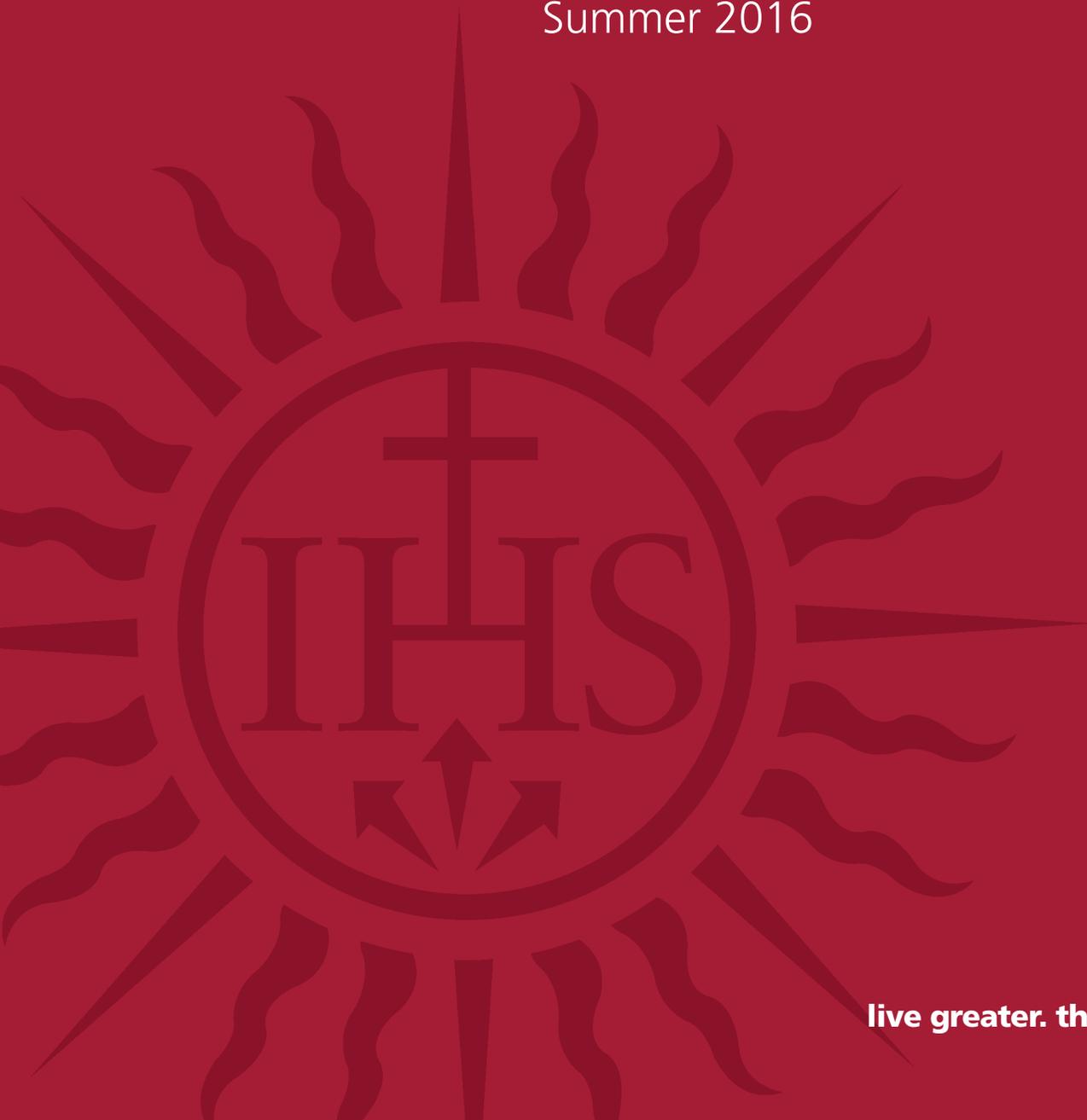




**Summer Scholars Program**

Summer 2016



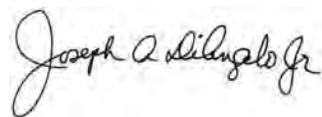
**live greater. that's the magis.**

Welcome to the 17<sup>th</sup> Annual Summer Scholars Dinner at Saint Joseph's University. This year, 94 students and 59 faculty mentors, representing 24 departments and programs participated in the Summer Scholars Program. We are excited to have families, donors, administrators and staff join us in tonight's celebration. This signature program would not be so extremely successful without your support.

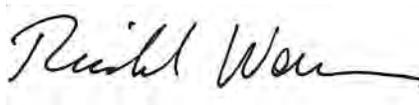
We especially like to thank the Faculty Mentors who give of their time and energy to work closely with students engaged in creative scholarly work and independent research across the University. Our Summer Scholars are grateful for the opportunity you have provided and recognize the difference it makes in their college experience.

Thank you for taking the time to join us tonight as we celebrate the accomplishments of our true student scholars. We would also like to thank everyone whose support continues to make scholarly activity at Saint Joseph's University a priority.

Sincerely,



Joseph DiAngelo, MBA, Ed.D.  
Professor of Management  
Dean, Haub School of Business



Richard Warren, Ph.D.  
Professor of History  
Interim Dean, College of Arts & Sciences



Jeanne F. Brady, Ph.D.  
Professor of Educational Leadership  
Provost/VP for Academic Affairs

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**The Office of the Dean, CA&S**  
**The Office of the Dean, HSB**  
**The Office of the Provost**  
**Redemption Project**



**Matthew J. Anderson**  
Department of Psychology  
Saint Joseph's University

Ph.D. Kent State University

**Research Interests:** Avian Behavior

Dr. Anderson is an experimental psychologist specializing in animal behavior. His research focuses on avian species, with a particular interest in flamingos, budgerigars, and other gregarious birds. Dr. Anderson and his students study the captive flock of Caribbean flamingos (*Phoenicopterus ruber*) at the Philadelphia Zoo, and also employ web cams trained on flamingo flocks around the globe in order to better understand the behavior of these highly social, iconic birds, and to perhaps gain some insight into the evolution and workings of general behavioral processes. His research on Caribbean flamingo resting behavior and efforts to answer the age-old question, "Why do flamingos stand on one leg?" have received substantial media coverage from around the globe. In addition to his work on flamingos, Dr. Anderson also maintains a colony of budgerigars (*Melopsittacus undulatus*) in order to allow for on-campus behavioral studies of this ever-popular bird species. With the assistance of his students, Dr. Anderson investigates a range of behavioral processes, including: resting behavior, laterality, social behavior, and learning and cognition.

He is the author of over thirty articles and book chapters, has edited a book titled, *Tasks and Techniques: A Sampling of Methodologies for the Investigation of Animal Learning, Behavior, and Cognition* (Nova Science Publishers, ISBN 1-60021-126-7), and has written/illustrated a children's picture book titled, *Pink Flamingos All Around* (Speckled Egg Press, ISBN 9781620063149).

# **Investigating the Relationship Between Cognitive Capabilities and Hemispheric Lateralization in the Budgerigar (*Melopsittacus undulatus*) Through Problem Solving Tasks**

Angelo d'Antonio-Bertagnolli, '18

Faculty Mentor: Matthew J. Anderson  
Department of Psychology



Supported by the SJU Summer Scholars Program

Hemispheric laterality within the vertebrate brain is far from rare. The ubiquity of such lateral asymmetries across species lines has led to a recent resurgence in research regarding laterality's potential ethological advantages and evolutionary causes (Rogers, Zucca, Vallortigara 2004; Gunturkun *et al.* 2000; Duggan, Buckley, Anderson 2014; Magat & Brown 2009). Although laterality has found this home in contemporary research, further investigations into budgerigar (*melopsittacus undulates*) laterality are still warranted.

Cerebral lateralization labels the phenomenon of an individual's static behavior-specific side preferences that correspond with preferential processing in a particular cerebral hemisphere (Duggan, Buckley, Anderson 2014). As visual and tactile stimuli are often processed in specific hemispheres, side preferences (e.g., footedness) offer a pragmatic behavioral indicator of hemispheric laterality contralateral to the observed side preference (Magat & Brown 2009). In a number of prior studies, the degree of hemispheric lateralization quantified for a specific bird has shown direct proportionality with the bird's performance on a cognitive problem-solving task. Many previously studied bird species that have shown this result have phylogenetic relations to budgerigars (*m. undulatus*), which begs the question – do budgerigars show the same link between lateralization and performance on such tasks? If so, such findings would suggest that at one point a dual processing brain was an evolutionary advantage for the species and allotted the birds a fitness advantage in the wild.

In the present study, degrees of hemispheric laterality were quantified for 11 captive budgerigars, which subsequently underwent memory based dig-task and a complex tool use problem. We hypothesized that we would see individual level lateral preferences but not population level lateral preferences, and expected that the strength of the lateral preferences would be related to performance on cognitive tasks – with the stronger preferences being directly related to higher success rates. Two individual lateral preferences were discovered, as well as one population level lateral preference. One specific lateral behavior – preening – displayed positive correlations with measures of success on the dig task presented to the birds. Such data generally agree with past literature on budgerigar laterality, and support the idea that laterality in aves is a good predictor of increased cognitive capability and fitness advantages in the wild.



**Catalina Arango**  
Department of Biology  
Saint Joseph's University

Ph.D. University of Massachusetts

**Research Interests:** Environmental  
Microbiology and Bacterial Gene  
Regulation

Bacteria are my passion. I am fascinated by the sophisticated mechanisms that bacteria use to control their gene expression in response to environmental conditions, and most of my research is directed towards understanding these mechanisms. For example, some bacteria are able to “choose” the most energetically favorable carbon source when there is more than one available in the environment and use it first. This behavior, called catabolite repression, is the result of an intricate interaction of proteins and other molecules, where some sense the presence of the preferred carbon source and others communicate the signal to specific genes that are turned on or off. Although the players (proteins and such) are similar in different bacteria, the role they play may be very different! I use the bacterium *Sinorhizobium meliloti* as a model organism to study catabolite repression. My students and I are trying to understand how catabolite repression works in *S. meliloti* by studying a specific group of genes, the *melA-agp* operon, which are necessary for the utilization of certain sugars. We hope that by learning more about how catabolite repression affects these genes, we can gain understanding of how it controls other genes.

# Investigating the Architecture of a Succinate Mediated Catabolite Repression Controlled Promoter in *Sinorhizobium meliloti*

Mariana Duarte, '19

Vincent Pepe, '17

Leona Ryder, '18,



Faculty Mentor: Catalina Arango  
Department of Biology

Supported by the American Society for Microbiology Undergraduate Research Fellowship Program and the John P. McNulty Scholars Program

*Sinorhizobium meliloti*, a Gram negative bacterium, can form a symbiotic relationship with legumes. In this symbiosis, *S. meliloti* fixes nitrogen in exchange for carbon sources such as succinate. In the presence of succinate, *S. meliloti* exhibits a regulatory mechanism known as succinate-mediated catabolite repression (SMCR), a process where succinate controls the expression of secondary carbon source catabolism genes. In *S. meliloti*, succinate is the primary carbon source, whereas raffinose is an example of a secondary carbon source. Although the mechanism of SMCR is largely unknown, an incomplete phosphotransferase system (PTS) has been identified as participating in transmitting the signal from the presence of succinate, and in regulation of the affected genes. One of the operons regulated by SMCR is the *agp-melA* operon, which encodes proteins for transport and catabolism of raffinose. This operon is activated by AgpT in the presence of raffinose and is repressed in the presence of succinate. The focus of our research is to locate regulatory sequences that allow gene regulation through SMCR and identify proteins that bind to those regulatory sequences.

Previous research has identified a ~400 bp region upstream of the operon, *PmelA*, that contains all regulatory sequences necessary for SMCR. Upstream of *PmelA* is the *agpT* gene, which codes for the AgpT activator and is transcribed in the opposite direction of *agp-melA*. Random single nucleotide substitutions and truncations at the 5' end of *PmelA* helped to identify a region to which an activator may bind. Preliminary results from Electrophoresis Mobility Shift Assays (EMSA) suggest that AgpT binds to the first 30 bp of the *PmelA* and that there may be an important role for bp 16 of the sequence. Future gel shift assays will include the 30bp sequences with various point mutations and the full 400 bp sequence.

Looking forward, our research will investigate the nature of AgpT's expression. A reporter construct made from *PmelA* attached to *gfp* at the *agpT* end will help directly measure AgpT expression. From this construct, we will be able to determine whether it acts on *agp-melA* through SMCR or constitutively. Other possible regulators of the *agp-melA* operon that bind to the promoter will be recovered via DNA affinity chromatography. In addition, a 3' shortened promoter construct will be made to identify additional protein binding sites.



**Ernest Baskin**

Department of Food Marketing  
Saint Joseph's University

Ph.D. Yale University

**Research Interests:** Judgment and Decision Making, Consumer Behavior, Consumer Mispredictions, Encouraging Healthy Behaviors

Ernest Baskin's research focuses on consumer judgment and decision making with a particular interest in environmental effects on judgment and choice using experimental methodology and survey design. Within this domain, he strives to work on ideas that have both practical and theoretical implications. He is interested in how consumers make choices and particularly how to influence those choices towards healthier options. In addition, he looks at how the environment affects the choices that consumers make both at retail point of purchase as well as in their everyday lives. His work has been published in journals such as the Journal of Consumer Research and the Journal of Marketing Research and has been extensively covered in the popular press in outlets such as the Chicago Tribune, Lifehacker, and The Atlantic.

This summer, he worked with a summer scholar on two separate projects. One of the projects involved the impact of emotion on food eating behaviors. In particular, the research focused on how various emotional states such as sadness and angry affect one's preferences. The second project involved looking at the effect of meaningless descriptors on food preferences. In particular, we looked at how adding meaningless descriptors to menu items (e.g. fiducated corn bread) can affect consumer's perceptions of them. These projects involved experiences in literature review, hypothesis generation, survey design and survey analysis.

# **The Effects of Being “Hangry:” Is Anger a Key Factor in Food Consumption? Effect of Meaningless Descriptors on Price Perception**

Jane Hooper, ‘18



Faculty Mentor: Ernest Baskin  
Department of Food Marketing

Supported by the SJU Summer Scholars Program

Have you ever been “hangry”? The famous term, specifically seen in Snickers commercials, has been deemed in pop culture as anger provoked by hunger. Hunger induces anger due to a lack of food, which leads to a lower blood glucose level, making it harder for us to regulate our emotions. Thus, we get angry quickly. However, even with this cultural phenomenon, prior research has only focused on the effects of sadness and happiness on food consumption. My research looks to explore these unanswered questions of the effect anger has on consumers’ eating habits; what are people are most likely to eat when “hangry”?

My research project consists of a literature review on the theory of food consumption and emotions, specifically how anger differs from other negative emotions such as anxiety and sadness. My hypothesis is that the effect of anger causes people to increase their buying and consumption of products due to anger’s motivational tendency to have an “approach-related effect”. I have run multiple studies through online surveys using *Qualtrics* technology that have observed people’s eating and purchasing behavior when angry.

My second project examines the retail side of food marketing in the restaurant industry. Designed to add a “hipster” flair to impress “foodie” customers, some high class restaurateurs insert exuberant, but meaningless words to their menus to establish wealth and uniqueness. A website, “The Brooklyn Bar Menu” generates fabricated menus with meaningless food descriptors, such as “invigorated”, “fiducated”, “awakened” etc, aimed to mock these hipster restaurants. To see if these descriptors actually have an effect on consumers, my advisor, Dr. Baskin, and his coauthor, Dr. Peggy Liu, have run studies and found conclusive results. Their studies suggest that the meaningless descriptors have a significant effect on price perception, making consumers believe that the food is more expensive. However, these descriptive words have a negative effect on consumer’s willingness to try the food and go to the restaurant. The results also show no significant effect on the product’s taste.

I have furthered this research by exploring previous literature on menus, linguistics, and perception of nonsense words, price, and uniqueness to try and figure out why our studies have concluded these results. I also have been conducting studies using surveys to see how menus with these meaningless descriptors affect people’s overall picture of a restaurant’s atmosphere. Our hypothesis is that these descriptors produce a perception of uniqueness and fanciness, causing people to believe it is more expensive.

We will continue to research this project throughout 2016 with the hope of publication in a scholarly journal by the end of the year.



**Elizabeth Ann Becker**  
Department of Psychology  
Saint Joseph's University

Ph.D. University of Wisconsin

**Research Interests:** Neural Mechanisms of Social Behavior,  
Neurodevelopmental Consequences of Early Drug Exposure, Aggression,  
Epigenetics

My primary interest as a behavioral neuroendocrinologist, is understanding the neural mechanisms underlying the transmission of species typical behavior from parent to offspring. In particular, I focus on non-genetic, parental contributions to the development of offspring brain and behavior (e.g. how parental care influences offspring biology). In my lab we examine a range of social behaviors including aggression, monogamy, animal communication and future parental behavior.

For many species, the postnatal period, which consists primarily of feeding and thermoregulation, is a critical phase in development. In female offspring, it has been well-documented that care from mothers influences the development of maternal behavior and anxiety through epigenetic mechanisms. Although the majority of research has focused on maternal care, the early social environment is not limited to interactions with mothers alone, and may include fathers, siblings and even alloparents. In the bi-parental California mouse, for example, increased care from fathers leads to increased paternal behavior and aggression in adult male offspring. Paternal care is rare among mammals and therefore, has been largely understudied. In the Becker Lab, we work with the monogamous, territorial and highly aggressive California mouse (*Peromyscus californicus*), which is a model system for exploration of paternal investment on offspring development and the development of aggression.

We have a new area of research in the lab examining the neurodevelopmental consequences of early-life antidepressant exposure (via mother's milk). Our preliminary findings suggest a causal link between SSRI (a class of antidepressant) use by nursing mothers and impairment of the oxytocin system which is implicated in the development of autism spectrum disorders.

**Summer Research Highlights.** There were three summer scholars working in the Becker Lab this summer. Amanda Leithead, Alex Gill and Erica McDonald worked tirelessly on aspects of several studies in the lab including: study design, protocol writing, behavioral testing, brain collection and immunohistochemistry. Working with these truly bright and dedicated students was both rewarding and a pleasure.

# **Effects of Paternal Deprivation on the Development of Oxytocin and Vasopressin Systems in *Peromyscus Californicus***

Alex Gill, '18

Faculty Mentor: Elizabeth A. Becker  
Department of Psychology

Supported by the SJU Summer Scholars Program



The California mouse is a monogamous and biparental rodent species that is ideal for studying paternal care, as such care is rarely demonstrated in nature. California mouse parents both actively care for young from the day of birth. A large body of previous research indicates that two neuropeptide systems in the brain, vasopressin (AVP) and oxytocin (OT) are implicated a wide array of social behaviors including aggression, parenting, pair bonding, and others. The early social environment of the pups affects these systems, particularly the care given to them by each of their parents. California mouse fathers demonstrate a sharp change in behavior around the 15<sup>th</sup> day of a pups life, changing from mostly huddling, licking, and grooming their pups to more actively retrieving them (grabbing them by the scruff of their neck and returning them to the nest). Experimentally increasing retrievals has been shown to impact AVP systems in offspring.

My research will observe if and how this change in paternal behaviors impacts these important brain systems. It will also observe both sexes to determine if paternal care affects each sex differently. The research will also fill in a confound in previous research, the effects of paternal deprivation studies on the mother left to raise offspring alone. Paternal care in this study will be reduced by removing fathers from the cage for different lengths of time at different points during the early life of their offspring. Eventually, brains of offspring will be collected to determine the effects that the presence or absence of a father had on development. The project will be ongoing throughout the school year, so no data has been collected yet.

