and that possibly Rudo and Cursi were not his first exploits – indicating the active influence the foreign will continue to have on Mexico and the disruption it will cause, perhaps mirroring the inescapable post-NAFTA influence of the United States and suggesting negative future consequences. By contrast, the peace the brothers find together on the beach connotes a happier Mexico without the foreign, despite being unable to ascend economically, and gives an optimistic view of Mexicans’ ability to overcome the devastation the foreign can bring if they can ever rid themselves of it.

Both films present other post-NAFTA aspects to Mexican culture, sometimes suggesting commentary and sometimes simply presenting it as a reality of Mexican life. One obvious commentary on this influence is found in the character of Chuy in Y tu mamá también. During a boat ride toward the protagonists’ camp, the narrator explains:

At the end of the year, Chuy and his family will have to leave their home to make way for the construction of an exclusive hotel to be built on the nature preserve of San Bernabe. They will relocate to the outskirts of Santa Maria Colotepec. Chuy will attempt to give boat tours, but a collective of Acapulco boatmen, supported by the local tourism board, will block him. Two years later, he will end up as a janitor at the hotel. He will never fish again. The boat then pulls up to shore where we see that the camp has been overrun by pigs, which the narrator explains had recently escaped from a nearby ranch. He tells us that fourteen of them will be slaughtered over the next two months and that three will cause an outbreak of trichinosis in attendees at a local festival. That Chuy and his family will meet such a life-altering fate at the hands of developers speaks to the negative influence of foreign investors on local populations. Though the film does not specifically recognize the developers as foreign, it is reasonable to surmise that most of the money for the project will be, an intended result of the 1994 changes in the Mexican Constitution aimed at boosting foreign investment in the Mexican tourism industry and economy at large. It is also likely that a great many of the tourists visiting the hotel will be foreign as well, given Mexico’s widely recognized status as an international tourist destination known for its beaches. In this scene, the developers – as well as perhaps the future tourists – are embodied in the pigs that take over the protagonists’ humble camp and leave it an uninhabitable mess (Acevedo-Muñoz).

The detail that the hotel will be built on a nature preserve is notable as well, as here a parallel to Mexico at the time of the Conquest is apparent. Given that a nature preserve is generally an undeveloped swath of land set aside to preserve the indigenous flora and fauna of the area, this land parallels the ostensibly pristine Mexico of the Aztecs. That investors would be willing to destroy a nature preserve in the interest of economic gain suggests a foreigner who takes without considering the lasting local impact, further emphasized by the fact that Chuy will never fish again. Not only will he be forced to succumb to the foreigners on an economic level, becoming a janitor at the hotel, but he will also be so affected by it that he will never fish again. This emotional and economic toll reflects the burden that such foreign investment has on Mexico’s poorer populations, again suggesting an emotionally healthier Mexico when left on its own.

Further commentary is made in Y tu mamá también as well on the negative impact of post-NAFTA foreign influence as the narrator reveals the fates of the bricklayer.
from Michoacán and Luisita, the girl represented by a stuffed mouse, both of whom are suggested to have died indirectly due to the impact of Mexico’s post-NAFTA economy. As Saldaña-Portillo notes, several hundred thousand jobs were lost in Mexico, mostly in the agricultural sector, as a result of NAFTA, forcing an in-country migration of many rural workers into the cities as well as an influx of workers headed north to the United States and Canada looking for work (756). The bricklayer, a “migrant worker from Michoacán” whose body is not identified for four days, and Luisita, who “had died of a heat stroke… crossing the Arizona border with her parents, seeking a better life,” represent both sides of this post-NAFTA migration, while their tragic deaths suggest the devastating impact such influence has on Mexico’s working poor.

Rudo y Cursi, while less editorial in its post-NAFTA commentary, makes use of story line to suggest a certain inevitability of foreign influence in Mexico. The opening scene depicts a dirty, sweaty Cursi in soccer gear running through a banana plantation with a large, heavy bunch of bananas toward a truck. As he gets there, Rudo tells him not to run because he will bruise the bananas. “These are for export,” he says. Here we are presented with a look into the reality of many Mexican lives. The filmmakers remove any doubt that this produce is for export, indicating the economy of the Mexican countryside. Later in the film, the protagonists both fail to make a lasting career in Mexican soccer and they return to the banana plantation, destined to live out their lives there, suggesting a stronghold of foreign interests that is unavoidable in the lives of many rural Mexicans.

Other indicators of the prevalence of foreign influence come in the many allusions in both films about the reality of the foreign in the daily lives of Mexicans. And while Y tu mamá también places most of this influence among the urban in 2001, Rudo y Cursi offers a more widespread view seven years later. Examining the soundtrack of Y tu mamá también, partly reveals its urban-only foreign influence, as nearly half of the songs featured in the film are from English-speaking artists, but in the film it is the urban teenagers who listen to this music. Once out of the city and in rural settings, all music becomes Mexican.

Several details about Tenoch and his family also suggest an elite Mexican class significantly impacted by foreign influence: Tenoch’s choice of music, his intermittent use of English words where Spanish ones would be equally appropriate, his family’s vacation to Tahoe, their stint in Vancouver when his father — the Harvard-educated Undersecretary of State — was forced into exile. These examples, especially in light of Tenoch’s professed support of the Zapatista movement, suggest the extent to which Mexico’s elite are still influenced by the foreign and recalls the post-Revolutionary leaders’ similar ties to the foreign and thus hypocritical actions. Other details showing the prevalence of foreign influence include minor ones such as the teenagers eating Ruffles potato chips in the car, rather than a Mexican brand, and the boys’ nicknames of Charolastra, which comes from their friend’s misunderstanding the lyrics of an English-language song.

These details combine to lend weight to the idea of an increasingly hybrid Mexican culture. Taking a Bartra-Monsiváis view, it is the small details in particular, such as the potato chips, clothing and music, which reveal this hybridity. The foreign is so ingrained in the minutiae daily life that it is almost unnoticeable and therefore a true part of everyday culture. Where eating Ruffles potato chips might have been rare in 1960s Mexico, now it is just one of several brands available that no one thinks twice about.

Rudo y Cursi also provides several
examples of the prevalence of foreign influence, though such influence extends into the rural as well as the urban. The theme song to the film is Rudo’s Spanish-language ranchera-style cover of “I Want You to Want Me” by American band Cheap Trick. Early in the film, before moving to the city, Rudo asks his friends if they would rather him play “Tea for Two” or “Goodbye Girl” on the accordion, rather an a Mexican tune, of which there are many written for the accordion. Later, Cursi buys his girlfriend Maya a Hummer, Rudo’s wife, Toña, sells WonderLife products back in their rural town, and nearly all of Rudo’s gambling takes place at the club of a Mexican bookie-entrepreneur who provides what he calls “entretenimiento tipo Vegas” (“Vegas-style entertainment”).

Several characters, such as the Rudo’s bookie and Cursi’s girlfriend, also use English words where Spanish ones would suffice, and Rudo goes to the store with his bookie looking specifically for Pampers, an American diaper brand. The bookie is under instruction from his wife not to get any other brand and ends up having to look at another store because the one he goes to first is out. Again these details are presented in passing, as part of everyday life, and serve as indicators of how pervasive this influence has become throughout Mexico since just eight years prior, when such examples were revealed only in the urban settings of Y tu mamá también.

In the end, a study of both films in view of Mexico’s post-Revolutionary identity building suggests that overall, the filmmakers portray foreign influence in a negative light and thus, cling to a traditionalist attitude about this aspect of mexicanidad. While some representations of foreign influence in Y tu mamá también and Rudo y Cursi are presented in a neutral fashion, seeming to acknowledge a reality rather than commenting on it, there is still an overall sense of the negative impact of foreign influence on Mexico. The several tragic deaths, the dismantling of friendships and livelihoods, and the mostly self-serving nature of the foreign characters and entities presented in the films maintain a nationalistic, post-Revolutionary negative outlook regarding the influence of the foreign in Mexico.

While not ignoring a modern, Monsiváis-Bartra style reality of a hybrid identity in the works thanks to unavoidable foreign influence, the Cuaróns ultimately present a dominant traditional Vasconcelos-Pazian attitude regarding the effects of such foreign influence. With this in mind, it is safe to say that at this time, while Mexico’s reality may be changing, its perception of foreign influence has yet to follow suit.
WORKS CITED


The Ghosts of Aktibistas Past: A New Generation of Filipino Women’s Rights Activists Faces a Daunting Legacy of Inspiration, Expectations, Stigmas & Divisions

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ABSTRACT
For young Filipinos activists like Judy, a leftist working for women’s rights, the Filipino activist tradition is a complicated inspiration and a mixed legacy. In the 1980s, now-revered aktibistas successfully overthrew Ferdinand Marcos’ dictatorship. Today, those working towards social change are frequently and negatively compared to the anti-Marcos activists, who had the benefit of a single, easily defined enemy. Young activists have also inherited a division within the left, born after the collapse of the Marcos coalition that stigmatizes all activism as “communist” while creating tensions between individual organizations. Judy’s story shows the impact of these expectations, stigmas and divisions.

In an upscale pastry shop in one of Manila’s many shopping malls, Judy, a 23-year-old women’s rights activist, leans across the table and says that she does not offer clients hope. As a full-time counselor and paralegal assisting victims of rape and assault, what she offers is a choice. “I just tell them that the justice system here sucks and we all know it. Now, what do you want to do? You want to continue fighting for your rights, no matter what the ending? At least you can tell people that you fought for your rights. Or just go back out and continue with your life.” She pauses. “The longest-running case I ever encountered went for twelve years. Incest. It got dismissed.” Bitterness haunts her voice. “That’s reality… The progress we make on women’s rights is like a centimeter a year, just a centimeter.”

Her words seem pessimistic, but Judy’s passion for her work drives her to speak for hours. All I have to do is listen. I’ve been doing a lot of listening; I am in the Philippines conducting interviews with young women’s rights activists and asking them about what brought them to activism. I’ve recorded story after story, and I’m meeting Judy to discover hers.

As a young white woman without the ability to speak a word of Tagalog, I feel conspicuously out of place everywhere I go, but Judy doesn’t bat an eyelash when I reach out to shake her hand. I mention my Filipino grandfather, my feminist mother, my research interests, but she doesn’t seem
to need my justifications. I want to hear about why she's an activist. That's all she needs to know.

Judy gestures to our pastries and informs me that their price could pay a family of four for a day, an example of the economic inequality crippling her nation. Picking at her roll, she castigates colonialism, corruption, inadequate laws, sexist social structures, and complacency. She's full of facts and figures, well-briefed by her organization, GABRIELA – the General Assembly Binding Women for Reform, Integrity, Equality, Leadership and Action, an leftist umbrella organization with operations are almost as expansive as its name.

Judy blends her training, knowledge and experience to explain the forces she is fighting. Her voice is steady, frustrated. She has turned down promising job offers in order to fight for women’s rights, for social and political equality, for the justice she cannot promise the women who come to her. But she is tired.

In my time in the Philippines, I learned that young women’s rights activists across this archipelago feel similarly mixed emotions towards the social justice movement driving their lives. Many of those conflicted feelings are tied to a complex relationship with the Filipino activist tradition. I interviewed 53 self-identified women’s rights activists or advocates under the age of 30, with a variety of socioeconomic backgrounds, educational experience, and family histories, from five different islands and eleven cities. Their organizations ranged politically from communist to moderate, and covered women’s issues from angles including women in politics, working women, reproductive right, religious issues, women’s health, indigenous women’s rights, and antiprostitution work.

In one-on-one and group interviews, I asked these diverse activists and advocates to tell me about their history with activism and what drew them to women’s rights in particular. At first, my goal was to collectively describe what had inspired these young people to pursue women’s rights activism. But as I conducted my interviews, I realized that interviewing the youngest generation of Filipino women’s rights activists had given me a fascinating cross-section of stories about an ongoing activist legacy. Judy’s story was one response to a generation-wide, highly contradictory inheritance.

In the 1980s, after decades of resistance, Filipino activists overthrew the Marcos dictatorship. While today’s young activists cannot remember this seminal event, it profoundly influences their activist work. The impressive achievements of earlier activists both inspire Filipino youth and give them an impossible standard to live up to, now that the struggle against a single, specific opponent has been replaced by attempts to change more subtle societal structures. Meanwhile, the shifting post-Marcos political landscape has linked the word “activist” with Maoist communist doctrine and sharply divided organizations with different political philosophies; both the stigma of activism and the split within it continue to haunt young activists.

The complex inheritance is implicit even in the language of Filipino activism: aktibista and tibak, the two Tagalog words for “activist,” directly invoke the popular social movements of the 60s, 70s, and 80s. Once valued, today the words have negative connotations. The mingled associations of aktibista and tibak, like Judy’s blend of passion and cynicism, reflect the paradox lived by young Filipino activists: their work, following a revered tradition, is often denigrated in the modern world.

Activism as Inspiration, Activist as Insult

Judy’s generation of Filipinos was raised in a world transformed by activism. Dictator Ferdinand Marcos, president
of the country since 1965, had declared martial law in 1972 and maintained an authoritarian and corrupt government for twenty years. During that time, covert opposition groups included armed resistance as well as moderate, non-violent organizations. In 1983, senator and opposition leader Benigno Aquino was assassinated and Marcos accused of masterminding his death. Aquino’s martyrdom fueled a widespread uprising, bringing decades of civil resistance and armed struggle to an astonishing finale. In the People Power Revolution of 1986 massive nonviolent demonstrations on the main highway of Manila resulted in Marcos fleeing the country. Democracy replaced autocratic martial law, Aquino’s widow, Corazon Aquino, became the new president, and the activists who led the revolution were national heroes. This peaceful revolution set a high standard for future activists to meet – in the Filipino memory, successful activism brings democracy back to a long-suffering nation.¹

Today, the public still venerates these martial law activists. Aquino’s face graces reverential t-shirts, and the names of both Benigno and Corazon Aquino are invoked in political conversation on a daily basis. Their son, Noynoy Aquino, won the 2010 presidential elections based primarily on his patriotic pedigree. The most moderate, respectable middle-class Filipinos will wax rhapsodic about the joy they felt marching during the People Power Revolution. But the same people who adore the old aktibistas look with suspicion upon the activists of today.

“If you were an activist in the 1970s and 1980s when there was martial law, you were viewed as being a patriot because your intention was very clean: to uplift the country, to free it,” explains John, 22, an interior design student not associated with any activist organizations. “But now...”

He hesitates. “People doubt your intentions. Nowadays it's not so patriotic to be an activist.”

“There is a connotation that you smell,” says Maria, a 24-year-old researcher who studies gender issues. “That you are always on the streets. That you are very hard-core.” She glances around her quiet office at a collegiate Women and Gender Institute, filled with pamphlets and project reports, and smiles ironically. “I think I don't fit well in that stereotype. But I see myself as an activist.”

The legacy of the martial law heroes both inspires and burdens the new activist generation. Young protestors have a level of respect for the Marcos-era revolutionaries that borders on the worshipful. But the pressure of constant comparisons with the original protestors – and the unquestioned validity of their cause – haunts contemporary activism.

From Overthrowing a Dictator to Changing a Society

Today, many Filipinos think that activism became obsolete after Marcos fell. En route to interviews, taxi drivers inform me that the activists I’m visiting are holding the Philippines back. In the pastry shop, Judy lays out their logic: “During the martial law era, there were a lot of abuses, very blatant human rights violations, and after martial law there was a lot of hope that things would change. I would say people are no longer in favor of activism because they would say Marcos was evil. And now he is gone. It’s okay!”

Anti-Marcos activists fought a dictator with the promise that if they threw him

out of power, the country would change forever. Today's Filipino activists can make no such claims. They fight against colonial influences, political and economic inequality, environmental destruction, corruption, poverty, poor health, sexism, and a host of other issues; women's rights activists, many of whom embrace intersectionality, often protest all at once. But they cannot point to a single issue or individual as the root of the nation's evils.

The efficacy of a common enemy in building a coalition or movement has been well-established since Émile Durkheim first started theorizing about social integration, and continues to be acknowledged contemporary social movement theory. As James M. Jasper writes in The Art of Moral Protest, “it seems easier to forge consensus around an analysis of what is wrong with current policies than around directions for the future.” For Filipino activists, this generalization seems to hold true; activists enjoyed stronger coalitions when they fought against Marcos than when they fought for any cause.

For woman's rights activists, their sense of decreasing popular support post-Marcos is almost completely disconnected from the actual effectiveness of activists. In many ways, after Marcos' fall the women's rights movement leaped forward more dramatically than ever; new organizations arose, and women gained new power within an activist community that had previously emphasized the "national good" over women's interests. But this "rebirth" of the women's rights movement occurred at a time when, according to the activists I interviewed, larger culture viewed activism in general as no longer necessary.

Elisa, a 30-year-old activist and advocate, remembers the aftermath of the fall of Marcos and has seen the role of activism evolve since then. She sighs when she talks about the growing mistrust of activists and their intentions. "The problem is that the issues now are not as manifest as they used to be," she says. "Young people might think that there's nothing wrong, but that's precisely it. When young people stop questioning and stop wondering why certain things are, that's a huge problem."

Even when people are aware of the Philippines' many modern struggles, they may still choose to dismiss modern activists on the basis of the martial-law history. Continued social and political problems lead some citizens to conclude that activism, even activism as successful as the People Power Revolution, simply does not work. After protests overthrew Marcos and later president Joseph Estrada, corruption remained. Poverty remained. Abuses of power, violent conflict, and failures of the justice system remained.

"When you hope so badly for change and you don't get it," Judy tells me, "you learn that if you want to get justice, you have to be rich. You see that there's no alternative to the society that you're living in. You know that, 'oh, well, this is life. People are apathetic, but to be honest, the primary need of the Filipinos is to survive.'" She shrugs. "It's understandable."

The perceived complacency of the general public, the same people who were on the streets during the People Power Revolution, continually frustrates

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2 For instance: “It is only when independent groups have been forced, particularly in order to defend themselves against a common enemy, to draw closer together and keep the peace with one another, that a group was able to repress an assault by one of its members upon another group...” Durkheim, Émile. “Political Obligation, Moral Duty and Punishment.” Durkheim on Politics and the State. Ed. Anthony Giddens. Stanford: Stanford University Press, 1986. 167.


Many activists and organizations work to improve the lives of the nation’s poor and marginalized while denouncing both the politics and the methods of the far left. To complicate matters, however, other activists believe that communist organizing, following Maoist philosophy and upholding the primacy of armed revolution, is the only valid type of activism. These leftist activists embrace the derogatory connotations of aktibista and promote the blanket stereotype that more moderate activists try to resist.

The divide within the activist community goes far deeper than this disagreement over the validity of stereotypes. After the Marcos regime fell, the community of Filipino leftists split between those who reaffirmed the armed struggle and those who chose to work with the new government. “National Democratic” organizations carry the standard for the ‘reaffirmists’ and stick to Maoist communist principles, and an array of more moderately socialist groups stand with the ‘rejectionists’. In the world of women’s rights activism, GABRIELA – Judy’s organization – represents the most powerful NatDem women’s rights group. These inherited, post-Marcos tensions still hamper attempts at cooperation between GABRIELA members and rejectionists, even those who once worked side by side. Activists from both sides of the split told me, plaintively, that the conflict impedes the development of effective coalitions that fight for women’s interests. Others saw the split as simply dividing right from wrong.

Irene, 22, a student activist with GABRIELA, bluntly frames her opinion of the division between moderate activists and the far left: “There are many people who claim to be activists, but they are not National Democratic activists and they can’t define themselves as activists... to be a real activist, I mean the ones who can really stand for the interests of Filipinas, you have to be Nat Dem.” The split between the left and the far left, which had

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present-day Filipino activists. They want to transform their country from the inside out, moving beyond a model in which international NGOs and aid agencies reach out to the Global South. Without the muscle and bank accounts of foreigners, though, they need a broad base of local support. Everyday they fight to overcome what they identify as their twin ailments in the public’s eye: general apathy and activism’s bad reputation.

Activism and the Left

Adding to the stigma of activism, popular opinion indelibly links contemporary activism, including women’s rights activism, with leftism. The anti-Marcos movement was not exclusively leftist: it included a somewhat fractious coalition of the Catholic Church, the military, moderate political organizations, and the intellectual elite, as well as armed communist groups. After Aquino became president, most groups chose to cooperate with the new government; a communist faction, however, was excluded from the new government and continued armed resistance to authority even after the fall of Marcos.

Today, many Filipinos closely associate the word “activism” with the New People’s Army, or NPA – communist guerillas, hiding in the mountains, opposing democratically elected presidents. When I mentioned to one cab driver that I was visiting an activist, he said with concern, “Why would you want to talk to them? Isn’t that dangerous?”

Any type of social justice work can open activists, advocates, and non-profit employees up to accusations of communist leanings. Elisa, 30, has faced this stereotype for solongethersrespondswithamusement. “After college,” she says, “I wanted to get into human rights work. My mother said, ‘Why, do you want to be mistaken for a leftist?’” Elisa shrugs. “That stigma is very limiting to a lot of people. I just tried to change it.”
Camila Domonoske

combined forces during the days of martial law activism, defines the very meaning of aktibistaformanyoftoday’syoungactivists.

The Path to Activism – And The Price

Like Irene, Judy considers all non-Nat-Dem groups “an enemy” to her cause; she, too, does not believe that members of non-communist groups deserve the title of “activist.” But she is more diplomatic than Irene, saying, “We all have different perspectives based on our experiences in life.” Judy herself was born into an upper-middle-class family and supported by her father’s work overseas, a common path to Filipino prosperity. She was as surprised as her family by her journey from a comfortable childhood into the world of activism and its complex divisions and challenges.

Educated at one of the Philippines’ top private colleges, Judy first encountered Marxism in a sociology class. As she learned more about leftist political ideology, and as her psychology practicum led her to work with GABRIELA, she soon turned away from her original goal of being a doctor and became interested in activist causes.

Meeting victims of rape and incest led her to women’s issues in particular. “I realized Sex and the City didn’t do much when it came to women’s liberation,” she says wryly, as the pastry shop starts to close. She describes how devastating poverty, an unresponsive police force, and the lack of reproductive health care services exacerbate many problems facing Filipinas, particularly problems of assault and abuse. Sexist cultural and social institutions also abound. The waitresses in our pastry shop – there are no waiters – wear a uniform featuring short skirts and tall socks. Judy looks pointedly at their clothes and asks, “Do you think they have a choice whether to wear that?” She sighs. “I just want to live in a society where people are not raped and won’t experience sexual harassment.”

When she was 18 years old, Judy became an activist, saying to herself: “I want to do something that’s worthy, that’s important in my life. I want to do something so even if I died right now I would say: I did this thing.” She lied to her parents and told them she had to keep working with GABRIELA to get her degree. Long after she’d finished her practicum, she kept volunteering. In women’s rights advocacy she did rewarding work, used her psychology degree, and found a community that supported her as a woman, as a lesbian, and as an activist.

Her non-activist parents were not pleased. “If your father worked his ass off to give [you] a great education… get you to study in a very expensive school, let you choose whatever courses you want, and then suddenly you work in a non-government organization with no pay, no salary, you go to the streets to protest and rally…” Judy says, “Nobody wants that.”

Life as an activist comes with risks as well as financial costs. Filipino activism has always been dangerous. While many organizers hope for a safer environment under President Aquino, the son of two activists, such improvement is hardly guaranteed. Journalists who uncover injustices routinely disappear, and activists fighting those injustices are equally vulnerable; a U.N. investigation cited a Karapatan report claiming that 885 left-leaning activists and political leaders were killed over six years, including human rights defenders and unionists.

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While I was in the Philippines a prominent party-list leader was assassinated in broad daylight, and many of the activists I spoke to expressed anxiety over his killing.7

Kim, who once served as a spokeswoman for GABRIELA and now holds a more moderate rejectionist stance, describes the daily fears of activists: “Especially under the previous administration—Gloria Arroyo’s—it was very, very tense time for activists. I was coming home, always looking over the shoulder to see if someone was following me. Every week could be three to five people dead,” she says. “There’s a lot of worrying, should I continue or should I just let things mellow for a while? I want to preserve myself...”

“A lot of activists actually went to hiding for a while,” she says, “but I couldn’t go into hiding at the time. I was the only public figure of GABRIELA in my area. Plus, why would I hide? I’m not doing anything wrong!”

“But I was crossing my fingers every time I left to go home.”

Bringing Filipino Activism Into the Future

Today’s young Filipino activists, carrying both the burden and the banner of their martial-law forebears, face big questions. Will the rejectionist/reaffirmist split be bridged by cooperation? Should activists continue street organizing and rallies, or turn to online organizing and social media? Can these two organizing approaches be integrated, or does the Internet only create “armchair activists” who will not appear at rallies? More fundamentally, how can dozens of separate political causes be pulled together into a sustained movement?

And, given the high expectations, harsh stigma, lack of mainstream support, conflicts between activist groups, and physical risks, is life as an activist still worth it?

I interviewed over 50 young women’s rights activists, and almost all answered that question, explicitly or implicitly, with yes. They didn’t deny the challenges they faced, and some had lowered their own personal expectations of success, but all were unambiguously committed to their fight. Except one—Judy.

By the end of our interview, Judy and I sit outside the mall, after the pastry shop waitresses locked the doors and the mall policemen pushed us out. The sun has long since gone down, but Judy isn’t done talking. She jokes lightheartedly that as the youngest woman at her office, the other activists treat her like she’s crazy. “But I have a right to get crazy,” she says, less jokingly, “I get an average of ten calls a day from women talking about their abuses. Who wouldn’t get crazy?”

Entirely serious now, she stutters to a stop. After three hours of talking ceaselessly about why she works with women, day in and day out, listening to their pain and giving them emotional support and legal advice, she now has to pause to choose her words.

“What if I tell you that I want to stop?” I wait. The Manila heat is finally dissipating into the night air, and a cooler breeze hits our faces.

“Sometimes you want to explore other things,” she says as if apologizing. “Of course I’d still be a woman’s rights advocate. Just maybe not an activist.”

Judy told me that anytime spent promoting women’s lives, health and safety doesn’t count as activism unless it is within the framework of a NatDem organization. She is convinced that only a NatDem strategy

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has any hope of creating substantive, positive changes for her country, so any other type of activism – or labor – is futile. If she leaves GABRIELA, by her definition she will no longer be an activist.

As we sit on the steps, I feel the urge to comfort Judy, who looks bereft at the thought of losing that aspect of her identity. I tell her about another woman I recently interviewed, Michelle, a researcher and activist who works with high school girls to promote self-esteem and gender consciousness. Michelle had told me, “Activism is a lifestyle. It’s not just something you do. If you’re an activist, if you are a feminist, then you are an activist for the rest of your life.”

Judy’s face is somewhat doubtful. When she talks about stopping, about moving from the world of activism to the world of paid labor, her voice wavers with the fear of something ending forever. Michelle’s eyes shone when she talked about the frustrating challenges she faces. Judy just looks pensive. But after a long moment, she smiles again.

No activist I spoke to could stand as a representative of “the young Filipino women’s rights activist experience,” and certainly not Judy, the only activist who told me of plans to leave the field. Where she is frustrated by what she sees as an apathetic post-Marcos public, some activists were inspired; where she embraces the post-Marcos link between communism and activism, many others try to erase that association. But every activist I spoke to was, in some way, navigating this relationship with the glorified activist history. In that sense, Judy’s struggle is entirely representative: even the most committed and passionate activists struggle with the standards imposed by the past, and the divisions that have arisen within old alliances.

For Judy, that struggle may end in a change of lifestyle, but as her stubborn glance makes clear, that doesn’t make her any less of an activist now. She won’t be leaving GABRIELA today, or this week. She won’t make this decision overnight.

Tomorrow she’ll go back into work, greeting her patients and clients. She’ll answer calls from new victims, hoping she will not hear more terrible stories than she can bear. Unable to offer those victims a promise of justice, she’ll tell them about their choices. It will be a long day’s work, and to carry her through it, Judy holds on to a humble hope, smaller and yet somehow more profound than the old vision of a toppling dictatorship. Knowing all the limitations on her achievements, on her mission, and on her nation, tomorrow she’ll keep seeking a centimeter’s worth of progress.

Names have been changed to pseudonyms.
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All other quotes and data are from personal interviews conducted in the Philippines in June and July of 2010.
Discoveries in Encaustic: A Look through History

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ABSTRACT
Discoveries in Encaustic: A Look through History examines the techniques and history of encaustic art, a painting medium using melted beeswax and mineral pigment. This paper brings attention to encaustic so that it can be understood as an important art historical topic and as a viable medium. Additionally, it sheds light on the encaustic artists who practiced before American artist Jasper Johns popularized the medium. Though critical and historical literature on the subject is slim, encaustic formulas, methods, and subject matter have changed drastically since the medium’s ancient origins. In addition to these historical considerations, this paper examines modern innovations which are fostering a renaissance of encaustic as an important art form. Both historical and contemporary ideas about encaustic through research and experimentation were explored. This project seeks to place a centuries-old technique in a contemporary light, to recognize its changes, and to appreciate its relevance in art today.

Encaustic painting, though not often discussed in art historical literature, has served an important role in the creation of art throughout the past several centuries. Although encaustic as a medium has changed little in its formulation, it has gone through multiple stylistic changes. A closer look through art history will yield a diverse and complex past of the medium – a past not easily plotted or pieced together.

Encaustic uses wax, heat, and usually pigment to create a work of art or to varnish a work of art or sculpture. The term is derived from the Greek enkaustikos, meaning to inust, that is to “burn in”; thus encaustic is marked by the use of heat to melt and fuse layers of beeswax. Burning in is the part of encaustic that literally separates the medium from other painting styles that use wax (such as ganosis and wax emulsion), as heat is included in every stage of encaustic painting. As Danielle Rice speculates in her essay, “Encaustic Painting Revivals,” the “magic” of encaustic has caused much debate, as art historians struggle to categorize this complex medium. Yet, artists have found encaustic as a means to visually express a unique poetic beauty. Plutarch wrote, “A beautiful woman leaves in the heart of an indifferent

man an image as fleeting as a reflection on water, but in a lover’s heart, the image is fixed with fire like an encaustic painting that time will never erase.” This romantic notion pairs well with the medium he chooses as his comparison; the very ingredients of this medium cause encaustic works to have a permanence not present in other works Plutarch may have encountered, such as frescoes that could chip and statues that could crack. Encaustic is based upon the layering and fusing of wax and pigment, and because wax becomes inert when hardened, an image will remain fixed within its wax “shell.”

The origins of encaustic are unknown, though the Greeks may have learned to use wax for utilitarian purposes, such as caulking and painting ships, from the Egyptians, only to pass it down to the Romans. There are no known existing examples of either early Egyptian or ancient Greek or Roman encaustic art; only those works called the Fayum portraits exist, and the earliest of these dates from the first century of the Common Era. However, ancient textual and visual sources, beginning with Homer’s reference in The Iliad to the Greeks’ “vermell-painted ships,” provide some evidence of early encaustic methods and usages. In Pliny the Elder’s Natural History (77-79 CE), the author devotes Book 35 to art, and specifically focuses on encaustic: “We do not know who first invented the art of painting with wax colors and burning in the painting.” Pliny’s writings describe three separate methods of using encaustic: 1) application of wax with a cauteria, 2) engraving on ivory and filling with wax using a cestrum, and a rhabdion, and 3) wax colors dissolved in naphtha and applied warm with a brush. Each of the three methods was suited to one particular outcome: the first was meant to produce murals; the second to produce small, flat, engraved ivory works similar to cameos; and the third to paint and seal ships. Homer wrote that the second method “was invented in Asia Minor and brought to Greece,” while the first and third methods were invented in Greece.

There were apparently four primary uses for encaustic. Probably the most common was ship painting, a practical solution to both decorating as well as waterproofing the wooden sides of the ship. Panel, or mural, painting was another format. A third was ganosis, the use of encaustic to color the white marble of statuary, to polish it and provide a sheen, and to coat it with a chip-resistant sealant. A 4th-century krater, now in the collection of the Metropolitan Museum of Art, illustrates ganosis, or painting wax on sculpture for surface protection. The red-figured krater pictures an artist dipping a brush in a vat that resembles those described by Pliny. Ganosis has been viewed by some as the start of encaustic painting and by others as an offshoot of it. A fourth use for encaustic was decorating fabric. In De Architectura, Vitruvius noted, “Punic wax (is) melted in the fire…let it be smoothed over with waxed cord and clean linen cloths, the same way as naked marble sculptures.”

No works and few references to works or artists have survived; the information we have on a few famous works of the time is solely based on literature. “Waxes,” as the works were called, would have held

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6 The Iliad, book II, verse 79.
up well against normal wear and tear, as beeswax is generally insoluble and quite durable; but unfortunately due to various wars and natural disasters, none are extant today. Despite this, there are several accounts that cite ancient works found recently. The first is of Eugenio Latillo, who, between 1838 and 1840, wrote a treatise which hinted that he owned an encaustic work from Pompeii, and mentions the evidence of the use of a cestrum and impasto effects. The second is of a peasant farmer who unearthed an encaustic painting, now titled “The Muse of Cortona,” in 1732 in Cortona, Italy. The third account relates to a “Death Portrait of Cleopatra of Egypt,” which would have been painted in honor of Augustus Caesar’s defeat of Mark Antony and Cleopatra. This was found near Emperor Hadrian’s villa in 1818. There is supporting evidence that the “Muse” and “Cleopatra” are in fact ancient Roman, as they were both found at Roman sites, and were passed through several hands. It is known that Julius Caesar purchased an encaustic painting from the artist Timomakos for 80 talents and later bought another work, both of which were to adorn temples. A site excavated in St. Medard, France in 1895 revealed a female artist’s tools, several of which were associated with wax painting, such as cauteria, a burner, and containers of wax and resin. These accounts and works provide evidence that Greek traditions of encaustic painting did spread into Rome and Europe.

Pliny’s in-depth description of encaustics suggests that the art form continued to be a vital medium in Rome well into the first century CE. It is from the centuries that followed this that we have our first surviving examples of ancient encaustic, but they come from another region of the Roman Empire: Egypt. While this was geographically a dramatic shift, the styles found in Egypt appear to be continuations of the Greco-Roman tradition of the previous centuries. Prior to the immigration of Hellenistic peoples, the use of wax in Egyptian funerary services does not appear to have been for artistic purposes.

All of the Egyptian encaustic works that survive today and all that are mentioned in ancient writings are funerary art. Generally called Fayum portraits because the first portraits were excavated from this area in the late 1880s, this group of works is unlike typical Egyptian art. Before Greco-Roman occupation, this application of encaustic did not exist in the region. Done primarily between the first and fourth centuries of the Christian era, these portraits were designed to adorn wrapped mummies and convey the likeness of the deceased into the future. Most of the Fayum portraits were done on wood and “show their subjects nearly at bust length.” Although some portraits were created after the death of the subject, others were made before the person died and may have served as a symbol of status in the community while he or she

12 Pratt and Fizel, p. 16
13 Pratt and Fizel, p. 13
14 When Hadrian ruled Rome in 117 B.C.E., he is said to have moved several treasures to his villa. Pratt and Fizel, p. 15
17 However, there is some evidence to suggest that the Greeks learned of the use of beeswax for other applications, such as use as an adhesive and sealer.
18 Images of Fayum portraits, as well as the mummies they graced, can be found in Doxiadis and Rice.
19 Note that not all Fayum portraits are encaustic: some were made on cartonnages (funerary masks) of linen, plaster, and stucco. David L. Thompson and Haskell V. Hart, NCMA Bulletin. XIV.1 (NCMA, 1977) 5 and Euphrosyne Doxiadis, The Mysterious Fayum Portraits: Faces from Ancient Egypt (Great Britain: Thames and Hudson, 1995) 13.
was still living.\textsuperscript{20}

Fayum portraits can all be loosely classified based on the substrate shape: most stepped panels come from Antinoopolis, rounded panels come from the Hawara region, and angled panels originated mostly in Er-Rubayyat.\textsuperscript{21} Doxiadis separates the portraits into four categories outside of their shape. Those of the first category, “the highly sophisticated portraits,” are all based in the Greek naturalistic tradition, handed down in the Alexandrian school. The second group is characterized by a less intricate rendering of the face and expression. The third category shows portraits that are schematic and most likely not painted from life. The final group shows portraits that are dramatically less sophisticated and exhibit little artistic skill.\textsuperscript{22}

The panels range in size from small to medium panels of wood or wood wrapped in linen. The panels were prepared with a thin layer of rabbit skin glue, which functioned as a sealant, and then finally painted with beeswax mixed with ground mineral pigments. After the wax paint was applied, often in an impasto-like manner, gilt garlands were applied over the person’s head, or gilt stucco frames were affixed to the panel. Unlike the Greek encaustic portraits (according to descriptions), gold leaf was added to Fayum portraits to make the mummies fit more in line with their traditional Egyptian funerary mask counterparts.\textsuperscript{23}

Doxiadis contends that Christians who lived in Egypt during times of persecution setup martyriformmummifiedmartyrs. These mummies were housed in shrines, and portraits, very similar to and quite possibly actually some of the Fayum portraits, would have been affixed to them. Escaping from persecution, the faithful would have taken the portraits with them as they fled.\textsuperscript{24} Thus the practice of painting a small, easy-to-transport eikon (Greek for icon) in Egypt mayhavedevelopedintotheByzantineicon tradition.\textsuperscript{25} Prior to Constantine’s decree, Christians might also have used encaustic painting in rituals in the catacombs under Rome.\textsuperscript{26} Pratt and Fizel also suggest a link between funerary portraiture of Egypt and the practice of icon painting: “The practice of painting and hanging the portraits anterior to death seems to have led into the painting of icons, or images, of the saints as objects of veneration.”\textsuperscript{27} Of express concern to early Christians was the representational element of portraiture, as “rationalizing their image veneration.”\textsuperscript{28} The subject matter, medium, and portability of icons transformed these art pieces into personal, symbolic, and powerful objects.

The Byzantine Empire, which flourished between the 4th century CE and the fall of Constantinople in 1453, has come to be intimately associated with icon painting. Though few of the early Byzantine encaustic icons survive today, the Monastery of Saint Catherine at Mt. Sinai houses well-preserved encaustic wall paintings in addition to some encaustic icons.\textsuperscript{29} The monastery and the area around it have provided many encaustic icons and pre-iconographical works. Thomas Mathews notes that the Byzantine icon represents the marriage of the pagan icon genre with “the

\textsuperscript{20} Doxiadis, p. 12 and 83
\textsuperscript{21} Corcoran, p. 44
\textsuperscript{22} Doxiadis, p. 83
\textsuperscript{23} Doxiadis, p. 84
\textsuperscript{24} Doxiadis, p. 90
\textsuperscript{26} Pratt and Fizel, p. 15
\textsuperscript{27} Pratt and Fizel, p. 16
\textsuperscript{28} Mathews, p. 10
\textsuperscript{29} Margaret Perivoliotis, Wax Resist Decoration, An Ancient Mediterranean Art (Artciencia 2.4: Web, 2006) 3.
tradition of ancient Roman painting."\textsuperscript{30} Not all of the icons found in the monastery are Christian, and clear pagan ties provide information about Egyptian influences on early Christian icon painting and style. This fact suggests that icon painters who worked in the monastery of Saint Catherine were familiar with the Fayum portraits, thus supporting the spread of encaustic from the Fayum in Egypt through the Sinai Peninsula into the monastery. A 200 CE pagan work, Suchos and Isis, depicts Egyptian gods seated on a double throne, clutching their attributes (Suchos holds a crocodile, sacred to the Nile, and Isis holds a sheaf of corn, representing her fertility).\textsuperscript{31} A telling element of the work is that the faces are encircled with gilt haloes and the physical form of the icon is very similar to later Christian icons as well as earlier Fayum portraits.\textsuperscript{32} The pose of Isis, the mother goddess of Egypt, predates portraits of the Virgin Mary but seems to define a generalized pose for her, as seen in later icons. These works, though not encaustic or explicitly Byzantine, serve as precursors to the technique and serve as evidence of the spread of Greco-Roman artistic methodology.

Byzantine encaustic icons share four distinct features with portraits from the Fayum district. The first feature is that of the similarity in facial structures, the second the pose of the sitter, the third the color palette, and fourth the use of the Punic wax and salt variant formula. Greek artists imported facial expressions as well as frontal and three-quarter poses to the Fayum district and combined their style with that of their Egyptian hosts.\textsuperscript{33} In addition, the palette with which the Fayum portraits were painted was primarily white, yellow ochre, red, and black. This provides evidence that the two eras shared mineral pigments and color patterns.\textsuperscript{34} One specific encaustic icon of St. Peter from the monastery upholds these ideas: St. Peter is pictured sitting in a frontal position, with his face slightly angled to the left. He is adorned with gilt additions and painted using the traditional palette. It is even described as having an "expressive and spiritual face."\textsuperscript{35} The formula for the paint, essentially the same as Punic wax, differs only in the addition of resinous material.\textsuperscript{36} This variation of Punic wax may have been the preferred formula in the Sinai region, as natron, a salt described by Pliny and vital to wax paint production, was particularly abundant in the Birket Quarun salt lake in the Fayum District and not in the Sinai.\textsuperscript{37} The connection between the wax formulas was most likely to the continued use of formulas already perfected by Fayum artists and brought to the monastery.

While Egyptian encaustic portraits had the greatest impact on the development of Byzantine icons, artists in the Crimea may have begun working in encaustic as early as the 4th century BCE. Paintings on a sarcophagus found at Kertch, now modern-day Ukraine, support this.\textsuperscript{38} The images on the sarcophagus are thought to be in encaustic medium. This early example of encaustic in eastern Europe can be seen as evidence of another influence on Byzantine wax painting, and may also have served as inspiration for some of the famous Russian

\begin{footnotesize}
\textsuperscript{30} See Mathews for images of various Byzantine encaustic icons. Mathews, p. 4.
\textsuperscript{31} Mathews, p. 6
\textsuperscript{32} Though the icon was destroyed in the Second World War, photographs of it remain. Mathews, p. 6
\textsuperscript{33} Doxiadis, p. 91
\textsuperscript{34} Doxiadis, p. 91
\textsuperscript{35} For an image of "Saint Peter" see Jens Fleischer, John Lund, and Majatta Nielsen, Late Antiquity: Art in Context (Copenhagen: Museum Tusculanum Press, 2001) 59.
\textsuperscript{36} Freccero, p. 68
\textsuperscript{37} Freccero, p. 51
\textsuperscript{38} Stephen, p. 14
\end{footnotesize}
icons, some of which were also done in encaustic. Historian A.P. Laurie’s 1935 text, The Painter’s Methods and Materials, notes that “the examination of Russian icons may reveal some other early examples of wax painting in addition to the well known Egyptian ones.”

It appears that encaustic as a mode of painting fell out of fashion at the end of the 7th century. Very few icons were painted in encaustic after the iconoclastic controversy began around 726, though a post-Byzantine icon from the 17th century was reported in 1935 to be owned by a professor at the Royal Academy of Art in London. Interestingly, Pratt and Fizel report that “encaustic is said to have flourished…until sometime between the 14th and 17th centuries,” but give no specific details about artists or works created between the 7th and 14th centuries. However, another source postulates that Lucas Cranach the Elder, Andrea Mantegna, and possibly even Leonardo da Vinci experimented with the medium during the Renaissance.

In the early 18th century, Comte de Caylus, a French antiquarian interested in Pliny’s writings on encaustic, began to experiment with the medium. Caylus hired chemist and artist Joseph-Marie Vien to test several formulations and applications of wax medium. Vien eventually painted and exhibited his own encaustics. Another intellectual of the day, Denis Diderot, “condemned Caylus…and championed instead the experiments (in encaustic) of Jean-Jacques Bachelier.” Both agreed that “the encaustic medium would offer certain advantages” such as strength, durability, and brilliance of color. Rice speculates that for Caylus and Diderot encaustic was a means to return art to the “ancient style.” Several other artists began to try both Caylus’ and Diderot’s methods, and artists such as Alexander Roslin and Louis-Joseph Le Lorrain exhibited encaustics in France during the late 1700s. The idea that French painting — regularly done in oil — had become corrupt pushed these men to champion an art medium that demanded discipline and great attention to detail, and secretly, a demolition of the “painterly style” then popular. In effect, the revitalization of encaustic caused attitude shifts in the European art world that began to favor the antique style, also known as the “goût grec.” Encaustic began to appear in Sweden, England, Germany, and Italy. Jacques-Louis David, the master of the neoclassical style and student of Vien, was no doubt familiar with encaustic. He commissioned the American artist Rembrandt Peale in 1810 to paint his portrait in oil and encaustic. In turn, Peale learned the technique from David’s student, Jacques Nicolas Paillot de Montabert, whom Rice gives the honor of bringing encaustic into the 19th century. In 1829, Paillot published a nine-volume treatise on painting methods, with one devoted only to encaustic. After learning from Paillot in Philadelphia
in 1793 and in Paris in 1809, Peale soon “became an authority on the medium” and painted several portraits, including ones of the Marquis de Lafayette and François Gérard.

In London in 1847, W. B. Sarsfield Taylor published his findings and theories on encaustic methods in A Manual of Fresco and Encaustic Painting. Artist Henry Styleman Le Strange studied the manual, and taught the American artist John La Farge the process of encaustic painting as they traveled in Belgium. La Farge began to work on decorative works in encaustic, and later painted encaustic murals at Trinity Church in Boston, beginning around 1876. In four months, La Farge had completed the murals, several of which were done in “durable, water-resistant encaustic, consisting of wax melted with turpentine, alcohol, and Venice turpentine and applied directly to the walls.”

Encaustic had always been a difficult and cumbersome painting material, and though several artists in its history capitalized on its complex nature, encaustic never became as popular as other painting styles because of this. However, several artists of the 20th century, emboldened by the recent interest in ancient history and in encaustic paintings and aided by new technologies that made the method easier, found working in encaustic to be a unique experience.

In 1934, a German artist named Karl Zerbe came to America, fleeing Nazi persecution. In 1935, the artist went on to become the head of the painting department at the Boston Museum School and began to search for ways to explain “what makes a picture.” His search led him to wax, a medium that allowed him to layer paint without the long drying periods of oils, and he discovered that applying it hot onto canvas or board gave him immense flexibility.

His experimentation eventually led him to “the right mixture: ninety percent beeswax and ten percent of sun-thickened linseed oil, heated to 225 degrees Fahrenheit” which he achieved with an electric palette and fused with blow-torches and hand-lamps. He demonstrated his process in a 1957 film he created and later shared with students.

While Zerbe created his groundbreaking Symbolist encaustics, American modernist Arthur Dove also began to work with encaustic. In the late 1930s and early 1940s, Dove painted several wax emulsion works.

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49 Rice, p. 10-11
50 For images of La Farge’s cathedral paintings, see Henry Adams et al., John La Farge (New York: Abbeville Press, 1987) 165.
51 Rice, p. 12-13
52 Stavitsky, p. 1
53 Amnon Goldman, Karl Zerbe: Biography (Rockport: Mercury Gallery, Web, n.d.)
Working from Max Doerner’s 1921 book, The Materials of the Artist and Their Use in Painting, Dove explored encaustic as a material for expressing his “vision of the underlying material and spiritual essence of nature.” He began to use beeswax in two ways, either dissolved with turpentine or mixed with oil paint, creating wax emulsion; because it can be applied cold this is not considered true encaustic. However, his interest in wax emulsion led him to paint with it as his principal medium during the last eleven years of his career.\textsuperscript{54}

American Abstract Expressionist painter Jackson Pollock began to experiment with wax in the early 1940s. In 1947, he created several works on paper that are known to be wax-resist, again not true encaustic. Pollock may have learned about wax-resist from his former teacher, Thomas Hart Benton, but may have also seen Zerbe’s film. In 1950 Pollock created two works that employed wax as a major element. Just a year before the creation of the two mysterious works, the first comprehensive book on encaustic was published by Frances Pratt and Becca Fizel, Encaustic: Materials and Methods, which documented the history of the medium from Pliny to 1949. Stavitsky notes that the book was extremely well received in the art community, and served to further fan the flames of an encaustic revitalization.\textsuperscript{55}

In 1951 Ralph Mayer published a short article in Art Digest on encaustic. It defined the process, denoted supplies, and gave a brief history of the medium. Mayer noted in his first paragraph that the medium was undergoing a revival among modern painters, mostly “because its effects are so appropriate to the visual and textural aims of many modern tendencies.”\textsuperscript{56} In 1955, four years after Mayer’s article was published, Robert Knipschild showed a group of fourteen encaustic abstractions at the Alan Gallery in New York City. In the same year, Jasper Johns’ first significant encaustic painting Flag propelled him into the limelight.

Easily the most recognizable American encaustic artist, Jasper Johns’ foray into encaustic seems to have begun in the early 1950s. Prior to painting Flag, Johns destroyed many of his works from before the mid 1950s and left only one encaustic untouched.\textsuperscript{57} That work, Star, was painted with wax and house paint in 1954. Johns experimented with different painting methods and tried to combat the slow-drying nature of his oil paints by mixing beeswax with tube paint and melting it on a hot plate. When he found that process ineffective, he secured the hot plate to a stick so that he could easily move the plate around without getting burned. Johns claims his work “had nothing to do with Zerbe,” though publications and other artists of the time (and especially Zerbe) had referenced the media.

Johns’ process combined layer after layer of paint, wax medium, newspaper and collage items to create a sensation evoking a personal history. After making a preliminary charcoal sketch, he would dip strips of newspaper into wax, either pigmented or clean, and adhere them to the canvas with the same medium. He would then apply strokes of wax with brushes and palette knives to create varied surfaces. Adding oil pigment and more newsprint, he could

\textsuperscript{54} Stavitsky, p. 1
\textsuperscript{55} Stavitsky, p. 2
\textsuperscript{57} Johns “methodically destroyed all the work in his possession” in 1954, the year his first encaustics appeared. Johns may have painted more prior to 1954. For an image, see Michael Crichton, Jasper Johns (New York: Harry N. Abrams, 1994) 29.
build up the surface indefinitely, hiding and obscuring certain sections as he went. Through a continual dialogue between the medium, subject, and composition, Johns was able to create a unique “amalgam of image/symbol, concept, and material.”\(^{58}\) In other words, this meant that he could make the wax part of the meaning, not just the vehicle for its creation. By allowing the newsprint to show through the wax veil just enough for the viewer to realize what it is but not enough to read it, Johns called attention to the medium as part of the piece.

Stavitsky notes that encaustic “played a significant role in Johns’ fundamental change of spirit and attitude…” in terms of what he has referred to as ‘a sense of becoming more independent and more focused, recognizing private strengths, doing something which was my own.’”\(^{59}\) Encaustic proved to be an especially important medium for Johns, and several of his most famous works were encaustics, made between 1954 and 1958, though he did use the medium well into the 1980s.\(^{60}\)

Working with encaustic allowed Johns the freedom to create work that hardened rapidly. It also offered him the ability to work in sections without the possibility of ruining other areas of the canvas or substrate. His work makes use of the texture of each brushstroke and the gestural qualities the wax contained. Each stroke became “distinct rather than blurred.”\(^{60}\) In addition to exploiting encaustic for its textural and painterly qualities, Johns used wax as a mask in many of his compositions. The wax’s ability to simultaneously shield and emphasize certain visual elements gave Johns the flexibility to control the amount of information viewable to the audience.

Johns’ prominence may have inspired others, including academics, to begin to seriously consider the topic. Thelma Newman’s 1966 book Wax as Art Form and the 1972 film Painters Painting emphasized encaustic, and Victor Stephen’s masters’ thesis on encaustic was completed in 1963.\(^{61}\) Artist Brice Marden also began working in encaustic in the 1960s after seeing Zerbe’s film. Marden researched the Fayum portraits on his own and sought out Johns’ work as well. In 1966, he created his first encaustic work, a monochromatic painting. Marden noted, “I am never exactly sure of how much wax is added to the oil paint in the final surface, but oil remains the primary binder as opposed to encaustic where the wax is the binder.” As early as 1965, Marden began to vary his formulas by combining graphite and beeswax to create works on paper. These works were divided into two sections, with one half covered in clear wax and the other covered but scraped down and rubbed thoroughly with powdered graphite to create an opaque surface with no visual texture.\(^{62}\)

American artist Lynda Benglis began to experiment with encaustic in the 1960s. Aware of the encaustic works of Johns and Marden, she purchased wax from a lipstick company and mixed it with damar resin crystals and powdered pigments. Benglis appears to be the first artist to use this particular formula. Her work from 1966 to 1975 became a “landmark” group of paintings that “were soon recognized as declaring ‘a very strong female sensibility, image and process… experienced as one.’”\(^{63}\) Her early work in encaustic mainly consisted of wax layered into sculptural forms on masonite. Benglis’ contribution to feminism in the visual arts and her innovation in encaustic make her an undeniably vital part of the American revival of encaustic. Her work would have (and continues to have) a

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58 Stavitsky, p. 2
59 Stavitsky, p. 2
60 Stavitsky, p. 2
61 Stavitsky, p. 3
62 Stavitsky, p. 3
63 Stavitsky, p. 3
profound influence on the work of Martin Kline, an artist who began working in the 1980s.

The 1970s saw a downturn in the interest in encaustic, though the medium did not become obsolete. Artist Nancy Graves created a group of encaustic paintings from 1977 to 1984. These works are little-known and under-researched due to the fact that many of them may no longer exist. She later began to overtly use wax in her sculptures. During the same period but halfway across the country, Noah Jemison also began to work in wax. Familiar with the Fayum portraits, Jemison also looked at the works of Zerbe, Dove, and Johns for inspiration; in 1971, he created his first encaustic painting. Jemison still works in encaustic, drawing upon his African-American heritage and love of jazz to create large-scale works characterized by organic lines and heavy layering of wax. His 1973 move to Brooklyn served to spread the influence of encaustic.

Encaustic supplies became more commercialized and accessible in the 1980s and 1990s, perhaps leading to an interesting debate about the high-art versus low-art nature of the medium today. Interest in the medium grew rapidly as exhibitions included more encaustics and as literature on the technique became more widespread. The 1990s saw an increase in encaustic exhibitions, including shows at New York’s Tibor De Nagy Gallery, the Palo Alto Cultural Center, the Contemporary Arts Center of Cincinnati, and the Montclair Art Museum. When Gail Stavitsky began organizing her exhibition entitled Waxing Poetic: Encaustic Art in America at the Montclair Art Museum, she received over two hundred submissions. Several artists included in the show challenged the still-young norms of encaustic painting, even in the mid to late 20th-century, by working with new substrates, pigments, and techniques.

Twenty years after Benglis began using wax, Martin Kline began working in similar styles. He continues to paint with encaustic medium to create heavily textured, built-up surfaces that can rise several inches off the base, in a style that is strikingly similar to that of Benglis. Artists have also challenged the idea of working small, or large with collage as support: Tony Scherman’s large scale portraits use a painterly style to present a textural, layered approach to figural storytelling. Byron Kim, a Korean-American artist, notes that encaustic is “long-lasting yet so fragile... like the human body in some ways.” Kim’s work pushes the boundary between painting and sculpture, as his process of pouring wax medium into a rubber “sheath” allows the medium to pucker in “a rotund, belly-like manner.” Many have now branched out into three-dimensional work. Of note are Sylvia Netzer’s wax-on-ceramic works, which possess an organic, sculptural quality that allows even heavy materials to seem almost weightless.

In addition to newer encaustic artists, others discussed earlier, such as Johns and Jemison, still work in encaustic but have adapted their styles as current issues change and impact their lives. Topics such as sexuality, AIDS, sexism, the human body, and social injustice provide rich material for encaustic painters already familiar with the layering effects of the medium. As alluded to earlier, there exists a sort of break between high art encaustic artists and “hobbyist” encaustic artists. The cyclical motion that has occurred throughout the history of encaustic is present yet again in the cycle of learning, understanding, and producing encaustic art. While many opportunities have been created so that current encaustic

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64 Stavitsky, p. 3
65 For images of the work of Byron Kim and Sylvia Netzer, see Stavitsky, p. 4.
66 Stavitsky, p. 5-6
artists can support and learn from one another, some other artists whose work has already been well received in galleries tend to distance themselves from what many consider “hobbyist” artists. These hobbyist artists learn from the multitude of videos online, basic wax art books on the shelf, and the classes offered by community centers in response to the explosion in popularity. This “easy access” may cause resentment in the art community, as some artists, whose artistic caliber may not be as high as that of others, attempt to join ranks with accomplished encaustic artists.

The study of encaustic art itself has evolved over the years, as formal research has been published since Pliny’s time all the way up to the present year. However, the decided lack of scholarly research on the subject published in the last decade calls for a well-researched, stringent article. It is the goal of the author to increase the understanding and knowledge of the subject, as well as to encourage further investigation of encaustic art across the globe.


Was Heidegger a Mystic?

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ABSTRACT
The goal of Martin Heidegger’s philosophy is to lead his readers to an experience of Being. Because Being is not conceived of as a thing, but as that which ‘transcends’ things, thinking and talking about it in traditional terms becomes impossible. Such a goal is strikingly similar to the goals of many of the world’s most prominent mystical traditions, and prompts the question, was Heidegger a mystic? In this paper I seek to answer this question by comparing the ways in which Heidegger believes that an experience of Being may be attained to the ways that mystics from many cultures have gone about bringing themselves to an experience of the transcendent. After demonstrating the strong analogies between the methods of Heidegger and of the mystics, I conclude that Heidegger is indeed a mystic and that the experience that he hopes to help people attain is probably the same experience toward which the mystics have traditionally striven.

“There is a thinking more rigorous than the conceptual” ~Martin Heidegger

“The Tao is beyond is and is not. How do I know this? I look inside myself and see.” ~Lao Tzu

Admittedly, grasping the objective of Heidegger’s philosophical inquiries is not easy. When we are first approached by his question, “What is the meaning of Being,” many of us smile at such a seemingly naive question. “Being is obvious”, we laugh, perhaps pointing to a rock in order to prove our point. But according to Heidegger that rock, and indeed anything, is not Being, but a being (note the capitalization). Being is not a thing, but that which ‘transcends’ things, “the transcendent pure and simple” (Letter on Humanism, 251). Without Being, nothing could be. But in the very fact that being is not a thing, not an object, it becomes difficult to talk about, for the structure of language forces whatever we speak about into a state of objectivity. In the statement, the ‘house is not red,’ the house is presented as an object that lacks the property of redness. Similarly, in the statement, ‘Being is not a thing,’ Being is presented as an object that lacks the property of thing-ness. But this is a misunderstanding, and we must learn to think differently if we want to understand and experience Being. In short, this is the primary goal of all of Heidegger’s philosophizing: He hopes to lead those who will listen to him into a new mode of thinking and speaking in which Being can be fully thought and clearly spoken, and thus truly experienced. Essential to this goal is his critique of metaphysics, which he claims has been mistaken in the West for thought itself ever since the time of Plato, and which he claims can deal only with beings and never with Being. In place of metaphysical thought he proposes a different way to approach Being. But Heidegger is not the first to abandon the metaphysical project and to pursue an underlying reality through alternative means. In fact such pursuit has existed for at least as long as metaphysics itself, and has been given the name of mysticism.
Like Heidegger, mystics reject metaphysical thought as an inadequate means by which the Absolute may be pursued, and seek different routes by which this pursuit may be carried out.

In this paper I will demonstrate that the affinity between Heidegger's philosophy and mystical thought is so deep and thoroughgoing that one may accurately label Heidegger's philosophy as mystical. At their hearts, both mysticism and Heidegger's philosophy have direct knowledge of an ultimate reality as their final goal, but since both Heidegger's Being and the mystic's Absolute are held to be ineffable and transcendent, and thus impossible to express in ordinary language, a direct comparison of these goals cannot be performed. Instead I will compare the ways in which Heidegger and the mystics claim that the Ultimate may be recognized and approached. Because there are so many striking analogies between the methods of Heidegger and those of the mystics, I will conclude that Heidegger's philosophy is in fact mystical, and that it is reasonable to think that the experience of Being to which Heidegger seeks to lead us is essentially the same as the experience of the Absolute toward which the mystics of all cultures have persistently striven.

Before initiating this comparison though, we must take a moment to clarify what is meant by the word mysticism. Often in philosophical circles the word is used as an insult for a system that is deemed vague or overly sentimental. In this paper, however, such derogatory connotations are not intended, and indeed, for a system to garner the label of mystical is, if anything, to be considered an honor, for such a label would signify that system's participation in one of the oldest and most venerable of humanity's intellectual and spiritual traditions. Perhaps Heidegger himself might have objected to being labeled a mystic, but he certainly would not have taken offense at the appellation, for he himself once said that "the most extreme sharpness and depth of thought belongstogenuineandgreatmysticism" (Caputo, 6).

Still the question remains, what exactly is mysticism? Doubtlessly, giving a concise definition of this rich and multi-cultural phenomenon will result in a generalization, but unfortunately the boundaries of this paper demand that we treat the subject briefly, and, therefore, I offer the definition that was put forth by a prominent expert on the subject, Evelyn Underhill, who says that "what the world calls 'mysticism' is the science of ultimates... The science of self-evident Reality, which cannot be 'reasoned about'..." (25). A mystic is one who yearns for firsthand knowledge of that which is Ultimate, but one who recognizes that this Ultimate may not come to be known through the use of the intellect alone. Rational thought is, as a general rule, seen by the mystics as an inadequate guide to the spirit, and so they employ other types of mental activity in order to approach the elusive Absolute. Every culture has its share of mystics, and though the names given to the Ultimate and the means by which it is sought vary, the core of each tradition remains true to Underhill's definition. Vedanta Yogis seek Moksha (the realization of the soul's oneness with Brahman) through ascetic and meditative practices; Zen Buddhists seek to attain Satori (cosmic consciousness) through strict meditation in which dualistic thought is willfully eliminated from the practitioner's mind; Sufis seek to experience the "transport of the soul" (direct experience of the divine) through lives of solitude, poverty and piety, which are intended to "[detach] the heart from all that is not God" (James, 455); and Catholic saints, seek the Unio Mystico (unification of the soul with God) through prayer, contemplation, and fasting. These are only a few of the most well-known branches of mysticism, but the list could be
extended indefinitely. The question now is whether Hedeggerians, who seek to experience the Truth of Being through “meditative thought,” disentanglement from the world of things, and distinction from das man, also participate in the mystical tradition (Discourse on Thinking, 46). A more detailed comparison of Heideggerian and mystical thought should yield our answer.

The first strong analogy that exists between the mystical quest for the Ultimate and the Heideggerian quest for Being is that even before a true understanding and experience of the Transcendent is attained, it may be sensed in a preliminary, partial way. It is this initial “taste” of the Transcendent that motivates the subsequent, ardent, often life changing search for total attainment of it. In the mystical tradition and in Heidegger’s thought there are two ranks of these preliminary experiences of the Ultimate, a lesser one, which is mild but commonly experienced, and a greater one, through which the person’s entire perception of the world is transformed and a strong desire for an even more complete experience is kindled.