# **Epigenetic Transmission of Parental Behavior in the California Mouse**

Amanda Leithead, '17

Faculty Mentor: Elizabeth A. Becker  
Department of Psychology



Supported by the SJU Summer Scholars Program

The California mouse is rare among mammals for its monogamous and bi-parental nature, with fathers playing an important role in the development of both brain and behavior in their offspring. In this species, both parents engage in caring for their young through huddling, licking, and grooming behaviors. Fathers also frequently engage in retrievals, a protective behavior by which they carry their pups back to the nest, away from environmental threats. Previous research indicates that high paternal care received during development increases paternal behavior demonstrated by adult male offspring. It is postulated that this transmission of parental behavior across generations occurs because environmental changes affect the structure of DNA strands which promote the expression of particular neurohormone receptors in the brain associated with parental behaviors. Both vasopressin and estrogen have been established as critical neurohormones for promoting the expression of parental behaviors. In particular, male and female offspring exposed to high degrees of paternal care during development have shown an increase in levels of vasopressin. Estrogen has been popularly associated with maternal behaviors in rodent species; however, previous studies have shown that male rodents treated with estrogen implants demonstrated increased levels of paternal care toward their offspring. Additionally, both male and female offspring exposed to high degrees of paternal care exhibited increases in the neurohormone testosterone, which is biologically related to the production of vasopressin and estrogen. It has yet to be determined whether these changes in the neural expression of vasopressin and estrogen are due to the impact of environmental changes on the structure of the DNA responsible for their production.

This summer, I have collected the brains of adult male and female offspring that underwent a previous study examining the effects of paternal care during development. These mice were exposed to conditions of either high paternal care or low paternal care during development, then observed in adulthood with their own offspring. Brains will be analyzed for epigenetic modifications of vasopressin and estrogen receptors. We will then compare modifications of these neurohormones with the degree of paternal care received and the level of parental behavior demonstrated to establish an epigenetic transmission of parental behavior between generations of California mice. I will continue the work of my Summer Scholars project as I develop my thesis this semester as a graduate student in the five-year Psychology program.

## **Establishment of Female Winner Effect in *Peromyscus californicus*, California Mouse**

Erica McDonald, '17

Faculty Mentor: Elizabeth A. Becker  
Department of Psychology

Supported by the SJU Summer Scholars Program



The winner effect is a phenomenon found in various species that increases an organism's probability of winning an aggressive encounter after winning several previous aggressive altercations. The development of this winner effect in the territorial *Peromyscus californicus*, also known as the California mouse, is due to multiple exposures to aggressive encounters, as well as a surge of testosterone release post-encounter. A full winner effect is developed in male California mice after three consecutive victories in resident-intruder tests. The release of testosterone post-encounter has been found to increase frequency of attacks as well as shorter attack latencies in aggressive altercations.

The objective of this study is to determine whether female California mice have behavioral and hormonal responses to aggression similar to that of male California mice. Numerous studies have shown the various factors that have an effect on male aggression in the California mouse, but very few studies have investigated factors of aggression in females. A study conducted by Oyegible & Marler, 2005 found that male California mice who have experienced multiple wins in aggressive encounters are more likely to win future encounters, as well as have a higher level of testosterone post-encounter compared to the control. This winner-effect seen in males has yet to be established in female California mice. This study will replicate the procedure found in Oyegible & Marler, 2005, but will instead use females to determine whether this phenomenon exists in female California mice. Another factor that needs to be taken into consideration while performing this experiment is the female estrous cycle. Studies have shown that the female California mouse is more aggressive in the diestrus stage of the estrous cycle, and less aggressive in the other three stages. This study will attempt to discover if the female estrous cycle has any effect on levels of aggression.

The experiment will take place during the semester. The summer was used to learn the techniques necessary to perform the experiment, as well as to draft the experimental design. The experimental design will follow that of Oyegible & Marler, 2005. During the training phase, female California mice will be exposed to zero, one, two, or three winning experiences through a biased resident-intruder test in which the focal female mouse will be exposed to an aggressive encounter with a disadvantaged intruder. During the testing phase, all female mice will be exposed to a resident-intruder test with an equally matched intruder to determine if the previous winning experiences or lack thereof had an effect on the female's chances of winning the aggressive encounter. After the testing phase encounter, a winner will be determined, and blood will be collected to determine levels of testosterone. The stage of estrous cycle of each female will be determined to see whether the stage of estrous cycle a female is in has an effect on aggressive behavior.



**Shantanu Bhatt**  
Department of Biology  
Saint Joseph's University

Ph.D. Emory University

**Research Interests:** Gene Regulation in  
Pathogenic *Escherichia*

Enteropathogenic *Escherichia coli* (EPEC) is a significant cause of morbidity and mortality amongst infants in developing countries. EPEC belongs to the attaching and effacing (A/E) family of pathogens that are so called because they attach intimately to intestinal cells and destroy cellular microvilli – organelles that play critical roles in the absorption of fluids and nutrients. The destruction of these appendages contributes to the observed diarrhea. The ability of EPEC to attach, efface, and cause diarrhea resides within the pathogenicity island locus of enterocyte effacement (LEE). The LEE of EPEC is necessary and sufficient for pedestal formation. Because of its indispensable role in virulence, the regulation of the LEE has been extensively characterized over the past two decades. Over 50 regulators of the LEE have been identified that affect the LEE at every imaginable level of gene regulation. Surprisingly, though, almost all the known regulators are proteins and very little information is available on the role of regulatory small RNAs (sRNAs) in EPEC pathogenicity. sRNAs are a heterogeneous group of molecules that range in size from 50-500 nucleotides in *E. coli* and are usually not translated. The majority of sRNAs elicit their effect by directly base pairing to their target mRNAs to affect stability and/or translation. My lab is interested in identifying sRNAs that directly or indirectly regulate the LEE and contribute to the virulence of EPEC.

A second project, that I have recently initiated, explores the pathogenicity of the emerging enteric pathogen *Escherichia albertii*. Several recent outbreaks of diarrhea have been attributed to this bacterium. *E. albertii*, like EPEC, possesses an intact LEE. However, the pathological and evolutionary significance of the pathogenicity island remains undocumented in *E. albertii*. In the past two decades since the original identification of this pathogen, not a single chromosomal gene has been mutated. This past summer we were able to successfully mutate multiple virulence genes in *E. albertii* and are currently investigating the roles of these genes in the pathogenicity of the bacterium.

Our research will provide insight into the repertoire of regulatory mechanisms used by LEE-possessing pathogens to cause disease, which will aid in the rational design of therapies to combat these bacteria.

# Investigation of the Roles of Hfq and the Hfq-dependent sRNA RyhB in the Virulence of Enteropathogenic *Escherichia coli* (EPEC) and *Escherichia albertii*

Marisa Egan, '18



Faculty Mentor: Shantanu Bhatt  
Department of Biology

Supported by the SJU Summer Scholars Program and the John P. McNulty Scholars Program

Enteropathogenic *Escherichia coli*, commonly known as EPEC, is a diarrheal pathogen that infects infants in developing countries. The bacterium belongs to the attaching and effacing (A/E) morphotype of pathogenic *E. coli*, since it colonizes the small intestine by directly binding to the intestinal epithelial cells and destroying cellular microvilli. Currently, there are no vaccines to counteract EPEC infections due to the heterogeneity of its surface associated proteins. Moreover, there is an emergence of multi-drug resistant strains. Similarly, *Escherichia albertii* is a novel A/E pathogen with an unstudied virulome, despite a report from the Centers for Disease Control and Prevention (CDC) that *E. albertii* is an emerging pathogen. Routine commercial diagnostic procedures often misidentify *E. albertii*, since it shares common biochemical properties with other bacteria such as *E. coli*. Due to our inadequate knowledge of the distinct properties of *E. albertii*, its misidentification persists. Multiple recent studies have shown that a substantial number of EPEC and EHEC isolates (~15%), which were previously incriminated in food-borne diarrheal outbreaks, are taxonomically *E. albertii*. The pathogenic potential of *E. albertii* is evident yet its virulence is still unexamined. Clearly, there is an increased urgency to understand the molecular mechanisms of virulence of both *E. albertii* and EPEC in order to combat these infections.

The virulence of these two enterobacteria is attributed to their major pathogenicity island: the locus of enterocyte effacement (LEE). The LEE is essential for the attaching and effacing nature of these pathogens, as it provides the genetic basis for the pathogenicity of A/E pathogens. Specifically, the LEE encodes a type-3-secretion system (T3SS) that pierces the host cell membrane and traffics effector proteins directly into the infected epithelial cells where they *efface* cellular microvilli and *attach* the bacterium to the host cell. Diarrhea and dehydration of the host ensues, since its cells can no longer retain nutrients and water.

Previous results suggest that the RNA-chaperone protein Hfq posttranscriptionally represses the LEE of EPEC in conjunction with sRNAs. One such Hfq-dependent sRNA is RyhB. Whereas substantial progress has been made towards understanding how Hfq and RyhB regulate the LEE in EPEC, the role of Hfq in *E. albertii* remains unexplored. In EPEC, our data suggests that Hfq represses the LEE. However, its potential regulatory role in *E. albertii* is still unknown. So, one of the main purposes of our research is to investigate the regulatory network of the LEE in *E. albertii*, especially focusing on the roles of RyhB and Hfq in regulating the virulence of this novel pathogen.

This summer, we have continued to investigate the regulatory effects of Hfq and RyhB on gene expression from the LEE in EPEC and *E. albertii*. In *E. albertii*, my efforts have been focused on understanding the core regulatory network of the LEE. Two major transcription factors that regulate the LEE and are encoded by the LEE include *ler*, which codes for the master regulator of the LEE, and *grlRA*, which codes for the global repressor and global activator of the LEE. After engineering the first mutations in *E. albertii* at the *ler*, *grlRA*, and *hfq* loci, we have started to compare the regulation of virulence-associated genes between the mutant and wildtype strains of *E. albertii*. Specifically, we have compared gene expression from the LEE between wildtype strains and *ler*, *grlRA*, or *hfq* mutants of *E. albertii*. We performed qRT-PCR and Beta-galactosidase assay to survey the expression of the LEE. Our preliminary results suggest that *ler* and *grlRA* have a similar role in *E. albertii* as has previously been reported for EPEC. Moreover, Hfq appears to specifically target the 5' UTR of *grlR*. Ultimately, using the current and future data, I intend to compare and contrast the regulation of the LEE, specifically the Hfq-dependent and RyhB-dependent regulation, in EPEC and *E. albertii*. Our studies will profoundly expand our current knowledge of posttranscriptional regulation of the LEE in EPEC and the emerging but cryptic pathogen *E. albertii*. This, in turn, will aid in the development of novel and effective therapies against these pathogens.

# Role of Base-Pairing Small-RNA Spot42 on Virulence in Enteropathogenic *Escherichia Coli* Bacteria (EPEC)

Valerie Jenkins, '17

Faculty Mentor: Shantanu Bhatt  
Department of Biology



Supported by the SJU Summer Scholars Program

Enteropathogenic *Escherichia coli* bacterium (EPEC) is a member of the attaching and effacing family of pathogens. When these bacteria infect a host, they intimately attach to intestinal cells and destroy the microvilli, causing a decrease in the ability of these cells to absorb water and nutrients. Due to the nature of this virulent bacteria, EPEC is a serious public health concern in developing nations and causes a large amount of mortality and morbidity in infants. Many infants infected with EPEC die from persistent diarrhea and dehydration. The pathogenicity island locus of enterocyte effacement (LEE) must be present to cause disease in the host cells, making it a crucial component for genetic regulation in EPEC.

The *tnaCAB* operon is one of the operons responsible for the virulence of EPEC and contains the genes *tnaC*, *tnaA*, and *tnaB*. *tnaA* codes for the enzyme tryptophanase which converts tryptophan to indole, ammonia, and pyruvate. Indole is a bifunctional molecule, which represses the LEE and also functions as a secreted exotoxin that kills the nematode *C.elegans*. The small RNA Spot42 is predicted to base pair to *tnaA* with the assistance of the chaperone protein Hfq and repress the expression of tryptophanase and ultimately inhibit the production of indole. Therefore, Spot42 is predicted to be an indirect regulator of the LEE through the *tnaCAB* operon. The emergence of multidrug-resistant EPEC strains make this research very important since novel mechanisms of bacterial virulence can be identified, with the goal of thwarting them by developing effective therapies.

During the Summer Scholar's Program, I investigated the ability of Spot42 to modulate the pathogenicity of EPEC. Overproduction of Spot42 abolished the production of indole. Using the computational program IntaRNA, complementarity was predicted between the *tnaA* mRNA and the Spot42 sRNA. Consistent with this prediction, tryptophanase protein levels were reduced in the Spot42 overexpressor, shown through Western Blot assays. Thereafter, we engineered a translational fusion in which the predicted *tnaC-tnaA* base-pairing region was fused to a truncated *lacZ* gene, under the transcriptional control of the *P<sub>araBAD</sub>* promoter. Overproduction of Spot42 repressed the *P<sub>araBAD</sub>-tnaA'-lacZ* fusion suggesting that the cloned *tnaC-tnaA* intergenic region is sufficient for the repressive effect of Spot42. We then introduced a polynucleotide mutation in the predicted base-pairing region of Spot42 and observed that the Spot42 mutant no longer repressed the *tnaA'-lacZ* fusion, which further validated our hypothesis of direct base pairing between Spot42 and the 5' UTR of *tnaA*. We are currently engineering a compensatory mutation in the *tnaC-tnaA* intergenic region, which is complementary to the Spot42 mutant allele. We predict that the mutant Spot42 allele will be able to bind to and repress the mutant, but not the wild type, *tnaA'-lacZ* fusion. Collectively, the completion of these experiments will decipher the molecular mechanism by which Spot42 represses gene expression from the *tnaCAB* operon. In the future, I would like to explore the effects on *C.elegans* when Spot42 is overexpressed in EPEC, since it should prevent the expression of the molecule indole, which is toxic to *C.elegans*.

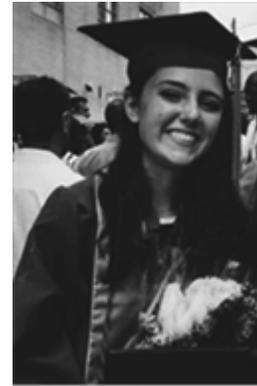
# The Role of RNA-Binding Protein Hfq to Stressors in the Enteric Pathogen

## *Escherichia albertii*

Sarah Muche, '19

Faculty Mentor: Shantanu Bhatt

Department of Biology



Supported by the SJU Summer Scholars Program

Only two decades ago, *Escherichia albertii* was isolated from stool samples of 5 Bangladeshi children who had been experiencing symptoms typically associated with attaching and effacing pathogens (i.e. diarrhea and dehydration). The bacterium was originally misidentified as a member of the innocuous genera, *Hafnia*. Consequently, *E. albertii* was able to fly under the radar of pathologists. It wasn't until 2003 that sufficient information had accumulated to place the unique species within the genus *Escherichia*. Even after its taxonomic classification, there has been limited investigation into understanding the regulatory mechanisms of its virulence.

The RNA chaperone protein Hfq plays an important role in the virulence of other members of the A/E family such as EHEC. Hfq accomplishes this both directly, by regulating genes within the LEE, and indirectly by stabilizing mRNA and inducing translation of proteins needed when exposed to environmental stress. The latter response is particularly relevant because A/E pathogens must combat a plethora of host immune stressors, such as the acidic environment in the host's stomach, before reaching the small intestine. Unlike EHEC, the role of Hfq remains unexplored in *E. albertii*. Thus, it is important to evaluate the role of Hfq in responding to stressors and mediating the virulence of *E. albertii*.

The process of finding the various stressors in which Hfq is needed is quite intuitive. Mutants of *E. albertii* lacking *hfq* ( $\Delta hfq$ ) were engineered. Wild type and  $\Delta hfq$  *E. albertii* strains were briefly exposed to oxidative stress and their fitness was quantified by the amount of colonies they could form on agar plates after exposure. The  $\Delta hfq$  mutant exhibited a reproducible increase in the sensitivity to hydrogen peroxide (1.25mM) in  $\Delta hfq$  compared to the wild type parent. Future studies aim to determine the precise mechanism by which Hfq counteracts oxidative stress. Moreover, the role of Hfq in other stress response pathways, particularly the ones encountered by the bacterium in the host, will also be evaluated.



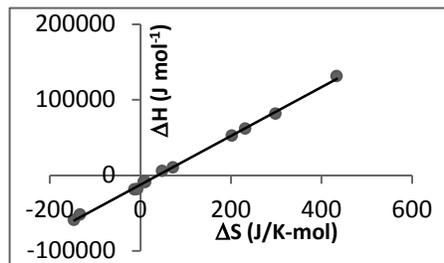
**Jose F. Cerda**  
Department of Chemistry  
Saint Joseph's University

Ph.D. Michigan State University

**Research Interest:** Spectroscopic and  
Electrochemical Studies of Redox  
Proteins and Heme Model Compounds

Heme proteins are a family of proteins that contain the heme cofactor and are involved in many types of biological functions. For example, heme *b*, a type of heme cofactor found in myoglobin (Mb), hemoglobin (Hb), and heme peroxidases, is used by heme proteins for oxygen storage and transport, electron transfer, oxygenase, catalase, peroxidase, and gas sensing. Although all these protein structures may be different, the heme cofactor is the active site in all of them and my research goal is to understand how heme-protein interactions uniquely defines the biological role of a heme protein. For many years, we have used UV-vis spectroscopy and electrochemical techniques to study heme proteins because of the physical-chemical properties of the heme cofactor: hemes absorb strongly in the UV-visible region and can also be subjected to oxidation reduction reactions. In our studies, we have used fluoride binding as a probe of the heme pocket structures of Hb, Mb, horseradish peroxidase (HRP), and clam hemoglobins. Fluoride ion is an interesting choice since it is not a physiological ligand. However, many heme proteins have the ability to bind fluoride ion and differences in the fluoride binding properties suggest differences in the heme pocket structure.

Our past studies using this method have shown that the heme pocket structure affects the electronic properties of the heme in the presence of fluoride.



But because there are many type of heme-protein interactions, it is very hard to pinpoint a particular protein-heme interaction as the sole definer of the biological role of the heme protein. To achieve a greater scope in understanding the role of the protein structure, during the last two years, my SSP research students have added temperature-controlled experiments to study the thermodynamic properties of fluoride binding. In doing this, we have been able to measure the enthalpies and

entropies of fluoride binding in Hb, Mb, and horseradish peroxidase (HRP). We have observed that all these three heme proteins show a strong correlation between the entropy and enthalpy of fluoride binding even when the protein is denatured (see figure). We have also noted that despite the similarity in the heme pocket structures of Hb and Mb, these proteins exhibit differences in their thermodynamic properties of fluoride binding. Unlike Mb, Hb is able to utilize entropy for favorable fluoride binding. These thermodynamic differences could be a reflection of the difference in the protein structures, mainly the quaternary structure of Hb which is lacking in Mb.

## Dissociation Constant Measurements of Fluoride Binding in Heme Proteins and the Effects of the Distal Amino Acid

Kaitlyn Frankenfield, '17

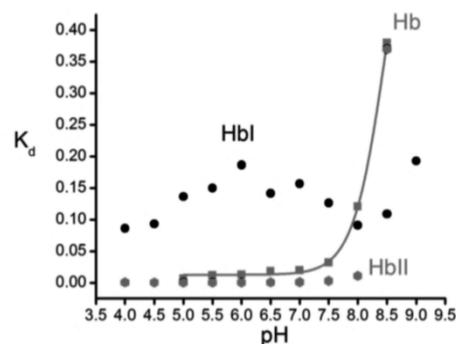
Faculty Mentor: Jose F. Cerda  
Department of Chemistry



Supported by the John P. McNulty Scholars Program and the SJU Summer Scholars Program

Fluoride binding can be used to study the heme pocket structure of heme proteins. In this work, we used this approach to study two of the three hemoglobins present in the clam (*L. pectinata*). This mollusc contains three hemoglobins, HbI, HbII, and HbIII, of which HbI is a sulfide-reactive hemoglobin. HbI delivers hydrogen sulfide to symbiont bacteria that utilize sulfide to produce nutrients for the clam. The heme pocket structure of HbI is of high interest because of its ability to strongly bind  $H_2S$ , which is a poisonous gas and has been found to be produced in mammalian tissues. It is believed that  $H_2S$  has neuromodulator-neuroprotector and muscle relaxant/constrictor properties just like nitric oxide (NO).