In her general study of mysticism, Evelyn Underhill calls “the power to perceive the transcendent Reality” “a power latent within the whole [human] race,” and says that “few people pass through life without knowing what it is to be touched by the mystical feeling” (Underhill, 73). Be it triggered by the sight of the sun on distant mountain peaks, the sound of a symphony, the embrace of a long missed loved one, or the sight of a suffering beggar, this “transcendental feeling wells up from another part of the soul and whispers to Understanding and Sense that they are leaving something out” (74). But though this feeling is familiar to many, the mystics are distinguished from the common folk by their exceptional attunement to it. While for the common person this feeling may be momentarily edifying, it remains at most a supplement to a life otherwise centered in the natural world. For the mystic, on the other hand, the experience of this feeling is so intense that when it occurs it initiates a total reorganization of her world view and a reorientation of her priorities around the transcendent Reality that the experience reveals to her. Underhill calls this acute experience awakening, and says that this is almost always the catalyst of the mystic’s journey from “things of the flesh … to things of the spirit.” She describes it in the following way:

The awakening usually involves a sudden and acute realization of the splendor and adorable Reality of the world—sometimes of its obverse, the Divinesorrow, the heart of things—never before perceived. Insofar as a person is acquainted with the resources of language, there are no words in which this realization can be described. It is of so actual a nature that the normal world of past perception seems but twilit at best. Consciousness has suddenly changed its rhythm and aspect of consciousness is revealed. The teasing mists are swept away and the sharp outline of the Everlasting Hills (178).

This quote highlights three essential aspects of the awakening experience: it is sudden and powerful; it leads to a detachment from worldly concerns; and motivates an intense drive toward further knowledge of that which has been revealed in the experience. It is important to remember that while the awakening experience is often described as joyous and liberating, it can also be a fearful and sorrowful realization. Two examples, one joyous, one anguished, will serve to illustrate this phenomenon. The first is that of a little known monk named Brother Lawrence, who reported that in his youth, as he was seeing a tree stripped

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1 Heidegger’s anxiety also is a phenomenon that occurs beyond the realm of language. He says that “Anxiety robs us of speech. Because beings as a whole slip away, so that just the nothing crowds around, in the face of anxiety all utterance of the ‘is’ falls silent” (What is Metaphysics? 103).
of its leaves and considering that within a little time the leaves would be renewed … he received a view of that Providence and Power of God, which [had] never since been effaced from his soul” and that “this view had set him perfectly loose from the world…” (190-191). The second is that of St. Catherine of Genoa, whose “inward revelation” was characterized by … “its anguish and abruptness, its rending apart of the hard tissues of I-hood and the vivid disclosures of the poverty of the finite self.” Catherine herself describes this experience as the “wound of Unmeasured Love” (196). An additional example of an awakening experience from a nonwestern source is that of The Buddha, who after seeing earthly manifestations of age, sickness and death, realized the ephemeral nature of worldly pleasures and gave up his luxurious life as a prince to practice asceticism in the forests of India. These three examples show that the awakening experience is triggered suddenly, can be either rapturous or unpleasant, and leads one away from material, worldly pursuits, toward spiritual work.

Heidegger also describes two levels of experience in which Being itself may be revealed, which can be seen to be highly analogous to the awakening experiences described by Underhill. Of the lesser, more common experience he says that an “average and vague understanding of Being is a fact” and defines Da-sein as the being that has “a relation to the question of Being itself” (Being & Time, 5). Elsewhere he says that care, which is an essential characteristic of Da-sein, tends nowhere else but “in the direction of bringing man back to his essence” and this essence is called “the ecstatic inherence of the Truth of Being” (Letter on Humanism, 245) So, for Heidegger, every human being has an instinctual notion of Being and a drive to experience the Truth of Being, i.e., to grasp “the transcendens pure and simple” (Letter on Humanism, 251). This is strongly analogous to Underhill’s observation that humanity has an instinctual attraction toward the Ultimate.

Heidegger also speaks of a greater type of preliminary transcendental experience, calling it “original anxiety” which “reveals the nothing” lying ‘within’ all inner-worldly beings (What is Metaphysics, 103). This type of experience can be seen to be strongly analogous to the experience of awakening as described by Underhill, and could be considered an example of it. Like awakenings, original anxiety is a sudden, often unexpected occurrence, which causes a withdrawal from worldly things and often results in the long term rearrangement of a person’s activity toward transcendental goals. Original anxiety, he says, “Can awaken in existence at any moment [and] needs no unusual event to arouse it” (108). During this experience beings “become wholly superfluous”, “slip away” and “pure Da-sein is all that is there” (103). During such an experience there is only there-being. It is precisely during this sudden and unsettling occurrence, when beings slip away, that Da-sein awakens to a new understanding of reality and of its potentialities within it. “In the Clear night of the nothing of anxiety”, for the first time, Da-sein

2 Da-sein is an important, but confusing term in Heidegger’s philosophy. It literally translates to here-being or there-being, and he believes that Da-sein is the essence of a human being. What is special about humans is that they are capable of being here, in a situation, in relation to other things. He also believes that Da-sein stands in relation to Being itself, but that this relation is usually veiled by our everyday mode of relating to things in the world.

3 Similarly to St. Catherine’s experience, the experience of pure anxiety undoes “I-hood;” for as Heidegger says, “we ourselves … slip away from ourselves. At bottom therefore it is not as though ‘You’ or ‘I’ feel ill at ease; rather it is this way for some ‘one’” (What is Metaphysics? 103).
experiences beings as they really are, as things that are distinct from the nothingness that it has just witnessed. Additionally it reveals to Da-sein that it itself is not a mere being, but is instead a transcendence of beings in that it is a “being held out into nothingness,” or, as Heidegger puts it in a later work, “a standing out in the clearing of Being” (What is Metaphysics, 105; Letter on Humanism, 248). Thus it is only through original anxiety that man can realize Being for the first time, realize his “en snarement” among beings and his “forgetfulness of Being”, and then to begin to take up an “authentic” relation to Being itself. From all this, it should be clear that what Heidegger calls original anxiety can accurately be labeled as an awakening experience as described by Underhill: it is a sudden acute experience; it reveals the relative unreality of worldly beings; and opens one to a transcendent reality, often motivating one to attempt to relate oneself to this reality more fully.

This leads us to our next point of analogy between Heideggerian and mystical thought. In both types of thinking the transcendent reality that the awakening reveals is understood as being unattainable by means of traditional rational or metaphysical thought, because it is beyond any relational concept which such thought may seek to enclose it within. Underhill says that:

The mystic finds the basis of his method not in logic but in life: in the existence of a discoverable ‘real’ as a spark of true being with which the seeker is subject, which can neither be fathomed nor experience which they call the ‘act of union’ fuse itself with, and thus apprehend, the reality of the sought object… In mysticism that love of truth which wesawasthe beginning of all philosophy is left behind; in that merely intellectual sphere and taken on the measured aspect of a personal passion, where the philosopher guesses and argues, the mystic looks and lives… Hence, whilst the Absolute of the metaphysician remains a diagram—impersonal and unattainable—the Absolute of the mystic is lovable, attainable and real (Mysticism, 24).

In a similar tone, appealing to philosophers on behalf of all mystics, Coventry Patmore says:

Leave your deep and absurd trust in the senses, with their language of dot and dash, which may possibly report fact but can never communicate personality; if philosophy has taught you anything it has taught you the length of the stir of the tetter, and the impossibility of attaining to the doubletless admirable grazing land which lies beyond it. One after another, idealists have arisen who, straining frantically at the rope, have announced to the world their approach to liberty, only to be flung back at last into the world of sensation. Philosophy tells you that it is founded on nothing better than sensation and the traditional concept of the race. Certainly it is imperfect, probably an illusion; in any event, it never touches the foundation of things (Mysticism, 24–25).

Mystics from every tradition can be seen to be in agreement with the two above quotes, and acknowledge the impotence of conceptual thought in bringing the individual into contact with the Ultimate. The Sufi writer Al-Ghazali says:

I recognized that what pertained most exclusively to the Sufi’s method is just what study cannot grasp, but only transport, ecstasy and the transformation of the soul… Just as the understanding is a stage in human life in which the eye opens to discern various intellectual objects comprehended by sensation, just so in the prophet the truth is illuminated by a light which uncovers hidden things and objects which the intellect fails to reach (The Variety of Religious Experiences, 439–441).

The Neoplatonic philosopher Plotinus agrees, saying: “In seeing God, what sees is not our reason, but something prior to and superior to our reason” (458). St. John of the Cross does also: “We receive the mystical knowledge of God clothed in none of the kinds of images, in none of the sensible representations, of which our mind makes use in other circumstances” (444). As does Lao Tzu: “The Tao is ungraspable/ How
can [the master] be at one with it? Because she does not cling to ideas," and "My teachings are easy to understand ... yet your intellect will never grasp them" (Tao Te Ching, 21, 70). This list could be extended indefinitely, for the Mystics are nearly unanimous in their decision against the path of reason as one that can possibly lead to the summit of the Holy Mountain.

In a similar manner, Heidegger comes to denounce representational and metaphysical thought as wholly incapable of leading man to an experience of Being. This attitude is perhaps most clearly seen in Heidegger's condemnation in his later works of his early work Being and Time, in which he sought to lead readers into an understanding of Being. In this work, Heidegger sought to remain within the "language of metaphysics," in order to "make the attempt at thinking recognizable and at the same time understandable for existing philosophy..." (Letter on Humanism, 246, 263). But he later acknowledges that such language "falsifies itself" and fails because it "does not think the truth of Being and so fails to recognize that there is a thinking more rigorous than the conceptual (263)." In his later works he recognizes the inadequacies of traditional philosophical thought which leads to his saying: "philosophy ... always follows the course of metaphysical representation; it thinks from beings back toward Being," which "means that the truth of Being ... remains concealed from metaphysics" (248). This realization in turn leads him to conclude that "in order to learn how to experience the ... essence of thinking purely ... we must free ourselves from the technical interpretation of thinking" (238). What new type of thinking must replace the technical in order that the truth of Being may be thought? Will Heidegger discuss in the subsequent paragraphs, but what should be noted now is that the transcendental experience that Heidegger seeks to lead us toward is ungraspable by conceptual thought, just as the mystic's Absolute is ungraspable.

Now the question arises, how should one go about seeking and attaining the Transcendent if not by means of traditional philosophical inquiry? Both Heidegger and the mystics propose similar answers to this question: entering into a meditative mental state in which the dualistic judgments of reason are muted and openness to the Transcendent is cultivated. Underhill calls this state "contemplation," and labels it "the education which tradition has ever prescribed for the mystic..." (Mysticism, 302). She describes this as a "humble receptiveness, [a] still and steady gazing, in which emotion, thought and will are lost and fused ... [in which occurs] a breaking down of the surface-self and those deeper levels of personality where God is met and known 'in our nothingness'..." (304). The revelation of the Ultimate through this state of receptiveness is central to all mystical traditions. St. Theresa reports such a revelation saying "One day, being in orison, it was granted to me to perceive in one instant how all things are contained in God..." (Varieties of

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4 Another relevant passage: "Above it isn't bright/ Below it is not dark/ Seamless, unnamable/ It returns to the realm of nothing/ Form that includes all form/ image without an image/ subtle beyond all conception/ Approach it and there is no beginning/ follow it and there is no end/ You can't know it, but you can be it/ at ease in your own life/ just realize where you come from/ This is the essence of wisdom" (Tao Te Ching, 14). It should be known that Heidegger was extremely interested in Taoist thought and at one point even attempted to translate the work into German, but abandoned the project having only completed the first 8 chapters. This fact helps to explain the striking affinities that exist between Heidegger's later thought and Taoism.

5 An additional aspect of contemplation that Underhill notes is that it requires practice. "In its early stages," she says, "contemplation is voluntary, deliberate and difficult" (Mysticism, 302). Similarly Heidegger says that meditative thought, "does not just happen by itself any more than does calculative thought. At times it requires a greater effort. It demands more practice" (Discourse on Thought, 47).
Religious Experience, (448), and St. John of the Cross confesses similarly “that a single hour of meditation had taught him more about heavenly things than all the teachings of the doctors…” (447). Al-Ghazzali describes a similar process, saying, “The first condition for a Sufi is to purge his heart entirely of all that is not God. The next key of the contemplative life consists in humble prayers which escape from the fervent soul, and in meditations on God in which the heart is swallowed up entirely” (440). An additional similar state is clearly recommended by Lao Tzu when he asks, “can you coax your mind from its wandering, and keep to the original oneness… can you step back from your own mind and thus understand all things,” and again when he asks, “Do you have the patience to wait till the mud settles and the water is clear” (Tao Te Ching, 10, 15). In all these varied instances of contemplation, the operations of the ordinary mind are suppressed, in order to create an openness to a greater reality which the ordinary mind cannot perceive.

In order to experience Being, Heidegger prescribes the same sort of mental exercise, which he sometimes calls meditative thought, in contrast to calculative thought. Whereas calculative thought “computes ever new, ever more promising… possibilities… races from one prospect to the next… [and] never stops, never collects itself,” meditative thought, “contemplates the meaning which reigns in everything that is” (Discourse on Thinking, 46). This form of thought, he says, need not be “high-flown,” but can consist simply in “dwell[ing] on what lies close to us and meditate[ing] on what is closest…” (47). Elsewhere, Heidegger says of the kind of thought that allows for the entering into the Truth of Being, that “because there is something simple to be thought in this thinking it seems difficult to the representational thought that has been transmitted as philosophy, but this difficulty is not a matter of indulging is a special sort of profundity and of building complicated concepts; rather, it is concealed in the step back that lets thinking enter into a questioning that experiences…” (Letter on Humanism, 255). In yet another work, Heidegger describes the kind of thought which alone allows access to Being, as a kind of will-less waiting, or as he says, a kind of “releasement,” and says that only through this kind of thought can that-which-regions be experienced (Discourse on Thought, 62, 66). It should be clear from these few descriptions that the kind of thought Heidegger proposes to be the means by which Being can be experienced is very similar to the contemplative method of the mystic.

Let us now look back upon what has been established. Three essential aspects of mysticism are, a sudden awakening to the Transcendent in which worldly beings fall away, the acknowledgement that logical thought is incapable of bringing about a full experience of this Transcendent, and the prescription of a non-conceptual type of mental activity, which stresses receptivity, as a means by which the Transcendent can be attained. Heidegger’s thought can be seen to be strongly analogous to mysticism on all three points: he speaks of original anxiety as the experience by which da-sein is revealed to itself in its transcendence; he condemns representational, metaphysical thought as capable only of thinking of beings, never of Being, and he proposes meditative openness and dwelling-with as a means by which Being itself can be experienced. From these strong analogies we can conclude that the transcendental experiences, which both mystical and Heideggerian thought seek to approach, 6 In Heidegger’s later thought this term, “that which regions,” seems to have replaced the idea of the “clearing of being” but functions similarly to it. So to experience purely that-which-regions can be identified with the old goal of experiencing Being.
are probably identical. Though there are surface differences between Heidegger’s thought and the various forms of mysticism, there are similar surface differences between all the other forms of mysticism as well. And though Zen’s Satori and Christianity’s Unio Mystico are described in totally different terms, the means by which they are attained are essentially the same, and, therefore, we may conclude that these experiences are of essential equivalence as well. I have shown the method by which Heidegger seeks to experience the truth of Being to be essentially the same as the method by which the mystics seek to experience the Ultimate, and therefore we are justified in concluding that the two experiences are probably one and the same.

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7 One important disanalogy between Heidegger and mysticism that deserves further study is that while all mystics affirm that the Ultimate is absolutely ineffable, one of Heidegger’s main goals is to bring the Truth of Being to language. Does this mean that Heidegger’s goal is different than the mystics? Possibly, but I rather think that it is simply a reflection on the fact that Heidegger seeks to restructure language so that it can speak the truth of being, which is simply a task that no mystic has ever thought to take upon himself. In terms of ordinary language both are in agreement, that such talk never touches upon the Absolute.
Works Cited


ABSTRACT

In the 1940’s, major record companies in the North failed to capitalize on a growing interest in Rhythm and Blues with musicians such as Fats Domino, Bill Haley, Chuck Berry, and Little Richard. A young man from rural Alabama, however, sensed what the major labels could not. Although Sam Phillips could not wholly articulate what that “something” was, he nonetheless saw potential in a cross-pollination of blues and country music. Phillips thus set out to create a new genre of music tailored to America’s booming postwar teenage population. Lacking capital and the newest technological recording devices, Phillips relied instead on unique cultural experiences and a fire in his heart, fueled by early childhood encounters with the blues. Not only was Phillips one of the major creators of Rock ‘n’ Roll, but his success in tapping the new teenage consumer through Elvis Presley contributed to jump-starting a cultural revolution.

John Lennon once said: “Before Elvis there was nothing, after Elvis nothing was the same.” While Lennon may have been right, major record companies in the North, like RCA, Columbia, and Decca, had been hard at work attempting to create “something.” The problem was that they did not know what that “something” was. Fats Domino, Bill Haley, Chuck Berry, and Little Richard had been on the music scene since the late 1940s trying to capitalize on a growing interest in Rhythm and Blues music, but to no avail. Fats Domino was considered too “laid-back,” Bill Haley was in his late twenties and lacked “youthful charisma and sexual swagger,” Chuck Berry struggled with the law and was “too black,” and Little Richard was viewed as too outrageous, “too raw,” and also “too black.”

While the major labels struggled with their search in the North, a young man in the South believed he knew what that “something” was. Although at first he could not define or articulate this musical element, Sam Phillips knew that the answer, however amorphous, would come to him in time.

As a young adult in the 1940s, Phillips became acutely aware that no genre of music existed primarily for teenagers. Eventually, Phillips saw potential in a cross-pollination of blues and country music, a new sound that America’s booming postwar teenage population would connect with and call its own. He also grasped the financial benefits that would result from this audience. Although he did not have the money or the newest technological recording devices that the major labels had, he did have unique cultural experiences and the knowledge...
to work with what he had. He also possessed a fire in his heart that had been fueled by his early childhood encounters with blues music through his family’s African American farm workers and an inspiring trip to Memphis, Tennessee. Ultimately, Phillips would use Elvis Presley to create a style of music so innovative and alive that it would become a revolutionary force. Not only was Phillips one of the major creators of Rock n’ Roll, a genre of music created for teens, but his success in tapping the new teenage consumer would contribute to jump-starting a cultural revolution, one that would change forever the face of American life.

Sam Phillips was born in Florence, Alabama in 1923. The youngest of eight siblings, he was raised comfortably on a three-hundred-acre farm until the stock market crash of 1929. Growing up during the Depression, Phillips learned to pick cotton alongside of his family’s black farm workers. The black workers would often sing gospel and blues songs while working in the fields, and it was here that Phillips was introduced to this “race” music that reflected subjects of heartache and despair, love and loss, loneliness, longing for home, and hope of better times to come. Silas Payne, a worker that Phillips considered a father figure, routinely sang the blues to him. In an interview with Rolling Stone, Phillips stated, “I saw how [workers like Payne] kept their spirituality. They felt hope, and that said something to me. He taught music to me. Not musical notes or reading, but real intuitive music.” Phillips also was influenced by gospel music heard in his church. Ultimately, however, it was not the white expression of gospel music that appealed to him; but rather, the black expression.

Arriving on Beale Street, Phillips recalled, “It was rockin’! The street was busy. It was active both musically and socially. God I loved it!” The unique vibe that resonated around Beale Street convinced Phillips that he would one day make Memphis his home—and to further

5 Kevin and Tanja Crouch, Sun King, 6.
6 Radio was the cheapest form of entertainment available, and offered an escape to Depression-stricken Americans like Phillips.
9 Ibid., 1.
explore his passion for music by getting into radio. Through radio, Phillips realized he could expose listeners to the music he grew up with and loved, and hopefully deliver the same impact that radio hosts had made on him during his childhood.

Phillips immersed himself professionally in the world of music by taking audio engineering courses at the Alabama Polytechnic Institute in Auburn, and winning a couple of radio jobs in Muscle Shoals, Alabama and Nashville, Tennessee. Then, in 1945, at the age of twenty-two, Phillips’ dream came true as he was offered a job at WREC, just blocks away from Beale Street in downtown Memphis. Here, he gained valuable engineering skills (pre-recording programs on to sixteen-inch acetate discs to be played later on air), and broadened his own tastes and the station’s playlist (routinely shopping at record stores for “daring” records that other stations overlooked). On his WREC show, “Saturday Afternoon Tea Dance,” Phillips became known for his eclectic mix of jazz, pop, and blues. Eventually, the vibrant sounds of these overlooked records inspired Phillips to open his own recording studio, where he could record the music that he loved, with no boundaries to creativity.

On January 1, 1950, Phillips opened Memphis Recording Service, in downtown Memphis, as a side job to supplement his income. This type of business had remained unproven in Memphis. Indeed, Phillips’ co-workers at WREC claimed his idea was crazy and reminded him of Royal Recording, which had opened in Memphis two years earlier but went bankrupt within a year. But Phillips was bored by the popular music of established singers such as Bing Crosby, Perry Como, and Frank Sinatra, and wanted to record the style of music that he heard growing up: blues, country, and gospel. Although a few friends were wary of Phillips associating with blacks, the young would-be producer was insistent, saying he “wanted to record black people, those folks who never had the opportunity to record. My unconscious mind was just saying I should do it.” This was not part of a social or political agenda; Phillips had no desire to speak for the black community. To him, it was simply about the music. Memories of Uncle Silas Payne, his family’s black farm workers, and the black church back at home turned the musical wheels of his mind. “People didn’t look upon black blues as real artistry,” Phillips told Bob Edwards in a 1993 interview for NPR. However, Phillips knew that the abilities of black musicians had been overlooked, and he saw potential in their unique talents. “The only thing I wanted to do,” he said, “is to see if I was right or wrong. I wanted to record it, get it out on the market, and see if the people would accept it or reject it.” Phillips, a commercial entrepreneur, aimed to capture and secure a kind of music that might become lost: “With society changing, I knew that this music wasn’t going to be available in a pure sense forever.” Memphis, Phillips became convinced, was

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10 Kevin and Tanja Crouch, Sun King, 12; Escott, Good Rockin’ Tonight, 10.
11 Colin Escott, Good Rockin’ Tonight, 13. The studio, located on 706 Union Ave. is still in operation today, not only as a recording studio, but as a tourist attraction that hosts tours for fans. When Phillips purchased the building, the lease was $150 a month. Phillips and his only assistant, Marion Keisker, renovated the building themselves. This included the creation of a control room, laying floor tiles, painting, carpentry work, and the installation of sound equipment.
13 Kevin and Tanja Crouch, Sun King, 15.
14 Ibid., 18.
16 Kevin and Tanja Crouch, Sun King, 18.
17 Colin Escott, Good Rockin’ Tonight, 19.
where that amorphous “something” could be found and made concrete.

By the 1940s, Beale Street in Memphis had become a center for African American culture and urban life as blacks traveled from the Delta to load cotton, find work, and play the blues. Beale Street became the black musical equivalent of the Grand Ole Opry. The jug band music, jazz, and blues played in juke-joints, saloons, and clubs brought Beale Street to life. Blues music at this time had fallen into a period of transition as it dropped its acoustic sound for an electric sound, characterized by a thriving rhythm. As Phillips told NPR’s Bob Edwards, “Beale Street convinced me that with all the talent coming out of the Delta, I wanted to do something with the music.”

Phillips’s studio, located seconds away from Beale Street, was perfectly situated to tap into this vibrant musical atmosphere.

The motto of the Memphis Recording Services was “We Record Anything – Anywhere – Anytime.” Phillips’s first recorder, a portable Presto five-input mixer, allowed him to record outside of his studio; he therefore recorded weddings, bar mitzvahs, speeches, and funerals until he had accrued enough capital and public profile to produce blues records for independent record labels. As blues is a creative response to oppression, Phillips was adamant in his desire to record the feeling of the oppressed. He wanted to capture emotions on record, because the blues, in his words, “is a symphony of the soul.” More pleasingly, he said he “wanted to feel what was inside of the black artists’ soul.”

Phillips recalls some artists thinking, “that white man behind the glass don’t want to hear what I do on the back porch.” In reality, that is exactly what Phillips wanted to hear.

Phillips started by recording artists from WDIA, which was a black-oriented radio station in Memphis. His first success came from recording B.B. King for RPM Records. As word spread, Ike Turner and his band drove from Mississippi to see Phillips. During the trip, a guitar amplifier fell off the top of the car, damaging the speaker cone. When the band arrived, Phillips began to play with the amp, stuffed paper into the broken cone, and proceeded to record “Rocket 88.” The amp produced the sound of a saxophone. Phillips maxed out the volume of the amp which ultimately allowed this unique sound to drive the song. Phillips told Rolling Stone, “the more unconventional the sound, the more interested I become in it.”

Phillips sold the masters to Chess Records in Chicago, and “Rocket 88” rocketed to number one on the R&B charts. Sam Phillips had his first hit record. Still, despite this success, Phillips felt as though that special “something” had eluded him.

Before World War II, major record label companies had abandoned race music and country music, deeming it unprofitable. Instead, they had focused on popular music by introducing musicians such as Bing Crosby, Perry Como, and Frank Sinatra. Popular music had been established in the North for the white-middle class; country music was established for the white working-class of the South; and now, rhythm and blues had become established in the South for the African American au-

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19 Sam Phillips, interviewed by Elizabeth Kaye, “The Rolling Stone Interview.”

20 Phillips and most music historians consider “Rocket 88” to be the first Rock N’ Roll song. Phillips also considered Howlin’ Wolf his greatest discovery and favorite artist, putting him above the likes of Johnny Cash, Jerry Lee Lewis, and even Elvis Presley. Curiously, Howlin’ Wolf was signed away by Chess Records, which recorded Wolf by attempting to recreate Phillips’ sound.
Some radio stations began to pick up on this new African American market, abandoning their country and popular music programs for the blues. The blues helped broaden the base of music because a cross-pollination emerged: whites began listening to blues, and blacks to country music. As an early advocate of this cross-pollination, Phillips was not surprised. In fact, he believed that whites, up to this point, had been secretly listening to the blues, as if it were socially unacceptable. “It hadn’t occurred to too many people that white people would listen to black singers,” Phillips told Rolling Stone. “I was in it to record something I felt, something I thought other people ought to have an opportunity to render a judgment on.” But it was not white adults who became excited about this music; it was white teenagers.

In the 1940s, the word “teenager” became the standard term for young people from the ages of thirteen to eighteen. It started as a marketing term that reflected the newly visible spending power of adolescents. During postwar years, the new teen market exploded. Declaring independence from their parents, in search of their true identity, teens looked for symbols and entertainment that mirrored their existence. Hollywood, in particular, succeeded in capturing the image of teens through their actors. In response, teens idolized actors such as James Dean, whose attitude, indifferent shrugs, confused postures, inarticulate mumblings, and anti-authoritarian stances paralleled their own. Teens, however, begged for more. They longed for a new form of entertainment that communicated specifically with them.

In the early and mid-1950s there was little in mainstream popular culture that teens could truly identify with. Popular music could not satisfy their crave for excitement. Ahmet Ertegun, founder of Atlantic Records, reflecting on those times, stated, “When we were making the music we made, we hoped to reach the large segment of the black American population, which we did, but we also reached a lot of white kids.” The radio, unlike schools and churches, could not be segregated. So it was through the airwaves that teens were exposed to the blues and began raiding record stores for albums. With its thumping backbeat and sexual lyrics the blues appealed to teens, and Sam Phillips looked to capitalize.

The teen phenomenon of the 1950s gave Phillips a new idea: to create a new genre of music tailored to teens. “Before Rock N’ Roll,” said Phillips, “teens didn’t have any type of music they could call their own, once they got over four or five years old, until they were in their twenties.” Simply hoping to make profit, the major record labels had their popular singers cover blues songs; their attempt to establish a firm grasp on this new phenomenon, however, was mostly unsuccessful. Conversely, Phillips

21 By the beginning of World War II, there were essentially only three record companies: Victor, Columbia, and Decca. They recorded country and blues music on subsidiary labels, such as Bluebird (Victor) and Okeh (Columbia), issuing records for black or Southern white audiences only. The big jazz band leaders like Duke Ellington and Benny Goodman, and crooners such as Bing Crosby, Perry Como, and Frank Sinatra were the pop stars for the mainstream audience. See Andre Millard, American Record: A History of Recorded Sound (New York: Cambridge Press, 1995), 252, and Robert Palmer, Deep Blues: A Musical and Cultural History of the Mississippi Delta (New York: Penguin, 1981), 135, 145.

22 Sam Phillips, interviewed by Elizabeth Kaye, “The Rolling Stone Interview.”

23 Jon Savage, Teenage: The Creation of Youth Culture (New York: Viking, 2007), XV.


25 Good Rockin’ Tonight: The Legacy of Sun Records, produced by Bruce Sinofsky.

(though he, too, was keen on tapping into the vast teenagemarket) wanted most of all to create a genre of music that teens could identify with, one that would bring together the booming generation. As Phillips noted, “[Teens at the time] had emotional starvation, and the most active, imaginative years of your life were going to waste because you didn’t have a thing for just shear enjoyment, or an ability to say hey this would help me make contact with this girl or boy.” Believing that the vehicle would come from blues music, Phillips reflected, “Thank God that the statute of limitations didn’t run on the blues and what came from it.”

In February 1952, Phillips created Sun Records and quit WREC so he could fully commit himself to running his own record label. Phillips’ own design for his label was a rooster with a rising sun behind it. Symbolically, the sun is universal and represents a new day for a new opportunity, so Sun Records would offer an opportunity to black artists who could not make the trip north to Chicago, or who were rejected by major record labels. Phillips could now release records on his own label and avoid dealing with the politics of major labels. Looking for a new raw sound characterized with feeling, Phillips held open auditions in an unsophisticated, informal atmosphere. Phillips recalled that he “wanted something ugly and honest. They’d [blacks] look at the recording booth and see a white man, and they’d start trying to be like [popular white] singers.” Phillips wanted the opposite. He was interested in the music that major labels turned away. As such, he urged his musicians to play with the enthusiasm of playing in front of a live audience—and to tell their story with feeling and simplicity.

In the first four years, Phillips recorded the likes of Walter Horton, Little Junior Parker, the Prisonaires, Little Milton, and Roscoe Gordon. But because of their failure to make an impact on the charts, Sun began to face financial burdens. To remedy his financial situation, Phillips would, for $1.99 per side, record a personal record for anybody who walked in the door. At the same time, blues started to lose commercial acceptance. For example, white retailers told Phillips that black music was ruining their children. Phillips therefore contemplated on how he could take the element of “feeling” from blues music and make it appeal to teens. According to Phillips, his philosophy at the time was, “If I can find a white person who can give the feel and the true essence of the black blues-type song, then I’ve got the chance to broaden the base and get plays that otherwise we couldn’t.”

Phillips had seemingly tried it all: he had perfected his sound skills, he had succeeded with the blues, and he had even made an unsuccessful attempt at recording white country artists, but he was still missing that “something.” Unbeknownst to Phillips, that “something” had been roaming in the vicinity of Sun Records for quite some time; in the summer of 1953, he finally worked up enough courage to enter Sun Studios.

He was an eighteen year old named Elvis Presley. Presley walked into Sun Studio wanting to record a song for his

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27  Good Rockin’ Tonight: The Legacy of Sun Records, produced by Bruce Sinofsky.

28  When Phillips quit WREC, he still had to support his wife, two sons, his mother, and his deaf aunt.


30  Perhaps one of Phillips’ most unique musical talents was a group called the Prisonaires. They consisted of five inmates of the Tennessee State Penitentiary, whom Phillips would record inside the prison walls. In light of such recordings, what’s clear is that although Phillips’ business had evolved, his musical integrity remained intact—he still embraced his “Anything – Anytime – Anywhere” motto.

31  Sam Phillips, interviewed by Barbara Schultz. Other stories say that Phillips said something to the likes of “If I could just find me a white boy that could sing like a black person, I could make myself a million dollars.”
mother’s birthday. Phillips’ secretary, Marion Keisker, asked Presley, “Who do you sound like?” Elvis replied, “I don’t sound like nobody.” Phillips proceeded to record Presley singing two popular ballads: “My Happiness,” and “That’s When Your Heartache Begins.” Phillips later remarked, “The only lie [Elvis] ever told me was that he wanted to make the record for his mother’s birthday.”

His mother’s birthday actually was in April, which was five months earlier (in later years, it was also discovered that the Presleys did not own a record player). Elvis simply wanted to be heard—and had either saved enough money to make a record, or finally worked up enough courage to visit Sun. Phillips saw some potential in Elvis, took the young singer’s information, and told him that he would give him a call. Phillips was so focused on the blues that he let “something” walk right back out the door.

Born in Tupelo, Mississippi, Presley had moved to Memphis with his family in 1945. Similar to Phillips, Presley grew up listening to the radio and was heavily influenced by the gospel music that he heard at his church. At school, Elvis was bullied and had few friends. When not working at the Precision Tool Company in Memphis or driving a truck for Crown Electric, he visited Beale Street to listen to the blues singers, and frequently attended gospel programs. As Phillips recalled, “[Elvis] didn’t play with bands, he didn’t go to this little club and pick and grin. All he did was sit with his guitar on the side of his bed at home.”

Presley’s physical appearance was also different: he bought his clothes from Beale Street and greased his hair into a pompadour style that sported long sideburns. Phillips remembers seeing Elvis walk by the studio many times and even

remembers a Crown Electric truck periodically driving by. A year later, Phillips finally gave Presley a call to come in for a recording session.

During his first session, Presley sang numerous pop ballads which amounted to nothing. “I guess I must have sat there at least three hours,” Elvis told Memphis reporter Bob Johnson in 1956. “I sang everything I knew – pop, spirituals, just a few words of anything I remembered.” Presley felt inferior, and due to his shyness and insecurity, his session ended in failure. Presley’s voice, nonetheless, showed potential, and Phillips saw something “different” in him, although he could not define exactly what it was. As a result, Phillips asked Presley back for another session with accompaniment.

On July 5, 1954, Phillips paired Presley with guitarist Scotty Moore and bassist Bill Black. As usual, the session was informal, and the band was told to play whatever came to mind; however, the early results were to no avail. Phillips lightheartedly exclaimed to Presley, “there ain’t a damn song you can do that sounds worth a damn.”

But as they took a break, some magic happened. Elvis recalled, “This song popped into my mind that I heard years ago, and I started kidding around with it.” As Moore tells it, “Elvis started singing this song, jumping around and acting a fool, and then Bill picked up his bass, and he started acting a fool too, so I started playing with them.” The song was Arthur “Big Boy” Crudup’s 1946 release, “That’s All Right Mama.” Phillips remembered, “It came through loud and clear. It was like a big flash of lightning and the thunder that follows. I

32 Sam Phillips, interviewed by Rita Houston.
34 Ibid., 85.
35 Sam Phillips, interviewed by Elizabeth Kaye, “The Rolling Stone Interview.”
36 Guralnick, Last Train To Memphis, 94-95.
knew it was what I was looking for.”  Elvis was the living vision of the dream that lingered in Phillips’ mind ever since leaving Alabama. Shocked that Presley knew this old blues song, Phillips asked Presley, “Why have you been holding out on me this whole time?” An unconfident Presley responded, “You liked that Mr. Phillips?” Based on Elvis’ past pop ballad sessions, Phillips was unaware that Presley was interested in blues music, and that night, they recorded “That’s All Right.”

Elvis’ rendition was original and exciting. Phillips did not know what to make of it; it was not black, white, pop, or country. Not even were blues characteristics evident. Bill Black played a bass rhythm that consisted of both tone and a slap beat, while Moore delivered a simple guitar rhythm that combined a blues style with a country style. Presley started the song off by strumming his acoustic guitar to an upbeat tempo. His voice boasted the confidence that his personality had lacked. The finished product satisfied Phillips’ need for something raw and ragged. A few days later, another session was held to record the B-side. Once again joking around during a break, Black began playing Bill Monroe’s 1946 bluegrass hit “Blue Moon of Kentucky,” imitating Monroe’s high-pitched voice. When Presley and Moore joined in, the time signature changed, the tempo was picked up, and Phillips hit the recording button.

The two sessions broke musical boundaries and left Moore and Black nervous about their version of “That’s All Right,” claiming it was so different that they would be run out of town. Phillips disagreed, thinking that if he was run out of town, it would be due to “Blue Moon of Kentucky,” because he said, “you don’t mess with bluegrass. Bluegrass is kind of sacred, you know.” But Elvis had just re-created a hit for Sun Records. After adding “slapback,” the main element of “the Sun sound” which was a tape delay that added echo to the performer’s voice, Phillips exclaimed, “That’s fine! Hell that’s different! That’s a pop song now, nearly about!”

Phillips did not know what to do with the record, or even how to categorize it, so he called his close friend, Dewey Phillips, for advice. In 1948, the Memphis radio station WHBQ debuted a show hosted by Dewey Phillips (no relation to Sam) called “Red Hot and Blue.” Dewey programmed an eclectic mix of blues, hillbilly, and popular white crooners that would become an institution in Memphis. His slang, “hip” voice-overs made the show “insane,” “chaotic,” and “inspiring.” The “Red, Hot, and Blue” Show was popular among white teens like Elvis, because Dewey Phillips played the music that most adults had forbidden their teens to listen to. If Dewey liked a song, he would tell his listeners they were hits; songs that he did not like, he would smash to pieces, live on the air. Excited over Presley’s unique sound, Dewey agreed to play “That’s All Right” on his program. As soon as the song hit the airwave, Dewey was bombarded with nonstop telephone calls from his listeners. Presley recalled, “I was scared to death; I was shaking all over, I just couldn’t believe

37 Sam Phillips, interviewed by Elizabeth Kaye, “The Rolling Stone Interview."
38 Good Rockin’ Tonight: The Legacy of Sun Records, produced by Bruce Sinofsky.
40 Phillips’ quotation culled from an outtake of Elvis Presley’s recording of “Blue Moon of Kentucky,” on Elvis: A Golden Celebration, RCA compact disc 1, track 3. Phillips’ new equipment consisted of two Ampex 350 recorders and a RCA 76-D radio console. He also switched to magnetic tape, which allowed him to issue 45 rpm records with better sound quality. Because the magnetic tape was reusable, he would record over outtakes to save money; therefore, not many outtakes from Elvis’ sessions exist.
41 Escott, Good Rockin’ Tonight, 5.
42 Floyd, Sun Records, 35.
After Sun Records released Elvis’ first record in July 1954, Presley and his band mates embarked on a journey of scheduled appearances that would take them from county fairs to the Grand Ole Opry and, in the process, popularize Presley’s image. Sam Phillips recalls that Billboard’s response to Elvis’ record was that Phillips had to be either a genius or an idiot, because he had taken a black blues song and paired it with a classic bluegrass hit. Phillips’ response was, “I ain’t a genius, maybe we got lucky.” Although luck may have been on his side, considering the two songs were stumbled upon, Phillips was, in fact, a genius. He had explored the music of downtrodden people, recorded music without racial bias, experimented with sound, broken musical boundaries, and was able to extract feeling and raw emotions from his musicians. Had Phillips not accomplished these things or given anybody the opportunity to be heard, perhaps Elvis would have remained an unknown truck driver, and the future of teen-oriented pop music might have been different or non-existent.

Former Sun recording artist Jack Clement stated, “Sun Records influenced the world in a pretty spectacular way. Without it, there wouldn’t have been any Elvis, might have been Beatles, but they sure would have been different. It was a hell of a thing.”

Sam Phillips now had that “something”—a singer whose sound and appearance could not be categorized. Elvis was in fact the total package that would soon revolutionize American culture. Realizing, however, that Elvis was headed for national and international fame, and also that he had other talented artists to produce (like Carl Perkins, Jerry Lee Lewis, and Johnny Cash), Phillips, in 1955, agreed to sell Elvis’ contract to RCA Victor Records for $35,000.

Meanwhile, in the 1950s, teen purchasing power exploded. Part-time jobs became readily available, and teens had few responsibilities other than school. During the fifties, teens spent more than nine billion dollars a year—six billion coming from allowances, three billion from their own earnings. This mass audience of teens with disposable income was exactly what Phillips had hoped to exploit, and in the 1950s, it all came together. Phillips’ new genre of music had been established in the South, but soon began to spread to the North where it had failed years ago. Helped along by a few key factors, DJ’s and television, this nameless style of music would gain a name and begin to rock teens all across the nation.

Alan Freed, a Cleveland disc jockey, became famous in the early 1950s among teens in the north for playing R&B. Interestingly, his first impression on “race music” was that it was too raw for his audience. But as young listeners called in with approval, Freed decided to create a program especially for the blues. In 1954, Freed moved to New York and coined the term Rock N’ Roll as the name for this nameless music, like Presley’s, that mixed blues with country. Freed’s popularity with teen listeners would help Rock N’ Roll spread through

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43 Guralnick, Last Train To Memphis, 101.
44 When Presley was a guest performer on the Grand Ole Opry, Monroe remembers, “he come around, apologized for the way that he changed ‘Blue Moon of Kentucky.’” Monroe’s response to Presley’s version was positive, and it led Monroe to re-record his version, starting with the original 3/4 time signature and then speeding up to a 4/4 time just like Presley. Neil V. Rosenberg, Bluegrass: A History (Illinois: University of Illinois Press, 1985), 121.
45 Sam Phillips, interviewed by Bob Edwards.
46 Good Rockin’ Tonight: The Legacy of Sun Records, produced by Bruce Sinofsky.
47 RCA also reverted to earlier blues songs, including Presley’s recording of Big Mama Thornton’s “Hound Dog.”
48 Brash & Britten, eds, Rock & Roll Generation: Teen Life in the 50’s, 98.
the North as well as nationally. Indeed, Freed would become known as an “entrepreneur of entertainment for the new teen market,” but a new form of entertainment signaled the death of the radio.49

The new medium of television also helped promote Rock N’ Roll. In 1955, nearly two-thirds of American homes had a television set. Shows like the Steve Allen Show, American Bandstand, and the Ed Sullivan Show helped popularize music as it allowed viewers to actually see their favorite singers. Adult disapproval of Rock N’ Roll music led to censorship, including Elvis’ appearances on the Ed Sullivan Show, which only showed Presley from the waste up. However, in 1959, three years after his Ed Sullivan Show performances, Elvis had sold 25 million copies of single records in four years, an all-time high.50 Significantly, teens were spending $1.5 billion a year on music, record sales tripled, and by the end of the decade the teenage market had amounted to $10 billion.51 Rock N’ Roll not only changed the way teens spent money, but it changed the way they walked, talked, dressed, and wore their hair. A catchy, insistent Rock N’ Roll encouraged teens to resist their parents’ authority, be more sexually adventurous, and learn from their peers about what to wear, watch, and listen to, when to study, and where to go on Saturday night.52 Former Beatles member Paul McCartney remembers, “In England, until Rock N’ Roll had arrived, it had been popular ballads, and then suddenly this stuff is coming over. The sailors [brought] it in from the states, and it started to creep onto the radio. We’d hear some of the stuff you guys were doing [talking to Moore and Black]. Just wow! What is this?”53

Most record executives in the fifties had viewed Rock N’ Roll as another musical trend; however, Sam Phillips saw it as a cultural revolution—one that could be used by generation after generation to express deeply felt aspirations and ideas.54 “It’s really mind-boggling sometimes to think of how Rock N’ Roll enabled us to bring this big world a little closer together,” Phillips said during an interview. By tapping into the musical atmosphere of Memphis Tennessee, Sam Phillips created a new form of entertainment for teens, Rock N’ Roll music, and helped revolutionize American culture. When asked in an interview if he thought Rock N’ Roll would have happened without Sun, Phillips replied, “I think that there might have been, but it would’ve been a long time coming.”55 Sam Phillips died in 2003, but inherent in the music of Sun Records is a vibrancy that has stood the test of time and reached across race and age.

49 Ibid., 20.
50 “A Young $10 Billion Power: The Teen-age Consumer Has Become a Major Factor in the Nation’s Economy,” Life, August 31, 1959, 78-84.
51 Brash & Britten, eds, Rock & Roll Generation: Teen Life in the 50’s, 27. Teens were able to buy a wide variety of consumer electronics, among other gadgets. For example, teens could purchase a transistor radio for $25. For $50, they could buy an Elvis Presley portable record player.
53 Good Rockin’Tonight: The Legacy of Sun Records, produced by Bruce Sinofsky. Towards the end of the fifties, Rock N’ Roll music went into a period of decline, and it would not be until the early sixties that Rock N’ Roll would regain popularity due to the British Invasion and the birth of Motown.
U.S. Media Objectivity and Arab Issues: A Content Analysis of Coverage of the Proposed “Ground Zero Mosque”

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ABSTRACT
This study examines whether national television and newspaper media is biased in favor or opposition to the proposed Cordoba Project, also known as the “Ground Zero Mosque”. The content and headlines of news articles from five national newspapers and two networks were studied to determine if there was a bias. This study analyzes the number of graphs dedicated to the sides in opposition and in favor of the Cordoba Project; the number of persons mentioned or quoted in favor or opposition; the type of person mentioned, be it a citizen, national politician, city official or organization; the number of stories that appeared to favor a single side; and the neutrality of the headline. The study finds that a majority of the news organizations appear to cover the opposition more often than supporters, regardless of the organization’s perceived political stance. It is not immediately clear if this is due to the bias of the news organization or to boost ratings. This study also finds the debate is not as prominent in the media as first perceived.

The proposed New York community center, dubbed the Cordoba Project and located in lower Manhattan two blocks from where the World Trade Centers stood, has captured media attention since its announcement in early 2010. The media have reported on questions raised concerning the intrinsic right to locate in such an area, from where the funding would be derived, as well as the political and ideological affiliations of the main Arab backers of the community center. The question arises whether the media are biased in its coverage of this issue and if it is truly of national importance, as network hype might lead one to believe. A content analysis of news articles from various media organizations can attempt to answer these questions. The first section of this paper discusses previous studies on media bias and a history of prejudice against minorities, specifically Arabs and Muslims in the United States. The second section discusses the methodology by which this content analysis is conducted. The third section provides the data from the content analysis, and the fourth section summarizes the findings in respect to the historical treatment of Muslims and Arabs.
LITERATURE REVIEW

Media Bias

Studies on media bias reveal relative equality in coverage of political parties, but omission or negative coverage pertaining to gender and race. Studies that look at election coverage for Republicans versus Democrats typically find that both sides were represented equally (Niven, 2003, p. 313; see also Niven, 2004; Hofstetter, 1972; Domke et al., 1996). While some studies have found bias in favor of one party or another, a meta-analysis of studies of election coverage reveals almost total equal coverage for each candidate in all cases (D’Alessio, & Allen, 2000). Although Niven (2004) found similar treatment of coverage for Republicans and Democrats, his study found whites and males typically receiving more favorable coverage than African Americans and women. Election coverage has also been proven to be stereotypical of gender and race of non-white candidates pursuing an office against a white male candidate (Major, & Coleman, 2008; for a list of other relevant studies, see Major, & Coleman, 2008, p. 315).

Beyond politics, studies show that minorities are either ignored or depicted negatively, typically in stories of criminal or violent acts (Avraham, 2003). An example of bias via omission includes studies on missing children, where it has been found that white children, particularly females, receive the most coverage despite a nearly 50/50 ratio of missing white and minority children (Min, & Feaster, 2010).

Arabs in the Media

There do not appear to be many journal articles contrasting media bias against Muslims prior to and following Sept. 11, although many studies exist concerning public opinion.

According to Weston (2003), newspaper articles about Arabs prior to Sept. 11, 2001, were few and generally stereotyped Arabs negatively. The images of Arabs prior to 9/11 were reinforced by events that occurred in the Middle East but were reported in the U.S., such as car bombings. Events in the U.S., such as the hijacking of PanAm 109 in 1988 and the initial attack on the World Trade Center in 1993, led many of the media to inappropriately assume Arabs were responsible for the Oklahoma City bombing (Weston, 2003, p. 3). Following 9/11, Weston found newspapers tended to focus on local Arab communities and represent Arabs as “doubly victimized” as both Americans mourning the loss of loved ones killed in the attack and as persons discriminated against by their neighbors and the government (pp. 1, 3).

Nacos and Torres-Reyna (2007) note that positive depictions of Arabs in the media following Sept. 11 experienced an eight percent increase, revealing the desire to depict Arabs and Muslims as patriotic and victims of hate crimes (pp. 11-12, 15). Prior to 9/11, “twice as many” news articles tended to allege a support by Arab Americans for terrorism than those that didn’t. Following Sept. 11, this reversed, with two times the number of articles refuting Arab Americans’ support of terrorism (p. 14). Studies of editorial coverage of Arabs and Muslims have found that editorials have been “more fair minded and measured” in discussion on Muslims and Arabs following Sept. 11 than prior (Treviso, Kanso, and Nelson, 2010, p. 14).

Ross and Lepper (1985) posit that media bias may be individual perception, which creates a “hostile media phenomena”. In an analysis of pro-Israeli and pro-Arab supporter reactions to television coverage of the 1982 Beirut massacre, each group perceived biases against their ideology in the form of more negative references; those with greater knowledge of the massacre exhibited a greater degree of belief in media bias (p. 1). The “results provide a compelling demonstration of the tendency for partisans to view media coverage of
controversial events as unfairly biased and hostile to the position they advocate," the study concluded (p. 584).

Methodology

This study examined whether or not coverage through news articles from various media organizations of the proposed New York community center was biased by conducting a content analysis of the coverage. The content analysis was conducted on the following newspapers: perceived liberal newspapers The New York Times, the LA Times and the Washington Post, and perceived conservative newspapers the New York Post and the Chicago Tribune. Articles from the following networks were also studied: perceived conservative Fox News and perceived liberal CNN. The specific articles were found online using Google Search and each media organization's individual website.

The first five articles on the topic of the Cordoba Project, Park 51 or the “Ground Zero Mosque” were chosen as a sample of each network's coverage. Originally, ten stories were to be chosen from each newspaper or television network; however, more than five articles could not be found in most papers. Some, notably the Chicago Tribune and the LA Times, did not have more than two or three news stories.

Articles were found by searching the website of a news organization and by using search engines. The Google search for news stories were generally conducted with the key words “New York Mosque,” “Ground Zero Mosque,” or the street-name-turned-nick-name “Park 51” in conjunction with the name of a specific news organization. The first five articles written about the community center were selected in an attempt to discover uniformity in the content covered among the news organizations. Articles from wire sources such as the Associated Press, editorials, and columns or opinion pieces were ignored in an attempt to study hard-news and purely journalistic work. The study also attempts to ignore articles that were not directly related to the community center or the debate concerning the project or the site.

Each of the stories was examined applying the following criteria:

- Headline bias. This study attempts to identify bias in two ways: first, intent to mislead by choice of words; second, the use of unnecessary adjectives,
- If the coverage appeared biased. This is determined by the number of paragraphs dedicated to each side,
- The number of persons mentioned and/or quoted in favor of or opposition to the location or project,
- Whether the person quoted/mentioned is a citizen, a national politician, a representative of an organization or a New York City official, and
- The number of stories by the same news organization that are positive or negative.

The breakdown of peoples mentioned/quoted is meant to reveal trends in reporting content bias and is useful as a measure in the following way: citizens lend emotional power to the story. It is assumed those who are mentioned will likely be those who are connected to the Sept. 11, 2001 attack, either as a public servant or family of a lost loved-one, thus lending emotional power to the article. Nationally recognized politicians hold sway over the opinions of the mass population. In this way, the use of politicians may be a means by which the media attempt to set a national agenda. New York City officials represent the “control group” such that s/he will be representative of the city population and local government apart from the selected citizens mentioned in the article and national politicians with larger agendas; the organizations represent civil society-actors that have the ability to influence government and citizens separately. Non-profits have no direct emotional effect or political power, but can be influential.
DEFINITION OF TERMS

Bias

D’Angelo and Kuypers (2010) define content bias as: “consistent patterns in the framing of mediated communication that promote the influence of one side in conflicts…” (p. 338). Thus, for the media to be biased, a consistent trend of framing content to influence audiences must be identifiable. This definition is an amalgamation of other definitions, such as bias based on perception (Ross, & Lepar, 1985; Watson, & Hill, 2000); the idea that there is not one definition of bias, but various types and thus various definitions (Baker, 2004); and that the news creates a misperception about reality, favors one side of a conflict over another, or that journalists choose to produce biased material (D’Angelo, & Kuypers, 2010).

D’Angelo and Kuypers (2010) define framing communications as the conscious or unconscious effort to present a story in a specific light. Sources present information to the media in a certain perspective, which is then passed on via the media to a broader audience; the media may or may not impose its own slant (p. 1). An example of story framing would be defining the Cordoba Project community center as the “Ground Zero mosque” when it is neither located at Ground Zero nor a mosque. Depicting the community center as solely a Muslim house of worship at what many consider a sacred site frames the story in a negative light.

Despite sticking to an overarching definition, it may be important to note this study does focus on types of bias, including source selection, which attempts to select specific sources that align with the story’s intended angle. It is also important to reiterate that not all, or perhaps even most, bias is intentional. Goffman (1974) argues that framing is a cognitive function that guides perceptions of reality in which all humans unconsciously participate. In this light, all news is unconsciously framed according to the perceptions of journalists, media organizations and the audience.

Liberal/Conservative Bias

Webster’s Dictionary defines “partisan” as “adherent, often prejudiced, of a party or cause,” and “adhering to a faction” (2001). Thus, politically partisan bias in the media is the selection or distortion of information motivated by politically ideological views. A liberal bias would be a bias that favored “liberal,” “left” or “Democrat” beliefs. A conservative bias would be one that favored the views and opinions of the “conservatives”, “right-wing” or “Republicans”. In this study, liberal bias would correlate with favorable views of the Cordoba Project, while conservative bias would be in opposition to the project.

Content Analysis

Krippendorff (2004) describes content analysis as “a systematic reading of a body of texts, images and symbolic matter, not necessary from an author’s or user’s perspective” (p. 3). Thus, it is the analysis of a collection of material such that the content is deciphered and categorized to determine certain trends or patterns within the material.

ASSUMPTIONS

At the beginning of this study, the amount of attention this issue received by both liberal and conservative networks such as Fox and CNN led to the assumption that the issue truly was a national debate. A look into newspapers across the nation found that this was not so: the LA Times and Chicago Tribune were slated to be used in the study, but more than a couple original stories (i.e. articles written by staff as opposed to wire stories) could not be found. This was found to be true for major newspapers in U.S. with the exception to those in proximity of the Cordoba Project. This made it difficult to find an equal number of newspapers to represent both the conservative and liberal
bias and leads to the conclusion that the issue did not receive as much national attention as first assumed or perhaps as the media would lead one to believe.

The number of articles used in this study also changed; at one point, the objective was to find ten articles to analyze. Unfortunately, this number of news articles was hard to find, as they were quickly replaced with blogs or columns. Thus, the news worthiness of the story lessened over time or that the organization wanted to present a more opinionated approach than a news article would ethically allow.

Results

This section analyzes the articles of the previously mentioned news organization under the aforementioned criteria.

Network: Fox

As Table 1 portrays, Fox consistently referenced opposition more than support in both the number of graphs and the persons quoted or mentioned. In five stories, 11 people were mentioned or quoted in support of the community center, while 18 were mentioned or quoted in opposition. Also interesting is who was chosen to represent each side: those mentioned in support were typically President Barack Obama, New York City Mayor Michael Bloomberg and persons directly related to the Cordoba Project (labeled as organization representatives). Several other organizations were mentioned in support, but no citizens were mentioned. In contrast, politicians, most notably Sarah Palin and Newt Gingrich, most often represented the opposition. Organizations were the second largest party mentioned in opposition, with only two citizens mentioned.

Network: CNN

CNN also dedicated more paragraphs to the opposition, and quoted or mentioned more persons in opposition than in support of the project. As Table 2 shows, more citizens were mentioned in opposition than in favor, as well as more politicians. Only non-profit organizations were mentioned more in support of the project and city officials were not mentioned at all.

These findings are surprising; despite the liberal stereotype, CNN dedicated more space to those who opposed the project than to those who supported it. CNN did use citizens more often as representatives of the opposition, followed closely by politicians.

Newspapers: New York Times

The New York Times’ articles were far lengthier than those of the other media organizations used in this study. Table 3 reveals the number of graphs dedicated to each side is practically even, but the Times mentioned more persons in opposition than in support for the project. The Times preferred to mention the numerous politicians who opposed the project above the other groups recorded, followed by citizens and organizations. While organizations were overwhelmingly mentioned in support, more than 50 percent of persons mentioned or quoted were representatives of the Cordoba Project. Only two politicians were mentioned in support throughout the five stories.

Newspaper: The Washington Post

The Post’s coverage appears to lean in favor of the support for the community center. The number of persons in favor tends to be higher than those who oppose, and the number of graphs in support is equal to or higher than the graphs in opposition. Table 4 reveals politicians were still mentioned most often for both opposition and support. What is most interesting, though, comes in the stories written for 8/20/10. In 8/20/10_1, the number of graphs in support or opposition is misleading: the article spent 13 paragraphs chastising politicians for their rhetoric against the community center. This includes not only their stance against the project, but also specific instances of speech. The nature of the article
criticized only Republicans, showing a bias towards support for the project, but not in a way this study was prepared to measure. The story on 8/20 had similar findings. Nearly every graph was a criticism of the “Republican” rhetoric, including the term “Ground Zero Mosque.” Clearly biased in favor of the Cordoba Project’s location, it was not a bias measurable in the criteria used for this study. The ridicule on the attack of the Cordoba Project was blatant, although the article was without quotes from any parties, and there were no graphs dedicated to the opposition of the debate.

Newspaper: The New York Post

The New York Post appears to favor supporting the community center. Table 5 notes the first three articles feature more graphs in favor and/or more persons mentioned or quoted in favor of the project. The Post typically featured a person from the Cordoba Project to represent the supportive side. Politicians were cited most in opposition, although this occurred in only the story written on 8/19/10. No other articles mentioned opposition.

The article on 9/10/10 was almost perfectly balanced, only noting three persons who disagreed with the protests set to take place at Ground Zero for the anniversary of Sept. 11, 2001. There was little mention of support or opposition for either side of the debate, as the story centered mostly on facts about the protests. The article on 9/24/10 was in favor of the community center and was dedicated to a group of Muslims who met to discuss the perception of Muslims in the U.S. and to issue a call of support for the Cordoba Project. Five organizations were mentioned in support; no opposition was mentioned.

Newspaper: The LA Times

The LA Times had only two original articles that could be found at the time of this study. As Table 6 shows, the Times referenced support slightly more than opposition to the project in both cases; it also mentioned more persons in favor of the site or project than against, although both sides of the debate were represented solely by citizens and politicians. It is difficult to make conclusions with only two articles from which to draw information.

Newspaper: The Chicago Tribune

The Tribune also had only two original articles found at the time of this study. Table 7 shows the Tribune dedicated more space to the opposition than the support, but mentioned more persons in favor with the project than against. Those mentioned in support were citizens and politicians in equal number, followed by organizations. Only politicians were mentioned in opposition. As mentioned with the LA Times analysis, it is difficult to draw conclusions with only two articles.

HEADLINES

As noted previously, bias is measured in two ways: first, intent to mislead, and second, unnecessary use of adjectives. There are several instances in which a headline may be deemed biased pertaining to intent to mislead. One such possible bias is the term “Ground Zero Mosque,” which is used by most of the news organizations, with exception to the New York Times and the Washington Post. Shown in Table 8, each of the news organizations cited it as “the mosque near Ground Zero” prior to removing the word “near.” The site is five city blocks from Ground Zero site.

Furthermore, terming the community center a “Mosque” could be considered biased, as well. The project is described as a “community center” which will include a “prayer space…500-seat performing arts center, a culinary school, a swimming pool, a restaurant and other amenities” (Hernandez, 2010a, para 8).

Concerning unnecessary use of adjectives, CNN’s headlines appear neutral individually, as each lack emotionally charged or opinionated language. When
placed together, a trend is noticed: four of the five headlines focus on the opposition. The New York Post headlines don’t appear to be particularly biased individually or grouped. The New York Times also appears neutral. It refrains from calling the project the “Ground Zero Mosque” and has no signs of words to incite emotion. The Washington Post is supportive of the project in the headline on 9/10/10. It also calls the inclusion of non-New Yorkers in the debate as “rabble-rousers” on 8/20/10_1, revealing a negative perception of outside debate. Other headlines appear neutral.

**End Results**

Table 9 displays the summary findings concerning coverage and paragraph usage, which notes that four organizations — Fox News, CNN, The New York Times and the Chicago Tribune — gave greater coverage to the opposition, although it was sometimes by a slim margin. The Washington Post, The New York Post and the LA Times were more supportive of the project, although also by slim margins. With only two stories to analyze, the results from The Chicago Tribune and LA Times should be considered inconclusive. Regardless, opposition was covered more by the media regardless of perceived political affiliation.

Summarized in Table 9, those most notably mentioned in opposition were politicians, followed by citizens. Those most mentioned in support included organization representatives (many of which belonged to the organization over the Cordoba Project), followed by citizens. The city officials were consistently in support, with the exception to one Fox article, when the former mayor of New York stated his opposition to the location of the center.

Independently, most headlines appear unbiased. It is worth noting that many of the headlines can be considered misleading – or, at the very least, inaccurate - when considering the term “Ground Zero Mosque”, suggesting the project is located at the site of the attacks, and describing the community center as solely a mosque. Use of adjectives to incite does not occur often, with exception to the Washington Post which calls non-New Yorkers “rabble-rousers”. Grouped, however, the study finds that the headlines mostly trend coverage of the opposition.

Upon examination, it became apparent that original stories concerning the Cordoba Project were limited to only select newspapers in the U.S., typically those within a close proximity of the site, and that the coverage in the form of news articles diminished and switched to blogs or columns by August 2010. As noted previously, the lack of news coverage by individual organizations suggests the debate was not as prominent as initially believed. The fact that five news stories could not be found in the Chicago Tribune or the LA Times at the time of this study suggests that the issue did not gain national importance. This leads to the conclusion that the issue did not sustain a national following as initially perceived and newsworthiness diminished overtime.

While this study reveals a television and newspaper trend of discussing the opposition, it is important to note that this does not necessarily mean the news organization is biased. More coverage of the opposition may occur due to the contentious nature of the story, which will assist ratings and readership numbers. If the coverage bias were intentional due to the ideology of the news organization itself, it would be a continuation of the findings of earlier studies concerning perceptions and portrayal of Arabs and Muslims in the U.S. This determination is inconclusive, however; another study focused specifically on bias, as opposed to simply coverage, will shed greater light on the media’s intent concerning this story and the treatment of Arab and Muslim issues.
REFERENCES


Hannah Simpson


### Table 1: Fox News Article Analysis

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**Key:** C- Citizens, CO- City Officials, POL-Politicians, ORG- Organizations/organization representatives

* Denotes the Imam directing the project.
† Two of these are representatives of the Cordoba Project.

### Table 2: CNN Article Analysis

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**Key:** C- Citizens, CO- City Officials, POL-Politicians, ORG- Organizations/organization representatives
Table 3  
*New York Times Article Analysis*

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**Key:**  
C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives  
*At least one person is a representative of the Cordoba Project.

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Table 4  
*Washington Post Article Analysis*

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**Key:**  
C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives  
*The articles attacked Republican rhetoric against the Cordoba Project.*
### Table 5  
**New York Post Article Analysis**

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- CO: 1
- POL: 1
- ORG: 0

**Who opposed**
- C: 0
- CO: 0
- POL: 0
- ORG: 0

*Representative of the Cordoba Project.