To understand the properties of the heme pocket of HbI, we performed pH-dependent studies of fluoride binding and in HbI and HbII and used adult hemoglobin (Hb) as a control. The pH profiles of these three hemoglobins are shown in the figure. Both Hb and HbII at low pHs had low  $K_d$  values, suggesting that there was a high affinity between the heme protein and the fluoride molecule causing the protein to bind tightly. As the pH of Hb and HbII increased, the  $K_d$  values increased, indicating that at higher pHs there is a lower affinity between the heme protein and fluoride. However, HbI's pH profile appears to be more cyclical. As the pH increases, the  $K_d$  values initially increase only to decrease and then increase again. This difference in the fluoride binding of these heme proteins is likely caused by differences in their heme pockets.



Furthermore, X-ray crystallographic structure studies have shown that HbII and Hb have nearby amino acid residues that can have the ability to form hydrogen bonding with the heme-bound oxygen, while HbI lacks this type of amino acid and instead has a glutamine which is believed to accept hydrogen bonding from the heme-bound  $H_2S$ .

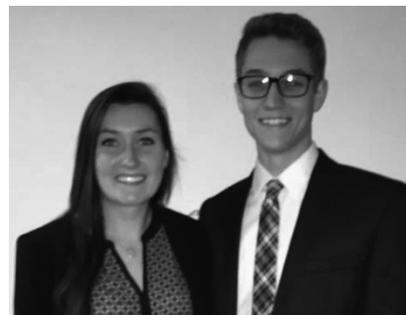
# Thermodynamics of Fluoride Binding in Heme Proteins

Mary Lockwood, '17

Thomas Nagle, '17

Faculty Mentor: Jose F. Cerda

Department of Chemistry



## Supported by the SJU Summer Scholars Program

Heme proteins are proteins that contain a heme cofactor, which is a porphyrin ring with an iron ion. There are many types of hemes that have biological roles. Throughout this summer, we studied three heme proteins that have the heme *b* cofactor: hemoglobin (Hb), myoglobin (Mb), and horseradish peroxidase (HRP). Despite having the same type of heme cofactor, all of these studied proteins have different functions. Myoglobin is found in muscle tissues and its role is to store oxygen, while hemoglobin's role is to transport oxygen through blood cells. On the other hand, HRP is an enzyme that catalyzes the decomposition of organic peroxides into water and organic alcohols. The overall goal of our research is to understand how the protein structure uniquely defines the physical-chemical properties of the heme cofactor, which results in a specific biological role of the heme protein. Fluoride has been shown to be able to bind to these three heme proteins, allowing for identification of the binding properties of the heme pocket.

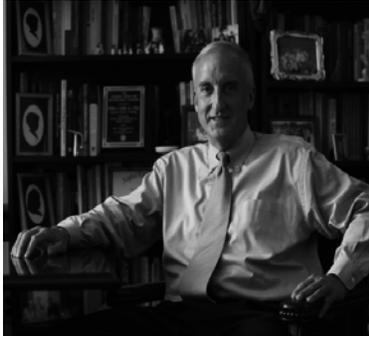
We first studied the stability of the heme proteins as a function of temperature. The “melting” temperature of each protein was determined as the temperature at which the protein loses 50% of its heme cofactor. The “melting” temperature of these proteins is an indication of the stability of the protein around the heme cofactor. We also measured the “melting” temperature for Hb, Mb, and HRP in the presence of fluoride at pH 5 and pH 7. A second set of experiments were performed to study the temperature dependence of fluoride binding in Hb and Mb at pH 5, 6, 7, and 8. The dissociation constant,  $K_d$ , from this set of experiments was calculated by titration with sodium fluoride at various temperatures using UV/Vis spectroscopy. The enthalpies and entropies were calculated to understand the thermodynamics of this ligand binding process.

	Hb	Mb	HRP
pH 5 with F <sup>-</sup>	66.2 °C	>70 °C	62 °C
pH 5 without F <sup>-</sup>	53.6 °C	69 °C	>70 °C
pH 7 with F <sup>-</sup>	>70 °C	>70 °C	>70 °C
pH 7 without F <sup>-</sup>	58.3 °C	>70 °C	>70 °C

**Table 1.** Measured “melting” temperatures of the three proteins.

The results from the stabilization experiments show that Hb and Mb are more stable in the presence of fluoride as indicated by their higher “melting” temperatures. Following a similar trend, both Hb and Mb were more stable at higher pH. HRP was also more stable at pH 7, but was less stable in the presence of fluoride. This decrease in stabilization in HRP with fluoride may be due to heme pocket differences between HRP and the oxygen-carrier proteins which results in different fluoride-protein interactions.

The results from the temperature dependence study of fluoride binding provided thermodynamic quantities of fluoride binding at various pH. It was found that at pH 5 and 6, Mb association was found to be driven by enthalpy, where at pH 7 and 8 it was entropically driven. When studying Hb, at pH 5 and 6, association was both enthalpically and entropically favored. Similar to Mb, at pH 7 and 8, Hb was entropically favored. A linear correlation was found between the enthalpies and entropies.



**Peter A. Clark, S.J.**

Departments of Theology & Religious  
Studies & Health Administration  
Director-Institute for Catholic Bioethics  
Saint Joseph's University

Ph.D. Loyola University of Chicago

**Research Interests:** My research this summer focused on editing a book: *Bioethics: Medical, Ethical and Legal Perspectives*. This book is examining bioethical issues from an international perspective. The authors are examining issues such as: genetic therapy, research ethics, organ transplantation, assisted reproductive technologies, assisted-suicide, preimplantation genetic diagnosis, etc. The purpose of the book is to help inform the international bioethics community of the various issues facing them from a cultural, medical, legal and ethical perspective. The book will be published in the Fall of 2016.

I was also involved in 6 writing projects that included: 1) *Deafness and Prenatal Testing*-can a genetically deaf couple use preimplantation genetic diagnosis to create a deaf child? 2) *Prescription Diacetylmorphine Hydrochloride Injections: A Form of Harm Reduction for Chronic Heroin Addicts*-can injectable heroin be regulated as a viable treatment option for chronic heroin addicts who do not respond to the standard methadone treatment option? 3) *Imodium's Loperamide: Is It Time For New Federal Regulations*- opioid addicts are now overdosing on Imodium and to date two patients have died from this type of overdose. Why are Emergency Departments not aware of this new addiction? 4) *To Treat or Not To Treat: The Case of Methylmalonic Acidemia*-should infants in Palestine be aggressively treated for this genetic condition? 5) *Chronic Traumatic Encephalopathy and Athletes: Do the Risks Outweigh the Benefits?* Can we institute concussion protocols for elementary and secondary school sports teams? 6) *Zika Virus: An Artificial Contraception Be Condoned?* Can the Magisterium allow for artificial contraception in the conjugal union when one partner has been infected with the Zika virus to stop infants from being born with microcephaly?

The remainder of my summer consisted in helping to formulate ethical policies for Caritas Baby Hospital in Bethlehem, Palestine. The Institute of Clinical Bioethics at Saint Joseph's University is now representing Caritas Baby Hospital as their Bioethics consultants. We are in the process of assisting the medical staff at Caritas in forming an Institutional Ethics Committee and helping them design and implement ethical policies on issues such as: brain death, Do Not Resuscitate Orders, medical futility, patient's rights, etc. The staff of the Institute of Clinical Bioethics has initiated and implemented a procedure to do ethical consults via Skype to assist patients, their parents and the medical staff in Palestine.

# **Chronic Traumatic Encephalopathy (CTE) and its Effect on Elementary and Secondary Student Athletes**

Brant Edmonds, '17



Faculty Mentor: Peter A. Clark, S.J.  
Institute of Catholic Bioethics and the Departments of  
Theology & Religious Studies & Health Administration

Supported by the Institute of Clinical Bioethics, the Swifty Foundation  
(Gustafson Foundation) and the SJU Summer Scholars Program

A more recent public issue is the increasingly large number of NFL football players passing away at unreasonably young ages. After the players passed, all autopsies showed that their brains had been overcome with a degenerative disorder called Chronic Traumatic Encephalopathy (CTE) caused by repeated brain injury, or concussions. As of 2015, a total of 87 out of 91 deceased NFL players have tested positive for CTE according to new figures from the nation's largest brain bank focused on the study of traumatic head injury. Not only did they show signs of the disease at earlier ages, younger players were displaying advanced stages of CTE. I wondered if the disease was beginning much earlier in a player's career, therefore we took a preventative approach to this issue. The issue is that there are not enough concussion protocols set for young athletes, therefore players could be suffering from repeated concussions and still playing the game every day. If this paper is accepted and its message is spread widely enough, then we can possibly save players from early development of this disease.

According to the Brain Injury Research Institute (BIRI), approximately 1.6-3.8 million sports and recreation related concussions are reported each year. About 60% of these are due to playing football. The BIRI also reported that a concussion suffered by a high school student has much more of an impact than one by a college student. Lack of proper diagnosis and management of a concussion may result in serious long-term consequences, or risk of coma or death. I have great respect for the players of such an aggressive and physically demanding sport, therefore I wanted to devote my time forming an ethical paper that will provide guidance and protocols that could reduce the likelihood that elementary and secondary student athletes develop CTE. In addition to developing this paper, I attended many ethics committee meetings, conferences, and ethics rounds at both Mercy Hospital of Philadelphia, and Mercy Fitzgerald Hospital. Throughout my Summer Scholars experience I have learned a lot about how the fields of Ethics, Law, and Medicine are intertwined and that there must be thorough understanding of each in order to navigate any ethical issue that may arise in a medical setting. This immersion in the field of medical ethics has been beneficial to the construction of my paper in that I am able to examine the ethical issue with confidence and provide a more educated recommendation as to how the issue can be reduced or eliminated.

The final paper will consist of six sections. The first section of the paper will concentrate on the Introduction and background information of CTE, and the thesis Statement. The next section of the paper will deal with the in depth medical analysis of CTE including the signs and symptoms, pathology, diagnosis, prevention, and epidemiology of the condition. Section three will be comprised of the history of the issue regarding sports such as football, ice hockey, rugby, wrestling, etc. Section four will discuss educational issues with regard to the damage caused by football specifically in elementary and secondary student athletes. Section five will address the ethical issues that are associated, while the last section will state the conclusion and recommendations that can hopefully assist in reducing the prevalence of CTE in contact sports among elementary and secondary student athletes.



**Clare E. Conry-Murray**  
Department of Psychology  
Saint Joseph's University

Ph.D. University of California, Berkeley

**Research Interests:** Social and Moral  
Development, Gender Development

My research examines reasoning about gender and fairness in several age groups from preschool through adulthood and in several countries (Turkey, Benin in West Africa and South Korea). I am currently focused on researching how children from preschool ages through middle school coordinate concerns with fitting in to gender norms and concerns with being treated fairly. My research shows that children are concerned with both gender norms and fairness and at times, these issues conflict.

In general, children state that people should be able follow their own interests or preferences when it comes to gender roles, but they also consider the situation. For example, children state that hypothetical children should follow unconventional interests (like a boy who likes pink bikes) in private, but not in public, where they might be teased (Conry-Murray, 2013). This is an important indication that children follow gender norms to fit in and not only as an expression of their real interests.

There are some important developmental differences in children's endorsement of personal choice and fairness. Younger children around the ages of 4-7 tend to overestimate the likelihood that preferences will be in line with traditional gender roles, and they are more likely than older children to be inflexible about gender norms. In one study (Conry-Murray, 2015), I found that young children accepted a teacher treating boys and girls differently and unequally if it was consistent with gender roles. For example, young children approved of a teacher giving boys each a robotics kit and girls each an old maid card game, while older children were less likely to approve of this. Young children seemed to see these unequal gifts as a response to the interests of boys and girls and therefore, as justified. However, both younger and older children did not approve of a teacher who gave unequal, but gender-neutral gifts, to boys and girls (e.g. M&Ms to girls and bananas to boys). This is concerning because it means that young children may not be aware of the diversity of preferences that exist and they may not challenge unfair treatment based on gender norms.

My summer Scholar this year, Neanta Parnell, developed a survey on attitudes about single mothers in the U.S. and Korea. She asked participants (women the same age as parents from 21-50) about whether single mothers need to take responsibility on their own or whether communities should help single mothers. She expected that in a collectivist culture like Korea, there would be more focus on helping, and that is overall what she found. However, she also found that in the U.S. participants were more willing to reach out to the child of the single mother. We believe this reflects the individualism in the U.S. where children do not reflect their parents. In both cultures participants judged single mothers differently depending on the reason they were single.

# **Attitudes About the Parenting Responsibility of Single Mothers in the U.S. and South Korea**

Neanta Parnell, '17



Faculty Mentor: Clare E. Conry-Murray  
Department of Psychology

## **Supported by the SJU Summer Scholars Program**

South Korea has been called a collectivist culture as there are strict rules within the family dynamic. There is a demand for obedience to authority and elders of a community. The sense of community and strict roles within a family unit differ from individualistic cultures where their children have more influence on familial roles and dynamics. There is instead an emphasis on personal development of the child rather than the strict obedience to family and societal roles. What the current study looks at are attitudes toward single mothers in South Korea versus the United States.

According to South Korean tradition single mothers are a taboo within society as they go against societal norms. In Korean history, single mothers were seen to have been unfaithful to their husbands and therefore abandoned by them. This is in strong contrast to the view on single mothers in America who are seen as strong independent individuals. To analyze current day attitudes on single mothers, an online survey was posted onto both South Korean and American based Facebook pages of chosen research personnel. The survey was posted in English for American participants and Hangul for Korean participants. The survey asked a series of questions about different scenarios and conditions concerning single mothers. There were 5 different statuses of the mother: single accidental, abusive husband, married, widowed, and single by choice. Within these different statuses were evaluations of responsibility via time and the action of picking up the child from various activities. The evaluations of responsibility were evaluated for the mother herself, the father of the child, the family of the mother, and community. There was also an evaluation of the treatment of the child of the single mother.

Results were analyzed using a repeated measures ANOVA statistical test. Korean participants generally advocated assisting single mothers more than U.S. participants, especially in conditions where the single mother did not choose to be single. U.S. participants may not have advocated for assisting the single mother as often as Korean participants due to the individualistic idea that it is up to the individual to take responsibility for their actions and make their situation better for themselves. In Korea, participants most likely chose to assist the single mother more because of the collectivist idea that a community works together as a single unit.

Interestingly, American women saw more of a role for fathers, indicating that collective responsibility extended to men in the U.S. more than in Korea. However, this was not the case for an abusive husband, where American women may have been sensitive to possibility of continued abuse, while Korean women judged that an abusive father should participate at high rates.

Finally, U.S. women were more likely to allow their children to play with the child of the single mothers. U.S. participants may have been more likely to engage with the child because the individual is not defined by their familial status in American culture, unlike Korea where one is an extension of their family.



**Robert (Tom) Coyne**  
Department of English  
Saint Joseph's University

M.F.A. University of Notre Dame

**Research Interests:** Creative Writing

I am interested in stories and storytelling. My writing ranges from fiction to nonfiction, from travel writing to screenwriting to sports writing (as part of my life's goal of making golf tax-deductible, I write a great deal about this particular pastime). But the common motivation behind all my work is a curiosity about the ways we process our experience of the world and share that experience with others.

For me, it's all about narrative. Life is a great story, something with a beginning, middle, and end, and the more richness and thoughtfulness that we can bring to that story makes not only our lives better, but as writers, can deepen the experience of those around us. It's in our DNA to need stories—we require them as human beings. Comedy, tragedy—we learn how to walk through our day via the experience of others. Ever since humankind started scratching scenes on cave walls, we have looked and listened and learned: This is how I got the bear. Or this is how the bear got me.

We all have stories and experiences to share, if we look at our lives closely enough. The challenge in the noise of our culture is to make those stories stand out and capture an audience. This is where the craft of creative writing enters our work. We work at organizing our thoughts in a way that reaches out and engages and reveals something genuine. The beauty and wonder of writing—of all art, really—is that it gives us the chance to create and convey something that has never quite been captured before, at least not as it comes through our unique and individual consciousness. This is a great gift. And one worth our most sincere efforts.

**Writing a Mystery Novel:  
The Detective of Craterwell**  
Brenna Ritzert, '17



Faculty Mentor: Robert (Tom) Coyne  
Department of English

Supported by the SJU Summer Scholars Program

Writing works as a creative outlet in its simplest form, but when used as more than a hobby, writing becomes a powerful tool. An author can write an enchanting story that leaves readers hanging on every word. The story can act as an escape for a reader and become a source of enjoyment. This kind of writing acts as a gift from the author to the reader. The author presents an enticing story with lively characters that a reader cannot help but love. But again, this is writing simply on its surface—the basic positives of writing.

On a deeper level, writing is a powerful tool used to dissect real life themes and challenges in not only the author but also the reader's lives. Writing acts as a way for the author and reader to examine different themes in both implicit and explicit forms. Explicit forms act as a way to raise an immediate reaction from readers sparking a quick conversation. Implicit, however, pushes not only the reader but also the author to think deeper about the targeted real life theme. Authors must think how to creatively convey these themes to a reader who must then process the information, causing them to think deeper. Creative writing is a lot of fun for those that enjoy it, but it serves a greater purpose than just fulfilling a hobby.

By setting out to write a mystery novel, I not only began constructing an important piece for graduate school applications but also implicating relatable real life themes. The story follows a young man named Terryn. Just when Terryn finally thought his life was beginning to turn around, he becomes the victim of a malicious spell known as a death hex. However, the hex fails, leaving Terryn in a state of neither life nor death. Terryn's body decomposes as an effect of being dead as a result of the death hex, but the negative effects of the death hex failing make it impossible for him to die, causing his body to regenerate. Terryn becomes disgusted with his body and himself and begins searching for a way to undo the faulty death hex and finally die.

Along the way he meets a girl named Dimia whose sister has recently gone missing. The two decide to work together to not only find Dimia's sister but also to find Terryn's answers. No journey is ever easy and along the way the two meet other people less than satisfied about what has become of their bodies (such as a man whose armor has fused to his skin and a woman forcibly changed into a man).

Implicitly my novel analyzes multiple themes: the effect of family ties on individuals, the fragility of life and death, and the struggle of not feeling comfortable in one's skin. Terryn as well as other characters exhibit feelings of discomfort with their bodies; however, it is shown in the most literal sense by each character as these discomforts take a tangible form. Terryn also is a literal example of the fragility of life and death and how negative the consequences are when tampering with this fragile line. And lastly, Terryn and Dimia both have different family situations, which shaped the way both of them interact with others, reflecting on them personally. The novel itself leads the reader on a journey that Terryn and Dimia both experience—one of coming to understand each other and as well as themselves.



**Laura M. Crispin**  
Department of Economics  
Saint Joseph's University

Ph.D. The Ohio State University

**Research Interests:** Labor Economics,  
Economics of Education, Economics of  
Poverty and Income Inequality, Applied  
Econometrics

My primary research interests are extracurricular participation and the effects on educational and labor market outcomes. Extracurriculars help students to gain both cognitive skills such as math and reading, and non-cognitive skills such as interpersonal, leadership, and teamwork skills, all of which increase human capital and ultimately wages. Furthermore, there is an opportunity cost associated with participation: time spent in extracurriculars must take time away from other activities, which tends to reduce risky behaviors such as smoking and drinking. Thus, it is likely that participants will be more successful than non-participants in terms of educational attainment and wages.

The causal effect of extracurricular participation on educational and labor market outcomes are often difficult to ascertain due to selection issues: students who choose to participate may also be those who choose to continue their education, which is difficult to account for empirically. Using econometric techniques and rich, nationally representative data from the Department of Education, I am able to estimate the causal effects of extracurricular participation in high school on students' high school dropout decision and college attendance and completion decisions. As an example of my findings, I find substantial effects of participation on dropout rates, reducing the likelihood of dropping out by 14 to 20 percentage points.

I am particularly interested in "at-risk" students—those from disadvantaged backgrounds—because dropout rates for this group are more than twice as high as the dropout rates of their peers, and without policy intervention, the outcomes for at-risk students will be substantially worse than their peers. I find that for at-risk students, extracurricular participation is especially important for reducing the dropout rate, indicating that policies to provide and promote extracurricular activities in areas with high concentrations of at-risk students will be particularly effective at increasing educational attainment and wages for students.

A related project that I've recently begun is to estimate the effect of time allocated to extracurriculars and work on college students' time spent on homework and sleeping. I focus on these time use categories because organizations such as NCAA have increased funding for scholarships, which requires recipients to increase time spend on extracurriculars. Additionally, due to the rising cost of college, students may feel an increased pressure to work during college to reduce their need for loans. These two trends may lead to the final trend: an increase in the time to graduation, with many students in four year colleges taking significantly longer than four years to complete their degree. If time spent in extracurriculars and work reduce time spent on studying and sleep, then policies that promote extracurriculars and work during the school year may have unintended consequences for current college students.

## **Time Allocation, Sleep and Academic Achievement in the Student Population**

Patrick Ryan, '18

Faculty Mentor: Laura M. Crispin  
Department of Economics

Supported by the SJU Summer Scholars Program



The study of economics focuses on the allocation of resources under the assumption of scarcity. Perhaps the scarcest resource to the human race is time. Sleep occupies roughly a third of a person's life and for this reason, the importance of understanding sleep behaviors cannot be underestimated.

Common public sentiment believes that the student population does not receive enough sleep each night. Due to the negative effects associated with sleep loss and sleepiness, it is important to understand the implications of a sleepy student population. The first aspect of my research deals with conducting my own analysis to determine if public views are correct. Using time diary data, I find that the student population on school nights tends to sleep a little more than eight hours (including daytime naps). These results suggest that the public has an incorrect perception of time spent sleeping. The inconsistency between perceived and recorded sleep time could be a result of an increasingly hectic daily life.

Students tend to be involved in a variety of on-campus clubs, sports, and other recreational activities. Moreover, 25% of the student population worked on the day that they responded to the time use survey. With increasing participation in these activities, there must be a trade-off due to the finite hours in a day. With less free time, the trade-off between activities becomes increasingly more important due to the opportunity costs of the expense of foregoing one activity to dedicate attention to another -- particularly if time is taken away from academic activities.

My analysis concentrates on determining which activities tend to take away the most time from sleep and time spent focusing on academics. Sleep and academic time are of particular importance due to knowledge that adequate nighttime sleep has the ability to increase cognitive functioning and time spent on academics has been shown to be a reliable predictor of academic success. My initial results suggest that working a short, two hour shift has an impact of decreasing homework time by  $\frac{1}{8}$  on that day. Working on a given day also negatively impacts the sleep that a student will get that night.

With an ever more involved student population in high school and college, it is important to consider if students are dedicating time to the correct combination of activities that work towards building human capital and higher academic achievement. Tasks that take away from sleep and academic time inevitably work against the goal of higher academic achievement and human capital accumulation.



**Ronald Dufresne**  
Department of Management  
Saint Joseph's University

Ph.D. Boston College

**Research Interests:** Vulnerability, Humility,  
and Authenticity in Leadership; Developing  
Ethical Leader Character

Many of us expect—whether explicitly or implicitly—our leaders to be strong, in command, to know what they are doing, and to reduce uncertainty through their certainty. Yet many of us also expect our leaders to be human, to admit mistakes when they inevitably make them, to embrace their shortcomings, and to be honest about their uncertainties. This tension exposes the paradox of how, ideally, leaders are strongly humble and certainly uncertain. I believe this tension to be at the core of how we think about leadership in general, and how we implicitly craft our own growth as leaders.

In my previous research I've explored how leaders can embrace their vulnerabilities by admitting mistakes and failures, openly exposing shortcomings, and recognizing external reasons for one's success. Engaging in these behaviors would expose the leader to the risk of others seeing him or her as imperfect and flawed—in a word, human. Being seen as a human who is willing to admit mistakes and shortcomings ought to increase the degree to which others trust the leader.

However, there are clearly boundary conditions when considering a leader's vulnerabilities. One such boundary condition is the nature of the mistake or shortcoming the leader is exposing. For example, there are likely differential outcomes if admitting the mistake is seen by the followers as being a step toward growing as a leader or if the mistake is seen by the followers as exposing a flaw in the leader's character (that would be more difficult to learn and grow from). As such, admitting a mistake about a task may be seen as trust-building more so than admitting to the shortcoming of lying.

Brittney Welde's qualitative project offers significant promise to begin unpacking some of the complexities facing a vulnerable leader. First, her interviews explore the dimensionality of vulnerability; do different types of vulnerability have different effects on trustworthiness or perceptions of leader effectiveness? Second, her interviews explore the I-Thou gap in vulnerability; is vulnerability something I value in my leader, but might I think I am not able to afford to vulnerable myself?

# **The Construct of Vulnerability and its Role in Authentic Leadership**

Brittney Welde, '18

Faculty Mentor: Ronald Dufresne  
Department of Management

Supported by the SJU Summer Scholars Program

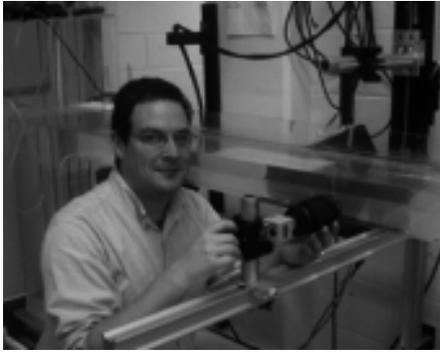


In researching leadership, it is no secret that there are multifarious benefits of displayed vulnerability between superiors and subordinates. Typically, vulnerability has appeared in leadership research relating to how subordinates make themselves vulnerable to the leader by choosing to trust him or her. With that said, less is known about leaders' choices to make themselves vulnerable to their peers and subordinates. Recognizing the powerful effects that vulnerability yields in the professional world is one task, but a leader's ability to understand the underlying motivations or avoidances to being vulnerable is another. Once a leader has the valuable knowledge of the constructs and mental processes behind vulnerability, he or she will be able to not only positively affect workplace relationships but benefit the success of any organization as a whole.

As the first step to an honors thesis to be completed during my senior year at Saint Joseph's University, this opportunity has provided me the platform to begin conducting qualitative research on vulnerability in the workplace to enable leaders to harness the power of vulnerability. I conducted one-on-one interviews with individuals from preselected industries like education, financial services, healthcare, and food services. My goal was to unravel the underlying thought processes that took place during showcases of vulnerability in varying professional environments. The interview consists of three separate reflections.

The first segment focuses on the research subject's personal definition and display of vulnerability within his or her work environment, an attempt to breakdown the psychological factors that lead a professional to be, or not to be, willing to put him or herself personally in a vulnerable situation. I also probed about the impact that such vulnerability could have had on a superior's perspective of his or her leadership and work. The second portion includes conversation surrounding a direct manager or supervisor's vulnerability and permits the individual to discuss the rationale that may have led this superior to face or avoid vulnerability, which may or may not have affected the reputation of this superior. This section successfully prompted the research participant to ponder vulnerability from a subordinate perspective. Lastly, the third and final talking point involved a series of ranking and thought-provoking questions that pertained to Dr. Dufresne's theory regarding a speculated relationship between trust and vulnerability based on benevolence, integrity, and ability, which will most likely be further explored through additional analysis.

While deconstructing vulnerability will remain an ongoing endeavor throughout the next two years, this initial gathering of valuable data through the Summer Scholars program has allowed for the drawing of theorized conclusions, conclusions that will be only further developed through additional qualitative and supplementary methods of research. It is my hope that my findings will serve as impactful published data that develops and benefits authentic leadership in the workplace.



**Jonathan T. Fingerut**  
Department of Biology  
Saint Joseph's University

Ph.D. University of California,  
Los Angeles

**Research Interests:** Invertebrate Zoology

My laboratory asks the question “how are organisms affected by the physical forces in their environment?”. Answering this question has required an interdisciplinary approach combining physiology, behavior, ecology, physics, and chemistry. The resulting research program has led to exciting and novel results and provided an excellent training ground for both undergraduate and graduate students in a wide range of skills and scientific disciplines.

Within the broad range of physical factors that can impact an organism I have chosen to focus primarily on the effect of flowing water. Flow is often referred to as a “master variable” due to its role in almost all aspects of an organism’s life. It can determine where an organism lives, how much food it gets, its shape and material composition, and even its chance of reproduction. For the past thirteen years my attention has been on freshwater streams and the insect larvae that live in them. Understanding how physical forces affect an organism’s ability to survive and reproduce in these systems is growing in importance. Human activity and global warming are changing the volume, timing, and velocity of flow through human activities such as damming or withdrawal for irrigation and changing precipitation levels. Much of the research in this area has focused on the more charismatic stream inhabitants such as fish, whose economic importance makes them a logical starting point. It has become clear in recent years, however, that to understand the effects of changing flow on an ecosystem one must have a solid understanding of how such changes affect the foundation of that ecosystem. In most streams that means the invertebrates, which are dominated in numbers and diversity by insect larvae. Investigating the role of hydrodynamics in the lives of invertebrate insect larvae provides some unique challenges such as accurately quantifying behavior and recreating realistic flow conditions at scales relevant to their body size (often <1 mm). These technical challenges are, however, part of what makes this work engaging for myself and my students. Every new project brings with it an opportunity to develop new techniques while adding to a growing understanding of the importance of physics in biological systems.

# Investigating the Impact of Blueberry pH, Sucrose Content and Firmness on *Drosophila suzukii* Fecundity

Daniel McDevitt, '17

Faculty Mentor: Jonathan T. Fingerut  
Department of Biology



Supported by the SJU Summer Scholars Program

*Drosophila suzukii* is species of fruit fly indigenous to southeast Asia. Unlike other fruit flies who lay their eggs in rotting fruit, *D. suzukii* have the ability to oviposit directly into fruit ripening on the vine. The ability of *D. suzukii* to oviposit directly into ripening fruit is due to the unique saw like morphology of their ovipositor. Soft skinned fruits like blueberries and grapes are susceptible to oviposition by *D. suzukii*. *D. suzukii* was introduced into the United States in the early 2000's and since then has spread across the continental United States and Western Europe. Their introduction has resulted in significant soft skinned fruit crop loss, making the species a significant agricultural pest. Little success has been achieved in attempting to control *D. suzukii* populations in the U.S. As they have only recently become an agricultural pest in the United States, information on *D. suzukii* has been limited.

The impact that chemical and morphological attributes of soft skinned fruits have on *D. suzukii* fecundity is largely unknown. Understanding how these attributes affect fecundity will allow for better modeling and predictability of fruit susceptibility to ovipositioning. The objective of this study is to identify how sucrose content, pH and berry firmness affect fecundity in *D. suzukii*.

In analyzing how sucrose content, pH and berry firmness affect fecundity, a technique to isolate these variables had to be created. Studies on the effect fruit variables have on *D. suzukii* fecundity involved using different cultivars or entirely different fruits. The problem in using different cultivars or fruits to study the effects of a single chemical or morphological attribute is that the attribute could not be properly isolated from other variables between treatments. To exclusively isolate one variable, this research project created fake berries that could be manipulated to isolate a single chemical or morphological attribute. The fake berries were created by mixing a liquid medium with a small amount of sodium alginate. The mixed solution would then be added drop wise to a mix of water and calcium chloride. In the calcium chloride bath the medium would spherificate. By adjusting the contents of the liquid medium or the spherification period, treatments could be created where a single variable is isolated and manipulated.

Results from preliminary experiments indicate both that *D. suzukii* oviposit into the fake blueberries at a similar rate to real blueberries, and that manipulation of a single variable in the fake berries can effect fecundity. Two additional experiments are currently ongoing to understand how selection and nutrition effect fecundity. The first of these experiments involves adding a recently copulated female to a vial containing three fake berries of a specific treatment, and after two weeks, the offspring are counted. The second experiment involves filling a population box with jars containing different fake berry treatments. the number of flies in each jar is counted over several time periods, and after two weeks, the number of offspring produced in each jar is counted. Collectively, the two experiments will shed light on how variables like sucrose content, firmness and pH affect selection and fecundity of *D. suzukii*.



**Janine M. Firmender**  
Department of Teacher Education  
Saint Joseph's University

Ph.D. University of Connecticut

**Research Interests:** Instructional Practices  
for Elementary Mathematics and Gifted  
Education

Most students with high potential in mathematics, or mathematically talented students, spend the majority of their elementary school time in the regular classroom and to meet their learning needs, teachers may look to best practices in the field of gifted education for guidance. One such practice involves engaging students as the practicing professionals in a field, or providing students authentic learning experiences. In the case of mathematics, teachers would engage their “student mathematicians” in the practices that are authentic to mathematics, which would include problem posing and solving, reasoning, and communication. It is this practice of communication that has been the focus of recent attention in mathematics education, as there have been recent calls for writing in all grade levels across the curriculum, including mathematics.

With these current calls for engaging all students in writing mathematically and the recommendation that mathematically talented students communicate in ways that mirror practicing mathematicians, one may wonder about the guidelines provided for elementary teachers to engage their mathematically talented students in this practice. Until recently, guidelines and recommendations for engaging all elementary students in mathematical writing have been unclear. For example, a recent study of almost 2000 writing prompts across 9 nation-wide grade 3 mathematics curricula highlighted that there is a wide variety in the types of writing prompts provided. In response to the lack of coherent guidelines, the Elementary Mathematical Writing Task Force, which I co-led, recently identified the types of and purposes for mathematical writing in which to engage students to engage them in reasoning and communication and to leverage their mathematical learning: exploratory, informative/explanatory, argumentative, and mathematically creative.

Given my interest in both mathematics and gifted education and knowing that teachers seeking to meet the learning needs of their mathematically talented students may use the enrichment or extension resources provided by their mathematics curriculum series, the summer scholars project we engaged in was to analyze the characteristics of the writing prompts in these resources. While ultimately meeting the learning needs of mathematically talented students through mathematical writing depends on how teachers engage their students in the practice, determining the characteristics of the prompts available may help teachers make more informed decisions about the types of prompts or which curriculum resources to use in this effort.

# **An Analysis of the Characteristics of Grade Three Writing Prompts for Mathematically Talented Students**

Krista Bouregy, '17

Faculty Mentor: Janine M. Firmender  
Department of Teacher Education



Supported by SJU Summer Scholars Program

With the recent push for writing across disciplines, mathematics curricula and their resources include prompts for students to participate in written communication. Specifically, for mathematically talented students, writing provides an opportunity to provide appropriate complexity and challenge. The purpose of this study was to further the discussion on the mathematical writing opportunities provided in current curricula for mathematically talented students and to answer the question: What are the characteristics of writing prompts included in curriculum resources for mathematically talented students? For this study, we examined two different curriculum resources, an enrichment resource for a grade level curriculum series, *Math in Focus* and units developed for use with mathematically talented students specifically, Project M<sup>3</sup>.

To determine the characteristics of the available writing prompts in these resources we utilized an analytical framework. This analytical framework is used to categorize writing prompt characteristics in the following ways: the amount of space provided for students to write, the domain of the 3<sup>rd</sup> grade Common Core State Standards for Mathematics (CCSS-M) addressed by the prompt, the purpose of the writing prompt (compare and/or contrast, compose a problem, define a term, describe observations, explain what, explain why, rewrite a sentence, write a question or other), if the prompt addressed procedural or conceptual knowledge, the number of perspectives students had to consider before writing, and if the response would require a specific writing feature.

The results of categorizing the writing prompt characteristics are as follows: The space provided for writing varied from 3.75 inches to 139.25 inches. Across both curricula, the writing prompts addressed content both at and above the Grade 3 CCSS-M. Each curriculum addressed at least 6 of the 10 previously listed categories; “explain what” had the highest percentage, most of which were also coded as procedural questions. The prompt for writing support features shows that 69.1% of *Math in Focus* prompts and 20% of Project M<sup>3</sup> had writing supports. Most prompts focused on considering only the student’s own perspective, with each individual curriculum varying on considering one and two other perspectives.

These curricula provide the opportunity for students to explore concepts that are more advanced than the regular curriculum by addressing concepts at and above grade level. Although these opportunities are provided, we cannot make any claim as to if and/or how they are implemented. However, through the examination of these curricula, we can provide a foundation to begin the discussion of the writing opportunities for mathematically talented students, and their characteristics.



**Mark A. Forman**  
Department of Chemistry  
Saint Joseph's University

Ph.D. University of Pennsylvania

## Research Interests: Strained and Theoretically Interesting Organic Molecules

The focus of my research program involves the synthesis and study of non-natural products that possess unique properties and enhanced reactivity as a result of forced deviations from their ideal geometries. In particular, my research group has been interested in studying the effects of bond angle distortion on the structures and properties of alkenes.

The carbon-carbon double bond of an alkene is made up of a sigma ( $\sigma$ ) bond and a pi ( $\pi$ ) bond as shown in Figures 1a-d. Maximum overlap between the p-orbitals of the  $\pi$  bond occurs when the axes of the p-orbitals are exactly parallel, as shown in Figures 1c and 1d. Any deviations from this ideal geometry are manifested in the form of enhanced reactivity and unique properties of the alkene. One type of distortion in alkenes is referred to as pyramidalization and results from a *syn*-folding of the R group substituents (Figure 1e). The degree of folding may be conveniently measured via the pyramidalization angle,  $\phi$ , which is defined as the angle between the plane containing one of the doubly bonded carbons and the 2 substituents (R) attached to it and the extension of the double bond. Representative alkenes possessing pyramidalized double bonds include cubene (**1**) and pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene (**2**) (Figure 1f).

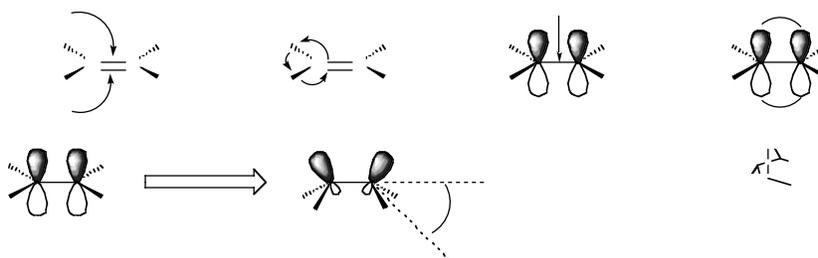
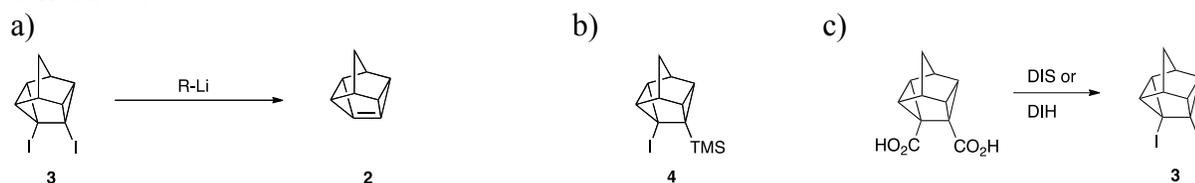


Figure 1

During the summer of 2016, my research group continued the investigation of the synthesis and study of pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene (**2**) and direct synthetic precursors.

We have previously shown that alkyllithium induced dehalogenation of 4,5-diiodopentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]nonane (**3**) leads to pyramidalized alkene **2**. This summer we investigated new synthetic routes to the precursor diiodide **3** and related polycyclic alkyl iodides using 1,3-diiido-5,5-dimethylhydantoin (DIH). We also investigated route to a new precursor, trimethylsilyl derivative **4**.



# The Synthesis of Pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene

Elise Brutschea, '19

Linda Bui, '18

Amanda Tallon, '18

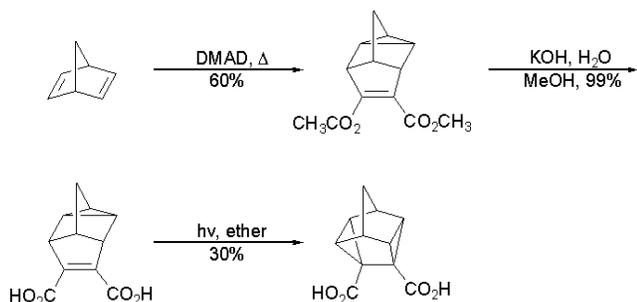


Faculty Mentor: Mark A. Forman  
Department of Chemistry

## Supported by the SJU Summer Scholars Program

This summer, the Forman research group focused on the study and synthesis of manmade products. Through synthesis reactions, the Forman research group attempts to create pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene. The study of these products concentrates on geometric derivatives of alkenes from their ideal structure, through bond angle distortion. The carbon-carbon double bonds of alkenes, ideally form bond angles of 120°. Pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene has unique bond angle strain on the carbon-carbon double bond that deviates from its ideal shape, resulting in increased reactivity and high energy.

Pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene experiences syn-folding, a source of the strain in the carbon-carbon double bond. Syn-folding, or pyramidalization, causes substituent groups on the molecule to bend toward one another, resulting similarly to a tetrahedral geometry instead of the ideal trigonal planar geometry. This strain renders our target molecule highly reactive, and thus a short life span of only seconds. The high reactivity and short life span of pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene contribute to the difficulty in synthesizing the molecule.



The focus of this summer's research was to synthesize the intermediate products of pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene. Building up a stockpile of the intermediate compounds allows research to continue during the year. The reactions for each precursor required a large amount of time to carry out completely, highlighting the importance of building up a supply during the summer. The precursor we focused on was closed diacid. To achieve the closed diacid,

first a Diels-Alder reaction was carried out, the end product being diester. This diester then underwent hydrolysis resulting in open diacid. The last step is to expose the open diacid to ultraviolet light forming closed diacid, our desired product. However, this last step of the synthesis proved itself to be challenging, for the entire reaction runs overnight, and produces very low yields. Each of the above reactions was repeated numerous times with careful attention to detail so that the maximum amount of closed diacid, our target product, could be synthesized.

By the end of the summer, we have been able to synthesize enough closed diacid to further our research goals for the upcoming school year. The closed diacid will be used to aid in our efforts to potentially synthesize pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene.

# The Synthesis of Pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene

Renee Kontos, '17

Caroline Stow, '17

Faculty Mentor: Mark A. Forman

Department of Chemistry



Supported by the SJU Summer Scholars Program and the John P. McNulty Scholars Program

Over the summer, the Forman research group studied the synthesis of pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene, an alkene with distorted bond angles. Alkenes are a class of organic molecule that contains a double bond between two carbon molecules. Ideally, an alkene has a bond angle of 120°, but deviations from this ideal angle result in enhanced reactivity and unique properties. Pyramidalization is one of the main types of distortion, resulting in syn-folding of the substituent groups.

We have recently focused on modifying the synthetic route to reach of our target molecules. Formerly, it would require a five step synthesis to go from closed diacid (Figure A, 1) to diiodide (Figure A, 5). However, this process takes a lot of time and results in product loss through each step.

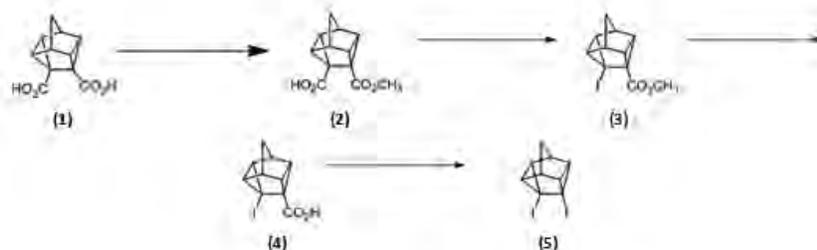


Figure A

Therefore, our efforts this summer have focused on going directly from closed diacid to diiodide (Figure B). Diiodide is extremely important as it is a direct precursor to our target molecule, pentacyclo[4.3.0.0<sup>2,4</sup>.0<sup>3,8</sup>.0<sup>5,7</sup>]non-4-ene (Figure B, 5).

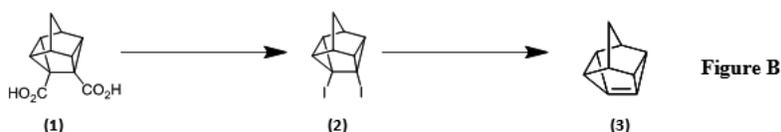


Figure B

By streamlining the synthesis, diiodide is produced faster, which then means we can reach our target molecule with greater ease and ideally, less product loss. We will continue this research throughout the school year to finalize the reaction and maximize yields and efficiency.



**Brian M. Forster**  
Office of Associate Dean  
College Arts & Sciences  
Saint Joseph's University

Ph.D. Cornell University

**Research Interests:** Science Pedagogy;  
Microbiology

I am the laboratory coordinator for the general education program natural sciences laboratory-based classes for students who are not majoring in science. Since my arrival in Fall 2011, my colleagues and I have started several research projects on science pedagogy. Pedagogy is the science of teaching. I am specifically interested in defining best practices for teaching science to non-science majors.

Past pedagogical research in my teaching laboratories has examined techniques to demonstrate the collaborative nature of science. One project involved the use of Winogradsky Columns, miniature ecosystems that allow for the enrichment of phototrophic bacteria (bacteria that use sunlight as their energy source). Non-science majors and biology majors team up to identify bacteria enriched in these columns using different techniques. A second project recently completed involves the identification of bacteria from water samples where non-science majors from different lab courses must combine the different techniques they have learned in order to isolate and identify bacteria. The uniqueness of this lab activity is that there are very little directions given in their lab handout.

This summer, my pedagogical research has turned to identifying inquiry-based methods to teach the concept of filtration to both science majors and non-majors. One activity my colleagues (Jonathan Fingerut, Matthew Nelson, Louis D'Angelo) and I have been interested in developing a lab focusing on the anatomy and physiology of the kidney. The kidney filters blood and produces urine. Many lab manuals covering the kidney relies on dissecting the kidney and discussing the filtration system of the nephron (functional unit of the kidney). Our newly developed lab activity utilizes a functioning nephron model that allows students to see how blood is filtered to make urine. They can then use this information to perform urinalysis on simulated samples and identify urine from individuals that have properly functioning kidneys or have disease.

# Development of Inquiry Based Lab Protocols Involving Water Quality and Filtration by the Nephron in the Kidney

Aelin Shea, '18

Faculty Mentor: Brian M. Forster  
Office of the Associate Dean, College of Arts & Sciences

Supported by the SJU Summer Scholars Program



This summer, I designed two inquiry based lab protocols as part of a pedagogical study to improve the teaching of the material in the lab-based science courses designed for non-science majors. The goal in developing these labs is to improve the students' understanding of filtration. Filtration is a process in which impurities are removed from a liquid. Filtration is a concept taught in both non-science majors Environmental Science and Biology. Each activity shows a different approach to the application of filtration. Both lab activities contain instructor-led demos, and more importantly, activities where students can perform and analyze the results of filtration.



Fig. 1

The first lab protocol I worked on was an environmental science lab where students measure water quality by identifying different pollutants commonly found in water. I focused on identifying different substrates that could be used to remove the pollutants. These substrates included sand, activated powdered charcoal, and gravel to name a few (*Fig. 1*). I prepared various samples of water with different pollutants and tested each substrate. The substrate that worked the best was the powdered activated charcoal. The small pores slow water down to allow a longer interaction between the charcoal and various pollutants to bind.



Fig. 2

In addition to the substrate filtration activity, the students will also observe a wetlands setup (*Fig. 2*) that I have made in the lab to better understand how plants and microbes work together to perform filtration in a natural way. Currently, my filter is able to pull out ammonium ions ( $\text{NH}_4^+$ ) from water.

The second lab protocol for biology labs involves the anatomy and physiology of the kidney. The nephron is the structural and functional unit of the kidney that filters blood. I built a model nephron that shows how the nephron works, and which molecules are being filtered from blood, reabsorbed by the body, and secreted as urine (*Fig. 3*). To also assist in bettering the understanding of the end result of this filtration system, I created mock urine samples so the students can perform urinalysis to detect which molecules should and should not be present in urine. I also constructed a nephron and urine samples mimicking pathological problems including glomerulonephritis, diabetes and urinary tract infections.



Fig. 3

Throughout the upcoming academic year, I will be distributing and analyzing surveys looking at student knowledge and understanding of filtration before and after completing the lab exercises. The surveys will be included as part of the pedagogical study and will further be put towards writing a pedagogical paper on the study in the upcoming year.



**Brian Frain, S.J.**

Department of Teacher Education  
Saint Joseph's University

Ed.D. University of Rochester

**Research Interests:** Qualitative Research  
Methodology, Religious Diversity in Schools

Having taught theology and religion in a Jesuit high school for many years, I wondered, “Does what I do in my classroom actually make a difference for students who are not Catholic?” Qualitative research study can inform religious educators about accurate and inaccurate assumptions of adolescent religious identity formation in schools that are becoming increasingly diverse. My study began with conversations I had with Robert Jackson, a researcher who studies religious diversity in British schools. Adopting his interpretive methodology practices, I observe adolescents and interview them about four educational activities (religious education classes, community service, liturgy participation, and retreats). Initial results indicate that two of these formation activities (religious education classes and retreats) provide greater scaffolding in the formation process than other domains.

At Saint Joseph's University, I instruct education students preparing for careers at the secondary school level. I invite my undergraduate or graduate students to research on school practices. Using qualitative methods, they design and conduct their own research from questions they raise, challenges they pose to the prevailing folk pedagogy, and interviews in their respective fields. I hope that such qualitative research investigation prepares future teachers to become educational researchers who solicit student input. Ultimately, student participation strengthens existing identity formation activities in schools, and opens up the possibility to construct new learning activities if necessary.

## **A Pedagogy of Literacy**

Jessica Marinucci, '17

Faculty Mentor: Brian B. Frain, S.J.

Department of Education



Supported by the SJU Summer Scholars Program

This project was a pilot study into the classroom environment of urban, public schools. The goal was to better understand the backgrounds and perspectives of teachers as they approach educating some of the most vulnerable student populations in Philadelphia. In working towards this goal, the study also unveiled a grander narrative of how our society defines and defends literacy. The study was spurred on by an in-depth reading and analysis of Paulo Freire's 'Pedagogy of the Oppressed' in which his ideologies on the relationship between the oppressor and oppressed are thoroughly discussed and examined. This project began with an intent to parallel the theology of Paulo Freire to the pedagogy of the contemporary urban classroom. As discussions with educators unfolded, I was exposed to a larger narrative of what it means to educate—to invest one's life in the motivation, development, and success of a child. Looking closely at the personal narratives with the background of Freire, I began to notice overlapping structures where teachers both perpetuated oppression and educated for liberation.

As my analysis of the text remained the background of my study, I also incorporated texts such as Clandinin and Connelly's (2006), "Narrative Inquiry." This text supported my approach to synthesizing and analyzing the interviews used in my pilot study. An additional text sourced for critical support was John Dewey's (1938) "Experience and Education," which provided powerful resonance to the needs of a classroom. In working with these sources for my analytical framework side by side, a greater variation and depth of analysis was made possible.

With goals to explore a world that intersects traditional education with society's role in crafting an accepted standard of literacy that serves to both promote and oppress individuals based on their personal path of literacy acquisition, "A Pedagogy of Literacy" became an exploration of how theorists, theologians, and educators alike utilize social implications of literacy to explain larger concepts of education.

Education is a main unifying factor that brings together all of humanity. Whether the learning takes place at home, in the community, in a school, or at work, we all receive an education in life. The basis of this learning is housed in literacy; proficient knowledge in a specified area. From there, the opportunity said to be guaranteed in education becomes a possibility. However, the amount of students--particularly those taught in a typical American public education setting--who are oppressed when standard literacy is the general expectation are often restricted from that promise of opportunity. When the foundation of educational success is withheld, every branch of its supposed opportunity is trimmed by a student's inability to fit a standard mold. Nevertheless, they are able, but have been underserved in classrooms that don't bend enough to meet their individual needs.



**Cheryl L. George**  
Department of Special Education  
Saint Joseph's University

Ph.D. University of North Texas

**Research Interests:** Improving the Behavior and Academic Performance of Children with Disabilities

My primary research interest is improving the behavior and academic performance of children with disabilities (especially students with Autism Spectrum Disorder (ASD) and those with Emotional/Behavioral Disorders (E/BD)). Because I taught students with E/BD, I have a desire to see them experience more success academically, socially, and emotionally. I have studied instructional strategies that promote active student response with this population to observe their impact on correct responding and on-task behavior. I hope to study the impact of aerobic exercise on the academic and behavior performance of students with E/BD in the near future.

For the last 11 years, my colleagues and I have been studying the effects of aerobic exercise on children with a variety of disabilities, but primarily those with ASD. We have conducted land-based after-school exercise studies as well as aquatic exercise studies. We have found improvements in sleep, arousal regulation, and academic responding following aerobic exercise in children on the Autism Spectrum. We have also found reductions in aggression, resistance to change, and specific fears following aquatic exercise.

Equally important to me is faculty/student research. I believe that undergraduate research provides pre-service teachers with practical experiences which increase their abilities to successfully educate and support children with disabilities and their families. I have published the results of the collaboration experiences of undergraduate pre-service teachers and doctoral physical therapy candidates who jointly planned and implemented exercise programs for children and youth with disabilities.

In Summer 2016, Erin Ross and I had the privilege of collaborating with the Kinney Center to study the impact of aquatic exercise on correct responding and stereotypy in the 3-7 year olds attending camp. Little is known about the impact of aquatic exercise on the academic responding of children with ASD. Also, fewer published physical exercise studies examine the effects on young children on the Autism Spectrum. Erin and I were studying whether or not aquatic exercise increases the correct academic responding and decreases stereotypical behaviors in young children with ASD. We were also examining how much energy expenditure is needed to produce desired effects, and how long the benefits of swimming, if noted, sustain.

# **The Impact of Aquatic Exercise on Academic Responding and Stereotypical Behavior in Children with Autism Spectrum Disorder**

Erin Ross, '17

Faculty Mentor: Cheryl L. George  
Department of Special Education



Supported by the SJU Summer Scholars Program and the Kinney Center for Autism Education and Support

With the rise of Autism Spectrum Disorder impacting children and families, the need for research on effective treatments continues to increase. According to Dr. Rosenberg, Westling, and McLeskey (p. 261, 2011), Autism Spectrum Disorder (ASD) is “a severe developmental disability characterized by an early age of onset.” Typically, children with ASD have social deficits and pervasive verbal and nonverbal communication. One specific behavior that is frequently seen in children with ASD is stereotypic behavior (rapid, repetitive movements). Similarly, the Office of Disease Prevention and Health Promotion recommend that all children participate in 60 minutes or more of physical activity daily. Continued research is needed to fully understand the impact of daily exercise on children with ASD.

This summer, I spent my time researching the impact of aquatic exercise on academic responding and stereotypical behavior in children with Autism Spectrum Disorder. The hope is that this research will add to the literature needed to understand the impact of exercise on children with ASD. Alongside Dr. Cheryl George, I worked with the Kinney Center observing age 3-7 year olds at Kinney Camp. The children were placed into two conditions: exercise and no exercise. The exercise condition was examined to see whether or not aquatic exercise increases the correct academic responding of a child and decreases the stereotypy of the child. We were also examining how long the energy expenditure needed to be, how long the desired effects would last, and if the effects were different from child to child.

Additionally, I gained from my summer scholars experience the exposure to doing research with human subjects and the IRB process that this entails. I also began to understand the difficulties surrounding research on ASD since each individual is different and has different behaviors. Dr. George guided me through the process of data collection, analysis, and reliability checks to further my abilities as a student and researcher. I look forward to continuing to research ASD in the future and use what I learned during my summer scholars experience in my future endeavors.

## References:

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**WaQar L. Ghani**  
Department of Accounting  
Saint Joseph's University

Ph.D. Drexel University

**Research Interests:** Earnings Management & Business Ethics; Accounting in Developing and Emerging Economies; Capital Market Research; Economics of Regulation; Corporate Governance; Sustainability and Corporate Social Responsibility.

It all began when I was asked to develop a gateway course for the MBA program. The title of my course (that I still teach at the graduate level) is called “Cooking the Books: Lessons in Business Ethics.” While developing this course, I was fortunate to get exposed to some intriguing and timely topics such as earnings manipulation, earnings restatements, earnings smoothing, and fraudulent financial reporting. In turn, these topics were found to be intertwined with issues of corporate governance, corporate social responsibility, and more importantly, business ethics. Hence, earnings management became one key aspect of my overall research portfolio.

A business entity (in this case a publicly traded firm) creates value (profit) or it destroys value (loss) by calculating the difference between all revenues (sales) or gains of the period and all expenses or losses of the period. Accounting discipline assigns various names to this value creation effort, such as, net income, bottom line, net earnings, and so on. But what is earnings management? Research tells us that earnings management manifests itself in two ways – accrual-based and real-earnings management. Accrual-based earnings management is an attempt by managers to use accounting choices, based on generally accepted accounting principles (GAAP), to intentionally distort financial reports for some opportunistic purposes, thereby systematically misleading stakeholders. An example would be building ‘cookie jar reserves’ and releasing them in a later period to pad profits. Real earnings management, on the other hand, happens when managers may decide to defer discretionary expenditures such as, maintenance, R&D, advertising, and investment in a new project, for the purpose of meeting or beating an earnings target.

Why managers manage earnings? There are various incentives associated with the managers’ actions. Managers are awarded bonuses and stock options if they meet or beat a certain financial target (it could be a sales target, operating profit target or an earnings target). Managers know that in most cases, meeting or beating of a certain accounting target improves predictability, increases share price, enhances manager’s reputation, and in some cases, helps a company avoid debt covenant violation or minimize the potential negative impact of a regulation. These targets are not only set internally but are also signaled externally by market participants such as financial analysts, activist investors, and other market makers.

## **Business Ethics and Financial Reporting: An Examination of Trends in Earnings Management**

Alison Markmann, '18

Faculty Mentor: WaQar L. Ghani  
Department of Accounting



Supported by the SJU Summer Scholars Program

Earnings management is the practice of manipulating the accounting or financial data of a company that is reported on its financial statements in a way that enhances its financial position or profitability profile. Extant literature shows that managers manage earnings in order to: avoid violation of debt covenants (debt-covenant hypothesis), maximize their financial compensation and other perks (management compensation hypothesis), ward off harmful regulations (political cost hypothesis), and manage Wall Street expectations, to name a few.

In practice, earnings manipulation takes on two forms: real activities manipulation and discretionary accruals (accrual-based earnings management). Whereas real activities reflect the timing of actual business activities, such as when to spend on R&D, advertising, and training, etc., in contrast, discretionary accruals pertain to the management's discretion to opportunistically time the recognition of revenues, expenses, write-offs, reserves, etc. without violating GAAP rules.

By examining trends in both real and accrual-based activities manipulation, we aim to identify periods in which managers of major corporations in the United States have engaged in earnings management. We hypothesize that extreme economic conditions (or shocks) are more likely to lead managers to manipulate earnings than they would during normal times. Using a series of models based on previous literature--namely, the modified cross-sectional Jones model (Jones 1991) and models of accrual quality (Dechow & Dichev, 2002; Beneish, 1999; Beneish, 2002)--we were able to model both real and accrual-based earnings management. First, we examined these trends around the passage of the Sarbanes-Oxley Act in 2002. The SOX changed financial reporting standards for all public companies, requiring further disclosures of business activities in their financial statements. Then, we expanded the time frame and included the financial crashes in 1987 and 2008, in addition to the Dot-com bubble of the early 2000s.

Next, we identified a group of firms that have been charged with manipulating earnings in the past. When we classified these firms in to various industries, we found that a large portion of the firms fell in to the same few industry classifications. Based on this finding, we intend to create a sub-sample taken from our original model that identifies firms that belong to these over-represented industries. We will then analyze the ways in which the managers of these firms manipulated earnings during the three recessionary periods: 1990-91, 2001, and 2008-2009. Our expectations are that managers from these industries are more likely to manage earnings than those of the control group during recessionary periods.