**Key:**  
C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives

### Table 6  
**LA Times Article Analysis**

<table>
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<tr>
<th></th>
<th>8/14/10</th>
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<td><strong># of persons in favor or opposition</strong></td>
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<td>Con: 1</td>
<td>Total: 3</td>
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**Who supported**
- C: 0
- CO: 0
- POL: 2
- ORG: 0

**Who opposed**
- C: 4
- CO: 0
- POL: 0
- ORG: 0

**Key:**  
C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives

*More original news articles from this organization were not found.
### Table 7  
**Chicago Tribune Article Analysis**

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<td><strong># of persons in favor or opposition</strong></td>
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<td>Pro: 2</td>
<td>Pro: 2</td>
<td>Pro: 2</td>
<td>Pro: 2</td>
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<td>ORG: 2</td>
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**Key**: C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives  
*More original news articles from this organization were not found.*

### Table 8  
**Headline Review**

<table>
<thead>
<tr>
<th>Source</th>
<th>Article</th>
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<tbody>
<tr>
<td>Fox News</td>
<td>5/14: Plan to Build Mosque near Ground Zero Riles Families of 9/11 Victims</td>
</tr>
<tr>
<td></td>
<td>8/3: New York City Panel Clears Way for Mosque Near Ground Zero</td>
</tr>
<tr>
<td></td>
<td>8/11: Offer Rejected to Move Mosque Away From Ground Zero to 'State Property'</td>
</tr>
<tr>
<td></td>
<td>8/18: Ground Zero Mosque Developers Deny Talk of Relocation</td>
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<td></td>
<td>9/12: Imam: I Wouldn't Have Picked the Mosque Site If I'd Known Fight It Would Cause</td>
</tr>
<tr>
<td>CNN</td>
<td>5/7: Mosque to go up near New York's ground zero</td>
</tr>
<tr>
<td></td>
<td>6/7: Protesters descend on Ground Zero for anti-mosque demonstration</td>
</tr>
<tr>
<td></td>
<td>7/21: In battle to build mosque near Ground Zero, opponents ask 'why there?'</td>
</tr>
<tr>
<td></td>
<td>8/4: Lawsuit challenges ground zero mosque</td>
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<tr>
<td></td>
<td>8/6: Manhattan mosque plan stokes controversy</td>
</tr>
<tr>
<td>NY Times</td>
<td>5/26: Vote Endorses Muslim Center near Ground Zero</td>
</tr>
<tr>
<td></td>
<td>7/14: Planned Sign of Tolerance Bringing Division Instead</td>
</tr>
<tr>
<td></td>
<td>7/31: Debate Heats Up about Mosque near Ground Zero</td>
</tr>
<tr>
<td></td>
<td>8/4: Mosque Plan Clears Hurdle in New York</td>
</tr>
<tr>
<td></td>
<td>8/8: Across Nation, Mosque Projects Meet Opposition</td>
</tr>
<tr>
<td>Wash Post</td>
<td>8/16: Democrats, Republicans spar over mosque near Ground Zero</td>
</tr>
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<td></td>
<td>8/20_1: Mosque debate: New Yorkers take dim view of rabble-rousing outsiders</td>
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<tr>
<td></td>
<td>8/20_2: What's in a name? Far more than Lower Manhattan mosque planners thought about</td>
</tr>
<tr>
<td></td>
<td>9/10: Near Ground Zero, mosque supporters gather to show their support</td>
</tr>
<tr>
<td></td>
<td>9/11: Crowds face off at Ground Zero</td>
</tr>
<tr>
<td>NY Post</td>
<td>8/16: Islamic leaders not abandoning Ground Zero mosque plans, says property owner</td>
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<td></td>
<td>8/19: Iran cash might fund Ground Zero mosque</td>
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<tr>
<td></td>
<td>9/9: Rauf: Move would spur a Muslim backlash</td>
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<tr>
<td></td>
<td>9/10: NYPD 'army' for protests</td>
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<td></td>
<td>9/24: Muslim leaders meet in Queens to discuss Park51 Islamic center</td>
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<td>LA Times</td>
<td>8/14: Obama supports plan for mosque near ground zero</td>
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<tr>
<td></td>
<td>8/23: New York mosque controversy worries Muslims overseas</td>
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<td>Chicago Tribune</td>
<td>8/17: New York mosque debate splits GOP</td>
</tr>
<tr>
<td></td>
<td>8/18: Leave mosque debate out of politics, Muslims urge Quinn</td>
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*Note: All articles were written in 2010.*
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<tr>
<th>Who supported</th>
<th>Fox</th>
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<th>NY Times</th>
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<table>
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<th>Who opposed</th>
<th>Fox</th>
<th>CNN</th>
<th>NY Times</th>
<th>W Post</th>
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</tbody>
</table>

Key: C- Citizens, CO- City Officials, POL- Politicians, ORG- Organizations/organization representatives
† A representative of the Park31 project is more than 30 percent of this number.
Mathematics
A Search for New Optimal Singly-Even Self-Dual Codes of Length 48

Kristy Mitchell
Fayetteville State University
Faculty Mentor: Vassil Yorgov
Fayetteville State University

ABSTRACT
The best binary self-dual singly-even codes of length 48 have minimal weight 10 and are called optimal. There are 75 such codes found by Harada at al. in 2005. We use the method for constructing self-dual codes via automorphism of order three to find 102 optimal self-dual singly-even codes of length 48. We use computer algebra system Magma to construct the codes to compute their weight enumerators and automorphism groups. Each of our codes has exactly 768 vectors of weight 10 and automorphism group of order 3 or 6. As a result, the pool of known optimal singly-even self-dual codes of length 48 is increased to 177. We check that all these codes are pair wise inequivalent.
Explorations | Mathematics

PRELIMINARIES

Prior to the start of this paper, it is necessary that certain terms be defined. We assume the reader has a background in Linear Algebra and Modern Algebra. Let $GF(q)$ be a finite field with $q$ elements (where $q = p^k$ and $p$ is prime) and $n$ be a positive integer. Let $GF(q)^n$ denote the vector space of all $n$-tuples with entries from $GF(q)$. Any $k$ dimensional linear subspace of $GF(q)^n$ is called a $[n,k]$ code. The number $n$ is called the block length of the code. Any $k$ by $n$ matrix with row space equal to an $[n,k]$ code $C$ is called a generator matrix of $C$. The weight of a vector $v \in GF(q)^n$, $wt(v)$, is the number of nonzero entries of $v$.

The smallest weight of the nonzero code vectors is known as the minimum weight of the code. An $[n,k]$ code is called an $[n,k,d]$ code if its minimum weight is $d$. Codes are used for error correction when information is sent via noisy channels.

Example. The matrix

\[
G_8 = \begin{pmatrix}
1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 \\
0 & 1 & 1 & 0 & 1 & 1 & 0 & 0 \\
1 & 0 & 1 & 1 & 0 & 1 & 0 & 0
\end{pmatrix}
\]

generates an $[8,4,4]$ self-dual binary (over $GF(2)$) code, $C_8$. We will illustrate how error correction works with $C_8$. For us, a piece of information which has to be transmitted is a binary vector, $u$, of length 4. We encode $u$ into a vector $v = uG_8$ from $C_8$, where $uG_8$ is the usual multiplication of a vector and a matrix over $GF(2)$. Then we send $v$ through the channel. The noise introduces errors and the received vector is $v' = v + e$, where $e$ is the error vector of 8 bits. In general, $v'$ is not in $C_8$. The Hamming distance between two vectors $x$ and $z$ from $GF(2)^8$ is $d(x, z) = wt(x - z)$. In other words, $d(x, z)$ equals the number of entries where $x$ and $z$ differ. We decode $v'$ to a closest vector from $C_8$ with respect to the Hamming distance. That vector corresponds to a unique vector of four bits under reversed encoding. We will show that when $wt(e) \leq 1$, that vector is exactly $u$. It can be checked that the distance between any two different vectors in $C_8$ is at least 4. It follows that the spheres in $GF(2)^8$ with radius one centered at the code vectors of $C_8$ are disjoint. As $d(v', v) = wt(v' - v) = wt(e) = 1$, $v'$ is in a unique sphere of radius one centered in $v$. Therefore, the procedure described above recovers the vector $u$. Thus the code $C_8$ can correct one error.

For any real number $\tau$, let $[\tau]$ denote the largest integer not greater than $\tau$. In general, an $[n,k,d]$ code over $GF(q)$ can correct up to $[(d - 1)/2]$ errors [8]. Codes with larger minimum weight have better error-correcting capabilities. Many of the known good codes have additional properties as being self-dual or having automorphisms. Under the inner product $\langle u, v \rangle = u_1v_1 + \cdots + u_nv_n$ in $GF(2)^n$, the dual code of $C$ is $C^\perp = \{v \in GF(2)^n | \langle u, v \rangle = 0 \ \forall \ u \in C\}$. A code $C$ is self-dual if $C^\perp = C$. Furthermore, a doubly-even code is a self-dual code that has only weights divisible by 4; otherwise the code is known as singly-even.

The following bound on the minimum distance $d$ of a binary self-dual $[n,n/2,d]$ code is obtained in [9]:

\[
d \leq \begin{cases}
4[n/24] + 6 & \text{if } n \equiv 22 \pmod{24}; \\
4[n/24] + 4 & \text{otherwise}.
\end{cases}
\]

If a self-dual code meets the upper bound, it is known as extremal. Any extremal code of length a multiple of 24 must be doubly-even [9]. Two binary codes are called equivalent if one can be obtained
Kristy Mitchell

from the other by only permuting the entries of its vectors using a single permutation. Up to equivalence, there are unique extremal codes of length 24 and 48 [8], [5].

The best codes in the class of singly-even self-dual codes of length 48 have minimum distance 10 [3]. Such codes are called optimal. We investigate the optimal self-dual singly-even [48,24,10] codes.

Let \( A_k \) be the number of words of weight \( k \) in a code \( C \). Then the polynomial

\[
\sum_{k=0}^{n} A_k y^k
\]

of the variable \( y \) is called the weight enumerator of \( C \). The weight enumerator provides information about the distribution of weights in the code. Since permuting entries in a vector does not change its weight, equivalent codes have equal weight enumerators.

Example. The weight enumerator of \( C_4 \) is \( 1 + 4y^4 + y^8 \) because this code has the zero vector, the all one vector, and 14 vectors of weight 4.

There are two possible weight enumerators for optimal self-dual singly-even \([48,24,10]\) codes [3]:

\[
W_{48,1} = 1 + 704y^{10} + 8976y^{12} + 56896y^{14} + \cdots \quad \text{and}
\]

\[
W_{48,2} = 1 + 768y^{10} + 8592y^{12} + 57600y^{14} + \cdots.
\]

All self-dual codes which have weight enumerator \( W_{48,1} \) are known. Proposition 3.7 from [4] states that there are exactly ten inequivalent such codes. Each of these ten codes is a neighbor of the unique extremal code of length 48, \( q_{48} \) [8, section 6.5]. A neighbor of \( q_{48} \) is any code generated by \( q_{48} \cap \langle v \rangle \) and \( v \) for some \( v \notin q_{48} \), where \( \langle v \rangle \) is the code generated by \( v \). All \([48,24,10]\) neighbors of \( q_{48} \) are determined in [4]. There are 74 such codes up to equivalence. The first ten of the neighbors of \( q_{48} \) have weight enumerator \( W_{48,1} \), and the remaining 64 of them have weight enumerator \( W_{48,2} \). A \([48,24,10]\) self-dual code with weight enumerator \( W_{48,2} \) which is not a neighbor of \( q_{48} \) is also provided there.

In this work, we show that there are new, previous unknown \([48,24,10]\) self-dual codes with weight enumerator \( W_{48,2} \). We find 102 such codes.

METHODS

We use the method of constructing self-dual codes with automorphisms developed in [6] and [10]. A permutation is called an automorphism of a code if it sends the code to itself. We look for codes which have automorphism of order 3 with no fixed coordinate positions. Let \( C \) be a binary self-dual code having length 48 and automorphism

\[
\sigma = (1,2,3)(4,5,6) \cdots (46,47,48)
\]

of order 3 with 16 disjoint 3-cycles.

We denote the cycle position sets \( \sigma \) by \( \Omega_1 = \{1,2,3\}, \ldots, \Omega_{16} = \{46,47,48\} \). Let

\[
F_\sigma(C) = \{ v \in C : v \sigma = v \}
\]

and

\[
E_\sigma(C) = \{ v \in C : \text{wt}(v|\Omega_i) \equiv 0 \pmod{2}, i = 1,2,\ldots,16 \}
\]

where \( v|\Omega_i \) is the restriction of \( v \) to \( \Omega_i \). For example, if \( v = 101000 \ldots 110 \) is a vector from \( E_\sigma(C) \), then \( v|\Omega_1 = 101, \) \( v|\Omega_2 = 000, \) \( \ldots, v|\Omega_{16} = 110 \) are vectors of length three of even weight. If \( v = 000111 \ldots 111 \) is a vector from \( F_\sigma(C) \), then \( v|\Omega_1 = 000, \) \( v|\Omega_2 = 111, \) \( \ldots, v|\Omega_{16} = 111 \) are repetition vectors of length three.

It is known [6], that \( F_\sigma(C) \) and \( E_\sigma(C) \) are linear subspaces and the following lemma holds.
**Lemma 1** The code $C$ is a direct sum of the subcodes $F_3(C)$ and $E_3(C)$.

Example. The code $C_8$ has automorphism $\lambda = (1,2,3)(4,5,6)$ of order 3 with two 3-cycles and two fixed points. The subcodes $F_3(C_8)$ and $E_3(C_8)$ are generated by the matrices
\[
\begin{pmatrix}
1 & 1 & 1 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1 & 1 & 1 & 0 & 1
\end{pmatrix}
\quad \text{and} \quad
\begin{pmatrix}
0 & 1 & 1 & 0 & 1 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 & 1 & 1 & 0 & 1
\end{pmatrix}
\]
correspondingly. Because $\lambda$ has two fixed points, the vectors from $E_3(C_8)$ must end with two zeros by an extension of the definition.

Knowing $F_3(C)$ and $E_3(C)$, we can recover $C$. For that reason, we consider some additional properties of these two subcodes. A vector $v$ belongs to $F_3(C)$ if and only if $v$ belongs to $C$ and $v$ is constant on each cycle. We use a projection $\pi: F_3(C) \to F_2^{16}$ by $(v^T)_i = v_j$ for some $j \in \Omega_i$, $i = 1,2, \ldots, 16$. The map $\pi$ is called a contraction map because for each set of cycle positions, $\Omega_i$, $\pi$ replaces the three equal entries of $v$ with one of them.

Example. The matrix
\[
\begin{pmatrix}
1 & 0 & 1 & 0 \\
0 & 1 & 0 & 1
\end{pmatrix}
\]
generates the contracted code $\pi(F_3(C_8))$. One can check that this is a $[4,2]$ binary self-dual code. As we will see in the next theorem, the contracted code is always self-dual.

Let $P$ be the subset of the factor ring $GF(2)[x]/(x^3 - 1)$ consisting of all even weight polynomials. Denote $e = x + x^2$, $xe = 1 + x^2$, and $x^2e = 1 + x$. It is easy to check that $P = \{0, e, xe, x^2e\}$ is a field with 4 elements. Hence, $P$ is isomorphic to $GF(4)$. For $v$ in $E_3(C)$ and for $j$ in $\{1,2, \ldots, 16\}$, we map the restriction $v|_{\Omega_j} = (v_{2j-2},v_{2j-1},v_{2j})$ into $v_{2j-2} + v_{2j-1}x^2$. This polynomial belongs to $P$ because the weight of $(v_0,v_1,v_2)$ is even. Thus, we define a map $\varphi: E_3(C) \to P^{16}$.

A *Hermitian self-dual code* is self-dual with respect to this inner product. The inner product is similar to the Hermitian inner product in complex vector spaces. Complex conjugation is an automorphism of order two in the complex number field. In the definition above, it is replaced with squaring which is an automorphism of order two of $P = GF(4)$.

Example. Let delete the last two coordinates of $E_3(C)$ and denote the result by $E_3(C_8)^*$. The code $E_3(C_8)^*$ is generated by the matrix
\[
\begin{pmatrix}
0 & 1 & 1 & 0 & 1 & 1 \\
1 & 0 & 1 & 1 & 0 & 1
\end{pmatrix}
\]
Replacing the restrictions of the rows on $\Omega_1$ and $\Omega_2$ with the corresponding elements from $P$ produces the matrix $\begin{pmatrix} e & e \\ xe & xe \end{pmatrix}$. Since the second row is a multiple of the first row, this matrix generates a $[2,1]$ code over $GF(4)$. One can check that this is a Hermitian self-dual code.

The method we use relies on the following theorem which is a specialization of a result in [6].

**Theorem 2** A binary code $C$ of length 48 with an automorphism $\sigma$ is self-dual if and only if the following two conditions hold:

(i) $C_8 = \pi(F_3(C))$ is a self-dual binary code of length 16;
(ii) $C_{16} = \pi(E_3(C))$ is a Hermitian self-dual code of length 16 over $GF(4)$.

Complete classifications of the binary self-dual codes of length 16 and of the Hermitian self-dual codes of length 16 over $GF(4)$ are presented in [7] and [2]. By selecting one code of each type, applying
the inverse maps of $\pi$ and $\varphi$, and combining them in different ways we can obtain many [48,24] self-dual binary codes with automorphism $\sigma$ can be obtained in this way.

RESULTS

Let $\sigma$ be an automorphism of a [48,24,10] self-dual code $C$ with weight enumerator $W_{48,2}$.

Lemma 3 The code $C_{\pi}$ is equivalent to the [16,8,4] binary self-dual code $F_{16}$ given in [7].

Proof. It is pointed out in the previous section that $C_{\pi}$ is a binary self-dual code of length 16. A weight 3 vector from $C_{\pi}$ corresponds to a weight 9 vector from $C$. Since the minimal weight of $C$ is 10, the minimal weight of $C_{\pi}$ is at least 4. Up to equivalence, there are three such codes [7]. The first two of them have weight enumerator

$$W_1 = 1 + 28y^4 + 198y^8 + 28y^{12} + y^{16}. $$

The third one, $F_{16}$, has weight enumerator

$$W_2 = 1 + 12y^4 + 64y^6 + 102y^8 + 64y^{10} + 12y^{12} + y^{16}. $$

Let $A_i$ and $a_i$ be the number of vectors of weight $i$ in the code $C$ and $C_{\sigma}$, correspondingly. The orbit $\{v, v\sigma, v\sigma^2\}$ of a vector $v$ from $C$ under $\sigma$ has length 1 or 3 because the order of $\sigma$ is 3. The length of the orbit $\{v, v\sigma, v\sigma^2\}$ is one if and only if $v$ is in $E_3(C)$. These orbits form a partition $C$. Hence, $A_{3i} \equiv a_i (\text{mod } 3)$ for $0 \leq i \leq 16$. These conditions do not hold for $W_1$ since $A_{12} \equiv 8592 \equiv 0$ (mod 3) and $a_4 = 28 \equiv 1$ (mod 3). An easy check shows that the conditions hold for $W_2$.

We use

$$MF_{16} = \begin{pmatrix}
1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
1 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\
1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}$$

as a generator matrix of $F_{16}$. Let's denote $G_1$ the automorphism group of $F_{16}$. Applying the Magma function AutomorphismGroup shows that the order of $G_1$ is 72728.

Lemma 4 The code $C_{\varphi}$ is a [16,8,6] Hermitian self-dual code over $GF(4)$ equivalent to one of the codes $D_{16,i}$, $52 \leq i \leq 55$, given in [2].

Proof. Each nonzero entry of a vector from $C_{\varphi}$ contributes 2 to the weight of the corresponding vector from $E_3(C)$. Hence the minimum weight of $C_{\varphi}$ is at least 5. Any Hermitian self-dual code contains only vectors of even weight. Thus, the minimum weight of $C_{\varphi}$ is at least 6. Among all [16,8] Hermitian self-dual code over $GF(4)$ listed in [2], only the codes $D_{16,i}$, $52 \leq i \leq 55$, meet this requirement.

The following generator matrices for the codes $D_{16,i}$, $52 \leq i \leq 55$, are provided in [2]:
Here $GF(4) = \{0, 1, w, w^4\}$ with $w^2 = 1 + w$.

Let $\pi^{-1}(MF_{16})$ be the 8 by 48 matrix obtained from $MF_{16}$ by repeating each coordinate three times. Let $\alpha$ be a permutation from the symmetric group of degree 16, and let $M_\alpha^i$ be the matrix $M_i$ with columns permuted with $\alpha$ where $i \in \{52, 53, 54, 55\}$. Let $\varphi^{-1}(M_\alpha^i)$ denote the 16 by 48 matrix obtained from $M_\alpha^i$ by replacing each of its entries with a matrix block according to the map

\[
\begin{align*}
0 &\mapsto \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}, \\
1 &\mapsto \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \end{pmatrix}, \\
w &\mapsto \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}, \\
w^2 &\mapsto \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}.
\end{align*}
\]

Then the code $C_{i, \alpha}$ generated by the rows of $\pi^{-1}(MF_{16})$ and $\varphi^{-1}(M_\alpha^i)$ is a binary self-dual [48,24] singly-even code.
Lemma 5. If \( \alpha_1 \) and \( \alpha_2 \) belong to the same left coset of the automorphism group \( G_1 \) of \( F_{16} \), then the codes \( C_{1,\alpha_1} \) and \( C_{1,\alpha_2} \) are equivalent.

Proof. Let \( \alpha_2 = \alpha_1 g \) where \( g \) is in \( G_1 \). The codes \( C_{1,\alpha_1} \) and \( C_{1,\alpha_2} \) are generated by the matrices

\[
\begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_1})
\end{pmatrix} \quad \text{and} \quad \begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_2})
\end{pmatrix}.
\]

The matrices

\[
\begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_1})
\end{pmatrix} = \begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_2})
\end{pmatrix}
\]

and

\[
\begin{pmatrix}
\pi^{-1}(MF_{16})^{a_2^{-1}} \\
\varphi^{-1}(M_i^{a_2})^{a_2^{-1}}
\end{pmatrix} = \begin{pmatrix}
\pi^{-1}(MF_{16})^{a_2} \\
\varphi^{-1}(M_i^{a_2})^{a_2}
\end{pmatrix}
\]

Generate equivalent codes. Since \( g \) is in the automorphism group of the code \( F_{16} \),

\[
\begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_1})
\end{pmatrix} = \begin{pmatrix}
\pi^{-1}(MF_{16}) \\
\varphi^{-1}(M_i^{a_2})
\end{pmatrix}
\]

The Lemma follows.

A computer search with Magma [1] over a large number of representatives of left cosets of \( G_1 \) in the symmetric group of degree 16 produced 73 permutations \( \alpha \) which determine optimal codes \( C_{52,\alpha} \), 7 permutations \( \alpha \) which determine optimal codes \( C_{53,\alpha} \), 5 permutations \( \alpha \) which determine optimal codes \( C_{54,\alpha} \), and 17 permutations \( \alpha \) which determine optimal codes \( C_{55,\alpha} \). The 102 permutations are given in Table 1 through Table 4 in the Appendix.

CONCLUSION

We used the Magma function IsEquivalent [1] to check that all of the 102 optimal codes we found in this work are pair wise inequivalent. They are also inequivalent to any of the codes found in [4]. We computed the weight enumerators and automorphism groups of the codes. Each code has weight enumerator \( W_{48,2} \), and automorphism group of order 3 or 6. To the best of our knowledge, these codes are previously unknown. As a result of this work, the pool of optimal self-dual codes of length 48 is increased by 102 new codes.

Acknowledgment

The authors are grateful to the anonymous reviewers. Due to their criticism, the quality of the paper was considerably improved.
REFERENCES


Table 1: The Codes $C_{52,\alpha}$

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Table 2: The Codes $\mathcal{C}_{53,\alpha}$

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Transitive Inference in Rats Using Odor Stimuli: Manual Versus Automated Training Procedures

Mary Elizabeth Pacewicz
University of North Carolina Wilmington
Faculty Mentor: Kate Bruce
University of North Carolina Wilmington

ABSTRACT
Transitivity is a type of higher-order learning that is demonstrated when untrained relations emerge after specific relations have been trained. The formation of a hierarchy is required to determine the transitive relations between stimuli. To train the hierarchy A<B<C<D<E, the pairs A-B+, B-C+, C-D+, and D-E+ are presented (the plus sign indicates the reinforced stimulus). After training, novel pairs, such as A-C+ and B-D+ are presented to test for transitive inference. This study compares three rats’ performances on tests of novel pairs in a manual procedure and four rats’ performances in an automated procedure. While automated procedures generally increase efficiency and objectivity and are a preferred method to manual procedures, rats trained using the automated apparatus failed to meet baseline training criterion and were not successful at tests of novel pairs. All rats trained with the manual procedure demonstrated transitive inference. The ecological significance of transitive inference and the testing procedure is discussed.

INTRODUCTION
Concept learning is a type of higher-order learning requiring the formation of categories. Categories are formed by utilizing features, such as shape or function, to group stimuli (Lazareva & Wasserman, 2008). Perceptual concepts, nonsimilarity-based concepts, and abstract concepts are three types of concepts used to evaluate and categorize stimuli. Perceptual concepts are shown when physical dimensions of the stimuli are the basis for categorization. Nonsimilarity-based concepts include stimuli that are physically different but have a similar function (Lazareva & Wasserman, 2008).

Abstract concepts are demonstrated when the relations among the stimuli are used to categorize the stimuli in context with one another (Lazareva & Wasserman, 2008). For example, if it has been trained that stimulus A equals stimulus B (A=B) and stimulus B equals stimulus C (B=C), the presentation of stimulus A and C would create a novel situation. However, by utilizing information from previously trained pairs, a relation between the two could be made. This relation would be that stimulus A equals stimulus C (A=C) (Sidman, Rauzin, Lazar, Cunningham, Tailby, & Carrigan, 1982). The example of the relation between stimulus A and C is an example of transitivity, one of the properties of the equivalence concept.

Equivalence involves making relations about items that have never been trained together (Davis, 1992; Lazareva & Wasserman, 2006). For example, if the
pairs A=B and B=C are trained during baseline training, they are grouped into one class. A class is a group of specific stimuli that are interchangeable (McIntire, Cleary, & Thompson, 1987). Training that classifies stimuli A, B, and C as one class allows novel probe tests to be given to test the relations that have been formed between the stimuli. The emergence of untrained relations between novel pairs such as reflexivity (A=A, B=B, C=C), symmetry (B=A, C=B), and transitivity (A=C, C=A) represents equivalence; the stimuli have never been presented together or in that order, yet subjects may respond as if the stimuli are related (Sidman, 2000). Nonhumans do not typically show the formation of all equivalence relations. In fact, the formation of equivalence relations has been considered a form of higher-order learning that requires the use of language (Hayes, 1989). However, Schusterman and Kastak (1993) provided the first concrete evidence that, given extensive training, a nonhuman animal (a sea lion) could form all equivalence relations.

Schusterman and Kastak (1993) trained a California sea lion on 30 equivalence classes in order to provide multiple exemplars. Each class was composed of three stimuli (A, B, and C). The first phase of training involved presentations of stimuli $A_1$-$A_{30}$ as samples and $B_1$-$B_{30}$ as comparisons. An example of this training is presenting $A_i$ as the sample and $B_i$ and $B_x$ as comparisons. Responses to $B_i$ were reinforced and responses to any other B stimulus ($B_x$) would not result in reinforcement. After this training, 12 of the A=B pairs were tested and then trained for symmetry (B=A). Not until the sea lion performed at a high level on presentations of B=A did the training of B=C begin. Once the sea lion met criterion on the B=A training, 30 B=C pairs were trained. Then, the same 12 pairs that were used to test B=A were used to test and train symmetry with the B=C pairs. After this symmetry training (C=B), the same 12 potential equivalence classes were tested and trained for transitivity (A=C). Following this training, those 12 potential equivalence classes were retested for C=A symmetry. This extensive training provided multiple exemplars for the sea lion before the final test of equivalence was conducted.

A higher-order learning task that involves the presentation of novel pairs of stimuli to determine the relations that have been made is a test for transitive inference. In a typical procedure to test for transitive inference, a hierarchical order of the stimuli is trained. For example, given the two statements “Alex is shorter than Brad” and “Brad is shorter than Chris,” the hierarchy in terms of height would be Alex<Brad<Chris. The inference that Alex is shorter than Chris can be determined due to their relationships to Brad in the hierarchy.

The training of a hierarchy is done by presenting pairs of stimuli and always reinforcing responses to one stimulus and never reinforcing responses to the other stimulus (Lazareva et al., 2004). For example, given the three stimuli A, B, and C, the hierarchical order A<B<C can be trained. This can be done by presenting two pairs, A-B and B-C. In the pair A-B, responses to B are always reinforced and responses to A are never reinforced. With the pair B-C, responses to C are always reinforced and responses to B are never reinforced. Once the training of the hierarchical order is complete, the test for transitive inference can be presented. This involves the presentation of the novel pair A-C. Using the trained hierarchy, a relation between stimulus A and stimulus C can be made (A<C). Though information relating stimulus A and C has not been directly trained, a relation between the two stimuli can be inferred due to their relation to stimulus B (A<B<C) (Davis, 1992).
Though a hierarchical order can be established using three stimuli, the novel pair (A-C) does not represent a true test of transitive inference. Stimuli A and C are called end stimuli, and success on a novel pair containing end stimuli can be explained by reinforcement histories (Dusek & Eichenbaum, 1997). Therefore, a minimum of a five-item list is needed to ensure that the novel test pair does not include an end stimulus (Weaver, Steirn, & Zentall, 1997). In a five-item list (A, B, C, D, and E), training would occur by presenting the following pairs: A-B, B-C, C-D, and D-E. Within these pairs, one stimulus would always be reinforced and the other would never be reinforced, A-B+ , B-C+, C-D+, and D-E+ (the plus sign indicates the reinforced stimulus).

The five-item list allows for a true test of transitive inference because two of the middle stimuli have equal reinforcement histories and have never been presented together (stimulus B and stimulus D). Success on B-D+ demonstrates transitive inference because both B and D have been previously reinforced 50 percent of the time they were presented and not reinforced the other 50 percent of the time. B and D have equal reinforcement histories and therefore, during a transitive inference test, the choice of D+ indicates that a relation between stimuli has been formed (Weaver et al., 1997).

Transitive inference has been demonstrated in a number of non-human species including chimpanzees (Gillan, 1981), rhesus macaques (Treichler & Van Tilburg, 1996), hooded crows (Lazareva et al., 2004), pigeons (von Fersen, Wynne, Delius, & Staddon, 1991; Lazareva & Wasserman, 2006), and rats (Davis, 1992; Dusek & Eichenbaum, 1997). Davis (1992) trained four rats with the series A-B+, B-C+, C-D+, and D-E+ to establish the hierarchy A<B<C<D<E. Olfactory stimuli were used, and the apparatus was a “Y” maze with a door at the end of each arm of the “Y.” The doors were scented with different food flavoring. The rats were trained on the following: A-B+, B-C+, A-C+, C-D+, D-E+, C-E+, and A-E+. Then, the novel pair, B-D+ was presented, and the rats chose D over B even without training.

Dusek and Eichenbaum (1997) also used olfactory stimuli, cups of scented sand, to train rats with a five item list (A>B>C>D>E). Pairs were trained in five phases similar to Davis (1992). Transitive inference was tested with 10 trials of the B-D pair and 10 trials of the A-E pair. New scents (W-X and Y-Z) were also presented to measure the rate at which the rats learned novel pairs. The rats demonstrated transitive inference when tested on the B-D pair and showed some evidence for learning the novel scent pairs.

Jordan (2009) replicated Dusek and Eichenbaum’s (1997) methods to train three rats on two five-item lists. She reported results from two rats and demonstrated transitive inference. In the current study, I will present results from the third rat trained with the Jordan (2009) procedure. Her procedure involved the manual presentation of all stimuli, and I will also compare her findings related to transitive inference using a manual procedure to those obtained using an automated procedure.

Success with olfactory tasks has been demonstrated with rats in automated apparatuses. Otto and Eichenbaum (1992) trained rats in a delayed non-match-to-sample task using odor stimuli that were presented through a nose poke in the operant
chamber. The rats rapidly learned the task. Lionello-DeNolf and Mihalick (2006) used an automated olfactory apparatus to test rats’ ability to learn a simple discrimination task, followed by a reversal. The results of the study supported the use of an automated apparatus in olfactory tasks and suggested that more complex tasks could be tested using an automated apparatus.

The use of an automated apparatus increases both efficiency and objectivity, and therefore, is a preferred method to manual procedures. Transitive inference tasks have never been tested in an automated apparatus, and the objective of this study was to train rats to form a hierarchy with five scents and test the performance on a transitive inference task.

We expected that transitive inference would be apparent using the manual and automated apparatuses. We hypothesized that rats’ performances on the B-D+ probe would be above chance levels, and the rats would choose the D stimulus over the B stimulus. We also expected that rats would learn the B-D+ relation more rapidly than a relation between two unfamiliar, untrained scents.

METHOD
Manual Procedure
Subjects
Three male Sprague-Dawley rats were trained using a manual procedure described by Jordan (2009). Jordan reported data from two rats (P39 and P23), and data from rat S16 is reported here. Rats were kept at 85-90% of their free-feeding weight with unlimited access to water. Approximately 30 minutes after finishing their session, the rats were fed 10-15 grams of Purina® Rat Chow. They were housed individually in a colony room that was illuminated on a 12-hour reversed light/dark cycle.

Apparatus
Testing occurred in an operant chamber with a modified front wall. The wall had a gap allowing a Plexiglas tray to be pushed into the chamber to deliver the stimuli during testing (see Figure 1).

Stimuli were lids scented with spices purchased from the Great American and the Rocky Mountain Spice Companies. Lids were stored for at least 24 hours before use in containers with spices (caraway, marjoram, celery, mustard, allspice, lime, anise, sage, onion, paprika, raspberry, thyme, cinnamon, garlic, savory, coriander, bay, carob, Worcestershire, tomato, fennel, beet, ginger, turmeric, cumin, nutmeg, clove, and dill).

Scented lids were placed on top of 2-ounce plastic cups. A layer of sand was placed in the bottom of each cup. Sucrose pellets (.45 mg) were used as reinforcers and were buried 0.5-0.8 millimeters below the surface of the sand underneath the scented lids. The cups with scented lids on top were placed in two holes (5 cm diameter) cut in the Plexiglas tray. All housing and testing procedures were approved.
by the Institutional Animal Care and Use Committee.

Procedure

Shaping

The rats were first trained to dig for the sucrose pellets. The first step in this training involved putting the sucrose pellets on top of the cups containing sand. Eventually, the pellets were buried between 0.5-0.8 mm below the surface. The rats were then trained to remove lids by pushing them off of the sand cups.

Five-Item List Training

Two five-item lists were trained as described in Jordan (2009). List one consisted of scents A-E, and list two consisted of scents F-J. Scents were presented in pairs of two (A-B<sup>+</sup>, B-C<sup>+</sup>, C-D<sup>+</sup>, D-E<sup>+</sup>, F-G<sup>+</sup>, G-H<sup>+</sup>, H-I<sup>+</sup>, and I-J<sup>+</sup>), to create a hierarchy (A<B<C<D<E and F<G<H<I<J). In each pair a response to one scent was always reinforced and response to the other scent never reinforced. Pushing the scented lid off of the cup was counted as a response. Correct responses were reinforced with a sucrose pellet. If an incorrect response was made, the Plexiglas tray was immediately removed from the chamber. If two minutes elapsed without a response to either cup, the tray was removed from the chamber and the next trial began.

The first five-item list was trained in four phases. The first phase consisted of the presentation of each pair in blocks of six trials. Six trials of A-B<sup>+</sup> were presented, followed by B-C<sup>+</sup>, C-D<sup>+</sup>, and D-E<sup>+</sup>, respectively. No more than two identical trials were presented in a row, and the reinforced scents were equally balanced between the left and right side. Criterion of 80% correct on each trial type for two consecutive days was required before proceeding to the following phase. In phase two, three trials of A-B<sup>+</sup> were presented followed by three trials of B-C<sup>+</sup>, then C-D<sup>+</sup>, and D-E<sup>+</sup>. This sequence was repeated for a total of 24 trials. Six blocks of four trials were presented in phase three. Each block had one A-B<sup>+</sup>, B-C<sup>+</sup>, C-D<sup>+</sup>, and D-E<sup>+</sup> pair presented in a random order. Phase four consisted of 24 trials with pairs presented in a random order. Six trials of each pair were presented with no more than two identical trials occurring in a row.

Once phase four criterion was met, a probe session followed. The session began with eight baseline pair trials. Two of each pair were presented, and 7/8 correct was required for the rat to be given novel pairs. If 7/8 correct was not achieved, the remainder of the session consisted of phase four training. If the criterion of 7/8 was reached, the probe test was given. Probe testing included two presentations of A-C<sup>+</sup>, A-D<sup>+</sup>, A-E<sup>+</sup>, B-E<sup>+</sup>, C-E<sup>+</sup>, B-D<sup>+</sup>, X-Y<sup>+</sup>, and one trial of each baseline pair. The X-Y<sup>+</sup> pair consisted of two novel scents, used to control for learning during the probe testing.

After completion of probe testing, two more days of training were given in phase five. Phase five included two trials of A-C<sup>+</sup>, A-D<sup>+</sup>, A-E<sup>+</sup>, B-E<sup>+</sup>, C-E<sup>+</sup>, three trials of B-D<sup>+</sup> and X-Y<sup>+</sup>, and two trials of each baseline pair. Following the two days of phase five, the second five-item list was trained. The second five-item list was trained in the same way the first list was trained.

Automated Procedure

Subjects

Four male Sprague-Dawley rats were trained for the automated procedure. They were kept at 85-90% of their free-feeding weight and given unlimited access to water. They were fed about 10-15 grams of Purina® Rat Chow after a minimum of 30 minutes after the completion of the testing session. The rats were kept on a 12 hour reverse light/dark cycle.

Apparatus

All housing and testing procedures were approved by the Institutional Animal Care and Use Committee. An operant chamber was used for training and testing (see
Figure 2A). The left side of the chamber had three nose pokes, with photo beam sensors that indicated when a response was made (see Figure 2B). Nose pokes were the response ports where scented air was pumped in. Only the left and right nose pokes were used in the transitive inference procedure. The right side of the chamber stored a pellet dispenser. Correct responses were reinforced by the presentation of a sucrose pellet. A house light was used to indicate the beginning and end of the session and to indicate a timeout after an incorrect response.

The stimuli used were scented oils from the Great American Spice Company. Peach, grape, bubblegum, strawberry, and banana were the scents used during baseline training and probe testing. Raspberry, vanilla, blueberry, and pineapple were used as unfamiliar scents during probe testing. Five ml of each scent was poured into each of three glass jars. One jar was attached to each olfactometer (see Figure 2C). One olfactometer was assigned to each nose poke. The jars were connected to the olfactometers by a lid that was connected to a pump. There was one pump per jar, and each pump was attached to a solenoid (see Figure 2D). Solenoids could be opened or closed, allowing for the corresponding scent to be pumped into the nose poke. A vacuum pump was used to constantly remove the scented air from the nose pokes to ensure that it did not spread into the chamber.

MedPC software was used to create the transitive inference programs. Four different programs were used in each phase. The programs were executed on a Dell desktop computer which was connected to the operant chamber.

Procedure

Magazine Training

One pellet was delivered and the hopper light turned on. The hopper was where the pellets were delivered, and the light was turned on to cue the rats that reinforcement had been delivered. The hopper light remained on for 45 seconds. After an intertrial interval of 15 seconds, another pellet was delivered and the hopper light turned
on. This procedure was repeated 25 times, with a total of 25 pellets delivered. After the completion of the session, the pellets remaining in the hopper were counted. Criterion to move to any nose poke shaping was the consumption of all 25 pellets.

Any Nose Poke Shaping

Sessions ran for 25 minutes. Both the left and right nose pokes were activated, and a response to either nose poke resulted in reinforcement. One pellet was delivered and the hopper light remained on for five seconds. One disruption of the photo beam was counted as one response. Criterion to move to nose poke shaping was set at 25 responses in one session.

Nose Poke Shaping

Sessions consisted of 48 trials. For a trial, either the left or right nose poke was activated. A response to the activated nose poke resulted in reinforcement. Reinforcement consisted of the delivery of a pellet. The hopper light was turned on and remained on for five seconds. A response was defined as breaking the photo beam in the nose poke. For the first day of nose poke shaping, only one response was required to receive reinforcement (FR1). Each day, the fixed ratio was increased by one (e.g. FR2 on day two). If responding slowed or stopped, the fixed ratio was decreased. Criterion was set at 45 rewards on a fixed ratio of five responses.

Five-Item List Training

Rats were trained to form a hierarchy of five scents (A, B, C, D, and E) by presenting the scents in four pairs (A-B+, B-C+, C-D+, and D-E+). In each pair a response to one scent was always reinforced and response to the other scent never reinforced. Responses were counted when the rat broke a photo beam in the nose poke. A correct response resulted in the hopper light turning on for five seconds as a pellet was delivered. If an incorrect response was made, the house light immediately turned off and resulted in a five-second timeout. After the five-second timeout, the next session began. This non-correction procedure was utilized throughout all phases.

Each rat was trained with the five scents: peach (A), grape (B), bubblegum (C), strawberry (D), and banana (E) during the 48 daily trials. Phase one consisted of four blocks of 12 trials. Only the A-B+ pair was presented in block one, followed by the B-C+ pair in block two, the C-D+ pair in block three, and the D-E+ pair in block four. Correct responses were reinforced with one sugar pellet which was released into the hopper. The hopper light remained on for five seconds. Incorrect responses resulted in a five-second timeout. Criterion to move to each phase was set at 10/12 (83%) correct on each type of pair for two consecutive days. In phase two, each pair was presented in blocks of six. A-B+ was the first block, followed by B-C+, C-D+, and D-E+ respectively. The blocks were then repeated so a total of 12 trials of each pair was completed. Phase three consisted of blocks of four trials. A-B+ was the first block of, then B-C+, C-D+, and D-E+. Once four trials of the D-E+ pair were completed, A-B+ pairs were presented again, followed by B-C+, etc. This order was repeated three times for a total of 12 trials of each pair. In phase four, each pair was presented once, starting with A-B+ and ending with D-E+. This sequence was repeated twelve times. The final phase, phase five, consisted of blocks of four trials in which each pair was presented once but in a random order. For example, the first block may be B-C+, A-B+, C-D+, and then D-E+ and the next block could be C-D+, D-E+, B-C+, and A-B+. Each pair was presented twelve times for a total of 48 trials.

Probe Testing

Once criterion was met during phase five, probe tests were given. Probe tests consisted of the presentation of B-D+ and X-Y+. The pair X-Y+ consisted of two novel scents which were used to control for
learning the novel pairs. Twenty-four trials of both pairs were presented each session for three sessions.

Following B-D⁺ and X-Y⁺ tests, retraining on phase five was given. Once the rat met criterion, more probe tests were given. End anchors A and E were presented (A-E⁺) and two novel stimuli were also presented (W-Z⁺). Twenty-four trials of both pairs were presented each session for three sessions.

RESULTS
Manual Procedure
S16 met baseline training criterion in 90 sessions. Figure 3 shows a breakdown of the number of sessions per phase.

After meeting criterion for List One Training, S16 was given probe testing with every possible combination of stimuli. Table 1 shows the number of trials correct for each pair for S16 and two rats from Jordan’s (2009) study, P39 and P23. All rats performed at above 90% correct for all transitive pairs. S16’s total percent correct out of the 24 trials, including baseline trials but excluding the two trials with unfamiliar scents, was 100%. On the two presentations of B-D⁺, S16 scored 2/2 (100%); that is, he chose D over B both times. The number of correct trials with the unfamiliar scents (X-Y⁺) is also presented in Table 1. S16 performed better on the tests with transitive pairs compared to the tests with unfamiliar scents (1/2, 50% correct).

S16 also met criterion in all four phases during List Two training. The total number of training sessions was 59. Figure 4 shows a breakdown of the number of sessions per phase.

Table 2 shows the number of trials correct for each pair during probe testing for S16 and two rats from Jordan’s (2009) study, P39 and P23. All rats performed at above 90% correct for all transitive pairs. S16’s total percent correct, including baseline trials but excluding the two trials with unfamiliar scents, was 90.91%. On the two presentations of G-I⁺, S16 scored 2/2 (100%). The number of correct trials with the unfamiliar scents (W-Z⁺) is also presented in Table 2. S16 performed better on the tests with transitive pairs compared to the tests with unfamiliar scents (0/2, 0% correct).

Automated Procedure
None of the rats trained with the automated procedure met criterion during baseline training. The mean number of sessions completed before retraining was terminated and subjects were either dropped...
from the study or given probe tests was 82.25. Figure 5 shows a breakdown of the number of sessions per phase each rat completed.

Y19 was dropped from the study using the automated procedure because of failure to meet criterion in phase two.

Y9 was presented with the A-E+ and W-Z+ probe test in three days of probe testing. A binomial test was conducted for each day for percent correct on A-E+ trials and W-Z+ trials. However, the binomial test for choice of E on A-E+ trials was not significant on any of the three days (15/24, 15/24, 18/24, respectively, all p > 0.05). The binomial test for choice of Z on W-Z+ trials on was not significant on days one and two (13/24 and 16/24, p > 0.05). On day three, Y9’s performance for choice of Z on W-Z+ trials was significant (17/24, p < 0.05). Figure 6 shows the percent correct on the final day of baseline training and all three days of probe testing. Y9 shows little evidence of transitive inference; while performance on the A-E+ trial finally reached significance on day three, it was not striking. Overall, learning appeared to be similar to learning the relation between the unfamiliar scents, W and Z.

Y10 was also presented with the A-E+ and W-Z+ probe test with three days of probe testing. Again, the binomial test for choice of E on A-E+ trials was not significant on day one (16/24, p > 0.05), but was on day two (17/24, p < 0.05) and three (19/24, p < 0.01). However, the binomial test for choice of Z on W-Z+ trials was significant on all three days (17/24, 17/24, and 22/24, all p < 0.05). Figure 7 shows the percent correct on the final day of baseline training and all three days of probe testing. Y10’s improvement in performance across the three days of probe testing provides some evidence for learning, however, no evidence for transitive inference. His performance was the same for A-E+ and W-Z+ trials.

Y10 was also presented with the B-D+ test.
and X-Y* probe test over three days. A binomial test was conducted for each day for percent correct on B-D* trials and X-Y* trials. The binomial test for choice of D on B-D* trials on day one was not significant (13/24, p>0.05), but was on days two (18/24, p<0.01) and three (21/24, p<0.01). The binomial test for choice of Y on X-Y* trials on day one was not significant (14/24, p>0.05), but was on day two (19/24, p<0.01) and three (21/24, p<0.01). Figure 8 shows the percent correct on the final day of baseline training and all three days of probe testing. Y10 shows evidence for learning over days. However, performance was identical for B-D* and X-Y* trials, so there is no evidence for transitive inference.

Y20 was presented with the B-D* and X-Y* probe test for three days. Figure 9 shows the percent correct on the final day of baseline training and all three days of probe testing. The binomial test for choice of D on B-D* trials was not significant on day one (13/24, p>0.05) or two (16/24, p>0.05), but was on day three (17/24, p<0.05). The binomial test for choice of Y on X-Y* trials was not significant on any of the three days (14/24, 15/24, 16/24, all p>0.05). Thus, Y20 showed no clear evidence of transitive inference or learning across the probe trials.

DISCUSSION
Manual Procedure
Overall, the results from the manual procedure show that S16 was able to make transitive inferences with both five-item lists. When presented with the novel pair B-D*, S16 chose D over B both times. Also, when presented with the novel pair G-I*, S16 chose I over G both times. The relations between novel pairs that emerged indicate that a hierarchy had been formed for both List One and List Two.

Automated Procedure
The results from the automated procedure were not very promising. Two of the four rats in the automated procedure never reached phase five, and of the two rats that reached phase five, only one was close to meeting criterion in phase five. Performance on the transitive inference probes was at chance levels.

Due to Y20’s health, it was unclear how much longer he would be able to test, so he was given the B-D* probe test before meeting training criterion. His poor performance
during training and on the probe tests may be attributed to old age. Y9 was presented with A-E+ probe tests because he reached phase five but could not meet criterion. Y9 had achieved 10/12 on each pair, just not on the same day. Y9 had been trained in all five phases, and we believed he would have been successful at the A-E+ pair. The A-E+ pair contains two end stimuli, and therefore, should be the easiest of all novel pairs to respond correctly to because the choice can be made based on reinforcement histories alone (Weaver et al., 1997). Y10 was the only rat to be tested on both the A-E+ and B-D+ pairs. He did not meet criterion in phase five. The decision to test Y10 on the B-D+ pair was made because he had met criterion of 10/12 on each pair on several days, just never consecutively.

The rats’ poor performances on novel probes in the automated procedure may be attributed to their failure to meet criterion during training. Other studies that involve abstract concepts, such as Schusterman and Kastak (1993), have shown that animals require extensive training before probe testing. Schusterman and Kastak demonstrated that a California sea lion was capable of forming equivalence relations, but only after extensive training. The California sea lion was extensively trained with multiple exemplars to criterion before novel tests of transitivity, symmetry, and equivalence were given. The success on the equivalence task may be due to the extensive training which prepared the sea lion for the probe tests. The rats in our automated procedure failed to fully meet the criterion for probe testing. Therefore, it may be argued that they did not receive the extensive training needed to form the five-item hierarchy.

Though the rats in the automated procedure did not reach criterion, they received much more training than the rats in the manual procedure. In the manual procedure, S16, was trained with 24 trials per session for 90 sessions. Rats in the automated procedure were trained with 48 trials per session for an average of 82.25 sessions. Despite the increased amount of training, the rats in the automated procedure did not meet criterion to receive probe tests, whereas S16 met criterion. This discrepancy between increased amount of training in the automated procedure and failure to meet criterion suggests that amount of training does not account for the automated procedure’s failure. By examining some of the differences between the manual and automated procedure, possible errors and improvements for future training in the automated procedure can be discussed.

Comparing the Two Procedures

One difference between the manual and automated procedure was the spatial difference between response and reinforcement. Rats trained in the manual procedure received reinforcement immediately after making a response. Rats in the automated procedure were required to make a response on the left side of the chamber, but the reinforcement was delivered on the right side of the chamber. The spatial distance between where the response was made and reinforcement was also increased the time between making a response and receiving reinforcement. In Otto and Eichenbaum’s (1992) study using an automated apparatus to test delayed non-match-to-sample tasks, there was not a long time or spatial delay between response and reinforcement. Access to water was used as reinforcement, and the water port was located directly above the nose poke. After making a correct response, the rats’ response was immediately reinforced. Otto and Eichenbaum’s success in training rats on delayed non-match-to-sample tasks using an automated apparatus may be attributed to the minimal time between when rats made a response and when they were reinforced. Moving the pellet dispenser
between the nose pokes in the automated procedure would decrease the spatial distance and time between when the rat makes a response and when reinforcement is delivered.

Using a photo beam may have also affected the rats’ performances in automated apparatus. Rather than having to make an explicit response, such as pushing a lid in the manual procedure, rats were required to make a less salient response. The photo beam was not visible to the rats, nor could disrupting it be heard or felt. If the rats had difficulty learning what response was required, this may have lengthened the amount of training needed.

The manual procedure also trained rats with different scents than the automated procedure. The manual procedure used spices whereas the automated procedure used scented oils, and all of the oils used were fruity (e.g., strawberry, grape, and banana). Though to us the oils were distinguishable, we do not know how the scents smelled to the rats. If this procedure was repeated, it would be useful to use scents that are more different (e.g., pecan, butter, and champagne). In addition, it may be useful to standardize the types of scents (fruits vs. spices) across procedures. This was not done in the current study because of the limited variety offered by the manufacturers we used.

Ecological Significance

Another difference between the manual procedure and the automated procedure is the ecological significance of the required response. The importance of utilizing ecologically significant procedures was demonstrated in a study by Wright and Delius (1994). In this study, pigeons were trained on match and non-match-to-sample tasks using different gravel types as stimuli. The stimuli were chosen by observing pigeons’ natural behavior of digging to find food. The pigeons learned the task at a much quicker rate than when traditional key-peck training methods are used. Traditional key-peck training with visual stimuli requires pigeons to peck at lights on a screen. The key-peck method is relatively “two-dimensional”, not allowing extensive manipulation with the screen, but Wright and Delius (1994) found that by using three-dimensional stimuli that could be manipulated, the pigeons learned the task much quicker. These findings are similar to the findings in our transitive inference study. The manual apparatus that used three-dimensional scented lids was much more successful and faster at training rats to form a five-item hierarchy.

Delius (1992) trained pigeons to discriminate between spheres and non-spheres. The stimuli were three-dimensional objects made of various materials and textures. Acquisition was very fast compared to other procedures using two-dimensional stimuli. Once the pigeons were trained, they were presented with novel stimuli and were able to discriminate between novel spheres and novel non-spheres. Pictures of the objects were also tested, and though the pigeons did discriminate between spheres and non-spheres, performance was lower than performance with the three-dimensional objects. The results from Delius (1992) suggest that the pigeons learned to discriminate between three-dimensional objects more quickly because the stimuli were more similar to stimuli found in the pigeons’ natural environment. The pigeons’ high performance and fast acquisition demonstrates the importance of using stimuli that are relevant to animals’ environmental experiences. It is possible to explain our results in terms of three-dimensional and two-dimensional stimuli. In the manual procedure, the scents were on the three-dimensional objects, Plexiglas lids. In the automated apparatus, the stimuli could be considered two-dimensional, like the pictures in Delius (1992). In order to make a response in the automated apparatus, the
rats did not have to manipulate the stimuli. Delius found that acquisition and performance were higher with three-dimensional stimuli compared to two-dimensional stimuli. These results are similar to our findings that the manual procedure succeeded in training a five-item hierarchy, but the automated procedure required more training and was not successful in training a hierarchy.

If the automated procedure was more difficult for the rats to learn because it is not ecologically significant, rats in this procedure may require more extensive training. Training the rats with different programs may help them learn the hierarchy more quickly. For example, Davis (1992) trained rats to form a five-item hierarchy by training one pair at a time. In phase one, only the A-B pair was presented. In phase two, only the B-C pair was presented. Phase three trained rats on the A-C pair, and phase four only presented the C-D pair. Phase five presented the D-E pair, phase six trained the C-E pair, and phase seven trained the A-E pair. The rats received extensive training on each adjacent pair as well as nonadjacent pairs. This procedure may have been successful because the rats were given experience with nonadjacent pairs before the transitive inference test.

Similarly, before the test of equivalence in Schusterman and Kastak’s (1993) study, the California sea lion was given multiple exemplars and had been trained and tested on tests of symmetry, transitivity, and equivalence. By first training the sea lion with symmetry, transitivity, and equivalence, the sea lion was familiar with these types of tests. Familiarizing our rats with the type of test that will be given on a probe day may be a useful addition to the automated procedure. Our automated procedure could be modified to train rats in a similar way as Lazareva and Wasserman (2006) and Davis (1992). Familiarizing our rats with the type of test that will be given on a probe day may be a useful addition to the automated procedure.

The wide range of species (e.g., macaque monkeys (Trechler & Van Tilburg, 1996), pigeons (von Ferson, Wynne, Delius, & Staddon, 1991; Lazareva & Wasserman, 2006), and rats (Davis, 1992; Dusek & Eichenbaum, 1997)) that have succeeded on transitive inference tasks may be related to abilities required for living in social groups. Animals living in social groups must be able to recognize others in their groups as well as monitor social rank and status. For example, male elephant seals fight for access to females and less than one-third of them actually mate each season (LeBouef, 1974). Body size is one of the factors that influence each male’s social rank. Central males are usually the largest and most experienced fighters. Peripheral males are restricted to the periphery of the social group, and outside males have little, if any access to females (Modig, 1996). Instead of fighting every male in the group, a newcomer can determine his place in the hierarchy based on his interactions with just a few individuals.

Male elephant seals may utilize physical characteristics of group members to form a hierarchy. However, hyenas are an example of a species that does not use physical dimensions when monitoring social rank. The social status of male hyenas is not based on physical characteristics, but is determined by the hyena’s “place in line.” Males essentially wait to rise in status rather than fight each other. Male hyenas that join a new group rarely use physical means to secure status. Rather, they are made aware of their status by a greeting ceremony. During the greeting ceremony, the new male is approached by another male of similar social status. By evaluating the male’s relationship with all of the other members of the group, the new male is able to determine his social status (Slater, Rosenblatt, Snowdon, & Roper, 2002).
The need to monitor and evaluate social status based on relationship to other group members requires the formation of hierarchies. The formation of hierarchies in novel situations allows an animal to determine rank without fighting several group members. Rodents such as meadow voles, African striped mice, and rats have complex social interactions that result in the formation of dominance hierarchies (Spritzer, Meikle, & Solomon, 2004; Kinahan & Pillay, 2008; Calhoun, 1963). This capability is an adaptive strategy that requires the use of properties of transitive inference.

Conclusion

Thus, it is important to continue studying transitive inference in laboratory settings. While our results do not provide evidence that an automated apparatus is an effective tool for training rats in transitive inference tasks, Jordan’s (2009) success in training rats in two five-item lists suggests that using a manual procedure is a preferred training method. However, using an automated apparatus has several advantages compared to using a manual procedure. For example, objectivity and efficiency are increased. Therefore, improvements to the automated apparatus should be made before it is determined that the automated procedure should not be used in training rats in transitive inference tasks.
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Children’s Support Networks after the 1999 Landslides in Teziutlán, Mexico

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ABSTRACT
Within the broader topic of disaster recovery, the project examined the relationship between personal networks and types of social support received by young women who were children when they experienced the 1999 landslides in Teziutlán in the state of Puebla in Mexico. I hypothesized that received support at the time of the event would be most frequently associated with familial relationships. I lived and conducted my research in the small resettlement community of Ayotzingo at the edge of Teziutlán, where many affected people relocated after the disaster, including children. While there I engaged in participant observation, semi-structured interviews, and a network questionnaire. I interviewed seventeen young women about their experience in the disaster and about their personal networks, paying particular attention to network content (level of closeness and relationship type) and type of social support received (material and emotional). In analyzing the data, I dichotomized the relationship types into either family or non-family, received social support as either material or emotional, and then classified the level of emotional closeness between the interviewee and each of the people within their network. The results indicate a relationship between closeness and material support, as well as a relationship between type of relationship (family or non-family) and material support; however, there is no significant association with emotional support. The results also reveal that age is a factor in determining type of support received, as the data shows older peers of children tended to give more material support while younger peers were more likely to give more emotional support.

INTRODUCTION
Natural disasters affect entire populations, including children. However, in the aftermath of disaster, children are often overlooked and pushed aside as adults deal with the larger and more important matters at hand. Children are seen by adults as resilient and able to quickly bounce back from anything. They are viewed as being too young to be affected. However, children are impacted just as much as, if not more than, adults. Children may not know how to use the resources, such as social networks, they may have at their disposal. They are instead often left to cope by themselves leading to possibly severe behavioral and mental health, lasting for years after the event.

There is an increasing interest in researching social networks in regards to disaster recovery; however, there has not been as much attention given to children’s networks. This study examines the relationship between personal networks and types of social support received by young women who were children when they experienced...
the 1999 landslides in Teziutlán in the state of Puebla in Mexico.

LITERATURE REVIEW

To provide a framework for my study of social support for children in disaster settings, my literature review first discusses previously conducted research on children and social support in normal settings, and then examines children and social support in disaster settings. It is essential to first define social support. In the article “Social Support Mobilization & Deterioration after Mexico’s 1999 Flood” the authors defined social support, as “…social interactions that provide individuals with actual assistance and embed them into a web of social relationships perceived to be loving, caring, and readily available in times of need” (Norris et al. 2005:16). In coping with life’s stressors including natural disasters, children rely on these webs of social relationships and the support offered through them.

Children and Social Support

Much of the research conducted on children and social support is about the important effect social support has on a child’s psychosocial development (Bryant 1994) as well as physical and mental health (Kana‘iaupuni et al. 2005; Baker et al. 2009) and other functional abilities (Wolmer et al. 2005). The social support examined in this research examines the web of social relations referred to by Norris, et al (2005).

Some of the factors examined by researchers interested in children’s social support include relationship type, closeness, and generational differences. These factors are seen as having the greatest potential to affect the type and level of social support offered and received within children’s personal networks. Family relationships are particularly important within the child’s network, as family members typically are providers of important resources including emotional and financial support (Kana‘iaupuni et al. 2005). Children’s peers within their own age group are equally important, especially in regards to emotional support. The level of closeness within these relationships is also imperative in regards to the tightness of the network and the level of support received. Oswald et al. (1994) discuss social support among peers of children, focusing on the closeness of their relationship with the assumption that the degree of closeness in a child’s relationship determines specific behaviors, including offering support. He concluded that the closer the relationship (e.g. best friend versus playmate) determines a higher level of support including protection against ridiculing peers, encouragement in case of sadness, and others.

In my study, I also examine the factors of relationship type and closeness studied by other researchers; however, I also examine the factor of age, which proved to be a determining point as same-age peers were found to have given more emotional support while older adults gave more material.

Children and Social Support in Disaster Settings

Considerable research has been conducted on adults in disaster settings, but much less research has focused on children. Prinstein and colleagues studied children’s coping assistance after natural disasters. Their findings indicated that children embedded in strong and supportive social ties are better equipped and more apt to cope well with stressful or traumatic situations than are children without those supportive networks (Prinstein et al. 1996). In their study, three different methods of coping assistance (emotional processing, reinstitution of familiar roles and routines, and distraction) were examined as well as three different groups (family, teachers and friends.) The results found that for emotional processing, most support was received by friends, while the parents most frequently gave support through the last two methods. As I did not measure coping in my study, I
was more interested in the types of coping assistance and their association with various relationships. This study focuses on the type of relationship the child has with the person giving emotional support, including age as a variable, although it does not provide information on the levels of closeness between the child and those giving support. This study also excellently examines types of emotional support, which leads us to ask about the material aspect, including how and from whom a child receives material support in the wake of a disaster.

Belfer (2006) also studied child care and support after natural disasters, using the 2004 Southeast Asia tsunami as a case study. Recognizing the unique needs of children and adolescents, Belfer outlined various methods of providing support that are necessary to the child's mental health, emphasizing the disabling affects and impacts of losing members of the child's personal network, not only on the child, but also on the community at large. Belfer specifically discusses the importance of support from family and kin groups. To round out our understanding of the role of relationship type in terms of social support, I looked at other key aspects of supporting children in the wake of disaster, such as material support, as well as looking at support received from non-kin sources.

The focus of this manuscript concerns how social network content (i.e., type of people in one's network) affects the level and type of support given to a person. Of particular interest is from where children received emotional support, and from where they received material support, which is not commonly researched. I was also interested in assessing how the source and type of support changed over a ten year period as the children became young adults.

SITE
The fieldwork for my research was conducted in the cool and rainy colonia (neighborhood) of Lomas de Ayotzingo, located on the outskirts of the hillside city of Teziutlán in the northern mountains of the state of Puebla in Mexico. The city of Teziutlán is a factory town and one of the biggest producers of blue jeans in the world. Of those who work in this industry, about half work in the factories, their hands practically dyed blue with the indigo. The other half of the workers (usually women) work from their homes, cutting loose strings or sewing on buttons, and are paid by the piece. The downtown area of Teziutlán is bustling with people who come in from the surrounding colonias—to work and/or shop. Teziutlán is located in the mountains, so the climate is rather cool. It also receives a large amount of rainfall throughout the year. This region supposedly has two seasons: wet and dry, however many residents joke that they are really wet and wetter.