**Owen W. Gilman, Jr.**  
Department of English  
Saint Joseph's University

Ph.D. University of North Carolina

**Research Interests:** American War Literature and Film, Nature Writing, Southern Literature, Contemporary American Literature

Using an American Studies approach, I have explored American war literature and film in some 30 articles and three books, particularly *Vietnam and the Southern Imagination*



(University Press of Mississippi, 1992) and *Fantasyland at War: The Hell of War Becomes the Hell of Home* (University Press of Mississippi, forthcoming in 2017). *Vietnam and the Southern Imagination* showed that writers from the American South represented the Vietnam War with a unique perspective—that of people whose history had earlier included devastating loss in war, a piece of history that would insert itself inevitably, one way or another, in stories featuring combat experience in Vietnam.

The most recent study uses an American Studies approach to explore why and how Americans become committed to engagements in war. After interrogating the long history of war experience for Americans, beginning with the “acquiesce in the necessity” formulation established in the Declaration of Independence, I examine the most recent war activity—in Afghanistan and Iraq—building on scrutiny of American culture and politics by Rachel Maddow (*Drift*), Jonathan Haidt (*The Righteous Mind: Why Good People Are Divided by Politics and Religion*), and Charles Duhigg (*The Power of Habit*), Nicholas Carr (*The Shallows: What the Internet is Doing to our Brains*), and Sebastian Junger (*Tribe: On Homecoming and Belonging*). The middle section of the book focuses on the imaginative responses to recent war activity, with chapters on journalism/creative nonfiction, film (e.g. *The Hurt Locker*, *Zero Dark Thirty*, *American Sniper*), poetry (collections by Brian Turner, Kevin Powers and others), and fiction (e. g. *Billy Lynn's Long Halftime Walk*, *The Yellow Birds*, *Young Blood*). The final section explores the massive tendency for American to be distracted by superficial “Fantasyland” interests which get in the way of significant understanding of war and its consequences for veterans. This pattern of distractedness adds significantly to the pain, physical and mental, suffered by veterans upon return from war, and it also makes certain the likelihood of future war activity for Americans.

# **Fear and Loathing of the Millennial Generation: An Exploration of the Politics, Culture and Ideals of America's Youth**

Angela Christaldi, '17

Faculty Mentor: Owen W. Gilman  
Department of English



## **Supported by the SJU Summer Scholars Program**

According to the Pew Research Center, millennials are defined as “those born after 1980 and the first generation to come of age in the new millennium.” While this seems to be a rather innocuous definition, there are people (typically of older generations, i.e. the Baby Boomers) who seem to believe in a harsher definition of millennials: a group of lazy, entitled young adults who are too involved in technology and their own interests to do “real” work or make any worthy contributions to society. I have always been fascinated by the 1960s and the changing politics and society of the era, and as a result, took Dr. Gilman’s “Rereading the Sixties” course in Fall 2015. Throughout the course we read a variety of authors, from Sylvia Plath and Joan Didion to Tom Wolfe and Ken Kesey.

Inspired by Didion’s 1968 essay collection *Slouching Towards Bethlehem* and by society’s criticisms of the millennial generation, I aspired to write a series of essays exploring the opinions and ideals of millennials. Didion’s stories focused on society as a whole, but she used the lenses of her essays to examine her personal opinions and how she fit into the changing world. She traveled to San Francisco and spent time with the counterculture protestors at Haight-Ashbury, and attended a trial brought against Joan Baez’s Institute for the Study of Nonviolence. She spent time in Las Vegas with teen brides and at 24-hour wedding chapels, and saw how nonchalant the culture of drugs had become. She was living in and documenting one of the most turbulent times in American history, but still managed to keep a level perspective, portraying the events without bias, and instead offering her truest opinions on the events she encountered.

I strove to emulate Didion’s style in my essay collection, and also wanted to shed light on the opinions and ideals of millennials, who are so often maligned for speaking their minds. I created and shared polls centered around the current candidates in the 2016 presidential election, social issues, and more. I aspired to shed light on the beliefs of my generation and make clear to everyone that we are not lazy or entitled, but rather engaged and idealistic. I made it a point to broaden my horizons and experience things I may not have otherwise had the opportunity to do, such as volunteering at the Democratic National Convention, in an attempt to better understand the values and ideals of my peers. I took frequent notes and did my best to recreate my surroundings and convey the situations I found myself in. I partook in activities outside my comfort zone, and while I was not always an objective observer, I have discovered that there is no better way to tell a story than to become fully immersed in it.

## **Mirrors: A Fiction Novelette**

Allison Craven, '17

Faculty Member: Owen W. Gilman

Department of English

Supported by the SJU Summer Scholars Program



### ***Project Overview***

Over the many years that I have spent weaving ideas into stories, I've found that I continually return to worlds that are slightly different from our own. Speculative fiction has allowed me to explore humanity in a way that externalizes emotions and thought processes an internalized monologue initially introduces into something more tangible and physical. I've often found it hard to complete a story without elements of fantasy worked into the plot; it simply happens naturally. My focus in writing *Mirrors* for the Summer Scholar's Program was to throw myself completely into writing, editing, and completing a longer work that I could later publish and use towards a portfolio for an MFA degree. My advisor, Dr. Gilman, and I corresponded throughout the summer as he read through and offered comments and suggestions on the chapters I was working on. The areas he dissected the most were often scenes I felt needed work as well. He was extremely kind and supportive towards my writing, and he made the editing process much easier.

The Summer Scholar's program gave me the opportunity to learn more about my writing process outside of a school setting. The importance of note-taking, developing a timeline, and cutting unnecessary scenes are just a few of the valuable tricks I learned along the way.

### ***Plot Overview***

*Mirrors* dissects the minds of three young girls caught in between sisterhood and isolation. It investigates the idea of alternate realities humans are able to invent inside themselves, and what sort of fates giving into these can lead to.

Four years into the foster care system, 16 year old Annie is transferred to a new home when her former caretakers move away. Her new foster mother, Amelia Jake, controls Annie's every action, scolds her for wandering too far from the house, and spends her sleepless nights pacing the floor of her bedroom, occasionally mistaking Annie for her lost daughter, Edith. Edith, 14 years old, went missing two years prior to Annie's arrival after she disappeared into the forest behind her house without being found. When Amelia is unexpectedly assigned another foster child, Eve, the two girls try to fit into the rhythm of a house run by a heartbroken mother. Annie and Eve then find a diary left behind by the lost girl, its contents the words of a girl yearning for an escape. Feeling abandoned by her own mother, Eve forms an unbreakable connection with the diary and begins to believe that Edith was never missing, but left to find a better space in the world. When Eve finds she's being followed by a strange figure, she ventures into the forest to face the creature without telling Annie. Annie eventually finds her foster sister—along with an alternate version of herself.



## **Paola Giuli**

Department of Modern and  
Classical Languages  
Saint Joseph's University

Ph.D. Rutgers University

**Research Interests:** Eighteenth-  
Century Culture, Italian Cinema,  
Gender Studies, Literary Theory

My research interests are mainly in the field of Italian intellectual history. My latest publications focus on eighteenth and nineteenth-century Italian academic and cultural life, with particular attention to the Roman *Accademia degli Arcadi*, the most influential academy of eighteenth-century Italy. Open to poets, painters, antiquarians, collectors, as well as mathematicians, philosophers, theologians, lawyers and physicians, *Arcadia* spearheaded professional networking and scientific cooperation together with social and aesthetic reforms. This year I published two book chapters. The first chapter (Toronto University Press) studies the relationship between the curia and the Roman academy, especially as regards Prospero Lambertini's (future Pope Benedict XIV's) early years in Rome (1700-1708), while a second chapter (Farleigh Dickinson University) studies the role played by the eighteenth and nineteenth-century learned improvisation in the definition of the Italian national character and of a national audience.

At present I am working on two articles and a book: one article studies the influence of an Arcadian classicist aesthetic on Prince Leone Strozzi's cabinets of curiosities (to be presented at the MLA) while a second article focuses on Grand Tourists' depiction of Neapolitan literary milieu during the long 18<sup>th</sup>-century and its impact on the international debate on Italian contribution to European intellectual history. Through archival research, my book shows that *Arcadia* promoted a new code of literary and academic sociability, that allowed women to become poets, translators, dramatists, essayists, memorialists, journalists, historians, and even university graduates, professors, and poet laureates for the first time in European history. In so doing, my work challenges unquestioned cultural and gendered assumptions of much literary-historical discourse on the value of Italian eighteenth-century academies, and *Arcadia* in particular.

In the context of the 2016 SJU Summer Scholar Program, Irina Grinberg and I explored the relationship between French realism and naturalism (in particular Honoré de Balzac and Émile Zola) on Italian verismo (mostly Luigi Capuana and Giovanni Verga) especially as regards the representation of gender roles. Irina's focus on realistic novels as a medium for the representation (and even the fostering) of social change allowed her to redefine a crucial aspect of the genre, while also exploring the Weltanschauung that informed them.

**19th Century European Realism:  
The Tales of Female Beauty, Religion,  
Society and Agency**

Irina Grinberg, '17

Faculty Mentor: Paola Giuli  
Department of Modern & Classical Language

Supported by the SJU Summer Scholars Program



The research project featured 19th century works of Italian, Russian, and French works of literature on how literature reflects society, and how society reflects literature. When the program started, we decided on utilizing gender. 19th century was a century of drastic change and I fully believe that literature reflects that change. Language, actions, and most of all, people do not live within a vacuum. Society influences decisions, and people make up society.

I mainly focused on Balzac's "La Comédie Humaine" which is a series of stories centered around families during 1800s France. Within his series of works, I researched, and wrote about "Albert Savarus", comparing the story to Giovanni Verga's "La Lupa/She-Wolf" and "Cavalleria Rusticana." Because the research also focused on society, I utilized supplement resources such as: Rinaldina Russell's "The Feminist Encyclopedia of Italian Literature" and Enza Francisci's "Giovanni Verga's 'New Woman' in La Lupa." Both women who focused on Italian literature through a gender criticism. As a foreigner of the text, I was able to reach my own conclusions while using their criticism as a spring board. Verga's "She-Wolf," Pina is a character that is treated as the whore, however, she has agency. Control over her own body is something that female characters tend to lack, while male characters are born already holding. Agency then becomes my main focus, because in Balzac's story, the main female character, Rosalie, is seen as this meek, silent character who is forced into an oppressive religious life by her mother. Rosalie is only able to have a religious education.

The treatment of agency using female characters, I believe is a direct social commentary.



**Peter M. Graham**  
Department of Chemistry  
Saint Joseph's University

Ph.D. University of Virginia

**Research Interests:** CO<sub>2</sub> Activation

As part of nature's carbon cycle, photosynthesis converts atmospheric carbon dioxide into carbohydrates which provide cells with energy and the chemical building blocks needed to synthesize other compounds. The world economy continues to rely on fossil fuels to provide energy and the chemical building blocks needed for the manufacture of everything from plastics to pharmaceuticals. This reliance on fossil fuels has broken the balance of the global carbon cycle by concentrating carbon in the atmosphere. The development of alternative chemical processes that use carbon dioxide as a chemical building block would ease this imbalance. Not only would such processes decrease the reliance on petroleum raw materials, but they would also consume excess carbon dioxide by converting it to useful chemicals. This would provide an economically viable way to mitigate carbon dioxide emission by chemical industry, and could become an important facet of ultimately restoring balance to the global carbon cycle.

Carbon dioxide is an attractive alternative carbon starting material for a number of additional reasons. Unlike petroleum or natural gas, carbon dioxide does not have to be extracted from the ground, and does not require transportation across the globe in order to be used. It is also nonflammable and nontoxic. However, carbon dioxide's innate stability presents a major challenge, and only a handful of known chemical processes can make use of carbon dioxide as a starting material. Therefore, in order to effectively use carbon dioxide in chemical reactions, its chemical stability must be overcome.

In my laboratory, we are investigating transition metal complexes of tungsten, molybdenum, and rhenium that can overcome the stability of carbon dioxide. These metals strongly coordinate carbon dioxide and in doing so bend the normally linear molecule. This activates carbon dioxide towards otherwise impossible reactions. Gaining a better understanding of how such metal complexes interact with carbon dioxide and promote chemical reactions is critical to developing new catalysts for carbon dioxide activation. Such catalysts could convert carbon dioxide into carbon monoxide, formates, acrylates or dialkyl carbonates, all traditional chemical building blocks.

# The Synthesis of New Molybdenum Carbon Dioxide Complexes Containing N-Heterocyclic Carbenes

Leslie Briggs, '17

Faculty Mentor: Peter M. Graham  
Department of Chemistry



Supported by the American Chemical Society Petroleum Research Fund

In an effort to lessen the social and industrial dependence on fossil fuels, there has been a push in the scientific community to develop alternative chemical processes that would fuel our world without the harmful consequences of burning petroleum raw materials. One such alternative chemical process includes using carbon dioxide as a chemical building block. This would ease the imbalance of the global carbon cycle as well as consume excess carbon dioxide by converting it into useful products. Such processes are attractive for additional reasons such as the accessibility of carbon dioxide since, unlike petroleum, it does not need to be harvested and then shipped around the world. Furthermore, carbon dioxide is also nonflammable and nontoxic thus making it safer than traditional carbon sources. The inherent stability of carbon dioxide, however, does make using carbon dioxide as a starting material a challenge. As such, this chemical stability must be overcome via chemical activation using catalysts such as those that contain molybdenum.

This summer, my project focused primarily on the synthesis of new molybdenum carbon dioxide complexes featuring trispyrazolylborate (Tp) and an N-heterocyclic carbene (NHC) attached to the metal center. I began with  $\text{TpMo}(\text{NO})(\text{NHC})(\text{CO})$  and oxidized this using  $\text{O}_2$  gas or *t*-butyl hydroperoxide to produce  $\text{TpMo}(\text{NO})(\text{NHC})(\eta^2\text{-CO}_2)$ , the desired carbon dioxide complex. In order to determine the success of each of these oxidations, I used spectroscopic techniques such as infrared and nuclear magnetic resonance spectroscopy. From this point, I began to test the thermodynamic stability of this complex by dissolving it in different solvents, such as dimethyl sulfoxide, and heating it until decomposition occurred. Currently, I am working on growing crystals of the carbon dioxide complex in order to study it by X-ray crystallography.

# Synthesis of Acrylates From Carbon Dioxide and Ethylene Promoted by Molybdenum

Madeline Graziani, '17

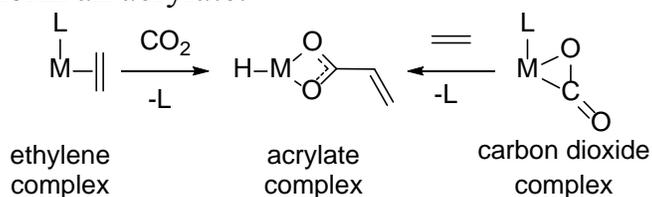
Faculty Mentor: Peter M. Graham  
Department of Chemistry



Supported by the American Chemical Society Petroleum Research Fund

Carbon-containing fuels, such as natural gas and petroleum, are used as starting materials in a variety of industrial chemical syntheses. Although carbon dioxide is readily abundant and nontoxic, it is rarely used as a carbon starting material. The problem with carbon dioxide is that it is relatively unreactive in its free form because of its linear shape and strong chemical bonds. The main goal of my research is to see if molybdenum complexes can promote carbon dioxide to react with other substrates to form a product, such as acrylate. Products synthesized from carbon dioxide would keep carbon dioxide out of the atmosphere for extended lengths of time by trapping it in the very structure of everyday products made by the chemical industry.

My project has mainly involved examining the potential of different molybdenum complexes to promote the reaction of carbon dioxide with ethylene to form an acrylate. I have approached these reactions from two directions. The first involves the synthesis of a molybdenum ethylene complex, which would then react with gaseous carbon dioxide to form an acrylate. The second route involves the synthesis of a molybdenum carbon dioxide complex, which can then react with gaseous ethylene to form an acrylate.





**Piotr Habdas**  
Department of Physics  
Saint Joseph's University

Ph.D. University of Silesia

**Research Interests:** Glass Transition,  
Soft Condensed Matter, Rheology of  
Non-Newtonian Liquids

During summer of 2016 two students worked in my laboratory, and one student volunteered for a part of the summer. Zachery Brown'17 and Rui Zhang '19 worked on extracting properties of complex liquids by tracking motion of magnetic beads suspended in dilute colloidal suspensions. Michael Jenkins'19 studied dynamics of colloidal particles in dense suspensions with various strengths of inter-particle attraction and ways to extract particle trajectories using machine learning.

Zack and Rui made samples with dilute colloidal suspensions and a small number of magnetic beads. Next, they constructed a motorized system next to a microscope in order to move a magnet near the sample and therefore exert a range of forces on the magnetic beads. From the motion of the magnetic beads one can extract properties of dilute colloidal suspensions. We have obtained preliminary results of how a magnetic bead moves through a dilute colloidal suspension. We plan to conduct systematic studies of magnetic beads moving with various speeds through colloidal suspensions of various concentrations.

Colloidal suspensions of spherical particles have been used successfully as a system that models the behavior of a regular glass. Typically, data is collected using confocal microscopy over several hours and then centers of colloidal particles are determined. The process of finding the centers of colloidal particles is time intensive. Recently, neural networks have started to be used in order to accelerate this process. Moreover, real time particle tracking can allow to determine if the data collection parameters are optimal or if there is something wrong with a sample. This summer Mike has constructed a neural network that determines if the image has a colloidal particle or not. This is just a start and we hope to construct neural networks that will eventually allow for real time particle tracking.

# Microrheology of Dilute Colloidal Suspensions

Zachery Brown, '17

Faculty Mentor: Piotr Habdas  
Department of Physics

Supported by NSF RUI-1306990

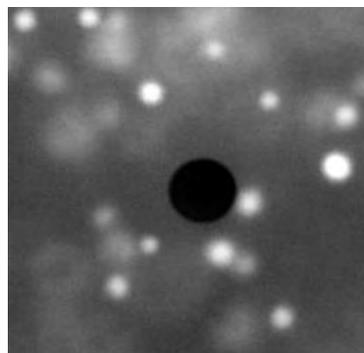


The field of rheology characterizes the flow and deformation of matter. Historically, these kinds of measurements have been conducted on fluids using a technique known as rheometry. A shear, or imbalance of forces on either side of the fluid sample, is applied, and the response of the fluid is measured. From this information, important physical properties can be inferred. One such quantity, viscosity, is sometimes thought to describe the thickness of the fluid. Technically, when using a rheometer (the primary instrument used in rheology), it is defined as the ratio of the shear stress to shear rate of a material. Another important quantity is the diffusivity, which describes the rate at which particles move through the fluid.

Rheometry, however, is not without limitations. Using a rheometer generally requires a large amount of the fluid in question. This presents obvious challenges in the case of materials that might be volatile, toxic, expensive, or possess any other limiting characteristics. Furthermore, a rheometer may not be appropriate for certain complex fluids. For example, colloidal suspensions, systems of small particles suspended in a fluid, are difficult for conventional rheology. The presence of colloidal particles in a fluid may significantly change its properties, though those changes are difficult to observe. One can mistakenly measure the properties of only the solvent rather than the entire suspension.

In recent years, a novel approach known as microrheology has been suggested to resolve these shortcomings. A probe particle of known size is placed into the bulk of a fluid and its diffusion is driven in one direction by an external force. The trajectory of the probe particle as it moves through the fluid is measured. From the average velocity in the direction of the force and the fluctuations in the motion of the probe, the same familiar fluid properties such as viscosity and diffusivity can be inferred.

In this study, magnetic probe particles (shown in black) are placed in suspensions of spherical colloids (shown in white). An electromagnet is mounted above the sample. The electric current through it, which produces the magnetic field, and its rotation can be controlled to force the diffusion of the probe particles at various speeds. Using microscopy techniques, we capture images of the probes in the bulk of the fluid. By recording a series of images over time of the particle's motion and using tracking software, the probe trajectories are extracted. From these we calculate the viscosity and diffusivity of our fluids.



# Exploring the Uses of Neural Networks in Particle Tracking for the Study of Glass

Michael Jenkins, '19



Faculty Mentor: Piotr Habdas  
Department of Physics

Supported by NSF RUI-1306990

A glass can be described as an extremely viscous liquid that feels solid to the touch. Window glass is a vitreous form of silicon dioxide. However, the small size and fast motion of silicon dioxide makes it hard to study glass. Instead colloidal suspensions, which were proven to be analogous to atomic glassy systems in experiments in the late 1960s to early 1970s, are used to replicate glassy materials. A colloidal suspension is a term that describes hard sphere particles suspended in a liquid. Hard spheres are small spherical particles ranging from 10 nm - 10  $\mu$ m that take an appearance of billiard balls. These hard spheres do not interact unless they become close enough to collide in which case they repel. Such a collision occurs due to the random motion of the particles, which is known as Brownian motion. A wide range of glassy systems can be studied using the two parameters of volume fraction and attraction strength. Volume fraction is defined as the fraction of volume occupied by the solid particles. Attraction strength is the magnitude of the attraction between colloidal particles towards each other.

The way we study these systems is by using confocal microscopy to take sequential 2-d images within the sample of the glassy material. Afterwards, we thread the images together into a short movie and use software to track each particle's trajectory throughout the movie. The problem with this approach is it takes time to determine the best parameters that locates the particles' centers for each movie. In order to reduce the time it takes to analyze the data, we investigated how machine learning, and more specifically neural networks, could reduce the time and increase the accuracy. Arthur Samuel, a pioneer in artificial intelligence and machine learning, summed up machine learning as a "field of study that gives computers the ability to learn without being explicitly programmed" in 1959 [1]. Two main braches of machine learning are supervised and unsupervised learning. Supervised learning is when the program is provided with labeled data and the computer learns a general rule that takes future inputs and outputs an accurate result. Unsupervised learning is when the data is not labeled and the computer determines how to sort the data into categories. We are using a supervised learning approach since we have many examples of labeled data. Additionally, the supervised algorithm we are using to implement the machine learning is an artificial neural network with backpropagation. The artificial neural network is an algorithm that was inspired and functions similar to the human brain. Backpropagation is a common mathematical method of training with artificial neural networks, and its job is to reduce the error of the output. We have one neural network that determines whether an image contains a hard sphere particle. In the future we want to optimize this neural network and add more features to it with the goal of eventually have the neural network track the particles in real-time during the data collection to increase speed of collection and reduce bad data.

[1] McCarthy, Feigenbaum. 1990. In Memoriam Arthur Samuel: Pioneer in Machine Learning. AI Magazine. 11(3): 10-11.



**Emily K. Hage**  
Department of Art  
Saint Joseph's University

Ph.D. University of Pennsylvania

**Research Interests:** 20<sup>th</sup> - and 21<sup>st</sup>-Century  
American and European Art; Magazines,  
Museum Studies, Art and Social Justice

With a background in philosophy, political science, and economics, I am fascinated by the social, political, cultural, and financial contexts of Western art in the twentieth and twenty-first centuries. My research focuses on artists' manipulations on the magazine medium, from Dadaists' art journals from the early the early twentieth century to artists' sustained involvement in *Fortune* magazine through the 1960s. Although often overlooked, artists' involvement with print media constitutes some of their most direct and widespread effectiveness. The relationship between image and text in magazines as well as in collages is especially compelling to me, as interaction between the two can communicate in particularly pointed and subversive ways. My research on artists' magazines from the early twentieth century informs my analyses of later artists' infiltration of mass media channels and questions about how present-day social media alter the landscape of artistic practice and social action.

Having worked in museums for years, I am committed to making cultural institutions accessible and engaging for a broad range of audiences and raising awareness of the importance of display design. Locally, I am involved in supporting artists in Philadelphia, whose work speaks to issues of social justice and contributes significantly to the increasingly globalized art world of the twenty-first century. I have worked with summer scholars on a variety of topics related to my research, including yarn bombing, critiques of representations of African Americans, present-day Philadelphia artists' efforts to promote social justice, and the role of images in the media and social media in debates concerning tensions involving police and the Black Lives Matter movement.

## **Civil Rights Through a Lens: Ferguson and Baltimore**

Tess Roy, '18

Faculty Mentor: Emily K. Hage  
Department of Art



Supported by the SJU Summer Scholars Program

On August 9, 2014, in Ferguson, MO, Officer Darren Wilson shot and killed Michael Brown, an unarmed black teenager. Following the death of Mr. Brown, major news media outlets intensely covered this issue and protests rapidly spread across the nation. In 2015, another tragedy occurred when Freddie Gray, a young black man, was murdered in Baltimore by six police officers. Like Ferguson, this death was closely followed by news outlets and many people participated in protests all over the country. The events in Ferguson and Baltimore were covered by intense news media scrutiny, but they were really characterized by the use of social media to organize protests and to gain support for the cause.

Relentless social media attention spurred a new wave of activism across the nation. Pictures of protests went viral and these images helped reap support for this cause. Social media and news outlets helped to catalyze political participation, but many of these news media outlets tried to create their own narratives of the events in Ferguson and Baltimore. Riots broke out in both cities and many of these news networks focused on that rather than reporting on the many peaceful demonstrations.

The news media coverage became more of a battle between the police's use of tear gas to subdue crowds versus a few people looting stores and rioting. The different narratives, images, and coverage further polarized an already divisive nation. The media's opposing views on the issue shaped people's perspectives on race and police. As a result, extremism on both the left and right was fostered. The radicalism on both sides pushed a race dialogue, but it also thwarted true reform.

By examining images and videos released by both liberal and conservative news outlets, I was able to see how different narratives were portrayed and how they contributed to political polarization in the American public. Additionally, I examined social media platforms such as Facebook, Instagram, and Twitter and I was able to see how they sparked outrage and were also used to mobilize the people.



**Virginia Goulding Johnson**  
The Faith-Justice Institute  
Saint Joseph's University

Ph.D. University of Delaware

**Research Interests:** As an educational psychologist I am interested in schools' impact on children's cognitive, social, physical and moral development. I consider the effectiveness of teachers' training as well as the social context of present day schools in examining the shaping and enhancing of children's learning experiences.

Research has shown that well trained teachers who understand the development of young minds and bodies are essential to children's academic and social growth. This has been the case for the longest time in American schools. Teachers' work in curriculum and activities has been shaped around the development of social/academic skills and understandings as appropriate at the various levels of a child's experience. At the beginning of this century, in an alarming shift in educational policy, and contrary to everything teachers knew about "best practices", the unprecedented No Child Left Behind Act presented them with very real hurdles in presenting a curriculum and a series of school days which would allow for the development of the "whole child" Administrative insistence on high-stakes testing to the detriment of a well-rounded curriculum then created a new focus on the all-important questions; "what is learning?" and "what is needed for children's learning to grow?"

If it is as Maria Montessori, an innovator of educational practice said that "Play is the work of childhood" recent events indicate a serious mistake in the emphasis on academic tests creating questionable data and putting developmentally appropriate activities and learning at risk. . Good teachers know that the fostering of cooperative and social skills is equally important to knowledge acquisition in young children. To that end, this summer, Amanda Hazel has created an independent project centering on the effects of too much testing and not enough developmentally appropriate practice like play in early elementary classrooms. Her research and wide ranging interviews should provide insights into the importance of play in an often restricted school day. Intending teachers as well as those already experienced should be able to garner play knowledge and skills from her work.

## Leveling the Playing Field

Amanda Hazel, '17

Faculty Mentor: Virginia G. Johnson

Faith-Justice Institute



Supported by the SJU Summer Scholars Program

Play has long been seen as a prominent and beneficial part of childhood. The famous psychologist Jean Piaget viewed play as an important tool for not only a child's social development he also believed that play provided children with opportunities for moral development through negotiating with peers. Fellow psychologist Lev Vygotsky also viewed play as beneficial to social and moral development but also believed play to be a crucial part of learning in that through play children are challenged to move a bit beyond their zone of proximal development. Today there is even more evidence and an even wider belief that play is crucial to children's learning. In their 2009 position statement on developmentally appropriate practice, the National Association for the Education of Young Children (NAEYC) states, "rather than detracting from academic learning, play appears to support the abilities that underlie such learning and thus to promote school success." Therefore, it is no surprise that in my education courses (Child Development and Foundations of Early Childhood Education in particular) play has been hailed as a crucial and necessary practice for young student development and learning.

However, when I would go into schools for field experience, I would see firsthand that the kids had such little time, if any for recess and that play was rarely ever utilized as part of the school day in the classroom setting. These observations served as inspiration to conduct a study on the role of play in educational settings.

I began my study through a literature review of studies and books about play in terms of childhood development as well as the role of play in academic settings. Immediately it became clear that while we often assume that the definition of play is universally understood in many works that I encountered that were labeled to be about play did not even try to define what play is! Among the works that did define play there were some common elements but still a great deal of variety across definitions. This led me to conclude that the confusion regarding what play is is ultimately detrimental to efforts to make play a more integral aspect of the curriculum.

The second part of my study involves interviewing people who are part of organizations and schools to determine their perceptions of the role of play in educational settings. Thus far I have interviewed a play historian, two directors of non-profit organizations dedicated to play incorporation and advocacy as well as a director from a childcare program that utilizes a play-based curriculum. As with the literature review, there was some variety and even hesitation regarding defining play. Even with the confusion and differences regarding how play should be fine, across the board all participants believe that play is a crucial vehicle for learning and that teachers should make their best effort to incorporate play into their classrooms even if the emphasis on academics is high. I plan on interviewing teachers during the school year about their perceptions on play in education.

From the literature I have studied and interviews I have conducted, I intend to create a handbook with strategies to help teachers, administrators, and others who may need it to incorporate play into classrooms so even in this age of high-stakes testing we do not continue to deprive our children with their fundamental right to play.



**Christopher E. Kelly**  
Department of Sociology &  
Criminal Justice  
Saint Joseph's University

Ph.D. Temple University

**Research Interests:** Interrogation

Shortly after his inauguration in January 2009, President Obama signed Executive Order 13491 that created a Special Task Force on Interrogations and Transfer Policies to reevaluate the interrogation practices authorized by the previous administration. In August that same year, the Task Force recommended that a new interagency collaboration be formed, called the High Value Detainee Interrogation Group (HIG), and specifically recommended that in addition to its operational duties, the HIG also create a program of research to evaluate the best practices in lawful interrogation. I have been fortunate enough to be funded by the HIG for three studies.

To begin our work with the HIG, my colleagues and I developed a "taxonomy of interrogation methods," identifying three conceptual levels of increasing specificity: first, the broad macro-level categories historically used to describe the dichotomous approaches to interrogation, such as rapport versus control, information-gathering versus accusatorial, friendly versus harsh, or minimization versus maximization; second, a meso- or intermediate level consisting of six domains –rapport and relationship building, emotion provocation, context manipulation, confrontation/competition, collaboration, and presentation of evidence– that we believe encompasses and parsimoniously describes all interrogation methods (with the exception of torture); and third, the specific micro-level techniques that have been empirically evaluated or appear in well-known documents like the Army Field Manual and those of the "Reid Technique."

Since the publication of the taxonomy, we have focused on examining interrogation using the six domains we developed in a survey of interrogators from 10 countries and a content analysis of interrogation recordings provided by the Los Angeles Police Department. We found that the domains were reportedly used at significantly different rates, with rapport and relationship building being the most used domain and confrontation/competition the least. We found significant, positive associations between confrontation/competition, emotion provocation, and presentation of evidence in both sources of data, and these three domains were also significantly more likely to be used where the suspect denied involvement. Additionally, with respect to confrontation/competition, we found that use of these harsher methods significantly suppressed suspect cooperation for 15 minutes regardless of the other methods used in the intervening time period.

In addition to an on-going relationship with the LAPD, I have worked with the Philadelphia Police Department and the Las Vegas Metropolitan Police Department to examine various aspects of interrogation, including the effects the physical space of the interrogation room has on cooperation and effective methods at eliciting information (as opposed to those designed to produce a confession) from gang members.

# **Investigative Jail Interviews: Beliefs and Practices in the Clark County Detention Center**

Ashley Varghese, '17



Faculty Mentor: Christopher E. Kelly  
Department of Sociology and Criminal Justice

## **Supported by the SJU Summer Scholars Program**

The majority of research on interrogation/interviewing thus far has been conducted on suspects from criminal investigations that aim to produce a confession and lead to a prosecution. The effectiveness of an interview in producing a confession depends on a variety of factors (Meissner, Kelly, & Woestehoff, 2015). One of these includes the interrogation methods and techniques that are employed. Kelly, Miller, Redlich, and Kleinman (2013) identified over 70 interrogation methods and organized them into six different categories: 1) rapport and relationship building, 2) context manipulation, 3) emotion provocation, 4) confrontation and competition, 5) collaboration, and 6) presentation of evidence. Of these six categories, rapport and relationship building was associated with increased suspect cooperation (Kelly, Miller, and Redlich, 2016) and confessions (Meissner et al., 2015), but there is little research on which methods are the most effective for the purposes of gathering information.

Data for my project came from the Clark County Detention Center (CCDC) in Las Vegas, Nevada. The project consisted of two different elements: focus groups conducted with the Gang Special Investigations Unit (GSIU) investigators and video recordings of interviews with CCDC inmates. The focus groups were conducted on two separate days with five investigators per day. After a close analysis of the transcribed data with Dr. Kelly, I interpreted the focus groups' responses into a narrative of the interview process, which describes the process before, during, and after the interview. Interviews come to fruition in a number of different ways including inmate-initiated interviews and referrals from other units of the jail. Before the interview, investigators prepare by doing research on the inmate's jail/prison history, personal background, etc. During an interview, the interviewer tries to establish some sort of relationship and rapport with the inmate by allowing the inmate to speak freely about himself. Generally, interviewers said that they debrief the interview, i.e. analyze the information they have received, look over missed questions, etc. Everything from the interview gets documented and the interviewers write reports after the interview. If possible, they will make referrals for further questioning. The second part of the data was actual recordings of interviews conducted with CCDC inmates by investigators. The interviews ranged anywhere from approximately 15 minutes to an hour in length, and were coded in 3 segments each (beginning, middle, and end) according to its duration. Dr. Kelly and I coded the recordings and looked for variables in 3 different categories: OARS (Open-ended questions, Affirmations, Reflective listening, and Summaries)/Question Type, Cognitive Interview Elements, and Interview Techniques.

In the focus groups, there was a large emphasis on asking open-ended questions and allowing the inmate to speak freely; however, the video recordings showed that investigators actually asked closed-ended questions more frequently than open-ended ones. It was also shown in the video recordings that the inmates' forthcomingness was much higher when asked open-ended questions more extensively. As such, investigators should move toward a more open-ended style of questioning in order to elicit more information from interviewees.



**Christina King Smith**  
Department of Biology  
Saint Joseph's University

Ph.D. University of Maryland, Baltimore County

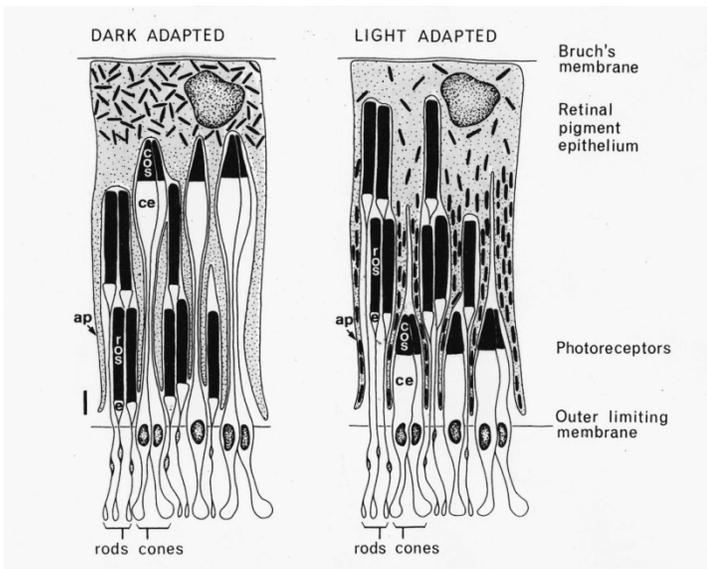
**Research interests:** The Cytoskeleton and Cell Motility

Research in my laboratory centers on questions concerning cell motility. Our current areas of investigation focus mainly on understanding mechanisms of actin-dependent organelle motility and how motility is regulated. As a model system, we use retinal pigment epithelial (RPE) cells from fish. These cells are found at the back of vertebrate eyes, and contain numerous pigment granules that in fish, undergo mass migrations in response to light. RPE cells can be isolated from the eyes of fish, dissociated, and cultured as single cells. Aggregation and dispersion of pigment granules within RPE is dependent on the actin cytoskeleton, and can be chemically triggered in isolated cells, allowing investigation of the mechanisms involved in motility.

Questions we are addressing include:

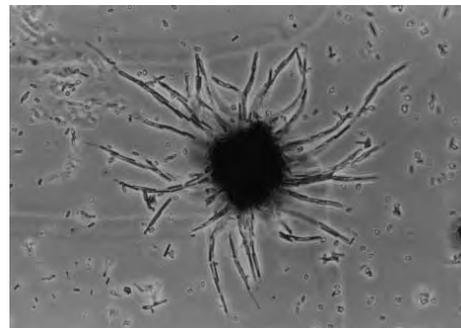
- What role do actin dynamics and non-muscle-myosin motors play in pigment granule motility?
- The signaling molecule, cAMP, stimulates pigment granule aggregation *in vitro*. cAMP is an activator of a protein kinase, protein kinase A (PKA). What are the targets of PKA?

We are currently focusing on identifying the protein or proteins are phosphorylated by protein kinase A after RPE cells are stimulated to aggregate pigment granules by cAMP. Using immunoblotting, we have identified a number of proteins that become phosphorylated either in the presence of cAMP or in the presence of phosphatase inhibitors. Next steps include immunoprecipitation of these phosphorylated proteins and their identification using antibody labeling and mass spectrometry.



Burnside and Nagle, *Prog. In Ret. Res.* Vol 2, 1983

**Left:** section through a vertebrate eye showing the rod and cone photoreceptors and the RPE (shaded grey). In light adapted eyes, pigment granules disperse into long apical projections. In the dark, this motility is reversed and granules aggregate into the cell body. **Below:** single isolated RPE cell in culture. After dissociation, the cell's long projections extend radially from the central cell body. The dark center is caused by accumulated pigment granules.



# Identification of Protein Kinase A (PKA) Substrates in Retinal Pigment Epithelium (RPE) From *Lepomis macrochirus*

Elizabeth Del Rio, '19

Joseph Quinlan, Jr., '19



Faculty Mentor: Christina King Smith  
Department of Biology

Supported by the SJU Summer Scholars Program

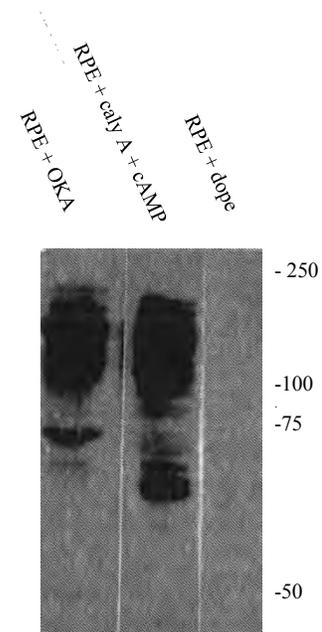
The retinal pigment epithelium (RPE) is a pigmented layer of cells in the vertebrate eye that is essential for proper visual function. In contrast to most mammalian species, fish and other lower vertebrates do not possess eyelids nor dilatable pupils to control influx of light. Rather, migratory melanin pigment granules located within the RPE are transported throughout the cells to protect the eye's photoreceptors from bleaching. When eyes are exposed to light, pigment granules migrate from the RPE cell body out into elongated apical projections, to protect the dim-vision-associated rod photoreceptors from overexposure. However, in the dark, they reverse this movement to aggregate back into the cell body to allow maximum light exposure to photoreceptors, a process that requires actin filaments.

The main purpose of this research is to study the process of the regulation of aggregation by using isolated RPE cells from dark adapted bluegills' eyes. Past research has provided evidence for an aggregation signaling pathway that includes the phosphorylation of an unknown target protein by the enzyme protein kinase A (PKA). The goal of this project is to ultimately identify target proteins of PKA in RPE that regulate pigment granule aggregation.