In October of 1999, this region experienced devastating floods and landslides as a result of several days of unrelenting rain. In fact, in just a two day period over October 4th and 5th, Teziutlán received the same amount of rainfall that they usually receive over a gradual six-month period (Olazo Garcia 2000). This caused tremendous damage in Teziutlán and in many of the surrounding villages that were built on mountainous terrain and unstable slopes. More than 400 people died and at least 200,000 people were left homeless in eastern Mexico as a result of the landslides and flooding, and majority of those were in Teziutlán (Norris 2005). However, these numbers do not include those who were never found or recovered among the destruction. Many people lost everything, including family members. As many of my informants recollected their different experiences, they all agreed that it was an experience that is impossible to forget.

The colonia of Ayotzingo was built by the government as a location for residents from the various neighborhoods in Teziutlán
who had lost their homes, felt in danger after the disaster, or who could not afford to rebuild or purchase a new home elsewhere. In the beginning, it consisted of basic cinder block houses, no electricity or running water, and unpaved roads. During the next two years, the government continued to support Ayotzingo by paving roads, installing electricity, plumbing, and other necessary services, and building a primary school. Since the government withdrawal in 2002, members of the Ayotzingo community continue to develop their colonia by remodeling their homes, building other schools, small shops or tiendas, and constructing a church. Over the past ten years, Ayotzingo has experienced slow, but definite, material progress; however, the people of Ayotzingo are still trying to make the colonia their home. Many do not want to live there, but it is for many, their only option. Relocating to Ayotzingo was a major adjustment for everyone, and some people continue to struggle with it to this day.

Ayotzingo is a small neighborhood with a population of no more than 250 households and 1607 residents (based on a 2007 community health census) living within fourteen blocks of tightly packed-in houses and a few corner stores scattered around. There is a primary school as well as a secondary school in Ayotzingo, but to attend high school adolescents must travel outside of the colonia to another neighborhood or to Teziutlán. There is one small communal farming area as well as a small grassy area for the kids to play. However, the colonia is still rather bare; the majority of the houses have only cement walls with no insulation from the cold and wetness caused by the constant rainfall. For the duration of my fieldwork, I lived in Ayotzingo with my colleagues (a fellow student from the US conducting similar research, and the field coordinator for our advisors’ study) in which we rented a small room in a house owned by a single middle-aged woman who spent most of her time working in a factory in Teziutlán. Living among the residents, eating with them, and interacting with them on a daily basis gave me an extraordinary opportunity to not only get close to them, but also to witness their day-to-day lives within Ayotzingo, including the many hardships that this relocation has brought.

The colonia of Ayotzingo is geographically isolated from the larger city of Teziutlán, which has proven problematic. It was built by the government upon a separate hilltop on the outskirts of the city. For most, a combi (local bus/van) is the primary means of getting to town, although some people occasionally must take taxis. In the early years of its foundation, people stated that transportation was extremely difficult since roads were not fully developed and the transportation costs many people money that they did not have. The people living in Ayotzingo were also socially isolated from the larger city, including family members, old friends, and neighbors. I observed that social isolation was a major factor influencing the social networks of the young women I interviewed, causing their networks to be closed and restricted to the confines of the colonia. With the exception of the women who worked in a factory (or maquila) many women do not leave the colonia on a regular basis. Also observing and conducting research within this region, Norris et al stated: “[o]verall, isolation from, or even loss of, primary attachments was more common than not, making it quite predictable that Teziutlán survivors would find it difficult to feel reliably connected to others” (Norris 2005:17).

A typical day for residents of Ayotzingo starts with waking up at first light. Those that work in the factory wake up even earlier, as they take the combi into town to work, where they remain until nightfall. Many will run errands on their way home or stop to visit friends and relatives. Those that stay within the colonia enjoy a more relaxed, but
Residents will open their businesses and get to work, whether it is at a store, making and selling food, or running the small laundry service. Women tend to the house and children, all the while preparing the main afternoon meal, after which the pace slows down a bit. During this time residents will visit with one another, go into town, or simply rest.

A typical day of my younger female informants varies slightly. During the school season, they get up early to go into town for school, since the only two schools in the colonia are for lower levels. Sometimes, they will return for the main meal, or stay in town until returning home later in the evening where they help out in the house, do their homework, and socialize. However, during periods of vacation from school, or if not attending school, young women spend more time at home helping with the responsibilities of the house. They also spend a great deal of time socializing, both within and outside of Ayotzingo. In the evenings they can be found chatting online at the local internet café, or when it is not raining, socializing in the street.

As a resettlement community for people affected by the landslides, people from several different areas were brought to live together in Ayotzingo. Due to the differences in origin, people tend to stick together with those from their previous community, and do not rely on others for support. For the most part residents are pleasant to one another but tend not to form deep relationships.

Children were also affected by this relocation. Not only did they suffer loss of possessions and loved ones, they were also uprooted from everything familiar to them and relocated to a new, under-developed area where nothing was familiar. My interviews focused on female residents who were children at the time of the landslides. Many young girls interviewed stated that they suffered loss of dear friends, not because of death, but rather due to relocation. For many of the children, relocation to Ayotzingo was a long, arduous transition. They had to make new friends. Many were delayed in their return to school and almost all of the girls I interviewed said that it took at least a year to reach a point of stability and “normalcy.”

I did not have much interaction with the children of Ayotzingo; however, because they were out of school for summer vacation, I was able to observe them a bit within the colonia. They seemed to break the boundaries of non-engagement. When they are not helping out in their home, they interact with one another, forming friendships. During the rare non-rainy moments, large groups of children run through the streets chasing a make-shift soccer ball or play together on the small rusty playground, which is the only place in the colonia where grass can be seen. Most of these younger children did not experience the trauma of the landslides or relocation. They were born in Ayotzingo; it is their familiarity, their home.

METHODOLOGY
Participants and Sampling
The participants were 17 unrelated young females aged 17-33 living in the resettlement colonia of Ayotzingo that had experienced the 1999 disaster and subsequent relocation. My actual sample had an age range only slightly larger than my desired sample. My interest was in talking with women who had been 7-17 years old when the landslides occurred. Since this research took place in 2010, the women at the time of my research would be approximately 18-27 years old, which was my intended sample. I chose the ages 7-17 (at the time of the landslides) because their memories would have been stronger than those of smaller children under the age of seven, whose brains and memories are less developed.
In selecting participants, I used various sampling methods including purposive, convenience, and snowball. I solicited help from older adults in the colonia that may have known young women in the appropriate age group that experienced the disaster and relocation. I also used the personal networks elicited from initial interviewees to locate other young women of the appropriate age range living in Ayotzingo. Of those solicited, seven of the twenty-eight refused, were too busy, or couldn’t be contacted. Of the twenty-one I originally interviewed, seventeen were available for follow-up questions.

The majority of the women within my sample were eighteen or nineteen years of age at the time of the interview. I chose this population of young females not only because they were the most available within the colonia of Lomas de Ayotzingo, but also because it was a population easier for me to identify with, as they were of my same gender and age group. Table 1 demonstrates the variety within my sample.

The sample population represented a variety of social, economic and educational backgrounds. The majority of the young women I interviewed were in their last year of high school, but other occupations included factory worker, teacher, homemaker and street food vendor. My sample population also represented a variety of former neighborhoods in Teziutlán. My informants relocated to Ayotzingo after the disaster from the following neighborhoods: Aurora, Francia, Xoloco, Aire Libre, Chignaulingo, Huehuemico, Avila Camacho, Colonia Juarez, La Legua, El Estadio, Campo Verde, and Fresnillo. The young women in my sample also come from varying family sizes, which is a possible factor in their support networks. The range of family sizes includes three to ten members, with a median of six people. This variance within my sample reflects the variance within Ayotzingo, which affects social ties and social support as family and neighborhood ties are critical to social support.

Participant Observation

For the duration of my fieldwork, I lived in Ayotzingo which allowed me to conduct participant observation by living, eating and interacting with the local residents on a daily basis. A typical morning was spent by waking up early and hitting the streets, greeting neighbors and chatting with people while occasionally conducting a structured

Table 1. Demographic Description of Sample

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Neighborhood of Origin</th>
<th>Family Size</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18</td>
<td>Aurora</td>
<td>10</td>
<td>Student</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>Francia</td>
<td>5</td>
<td>Student</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>Xoloco</td>
<td>7</td>
<td>Home Maker</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>Aire Libre</td>
<td>7</td>
<td>Student</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
<td>Chignaulingo</td>
<td>6</td>
<td>Student</td>
</tr>
<tr>
<td>6</td>
<td>22</td>
<td>Huehuemico</td>
<td>4</td>
<td>Student</td>
</tr>
<tr>
<td>7</td>
<td>17</td>
<td>Avila Camacho</td>
<td>4</td>
<td>Student</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>Avila Camacho</td>
<td>6</td>
<td>Home Maker</td>
</tr>
<tr>
<td>9</td>
<td>18</td>
<td>Juarez</td>
<td>4</td>
<td>Student</td>
</tr>
<tr>
<td>10</td>
<td>24</td>
<td>La Legua</td>
<td>7</td>
<td>Home Maker</td>
</tr>
<tr>
<td>11</td>
<td>27</td>
<td>Aurora</td>
<td>6</td>
<td>Home Maker</td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>Avila Camacho</td>
<td>4</td>
<td>Student</td>
</tr>
<tr>
<td>13</td>
<td>18</td>
<td>Xoloco</td>
<td>9</td>
<td>Food Service</td>
</tr>
<tr>
<td>14</td>
<td>26</td>
<td>Campo Verde</td>
<td>6</td>
<td>Factory Worker</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>Estadio</td>
<td>5</td>
<td>Student</td>
</tr>
<tr>
<td>16</td>
<td>18</td>
<td>Fresnillo</td>
<td>3</td>
<td>Student</td>
</tr>
</tbody>
</table>
were the best times to interview the young women. My structured interviews consisted of two parts, spread out over two separate interviews.

The first interview with each woman lasted approximately one hour. In this part, I collected qualitative data using a questionnaire of eight multi-part questions in which they described their situation before, during, and after the disaster, as well as how they dealt with the relocation and the aftermath of the landslides, plus what they learned from their experience and how they moved on afterward. (All questionnaires available from the author or faculty mentor on request.)

The second part of the structured interview involved collecting more data about their social support networks. This second interview lasted thirty to forty-five minutes. With each participant, I asked them to recall their personal network from 1999 at the time of the disaster, as well as provide a separate current personal network from 2010.

In the 1999 network, I asked for the names of ten people of the same age with whom they associated most immediately following the landslides. This resulted in the 17 interviewees naming a total of 170 people with varying demographics and different ways of offering support. I asked about the type of relationship, how emotionally close they were, where they lived, and whether they had received any type of support (material or emotional) from that person during the time period of the disaster and relocation. Then I recorded the connections within the personal network by asking how much they felt each of the ten people mentioned interacted with one another during the period following the landslides. The scale used for estimating the level of interactions between people in their network was: a lot, a little, badly, or not at all. In terms of the total possible ties that would be possible between the 10 people in each network, it is 45 of
(10*10-10)/2 because it is assumed that if A interacts with B, then B interacts with A; there is no directionality and thus the other half of the NxN matrix is not needed. In total, across all 17 interviews, there could have been 765 ties, or 17*45).

With the personal network for 2010, I used the same format and questions as stated above; however, I only asked for the names of five people in order to decrease respondent burden, giving me half as many network individuals and network attributes. I asked the same questions from the first network with this second contemporary set of relationships. I was hoping to observe variation in the degree to which types of relationships and levels of social support from their 1999 personal networks continued into the 2010 personal networks.

After collecting the personal networks, I followed up on the two different types of social support (material and emotional) that was received from their networks. If they had answered “yes” to having received a type of support from a specific person from their networks, I asked them specifically in what way they were supported and for what time period they had received that support.

Informal Interviews

My informal interviews were usually during meal times or as a result of casual interaction on the street or a bus. In conversation, I would ask about their experience in the landslides and who, if anyone, had helped them. Informal interviews were normally with older female adults. Occasionally they were the result of accompanying my colleague on her interviews, though occasionally interactions outside on the street or during meals. Once the residents of the community understood my purpose for being there, most were willing to talk and share their stories and perspectives. Since my focus was on younger women, I did not use the information in my data analysis, but it did serve as contextual information regarding the landslides, the immediate period of relocation to Ayotzingo, and the subsequent years of hardships and adjusting.

Measures and Variables

The overarching goal of the analysis was to look at how network content predicts levels of support with the context of the 1999 landslides and resettlement in Teziutlán.

Attributes of Interviewee: As potential correlates or independent predictors of received social support, I gathered the following information about each person interviewed:

- Occupation since it gives an idea of a person’s wealth and even type of work network;
- Previous residence since it gives an idea of wealth because of neighborhood;
- Family size because more family could give more support; and
- Gender because women and men can receive different levels of support, with most studies concluding that women typically better utilize relationships and therefore are more likely to receive support in time of need than are men (e.g., Taylor et al. 1988; Beggs et al. 1996). However, in Burke’s (2010) study on social support after the 2006 volcanic eruption in Ecuador resulted in a different conclusion that men reported having received support more than did women.

Network Structure: As potential independent predictors of received social support, I included a couple of measures of social network structure, which refers to the patterning of relationships for any given network. When I asked the informants for the names of 10 people and then whether each of those 10 people knew one another, this produced a personal network—or a network from the point of view of some one about people in their life—that has structure as characterized by how dense or sparse or connected it is, etc. I used two measures of structure of their individual personal networks: centralization of the network because this would give me a sense to which an informant’s network revolved
around one or a couple of key people; and number of components (disconnected individuals or subgroups) because this would give me an idea of how hard it might be to move support through a network.

Network Content: There are three independent variables that I chose to focus on in this study relating to network content. Network content refers to the nature of the people in a network, such as demographic characteristics or the nature of their relationships with others. The three variables were the age of people the interviewee named as part of their personal network because I expected age to matter for youth networks, the closeness the interviewee felt to each of the people they named as part of their personal network (0 = none, 1 = some, 2 = a lot) since I expected the strength of the relationship to predict social support provided, and the relationship with each of the people they named as part of their personal network—coded as family versus non-family—since I expected family to provide more social support than did non-family.

Received Support: The dependent variables focused on in this study were the two types of support received by the interviewee: material support and emotional support. After my interviewee had named ten people, of each one I asked whether she had received material support (e.g.: money, food, lodging, clothing, toys, etc) or emotional support (e.g.: kind words, encouragement, someone to talk to and/or share experiences, etc). Received emotional support and received material support (from network member to interviewee) were elicited as present/absent (yes = 1, no = 0). In addition, the type and duration of social support were investigated more in depth through follow-up open-ended questions, including to whom they went for help, what specific support they were given, and what their general experience was during the period of landslides and relocation.

Quantitative Data Analysis
In analyzing the quantitative data I ran several statistical analyses using SPSS software in order to find significant correlations between the type of received support (material or emotional) and the independent variables. This included several descriptive analyses, means tests (ANOVA), and means-ranking tests (Kruskal Wallis). I tested several different variables including level of closeness, age, relationship type, occupation, previous residence, family size, gender, centralization of the network, and number of components (disconnected individuals or subgroups) of the network as correlates of social support. The resulting significant correlations were age, relationship type, and level of closeness.

Qualitative Data Analysis
In analyzing the qualitative data I gathered, I first used Microsoft Excel to combine the data from the structured interviews, according to the organization of the questionnaire. I was then able to conduct textual analysis of the data, in which I examined the responses of each of my interviewees and searched for their intended meaning. I individually analyzed each of the quotes given as responses to the questions, with my primary intention being to draw out the unstated emotion. In this analysis I aligned the quoted text with side notes I had made during the interview about facial expressions, tone of voice, and other forms of body language. In my textual analysis I also compared the individual quotes to the responses of the other participants for each question in order to determine what the norm was, if one existed. This analysis also provided me with an effective means to draw out specific quotes from the interviews to apply to the quantitative data and the findings that resulted from the quantitative analysis.

Some themes of analysis that I focused on from the qualitative data include people/relationships mentioned that my
informants had gone to for support as children (e.g. immediate family, other relatives, friends, teachers, etc), ways in which they felt they were supported (materially or emotionally), as well as their description of their experience of the disaster and period of relocation and restoration. I chose these specific points of analysis not only because they provided supplementary information to the quantitative data, but also because it allowed me to compare and contrast the experiences and social support networks of young females in Ayotzingo and develop a generalized understanding of this specific gender and age group. According to Schensul (1999), personal network research and the information it provides is helpful in quickly establishing the important traits (e.g. network size, closeness and duration of relationships) of typical networks in a given culture and/or age or gender group. It is further explained that the traits of the typical networks can then be related to other characteristics associated with people’s lives in that culture (e.g. level of social support, quality of life, success in personal relationships, etc).

RESULTS AND DISCUSSION

My results for this manuscript cover the relationship between the dependent variables of received emotional and material support and the independent variables of age, relationship type, and level of closeness. I present each of the independent variables and discuss the correlation (if present) with the dependent variables.

Age and Received Support

While age was not originally a variable I was searching for in terms of received social support, it seemed to be a factor as I analyzed my qualitative data. According to the interviewees, they received emotional support mostly from people their own age, while adults were more focused on providing them with material needs. One young woman stated, “Adults didn’t pay much attention to children due to all of the problems they already had to deal with.” Another woman, while talking about only receiving emotional support from peers of her own age group stated, “I didn’t receive emotional support from anyone else because they were all older.”

To analyze this variable, I ran a means test (ANOVA) using the total number of network members provided by the 17 interviewees. I first removed the five oldest people, between the ages of 39 and 60 (thus, n=165) because it would have skewed the results and because I really was not looking for peers older than 39 years of age. In soliciting the personal networks, I had asked my informants to name people within their own age group, and some people did not. I interviewed women who were 18 years or younger at the time of the disaster, so eleven years later the oldest interviewee would be 29. I then allowed a 10-year range in either direction for the peer group, so anyone older than 38 on the list was removed from the data set for analysis because I am more interested in the peers of these women/children.

The results as displayed in Table 2

<table>
<thead>
<tr>
<th>Table 2. Age of Alters Giving Support (1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Support</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Material (n=165)</td>
</tr>
<tr>
<td>Emotional (n=165)</td>
</tr>
</tbody>
</table>
supported what was emerging from my semi-structured interviews and unstructured interactions in the community. The relationship between these two variables is clear, showing that 12 was the average age of peers who gave emotional support, and a slightly older average age of 16 for peers giving material support.

This result is important, especially when researching children’s mental health after disasters. It is first necessary to know where children go for emotional support before one can begin to implement strategies for emotional coping. Children and adolescents in Mexico looked to their parents and older adults for emotional support; however, due to a variety of factors, they sought and found their emotional support more often with people their own age, perhaps because they could better relate to and disclose feelings and worries and because adults were more focused on making ends meet and getting families back on their feet. Many of my informants stressed how they engaged in activities that allowed them to take their minds off the disaster, which they did with other children who were also trying to do the same thing. Others also mentioned sharing memories and experiences with friends and cousins of their own age, so that they could know that there were others going through the exact same hardships and difficulties.

However, due to their young age, these children and adolescents were unable to support each other materially. They therefore looked to parents and older adults, of working age, to provide these needs. While they did occasionally report receiving material support from people within their age group, this support most likely came from the parents of that reported person.

**Relationship Type and Received Support**

In soliciting the interviewees’ social networks, I asked for their specific relationship to each of the people listed. I dichotomized this information into either family or non-family relationships. During the semi-structured qualitative portion of the interview, most of the young women stated that they looked only to their families for support. One woman said “family during that time was the most important. We stuck together and helped each other. We didn’t have anyone else.” Many others echoed similar sentiments. This included both forms of support: material support in the form of food, shelter, clothing, and money; and emotional support in the form of soothing words, explanation, encouragement, and distraction. For example, the majority of the young women interviewed recollected hearing the words “everything is going to be okay.” Others even got together with others their own age to share their individual experiences as a form of emotional support.

However, in gathering the data from their social networks, each of the seventeen young women listed at least one non-family relationship, and a couple of them listed all non-family relations and reported receiving one or both types of support from them. The ties listed in the personal networks consisted of approximately half familial ties (44%) and half non-familial ties (56%). I asked that interviewees “please name 10 people of your age with whom you associated most immediately following the landslides,” so people were not limited to naming family, nor were they limited to naming people who had provided support of some kind.

Based on 170 ties for 1999 (17 people that named 10 individuals each) and 82 ties for 2010 (17 people that named 5 individuals each), I ran a Kruskal Wallis test, or a means-ranking test, on whether the level of social support offered through these ties differed based on the dichotomized relationship type (family vs. non-family). In Table 3, I show the average levels of support from 0-1 rather than means-ranking for family/
non-family, but then provide Kruskal Wallis levels of significance for 1999 and for 2010.

For material support, the type of relationship was significant in both 1999 (p=.005) and 2010 (p<.001), however emotional support did not correlate with relationship type for either year. The results also indicate that received material support was higher among family-relationships for the present and the recalled past of a decade ago.

There exists a significant relationship between relationship type and material support, with familial relationships providing the most support. This relationship is exemplified in a quote by one of my informants as she stated "My cousins helped my family. They brought us food, toys and clean clothes, and gave us a place to live. One cousin...even gave us money." Other informants echo this pattern, reporting to have received material support from family members including, but not limited to, money, shelter, food, medicine, clothes, toys, and help in finding a job. Therefore, although my informants listed a larger percentage of non-family ties within their personal networks, it was from their family ties and bonds that they received the most material support. However, although received support among familial relationships was higher than in non-familial ties, the average levels of received support were not extremely high, the highest being only .5 on a scale of 0-1. This is most likely due to the fact that the people listed within the personal networks were also enduring the same hardships. One of my informants stated "It was difficult to get help from anyone because we were all in the same situation."

However, average levels of received emotional support were high, with an average of .7 among familial relationships and a slightly higher average of .8 with non-family relationships. The lack of a significant correlation between relationship type and emotional support simply suggests that during the time of disaster as well as currently, these young women are receiving emotional support from a variety of sources. One informant stated "With my family, I always found the emotional support I needed. I felt safe with them and everyone around me." However, while talking about returning to school, another informant describes receiving her emotional support from a different source: "when I returned to school, I began to receive emotional support from my friends."

This result is important in understanding the social networks of young girls and women in Mexico, especially in times of disaster. Kinship and the expected obligations associated with familial ties are extremely important among Mexicans (Norris 2005). Each of my interviewees stressed the importance and value of family and how they looked to one another in time of need. Therefore, for these young women who suffered this disaster as children, it is important to have networks containing members of their kin group, and to be able to rely on them for material support.

<table>
<thead>
<tr>
<th>Type of Relationship</th>
<th>Received Material Support</th>
<th>Received Emotional Support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1999</td>
<td>2010</td>
</tr>
<tr>
<td>Family (44% / 18%)</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Non-Family (56% / 82%)</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Closeness and Received Support

Finally, I looked at the variable of closeness. In soliciting personal networks, I asked how close they felt to each of the people they named, asking them to choose between “not very,” “somewhat,” and “very.” I originally hypothesized that this variable would have a significant relationship between both types of received support.

I ran a Kruskal-Wallis test on whether the level of support offered through these 170 ties (1999) and 82 ties (2010) differed based on levels of closeness, or how close the interviewee felt to each of the people they named. In Table 4, I show the average level of support from 0-1 and the levels of significance for 1999 and 2010.

The relationship between material support and closeness was significant for both 1999 (p=.003) and the present of 2010 (p<.001). There is also a linear relationship between receiving material support and how close the interviewee felt to the person they listed in both 1999 and 2010. For example, one of my informants stated “I did not receive material support from anyone else because we were not very close.” However, this is not the case for emotional support when the children were little in 1999 (p=.346), but as adults (in 2010) there is a strong association between emotional support and closeness (p<.001).

Therefore, closeness is associated with received material support both in 1999 and in the present in that people either feel close to those who have supported them, or they are helped by those with whom they have close relationships. However, as was the case with the variable of relationship type, the average reported levels of received material support are extremely low. Although the level of closeness did make a major difference in the level of received material support, people simply did not have enough to give.

This variable of closeness is only associated with received emotional support in 2010. This means that as children, these young girls are receiving emotional support regardless of how tight the bond is; but as adults, they are choosing close relationships for receiving emotional support. As displayed in the table, the average levels of received emotional support in 1999 were equally high (.7) among the varying degrees of closeness within the various relationships listed. Though in the 2010 data set where there occurs a correlation, the average levels of received emotional support are higher among the relationships claimed to be very close. An interesting point for further research would be to investigate why the average levels were higher among relationships claimed to be not very close, than relationships claimed to be quite close.

In addition, as kinship ties are important in whether young women receive material

| Table 4. Closeness and Received Support (1999 / 2010) |
|----------------------------------|-------------------|-------------------|-------------------|
| **How close are they to you?**   | **Received Material Support** | **Received Emotional Support** |
| (n=170 / 82)                     | 1999 (p=.003)     | 2010 (p<.001)     | 1999 (p=.346)     | 2010 (p<.001)     |
| **Not very**                     | 0.1               | 0.1               | 0.7               | 0.7               |
| (15% / 14%)                      |                   |                   |                   |                   |
| **Somewhat**                     | 0.2               | 0                 | 0.7               | 0.5               |
| (26% / 18%)                      |                   |                   |                   |                   |
| **Very**                         | 0.3               | 0.3               | 0.7               | 0.8               |
| (59% / 68%)                      |                   |                   |                   |                   |
| **Average**                      | 0.3               | 0.2               | 0.7               | 0.8               |
| (100% / 100%)                    |                   |                   |                   |                   |
support in Mexico, having tight, close relationships, whether with kin or non-kin, is equally important for receiving material support.

**CONCLUSION**

To summarize my results, age determined the type of support given as peers gave more emotional support and adults more material support. Relationship type determined that it was the family relationships that gave more material support, while emotional support had no significant relationship to this variable. And finally, closer relationships provided more material support across the board, while closer relationships did not predict emotional support for children, but did once those children became adults.

One major conclusion that can be drawn from these results is a difference between emotional and material support, in that emotional support is not well-predicted for children (with the exception of the variable of age), while material support is. As adults, people choose with whom they want to be close and are presumably more readily accepting of both material and emotional support. Family is more likely to help with material support than are non-family, but are not more likely to provide emotional support.

Another conclusion is that average levels of reported emotional support were repeatedly higher than the average levels of reported material support. Natural disasters like the landslides that occurred in Teziutlán do not only affect individuals, but rather the entire community. While some were affected more than others, the whole region suffered loss, greatly limiting their ability to provide for themselves, much less help others materially. Instead, the majority had to look to the government for material needs, which were provided in shelters and open to whoever needed them. However, the people of Teziutlán during this time helped each other however they were able, usually in the form of emotional support. It may therefore be concluded that while important, personal networks that are a bit wider to include people from different regions would perhaps be more helpful in terms of receiving social support, especially material support.

This study reaffirms the research that family relationships are very important in a child’s network, especially in the wake of disaster. However, my research adds that non-kin relationships within a child’s network is also important, especially with peers within their own age group. This study also reaffirms previous studies in that peers give more emotional support and that close, meaningful relationships as adults also provide more emotional support. This research also adds to the literature in that all three of these variables (age, relationship type, and closeness) predict material support, which is equally important in times of loss and disaster. One difference that I found between my study and existing research is that the factor of closeness in a relationship is not necessarily a deciding factor of receiving or not receiving emotional support; however this may be amounted to the difference between a disaster versus a normal set of circumstances.

This study can be useful for governments to bear in mind when rebuilding after disasters. People’s social networks are critical to the type and amount of support they will receive. It is important to look at the resettlement community of Ayotzingo as an example of a socially non-unified community and to consider that perhaps people from a variety of neighborhoods may not want to live with one another and that once resettled, they may feel isolated and alone and not receiving the social support they need. Future points of further examination may include a stronger emphasis on the structure of the personal networks and the influences that has on received social support, including people with wider personal
networks able to receive outside support from those unaffected network members. It would also be enlightening to study and compare the results from a differing age and/or gender group.

ACKNOWLEDGEMENTS
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Structured Interview Questionnaire and Personal Network Sheets are available upon request from the author or faculty mentor.

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REFERENCES


Working Class African American Women and Heart Disease: How Communication and Community Impact Prevention Knowledge and Behaviors

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ABSTRACT
Heart disease is the number one killer of women in America. Obesity, diabetes, high cholesterol, and high blood pressure are all contributing, or resulting, illnesses of heart disease. African American women are disproportionately affected by heart disease and its accompanying illnesses, and this is especially the case for African American women in the South. This study evaluates the impact that communication and community have on the prevention knowledge and behaviors of sixteen African American women in North Carolina. The women were from working class and middle class backgrounds. Overall, there was a knowledge gap between the health practices and behaviors of working class and middle class participants. Working class participants also were more likely to be overweight than the middle class participants. Participants attributed their eating and exercise practices to various interpersonal and environmental factors, including access to grocery stores and a workout partner.

Heart disease is the number one killer of women and men in the United States (Centers for Disease Control and Prevention, 2011). The Centers for Disease Control and Prevention (CDC) projects that “about every 25 seconds, an American will have a coronary event.” Heart disease also can result in debilitating illnesses. In 2006, an estimated 81 million people had at least one form of cardiovascular disease— the most common forms being high blood pressure, coronary heart disease (CHD), stroke, and heart failure (American Heart Association, 2011). In the same year, approximately 73 million Americans were living with high blood pressure, 17 million were living with coronary heart disease, eight million had a heart attack, six million experienced a stroke, and 5.8 million were in heart failure (AHA, 2011). Reducing one's controllable risk factors “could prevent postponesubstantiallymoredeaths from CHD” (Capewell et al., 2010, p. 120).

Heart disease, which researchers may refer to as coronary artery disease (CAD), CHD, or cardiovascular disease (CVD), can be avoided or “reduced by taking steps to prevent and control factors that put people at greater risk” (CDC, 2011). Risk factors that correlate with heart disease include
“high cholesterol, high blood pressure, obesity, diabetes, tobacco use, unhealthy diet, physical inactivity, and secondhand smoke” (AHA, 2011). All of these risk factors are controllable through reducing alcohol and tobacco intake, increasing physical activity, consuming healthy foods, controlling one’s weight, and being aware of one’s heart health (AHA, 2007). Risk factors that contribute to heart disease that are less controllable at the individual level are age, sex, income, and hereditary factors (AHA, 2007). As people age, their risk for heart disease increases. Heredity, or genetics, is also a major factor in heart disease risk. In terms of ethnicity, “African Americans are more likely than Caucasians to have high blood pressure, and they tend to have strokes earlier in life and with more severe results” (AHA, 2007).

Gender also plays a major role in the development of heart disease. Researchers have found that “coronary artery disease (CAD) kills more women than all cancers combined and is the leading killer of women in the United States.” There are a large number of women living with heart disease. An estimated “one in three women in the United States suffers from CAD” (Shirato & Swan, 2010, p. 282). Women are also disproportionately affected by heart disease’s accompanying illnesses. For example, Shirato and Swan reported that “more women than men with CAD have diabetes, hypertension, hypercholesterolemia, and a family history of CAD” (p. 282). Theorists projected that these trends inobesity, diabetes, and high blood pressure among American women caused 30,000 additional deaths from heart disease in 2010 (Capewell et al., 2010). Though heart disease greatly affects women, it is seen as a man’s disease. In a health study assessing doctor-patient communication, researchers found that “lack of healthcare provider knowledge of the guidelines for prevention of CVD in women has been identified as a barrier to reducing morbidity and mortality in this population.” The researchers also stated that “women receive less cholesterol screening, less lipid-lowering therapies, less use of heparin, beta-blockers and aspirin during myocardial infarction (MI), and fewer referrals to cardiac rehabilitation compared with men” (Pleglar et al., 2009, p. 1542).

African American women, in particular, are greatly impacted by heart disease. For African American women, the “death rates from heart disease and cerebrovascular disease exceed those of all American women—Caucasian, Latino, Native American, and Asian and Pacific Islander” (Fleury & Lee, 2006, p.130). For this population “heart disease and stroke remain the first and third leading causes of death” (Lutfiyya et al., 2008, p. 86). Several factors might account for the increased risk of heart disease and stroke among African American women. In terms of weight, “African American women and girls are more overweight and obese than those of other ethnic groups” (Taylor et al., 2009, p. 53). Among African American women, 50.8% are obese, and 78% are overweight (Taylor et al., 2009, p. 54). Along with weight management, physical activity is a controllable risk factor to help prevent heart disease in women. Adversely, not being physically active is “a major independent risk factor for CHD in women” (Leifer & Nuss, 2006, p. 350). African American women are less physically active than other population groups. The level of physical activity correlates with heart health for African American women: “African American women have lower levels of physical activity and higher levels of cardiovascular health risk compared to other population groups” (Fleury & Lee, 2006, p.135).

Education level and socio-economic status have been identified as factors influencing physical activity among African American women. For example, Fleury
and Lee found that African American women “with low levels of education tended to be more physically inactive” (p.132). Socio-economic status also correlates with levels of physical activity. Income level has “a significant impact on the initiation and maintenance of health promoting behaviors, including participation in regular physical activity” (p.131). In addition, socioeconomics influence food options and choices. Demographically, the population group that is “least likely to meet the USDA guidelines for the recommended daily servings of fruits and vegetables is non-Hispanic Blacks and individuals with lower incomes” (Robinson, 2008, p. 395). Overall, socioeconomic status is a powerful indicator of health practice. African Americans have the highest rates of poverty in the United States of any ethnic group. In 2009, the Census Bureau reported that 25.8% of African Americans were below the poverty line (Census Bureau, 2009).

Although there are many studies on how uncontrollable risk factors impact heart health, there is little research on how social (and potentially controllable) factors influence heart health knowledge and behaviors. Existing research places an emphasis on community support. Community expectations about physical health “may enhance efficiency in goal formation and motivation related to physical activity” (Fleury & Lee, 2006). Scholars have argued, “Social factors play a dominant role in influencing individual and community goals, strategies, and opportunities for behavioral change” (Fleury & Lee, 2006). A community message about health must be set in place to enact positive change at the community level. Community communication must “include culturally relevant social support as well as social norms that may facilitate behavioral capacity and health behavior change” (Fleury & Lee, 2006). Given the above findings it is important to do more research on how messages between family, friends, and support networks can contribute (and, in some cases, undermine) heart health among African American women.

As such, this study focuses on the influence of communication and community on African American women’s knowledge and awareness of heart disease risk factors. Researchers have determined that “awareness and acceptance are necessary first steps in controlling and managing CVD risk factors” (Khavjou, 2009, p. 673). Thus, I aimed to assess African American women’s awareness and acceptance of heart disease risk. Specifically, I sought information about diet, physical activity, heart health knowledge, communication patterns, and community-level influences to address the following research question: What factors influence health heart knowledge and health behaviors among African American women in the South?

METHODS
Procedure
This study received approval from the North Carolina State University Institutional Review Board. This study involved semi-structured interviews with sixteen African American women living in the Southeastern United States. Recruitment entailed the use of convenience and snowball sampling. To recruit participants, I posted study announcements on community websites, social networking sites, and online listservs that catered to persons of color and women, and I distributed fliers at area colleges and centers for persons of color. As an incentive, I offered individuals free entrance into a raffle for a $50 Amazon gift card for their participation. When a person responded to the study announcement, I assessed his/her eligibility. To be able to participate, the individual needed to meet the following criteria: (a) be at least 18 years of age, (b) read and write English, and (c) self identify as an African American.
I began the interview by reading the informed consent form to the participant, and both she and I signed a copy. After giving the participant a copy of the informed consent form, we transitioned into the formal interviewing process. These one-on-one, semi-structured interviews ranged in length from 15 minutes to one hour. The interview schedule consisted of five parts. The interview sought to gain information about each participant’s: (a) environment, (b) knowledge of heart disease and its accompanying illnesses, (c) diet and eating habits, (d) health practices, and (e) communicative practices with regard to diet and exercise. The interview consisted mostly of open-ended questions designed to gain greater insight into the participant’s lifestyle, field of experience, and attitudes toward health. All participants consented to having their interviews audio-recorded. After the interview, participants completed a two-page questionnaire that assessed demographic information, health information, and health knowledge about diseases currently affecting African Americans. The interview process ended with me thanking the participants for participation in this research study. I also informed participants that they would be notified if they won the raffle for the $50 Amazon gift card.

I reviewed the interviews for transcription after the data collection process and transcribed sections of the interviews based upon their pertinence to the research study. The annotated notes I took during each interview allowed for better analysis of the audio-recorded interviews. I placed the information from the questionnaire into a spreadsheet. Once this was done, I was able to compare and contrast the data based on education level, age, and income level.

RESULTS

As expected based on the literature, this study indicated that income and class are important factors shaping participants’ weight, diet, and levels of exercise. Income also strongly influenced participants’ knowledge about heart disease. Within this research population, there was a knowledge gap between working-class and middle-class participants. Less than half of the participants were able to correctly identify all of the diseases related to heart disease for which they were at increased risk. Those who were able to identify these diseases had a median familial socioeconomic status of 4.4, compared to the median group status of 3.5. This finding suggests that African American women of higher socioeconomic status might be better educated about the diseases that place them at risk for heart disease and, thus, better equipped to prevent heart disease and its associated illnesses.

Although the majority of participants talked with others within their community about food, most did not discuss exercise, and over half did not exercise regularly. Four participants had open dialogue about their exercise routine; whereas, 14 participants had open dialogue about their diet. Only seven of the 16 research participants engaged in a weekly exercise routine.
with six of the seven participants exercising alone. Physical inactivity is a risk factor for heart disease. My findings suggest that beginning community conversations about physical activity may “create channels through which information related to activity may be disseminated” (Fleury & Lee, 2006, p.133). Creating an exercise support system or network among African American women may also prove to have sustainable impact on the physical activity levels of African American women, as many of those who reported not exercising cited lack of exercise partners as a reason. 

Obesity and Heart Disease Risk Awareness

Obesity is a major risk factor for heart disease. Based on the participants’ self-reported height and weight, body mass index values were calculated. According to the body mass index calculations, nine of the 16 participants were overweight, with seven classified as obese based on their self-reported height and weight. Although seven participants would officially meet the criteria for obesity, only three self-identified as obese. The average socioeconomic class ranking of the overweight participants was 2.5, which signifies working class, but is lower than the overall average income of the participants. I also asked the participants for their mothers’ height and weight as researchers have found a similarity between mother and daughter weight and health habits (Francis & Birch, 2005). Twelve of the 16 participants’ mothers could be classified as overweight, with six meeting the criteria for obesity. One participant’s mother was deceased.

The women also provided me with their mothers’ socioeconomic background characteristics. Of the nine overweight participants’ mothers, the average socioeconomic class ranking was 3.5, which also signifies working class. As stated earlier, most participants did not identify as obese, regardless of their weight. This pattern also held true for the participants’ reports of their mothers’ weight. Six of the participants’ mothers would be considered obese, but only two participants identified their mothers as obese.

I asked participants to complete a Heart Health Quiz I made as part of the post-interview questionnaire. The questions were based on facts given by the American Heart Association. The quiz assessed each participant’s knowledge of heart disease risk factors for ethnic groups. The participants were asked what disease was the number one killer of women and which ethnic group had the highest instances of heart disease, obesity, diabetes, heart attack, and stroke. Only seven of the 16 participants were able to answer all of the questions correctly. The average socioeconomic status for these seven participants was 4.4, which indicates lower middle class. Thus the working class women in my study were more likely to be overweight and less likely to be knowledgeable about heart disease compared to those whose income range was closer to middle class.

Exercise Practices

I also asked the participants about their levels of physical activity. Seven of the 16 participants participated in regular exercise routines, such as going to the gym for 45 minutes, five-six times a week or walking two miles, three times a week. These seven participants, who came from varied socioeconomic backgrounds, exercised on average four days a week. Six of the seven participants who participated in an exercise routine exercised alone, but four of these participants shared that they discussed their exercise routine with their mother, family members, and/or friends. The majority of the participants who did not participate in an exercise routine cited time constraints and not having a workout partner as reasons for not exercising.

All participants reported feeling that exercise was part of a healthy lifestyle and
that they should exercise. Participants reported exercising to “burn calories,” “exercise your heart,” “be healthy,” “relieve stress,” “be more upbeat,” “prevent diseases,” “strengthen heart,” and “to preserve muscles.” Although all participants reported that they felt exercise was part of a healthy lifestyle, less than half reported participating in a regular exercise routine.

**Eating Habits**

In addition to asking the participants about their physical activity levels, I asked them about their eating habits and whether they had discussed those habits with others. Fourteen of the 16 participants discussed their diet and eating habits with their mother, family, and/or friends. Nine of the 16 participants described their diets as healthy; however, about half also described eating fast food regularly and skipping breakfast. Two participants who described their diets as healthy ate very restricted items, such as a box of cereal throughout the day or a can of spinach for a meal, suggesting that healthy eating for these participants was equated with deprivation. As a part of the interview, I asked the participants to take me through what they ate in a normal day. Below I will share what two participants described eating in a normal day; participant names are pseudonyms.

Rosanna and Katie are both college students. Rosanna and Katie both describe their diets as unhealthy and do not participate in a regular exercise routine. Rosanna is working class, and Katie is middle class. Although Rosanna and Katie are both from different social classes, their eating and exercise habits are similar. Katie is middle class, but she revealed that her mother grew up “extremely poor.” Researchers have found that “women perform the majority of food-related work” (Allen & Sachs, 2007, p. 1), thus Katie may have learned much about food from her mother. As previously stated, low-income levels negatively affect children’s dietary and nutritional intake. Katie’s diet and health practices might indicate that messages about health are transmitted inter-generationally and might have a more powerful influence than income level.

Rosanna reported learning about healthy eating as a child. Rosanna’s mom also provided home-cooked meals. A vegetable dish within Rosanna’s household consisted of “collard greens with a bone, or piece of meat. And sometimes corn with bacon.” Rosanna and her mother are considered obese. Rosanna described her diet as “horrible.” Rosanna does not talk about her diet with anyone except her mother. When asked what those conversations centered around, Rosanna responded, “Just weight.” Rosanna said that her mother tells her she’s “getting fat.” Here is what Rosanna eats in a normal day:

- **Breakfast**
  - Water or Sprite
- **Lunch**
  - Hard Beef Taco and a Chicken Quesadilla from Taco Bell
  - Sprite
- **Dinner**
  - An eight-inch club on white w/ ham, turkey, bacon, provolone cheese, and mayonnaise
  - Water or a Watermelon Arizona Tea
- **Snack**
  - A chocolate chip cookie two-three times a week

Katie reported learning about healthy eating in a high school health class. Due to Katie’s parents’ busy schedules, eating out was “quick and easy.” Katie described her diet as unhealthy. She cited her busy schedule as a contributing factor to her unhealthy diet. She reported eating out at least two-three times a week. As previously stated, Katie reported eating out frequently as a child, due to her parent’s busy schedule. Katie and her mother are considered obese. Katie does not participate in a regular exercise routine. Here is what Katie eats...
on a normal day:
**Breakfast**
Egg and cheese sandwich, or egg and cheese English muffin
Water
**Lunch**
Four-piece chicken finger meal
Fries
Soda
**Dinner**
* Dinner meal is dependent on time available to cook meal. If there is not time:
  Wendy's spicy chicken sandwich – no lettuce
  Baked potato with butter and sour cream
  Medium Sweet Tea
*If there is time to prepare a meal:
  Italian grilled chicken
  Baked potatoes
  Velveeta shells and cheese
  Water

**Environmental Influences**
Community attitudes about exercise contribute to social norms regarding physical activity for a population of people. Seeing one's community members participating in regular exercise might have an impact on the exercise practices of individuals within that community. As such, I asked the participants about possible environmental influences, such as whether people within their communities walk for exercise and/or whether their neighborhoods have playgrounds to help promote activity among children. Almost all of the participants reported having a playground, or an area that children could play in, while they were growing up. Thirteen of the 16 participants reported that people walked in their neighborhoods. However, three of the 13 participants revealed that people walk, not for exercise, but for functionality or transportation. One participant, who reported that people did not walk for exercise in her neighborhood, also reported her neighborhood not having sidewalks. All of the participants described their neighborhoods as safe.

Laura's Story
Laura's experience is an excellent illustration of the general trends identified in the data. Laura is a middle-aged woman who said she grew up with access to healthy foods but not healthy behaviors. Laura is working class and grew up working class. Her family comes from the South. Laura is considered obese. Within the African American community, Laura said food can be a “comfort” to ease “depression” and “stress.” Laura also revealed her perception that within the African American family there is an emotional attachment to food. Laura reported learning about healthy eating later in life, although not until she reached her late 50s.

Interviewer: Tell me what you know about heart disease.
Laura: I know that I am very prone to it. I know that it is in my family. Well, in the African American community, it stems from a lack of knowledge. Um, eating, obesity, um, lifestyle, irregular visits to the doctor, you know just all the things that low socio-economic groups incorporate. So um, I believe that it is something that can be prevented in most cases. But, usually in my family, it has been a matter of fixing it, instead of preventing it, unfortunately.

Interviewer: And how do you think it can be prevented?
Laura: Early intervention is the key. I think it has, well I think it's actually very complicated because the questions you were asking earlier thought were excellent questions. You know if there's not--well let me go back. First of all, earlier if African Americans had more education, we had the food to be healthy. We were farmers; we had organic food that people are paying so much money for, but what we didn’t do is prepare them well. You know I think of all the fresh vegetables I had access to growing up, but then when you put a ham hock in it with a fat back, you're killing it. And, we had all the fresh cured meats, but when
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they were fried--you know nobody baked anything much. And then even if there was any baked fish or baked chicken you know it had gravy, and then you had mashed potatoes with butter. So you know all these things that could have been healthy had they’d been prepared differently, ended up being unhealthy because of the way we serve them and timing. You know you work all day, eat, then watch TV, and go to bed. All of that’s unhealthy. So I think that the government, well, should be intentional, as to why there are 15 liquor stores in some communities, and no grocery stores. Or if the grocery stores are there, there’s not fresh fruit and fresh vegetables. And if they are there, you have to think about--I know like now I work a whole lot, and I need more balance in my life. And, I fortunately have the resources that I can go buy a salad, or I can go to Whole Foods and get the vegan collards. But, if I still had children at home it would be very difficult because vegetables and fruit don’t last you know, more than a few days. So that means you can go to the grocery store once a month and get all of these frozen packaged stuff that you can fix quickly or you can learn how to do it another way. And I think that for people who have to work a lot, and don’t have balance in their lives with children, you have to be very intentional. And so when you’re dealing with bills and budget, and homework, and all of that it’s easier if you learned it early. Because that’s what I see, it’s what you teach your children and make accessible to them early.

I chose Laura’s story because it highlighted how communication and community can influence diet and exercise practices. Laura did not learn about healthy eating until she had reached her late 50s. Laura reported having access to healthy food, such as fresh vegetables, when she was a child but said that, when the food was prepared incorrectly, it was no longer healthy. Because Laura focused solely on food and never discussed other components of health, such as exercise, her story also suggested that there might be more salient messages about food than about exercise within the African American community.

DISCUSSION

Nearly 26 percent of African Americans are living below the poverty line (Census Bureau, 2009). The South has the highest rates of poverty in the United States (DeNavas-Walt et al., 2009) and heart disease is the number one killer of women in the South. Statistically, it is understandable why low-income African American women in the South are greatly affected by heart disease. But, what are the processes at work that exacerbate these women’s chances for heart disease? Researchers suggest that knowing that one is at increased risk for heart disease can decrease the acquisition of heart disease and its related illness. By examining knowledge of heart disease risk factors and health education within the African American community, I have begun to investigate the factors that place African American women at risk for heart disease.

From participant reports, there is a gap between actual and perceived risk for heart disease. This theme can be seen in the case of obese participants. Of the participants considered obese, less than half knew they were obese. This held true for identifying others as obese, as well. Of the participants with obese mothers, less than half identified their mothers as obese. There was also a correlation between obese mothers and daughters despite current income level, which indicates the mother’s importance in sharing positive health behaviors with her children. I also found that despite current income level, a mother who grew up poor passed down her initially learned ideals about food and exercise to her middle-class daughter.

Overall, there was a knowledge gap
between working class and middle class participants. Middle class participants were able to identify all of the risk factors associated with African American women and heart disease on the Heart Health Quiz. Most of the participants reported speaking about food with others within their community, but less than half of the participants reported talking about exercise. Physical activity and weight management are major preventative factors for heart disease. Having conversations about healthy foods, physical activity, and heart disease in the African American community can prove beneficial to reducing this disease among this population. Educating mothers, as well as future mothers, may also prove beneficial given that “women bear the responsibility for nourishing others” (Allen & Sachs, 2007, p. 1).

There were limitations to this study. The sample size of this study did not allow for a great number of African American women to share their stories. A bigger sample would also allow for a greater diversity within the sample population. This research study was a convenience sample. Only participants in the recruitment area were able to see and respond to the research advertisements. The majority of the advertisements were located on and near area university campuses. The placement of the fliers allowed for a greater number of individuals with post high school education to participate in the study, even though many still identified as working class. The percentages of African American women with post high school education in this study are not indicative of the entire population. Future research should attempt to solicit a larger and more diverse sample of African American women to fully understand the pathways by which being poor, being a woman, and being African American shape heart health behavior. Future research should also analyze the variations in communicative practices among varying linguistic groups within the African American community.

As revealed through the research there was a heart disease knowledge and awareness gap between middle and working class African American women. This signifies that class, or income level, affects the kinds of conversations that African American women have about health.
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About the Student Authors

David Blake is currently seeking a degree in biomedical chemistry with a minor in physics at the University of North Carolina at Pembroke. He is very interested in human physiology, and his goal is to pursue a career in mental illness research. His experimental studies have progressed into the realm of ultrasound research, where he is studying the effects of ultrasound on metabolism. He would like to pursue a PhD in a biophysical related science that is in line with his career goals and is currently exploring potential graduate programs.

Betsy Brinson graduated magna cum laude and received her BS in biochemistry from East Carolina University in 2007. She then went on to pursue a Doctor of Pharmacy at The University of North Carolina at Chapel Hill. She graduated with her PharmD in 2011 with University Honors. She currently practices as an oncology pharmacist at an outpatient oncology clinic in Sanford, NC. She enjoys patient care and has an interest in pharmacogenomics, where medication can be individualized based on a patient’s genetic makeup.

William Brown is currently an undergraduate student at East Carolina University, where he is pursuing his degree in History Education. Presently, he is anticipating his student teaching at J.H. Rose High School in Greenville, NC. He hopes to continue his studies and plans to pursue a master’s degree in education. His research interest is American History and is a member of the Lambda-Eta Chapter of Phi Alpha Theta.

Sheila Casalett is currently completing her last semester at Meredith College in Raleigh, NC, where she is pursuing a BA in Spanish. She plans to continue with higher education by pursuing a PhD specializing in Latin American studies. In addition to her studies, she currently volunteers with Wake Technical Community College’s ESL program and the North Carolina Society of Hispanic Professionals’ after school tutoring program in an effort to help foster cultural understanding between immigrant and local populations and to promote education among Hispanic youth. Her research interests include Mexican identity studies, Latin American colonialism, and U.S.-Mexico relations.

Camila Domonoske is currently a senior at Davidson College, where she is pursuing a BA in English. In the summer of 2010, she traveled to the Philippines on grants from the Dean Rusk International Studies Program, the George L. Abernethy Endowment, the Thompson S and Sarah S Baker Scholarship, and the Bank of America/Kemp Scholars Program. She is currently working on an honors thesis on ironic poetics in 20th-century American poetry. Her research interests include postcolonial theory, irony and satire, and modern and contemporary American literature.

Kristen Gallagher is currently an undergraduate student at Meredith College in Raleigh, North Carolina. She is studying Museum Studies and Art History, and plans to pursue a master’s in Museum Education after graduation.
Currently, she is concluding research on the contemporary art of Cambodia. She is involved in many museums within North Carolina, and has served as an intern or volunteer at art, history, and science museums. Her research interests include furthering her work in encaustic painting and history, Cambodian contemporary art, the interaction of art and science, and new methods in museum education.

Jeff Guilford graduated at the top of his class in 2011, receiving a BA in philosophy with a minor in Spanish from North Carolina State University. He is currently working on applications to various graduate programs, as well as on a short book that will offer a critical analysis of Richard Dawkins’ book, The God Delusion. Though he is uncertain of exactly where his future studies of philosophy, religion and history will lead him, he hopes above all that they will continue to help him to understand and appreciate the great mystery of human existence. His research interests include European intellectual history, philosophy of religion, and existentialism.

Clifford Eugene “Trey” Mayberry III received his Associate in Arts degree in 2009 from Mitchell Community College in his hometown of Statesville, NC and a Bachelor of Arts degree in history from Mars Hill College near Asheville, NC in 2011. He performs as an Elvis Presley, Buddy Holly, and Johnny Cash tribute artist, and plans on attending graduate school in the near future.

Kristy Mitchell, the Salutatorian of Fayetteville State University, graduated summa cum laude in May 2011 and received her BS in mathematics. She was as a member of the FSU Honors Program and Phi Eta Sigma Honors Society, and held an internship with the National Science Foundation in Washington, D.C. Kristy is currently a graduate student at Wake Forest University, where she is pursuing a Master’s Degree in mathematics. Upon graduation, she plans continue her education and pursue a PhD in Mathematical Biology. Her research interests are in the area of algebraic coding theory and mathematical biology.

Mary Beth Pacewicz graduated from the University of North Carolina Wilmington with a Bachelor of Science degree in marine biology and a Bachelor of Arts degree in psychology. She graduated with University Honors with honors in psychology. She is now attending Humboldt State University and working on her master’s degree in Biology. She is studying the marine mammals that strand along the coast of Northern California.

Rebecca F. Panter is currently seeking a degree in Chemistry at the University of North Carolina at Pembroke. She is a student researcher who is studying under both Dr. Brandon and Dr. Pereira. Her research with Dr. Brandon involves engineering optical instruments for chemical analysis, and acting as logistics team leader for an undergraduate physics research group. Her collaborations with Dr. Pereira include horticultural studies investigating physical methods to enhance plant growth without using chemical additives.
Olivia Pettigrew
is a recent graduate from the University of North Carolina Greensboro. She graduated summa cum laude in 2011, receiving her BA in anthropology and Spanish. Presently, she is spending a year in the Dominican Republic doing volunteer work. Upon her return, she hopes to continue in higher education and plans to pursue a Master’s of Public Health in International/Global Health. Her research interests within social anthropology include genocide and political violence and disasters and their aftermath.

Ranata Reeder
is a recent graduate of North Carolina State University, where she earned a BA in communication, with a minor in Spanish. She graduated with cum laude honors on May 14, 2011. Currently she is completing an internship with the Congressional Black Caucus Foundation in Washington D.C. She intends to attend graduate school in the Fall of 2012, where she hopes to pursue an MA in communication.

Hannah Simpson
graduated magna cum laude in 2010 with a BA in political science, a BS in journalism and a minor in economics from the University of North Carolina at Pembroke. She plans to pursue a Master’s degree in international economic development. She is currently preparing to relocate to Japan to gain experience in international community development. Her research interests include the political economy of transition countries, including transition policies and the effects of traditional culture on emerging social and economic institutions.

Bethany Starnes
is a 2011 graduate of Campbell University in Buies Creek, NC. She graduated magna cum laude with her BS in biochemistry and chemistry and minors in general science and biology. Starnes is currently attending NC State University in Raleigh, NC to pursue her PhD in chemistry. She hopes to study analytical and biological chemistry. After obtaining her degree she plans to work as a chemistry professor at a teaching university.
About the Faculty Mentors

James C. Boyles, PhD
teaches modern, American, and medieval art history at Meredith College and North Carolina State University. He received his BA, MS in LS, MA and PhD in art history from the University of North Carolina at Chapel Hill. His research focuses on nineteenth-century American art, with a concentration on American artists’ interpretation of Native America.

William D. Brandon, PhD
serves as an assistant professor at the University of North Carolina at Pembroke (UNCP). He graduated from the University of Tennessee with a BA in physics and mathematics and later earned a PhD in experimental physics. He often works with UNCP’s RISE program as a mentor to students that are interested in physics. He is an experimentalist, and collaborates with students in areas of optics, hardware and software engineering and other technical fields.

Kate Bruce, PhD
is Professor of Psychology at University of North Carolina Wilmington. She is collaborating with Dr. Mark Galizio and several fantastic students to study comparative cognition in rats. In the lab, the group uses olfactory stimuli to test whether or not rats can form abstract concepts such as identity, oddity, and transitivity. Her training in animal behavior and comparative psychology has set the stage for studying learning in nonhumans from an evolutionary and functional perspective. She also directs the UNCW Honors College.

Marina Bykova, PhD
is professor of philosophy in the Department of Philosophy and Religion at NC State University. She specializes in the history of philosophy. Her main field of interest is the nineteenth century continental philosophy, with a special focus on German idealism and theories of subject and subjectivity. She was awarded an Alexander von Humboldt Fellowship (1989-1990, Germany) and a Lisa Meitner Fellowship (1995, Austria). She taught at the Institute of Philosophy of the Russian Academy of Sciences and held visiting professorships at the Moscow Lomonosov University (Russia), University of Marburg (Germany), and University of Vienna (Austria). She has authored three books and numerous articles on Hegel and German idealism. Her works have been published in Russian, German, and English. She is currently working on the concept of Enculturation (Bildung Ger.) in German idealism.

Shireen E. Campbell, PhD
serves as a full professor and directs the Writing Center at Davidson College. Before joining Davidson College, she graduated from Florida Atlantic University with a BA in English and then earned a PhD in Modern Literature from Tulane University. Professor Campbell’s research and teaching interests range from writing center theory and practice to creative non-fiction, young adult fiction, and modern American and British literature.

W. Lin Coker III, PhD
serves as an assistant professor at Camp-
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Judith G. Curtis, PhD serves as a tenured associate professor in the Department of Mass Communication at the University of North Carolina at Pembroke. She earned a BA in journalism from the Pennsylvania State University, an MA in political science from Hood College, and a PhD in mass communication from the Union Institute and University. Prior to beginning her university teaching career, she worked for several decades as a professional journalist, editor, and executive in the newspaper, magazine, and book publishing industries. At UNC-Pembroke, she is the faculty advisor of the student newspaper, which wins yearly awards from the American Scholastic Association and the North Carolina College Media Association. She also oversees the journalism curriculum at UNC-Pembroke. Her research area focuses on Agenda Setting Theory and its extension to social issues.

Wade G. Dudley, PhD serves as an associate professor at East Carolina University. He holds a BS in social studies (East Carolina University), an MA in maritime studies and nautical archaeology (ECU), and a PhD in history from the University of Alabama at Tuscaloosa. Dr. Dudley spent two decades with Procter & Gamble Manufacturing before returning to academia. Author of eight books and numerous chapters and articles, he specializes in naval and North Carolina history. He also serves as the Director of the Carolinas Region for Phi Alpha Theta History Honor Society and as faculty advisor to the Lambda-Eta Chapter of Phi Alpha Theta.

Sinikka Elliott, PhD is assistant professor of sociology at North Carolina State University. Her research interests include family dynamics, gender, sexuality, and social inequality. Her current project examines how low-income families negotiate food access in rural and urban neighborhoods.

Mary Farwell, PhD holds an ScB in biology from Brown University and PhD in biochemistry from University of California, Berkeley. She began at East Carolina University in 1994 as an assistant professor in the Biology Department and rose to full professor in 2010. Her research centers on mitochondria and cell death, with an interest in oxidative stress. She is also part of a team studying the role of technology in science teaching and learning. Since 2008, Dr. Farwell has served as the Director of Undergraduate Research in the Division of Research and Graduate Studies at ECU.

John Gripentrog, PhD received his PhD from the University of Wisconsin-Madison in 2006 and is now an Associate Professor of History at Mars Hill College near Asheville, North Carolina. His article, “The Transnational Pastime: Baseball and American Perceptions of Japan in the 1930s,” appeared in the April 2010 issue of Diplomatic History. He is currently working on a study of U.S.-Japanese relations in the interwar period.
Kevin Hunt, PhD
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Eric Jones, PhD
research scientist, University of North Carolina at Greensboro, received his doctorate at University of Georgia in ecological and environmental anthropology. Jones has focused his recent work on understanding how the structuring of social relations following extreme events (e.g., natural disasters, pioneer colonization, and immigration) impact individual outcomes and recovery. He is the co-editor-in-chief of the Journal of Ecological Anthropology, coauthored the edited volume The Political Economy of Hazards and Disasters (2009, AltaMira Press), published the innovative methodological piece “Extreme Events, Tipping Points and Vulnerability: Methods in the Political Economy of Environment” in Environmental Social Sciences: Methods and Research Design (2010, Cambridge University Press), and applied social network analysis to the study of cooperation among pioneer colonists in ‘Wealth-Based Trust and the Development of Collective Action’ (2004) in the journal World Development.

Kami A. Kosenko, PhD
serves as an assistant professor in the Department of Communication at North Carolina State University. She earned her PhD in communication from the University of Illinois at Urbana-Champaign in 2008 after completing her MA at the University of Texas at Austin. Her research centers on the role of communication in the management of stigmatized identities and conditions, and she has published in top communication and biomedical journals.

Arthur Murphy, PhD
head and professor of anthropology, University of North Carolina at Greensboro, received his doctorate from Temple University in anthropology. Murphy’s research involves urbaneconomic systems, as well as the cultural and social dynamics of disaster recovery. His disaster research covers floods, volcanic eruptions, and hurricanes in the United States, Mexico, and Ecuador. He is the coauthor of Social Inequality in Oaxaca (1991, Temple University Press), The Mexican Urban Household (1990, University of Texas Press), and coeditor of The Political Economy of Hazards and Disasters (2009, AltaMira Press).

Maria J. Pereira, PhD
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Vassil Yorgov, PhD
is a professor in mathematics at Fayetteville State University. He graduated from Sofia University, Bulgaria, with master in mathematics and earned a PhD in mathematics from Sofia University. Before joining the Fayetteville State University he was with Shoumen University and Michigan Technological University. His research interests are in the area of algebraic coding theory and combinatorics.
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Who is eligible?

The primary author or authors must be undergraduates at a 2 or 4 year college or university in the state of North Carolina working on original research under the direction of a faculty mentor. Works may be co-authored. Students at NCSSM are also eligible.

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We are seeking research papers, critical essays (literature/research reviews, articles written on a particular topic), or media submissions of performing/fine art endeavors. Text of papers should be no more than 600 words. Explorations, the Journal of Undergraduate Research and Creative Activities for the State of North Carolina, provides opportunities for a variety of text and media submissions in the following disciplines:

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- Business and Legal
- Creative Writing and Discourse
- Humanities
- Mathematics
- Performing Arts
- Social Sciences
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3. Images need to be saved as .jpgs, preferably at high resolution (300dpi).

4. If images are not yours, please obtain permission in writing and cite the copyright owner.

5. Use grayscale (no colors) on all charts, tables, graphs.

6. Submit everything in its original file. (Example: article as Word doc, image as .jpg.) Do not convert files. Do not embed images into your article. Create an Appendix to indicate image placement.

Please attach your submissions and all additional forms in an email addressed to: csurf@uncw.edu.

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1. Make sure your name is on everything you submit

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4. Once your work has been blind reviewed, you may submit your work yourself or your faculty mentor may submit it. If you are a single author, you will be the main contact. If you are one of multiple authors, decide who will be the main contact and have him/her submit on behalf of all.