Protein isolation is completed by isolating RPE cells and treating them with an antibody that recognizes proteins which are phosphorylated on the amino acids serine or threonine. The RPE cells can also be treated with other substances, such as phosphatase inhibitors, to maintain phosphorylation of PKA targets.

Future work will involve specific identification of phosphorylated proteins.

**Figure:** Immunoblot of fish lysates treated with  $\alpha$ -Phospho-Ser/Thr. PKA substrate. Samples in Lanes 1 and 2 were treated with cAMP and phosphatase inhibitors, which promote aggregation. Lane 3 was treated with dopamine, which stimulates pigment granule dispersion, thus produces no phosphoproteins.





**Ronald M. Klein**  
Department of Art  
Saint Joseph's University

MFA University of Minnesota

**Research Interests:** Appropriated Art

Luck, chance and reason guide my work. The results are images that aid in my understanding of complexities I don't fully grasp.

Traveling and collecting in remote equatorial locations has been both an inspiration and source of my work. The infrastructures of these extraordinary rainforest habitats, replete with complex repetitive patterns, offer an abundance of objects, used to inspire and construct my sculpture. These organic materials are then combined with objects from our own urban jungle, where the motivating force is to depict how both exist simultaneously in a world of chaos and order.

I am searching for the order in chaos, and the chaos in order. Nature's symmetry of order, juxtaposed with the opposing force of industrial objects helps reconcile my concerns and delineate the fine line separating one from the other. It is these two formats that seem to make sense for me. I love both and they inform my daily life. It is this synergy, which creates the visual, emotional and conceptual content and illustrates the delicate balance between natural and industrial environments.

I chose images, icons, and things that seem to exemplify a particular quality in and of themselves. The objects that I select come from the culture of nature and humans. Both are borderless and are rooted in human and natural conditions. The smallest molecular structures of these objects are a source of infinite strength generating the larger world in which we live. The power of these tiny particles creates our physical realities. I believe that by observing and organizing these small visual components I may find my own connection to the larger world.

The specificity of these objects is a result of where I am at the moment I see something of interest. Like a diary – it traces and reflects my intersections of life by way of 3D images. These things are part of my life in some way or another. They can be new or old; each has its own character and can contribute to the sculpture. Many stick out as memories of adventures to many of the equatorials regions I go to get materials. Others are intrinsically linked to my life in Philadelphia. Certain objects are so important that they are eternal. Like DNA they can't be extinguished. They can be very personal objects from our lives containing embedded information – or simply common icons.

# **Form and Essence: A Study of Human Form and Existence Through Sculpture**

Katherine Lord, '17



Faculty Mentor: Ronald M. Klein  
Department of Art

## **Supported by the SJU Summer Scholars Program**

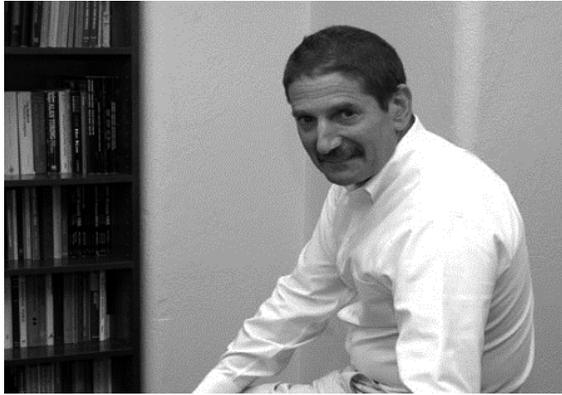
Every artist struggles when they are first starting out to find their distinct style. It can be incredibly easy to simply make work that looks good and people enjoy. This has been a continual struggle for me as I am capable of making good work but has no meaning to me, and is therefore inauthentic. I was able to begin to overcome this struggle through my research this summer.

I want my work to make viewers stop and think. Specifically, I want the viewer to think about who they are in space and what it means to be themselves especially in relation with others. I want people to question their own integrity in their daily lives. This should either motivate the viewer to act, or make the viewer feel completely at peace with themselves. It is my goal that this interaction be extremely personal. I have realized making a difference in people's lives is very important to me. I believe that I can do this through my art and impact as many people as possible in this way. Through continual study and practice I have been able to better understand how I can achieve these goals in my work, I have finally started to find my distinct style in sculpture.

I use appropriated objects or forms that I have made to create mass. Throughout the summer I have done that with many objects, such as wire, glass, and zip ties. I have come to a new understanding of what it means to use different objects; each object has a specific meaning and utilization, and that is all important to think about when creating pieces. I have also begun to explore what happens when I combine my appropriated work with realistic forms. I believe this has opened up a new set of opportunities for me and hope to continue to explore this in future pieces.

My mentor, Professor Ron Klein helped me discover all of this. He pointed me in the direction of Franz West and George Segal, two artists that were instrumental in my work this summer. I researched them, and not only found new ways to work, but also found meaning in another artist's work. Professor Klein was also able to help me with logistical questions and problems along the way. He pointed me in different directions and was an invaluable resource for me throughout the program.

I am very eager to continue my studies in sculpture with all of the knowledge and skills I have obtained throughout the summer. I have gained knowledge and skill, and am now able to work with all types of power tools and building materials that I would have never been able to use in the past. With this knowledge I am able to broaden the materials I can work with, and therefore advance my work. The body of work I have produced throughout the program will be extremely important to my future as an artist.



**Paul Klingsberg**  
Department of Mathematics  
Saint Joseph's University

Ph.D. University of Pennsylvania

**Research Interests:** Combinatorics;  
Graph Theory; Computational  
Complexity

My fields of research are *combinatorics* and *graph theory*. In very general terms, combinatorics deals with enumeration of the number of ways to perform a mathematical task (such as choosing a delegation of three people to represent a group of 15 people), and graph theory is concerned with diagrams you make by connecting dots with lines. Since these areas are relatively accessible to undergraduates, they are often sources of undergrad-level research problems, but not all the projects I have directed have been purely combinatorial, because the choice of topic is in large part driven by the student's needs and interests. I have directed projects each of the last five summers. In '06, I directed two summer scholar projects: *The role of invariance in mathematics* (which, among other things, investigated the use of an invariant in a number of combinatorial problems) and *Generalized Möbius Inversion* (which is abstract combinatorics). In Summer '07, I directed a project in another area of combinatorics, *Pólya-de Bruijn Theory*, which deals with enumeration questions in which not all the ways of performing a task count as different. (For example, consider painting the faces of a cube using  $k$  colors. Rotating the cube will make some colorings coincide with others.) I directed a project centered on probability theory '08, on stochastic processes and the Black-Scholes formula in '09, on problem solving in '10, on coding theory and public-key encryption in '12, on Financial Mathematics in '13, on computability theory in '14, and on mathematical tools for modeling prokaryotic gene/operon inter-regulation in '16. For more details on these projects, please see the one-page summaries prepared by the students.

# Mathematical Background for Modeling Gene/Operon Networks in Prokaryotes

Julie Osborne, '18

Faculty Mentor: Paul Klingsberg  
Department of Mathematics



## Supported by the SJU Summer Scholars Program

Many genes and operons on a prokaryote chromosome are involved in the activation or suppression of other genes, and it would be interesting to develop mathematical methods for determining the behavior of the entire network from the operating characteristics of the individual genes. This endeavor would no doubt require a variety of mathematical tools, and my project consisted of learning as much of this background material as I could over the course of the summer. The topics we covered are:

- Operators over complex inner-product spaces
  - The Gram-Schmidt process
  - Orthogonal complements and self-adjoint projections
  - Normal, self-adjoint, positive, and unitary operators
  - Polar decomposition and singular-value representation of an operator
- Operators over complex vector spaces
  - Generalized eigenspaces, Jordan normal form
- Orthogonal Functions
  - Christoffel-Darboux identity
  - Location of the zeroes of a Gram-Schmidt basis of the space of polynomials
  - Gaussian quadrature
  - Legendre polynomials, Chebyshev polynomials
- Differential Equations
  - First-order equations
    - Linear equations
    - Separable equations
    - Exact equations
    - Picard's Theorem
  - Second-order equations with constant coefficients
  - Systems of linear equations with constant coefficients [ $\mathbf{x}' = A\mathbf{x} + \mathbf{g}$ ]
    - $e^{tA}$  as fundamental set of solutions to  $\mathbf{x}' = A\mathbf{x} + 0$
    - Variation of parameters

Unfortunately, there was not enough time to cover all the topics that I hoped to get to. Continuation of the project would entail:

- Learning elements of graph theory
- Modeling a simple network by a system of linear differential equations

The long-term goal of this program is the construction of realistic models of prokaryote gene/operon regulatory networks; it is my hope that such models will eventually prove useful to the study of these networks and will deepen our understanding of them.



**Kenneth W. Kury**  
Department of Management  
Saint Joseph's University

Ph.D. Boston College

**Research Interests:** The Ethical Foundation of Social Entrepreneurship, Social Entrepreneurship as Social Change, and Ethical and Critical Aspects of Accounting

My research is influenced by my practical background in establishing bridges between the theoretical and the applied either, by seeking an answer to a practical problem or by focusing on the practical implications of a theoretical problem. Also influencing my research is my foundational background in accounting and finance. I find it interesting to examine how financial numbers, which are a cornerstone metric of the business world, are a social construction and drive individual and organizational action. This interest in the social construction of numbers has led to the overarching research frame of social construction that is present in some form in all my work.

I have become increasingly interested in social entrepreneurship as a means to social change. I view social entrepreneurship as an avenue to aid those marginalized by current markets and institutions. Social ventures around the world seek to solve the most pressing social problems such as poverty, homelessness, hunger, and the empowerment of marginalized individuals to create their own future. Incorporating ethics into social entrepreneurship fosters opportunity recognition through violations of moral rights and justice promoting creative new solutions to these problems. Taking a social change frame to social entrepreneurship, I seek to explore the complexity of problems which most often requires a multi-tiered solution.

# **Finding the Balance Between Commercial and Social Institutional Logics Embedded Within a Hybrid Corporation**

Meaghan Cherewka, '18



Faculty Mentor: Kenneth W. Kury  
Department of Management

Supported by the SJU Summer Scholars Program

Social Entrepreneurship, the practice of using business techniques to further philanthropic goals, is a relatively new but quickly growing ideology in the corporate world, bringing with it the concept of Hybrid Corporations. Just like social entrepreneurship, hybrid corporations have not yet been clearly defined, and still experience complications when designing how best to incorporate the commercial and social aspects of a business.

Maintaining a hybrid organization consists of creating a sustainable profit for the business while staying true to the social mission of the company. While the general concept of a hybrid corporation sounds simple, many businesses have failed to successfully implement this organizational structure. Most businesses lean too far in one direction; either focusing too much on the social mission where there is not enough profit made to keep the company afloat, or focusing too much on the bottom line and straying from the original mission of the company.

Since there is no clear-cut answer as to why businesses cannot maintain proper balance in hybrid corporations, there are several theories as to how this imbalance occurs. The theory I have chosen to focus on is the study of Institutional Logics, or the competing values within an organization, and how to properly balance those in order to maintain a hybrid structure. I mainly studied the makeup of Ben & Jerry's Homemade, Inc. and how the institutional logics competed against one another, which eventually culminated in tipping the balance of the hybrid organization.

Ben & Jerry's was known for its Triple Bottom Line of Product, Economic and Social mission. Ben & Jerry's was considered an early hybrid corporation, until they were bought out by Unilever in 2001 due to poor financial performance. For many years after the change in leadership, Ben & Jerry's switched to Single Bottom Line, shifting much more weight towards profitability and devoting much fewer resources towards social endeavors, resulting in an unbalanced hybrid structure. However, in recent years, leveraging stable financials and increased growth from their acquisition the social mission has actually expanded and the hybrid structure is more balanced.

After studying other hybrid companies similar to Ben & Jerry's, like Tom's Shoes and Newman's Own, as well as both traditional for-profit companies like J.P. Morgan and traditional nonprofits such as Goodwill Industries, it became clear that most hybrid corporations fail because they focus more energy into some logics over others, creating irreconcilable gaps between their competing missions. Rather than treating social endeavors as a separate entity in the company, hybrid corporations require interdependence; social endeavors must incorporate directly into your products or services, and must be run with as much discipline as your financial bottom line. While there is bound to be tension between these logics, both for internal and external factors, you must treat the company as a whole entity instead of trying to mesh together two independent sectors.



**Joseph M. Larkin**  
Department of Accounting  
Saint Joseph's University

Ph.D. Temple University

**Research Interests:** Internal Controls,  
Budgeting and Job Expectations/  
Requirements of Accounting Majors  
and Recruiters

In her research project, Philomena writes, "Cybercrime is where a hacker, almost always unknown to the victim, is able to access IT devices through an internet connection and obtain a user's personal identifying information." Not only does cybercrime cost billions of dollars in theft, but just as important is the loss of trust faced by its victims. Cybercrime is increasing and efforts to reduce it are critical. In all likelihood, it will probably never be completely eliminated, but it is important to raise the awareness of it to society. This paper does that.

Part one explains what cybercrime is and provides numerous examples of the different schemes criminals use. Victims include individual citizens like you and me, as well as Fortune 500 corporations and everyone in between.

The second part of the paper discusses the impact on businesses and the economy in general. In fact, cybercrimes have contributed to numerous business failures. For example, Target Corporation incurred cyber-related losses of \$291million as recently as 2016. And, the estimated "lost" sales are much greater than that amount!

The final section defines and explores cyber-security, including the various internal controls that can mitigate cyber-risks. "It is imperative that businesses take the needed steps now to protect their customers before it is too late. By having cyber-security measures set in place, businesses will be made aware of security breaches earlier so that the amount of customers impacted may be limited," she says.

Philomena's research digs deeply into a subject we should all be concerned with as technology touches people in all walks of life. It raises the awareness for consumers and provides advice and recommendations that we can and should use in our everyday lives.

# **Examining Cybercrime: Security Challenges for 21st Century Businesses**

Philomena Alexandria Faia, '18

Faculty Mentor: Joseph M. Larkin  
Department of Accounting

Supported by the SJU Summer Scholars Program



In today's rapidly growing business world, there is instant connectivity through smart phones, tablets, computers, and other electrical devices (herein, "IT devices"). These IT devices are essential for both businesses and daily life. Without these IT devices, the many conveniences and efficiencies created by these IT devices would not be possible. However, few people consider the security of their IT devices when using them. When accessing bank accounts, storing credit card information and other personal identifying information, users need to understand the risks of these conveniences. Within a couple of minutes and with a couple of clicks, skilled hackers can easily access and obtain the personal identifying information of these users. As a result, a new category of crime has been born, and it is called cybercrime. Cybercrime is where a hacker, almost always unknown to the victim, is able to access IT devices through an internet connection and obtain a user's personal identifying information. It can be difficult for companies to understand the motives of cybercriminals, which makes it even more challenging to defend themselves against these cybercrimes. Those who commit cybercrimes utilize computers from all over around the world, making it extremely difficult to pinpoint exactly who the criminal is. These criminals are able to hide behind a computer screen through the use of advanced encryption technology.

Cyber-attacks are a growing concern for companies of all sizes – from Fortune 500s to local businesses – and countries as a whole. Cyber-attacks pose a unique threat, in that essentially any one of the 3 billion internet users in the world has the potential to be a hacker. (Clough, 2015, p. 6). Recent large-scale information breaches have raised the awareness of the dangers of corporate cybersecurity and the immediate need of many to assess the quality of the controls currently in-place to protect the data they maintain. This leaves an opportunity for Big 4 accounting firms and others beginning to offer cybersecurity services to assess the internal IT controls of these companies. In the future, I foresee cybersecurity to be a major sub-sector of Big 4 accounting firms' consulting divisions

# **Analysis of the Relationship Between the Big Four Professional Services Firms and Their Criteria for Success in Undergraduate Accounting Students**

Elizabeth Fuentes, '16

Faculty Mentor: Joseph M. Larkin  
Department of Accounting



Supported by the SJU Summer Scholars Program

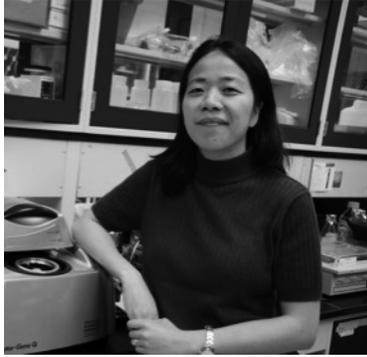
Today's society has grown immensely with the emergence of globalization, technological advances, and business innovations. With these new societal changes also comes a new demand of skill sets for the future candidates of the corporate world. Many companies are expecting undergraduate students to possess the skills necessary for success throughout their respective academic careers. In particular, this prerequisite is most common with students studying accounting.

The objective of my research is to detect if undergraduate accounting students from an AACSB accredited business school can accurately pinpoint the skills and characteristics that firms are looking for in potential candidates. To analyze this topic, a survey was administered to undergraduate accounting students registered in accounting courses in the curriculum.

The first portion of my research consisted of administering a survey to undergraduate accounting students on what characteristics they deemed to be important for a potential candidate to have. The survey was first created with the help of recruiters from the Big Four professional services firms. The recruiters were individually interviewed about what characteristics they sought out in potential candidates. After all the feedback was compiled, the list of characteristics was condensed into a total list of twelve qualities. The participants of the survey were asked to rank five out of the twelve characteristics that they believe are important for a potential candidate to possess.

The second portion of my research was focused on the final perspectives of the recruiters towards the same survey question. The recruiters were also asked to rank the top five qualities they believe are important for a potential candidate to possess. After analyzing the data, I was able to compile a final ranking based off of the results of each recruiter. This final ranking was then compared to the results of the students to see if they could accurately depict what recruiters are looking for in potential candidates.

Analysis obtained through this research will conclude the readiness of accounting students in preparation for careers in professional services firms. If undergraduate students can accurately detect the criteria for success that professional services firms are looking for in their candidates, then the students can better prepare themselves for their future careers. Thus, the firms will obtain candidates that have the skills that they deem important for a successful employee.



**Julia Y. Lee-Soety**  
Department of Biology  
Saint Joseph's University

Ph.D. University of Pennsylvania

**Research Interest:** Telomere Biology

Eukaryotic cells have linear chromosomes with ends that must be protected. Telomeres cap these ends with specific repeat DNA sequences that form unique secondary structures and recruit a variety of proteins. Because cells lack mechanisms to fully extend these ends during DNA replication, telomeres shorten with each round of cell division. This is thought to be a way for cells to limit their life spans so that aging cells may be replenished. Certain stem and progenitor cells express the telomerase enzyme complex and are able to avoid telomere losses, but cancer cells may inappropriately express telomerase to help them divide without limit. Understanding how telomeres are properly maintained may, therefore, further the knowledge in the natural processes of aging and cancer.

My lab uses baker's yeast as a model system to study telomere maintenance. Yeast cells express telomerase constitutively, but genetic manipulations can be done to disrupt telomerase function. The *tlc1* mutant cells are missing the RNA template component of telomerase and behave similar to many human cells. In the yeast, numerous mechanisms are known to play roles in telomere maintenance that interact with telomerase or other telomere-specific proteins.

One particular RNA-processing protein, Npl3, interacts with telomeres and thereby help maintain them. Yeast telomerase-null cells with the full *NPL3* gene deleted (*tlc1 npl3*) greatly accelerated the rate of senescence (cell cycle arrest) compared to telomerase-null cells with intact *NPL3* (*tlc1*). Furthermore, transcription in the telomeric region is turned on in the double mutant cells, generating non-coding RNA (TERRA); whereas in healthy cells, no such transcripts are made. This suggested that the expression of TERRA from telomeres is associated with cell senescence and that Npl3 may have a functional role at their repression. This summer, we are analyzing cells where the dBroccoli sequences have been cloned into various regions of the yeast genome. When dBroccoli is transcribed with adjacent genes, the dBroccoli RNA folds into an aptamer that fluoresces when bound to a specific substrate (DHFBI-1T). Using this method, we can visualize dBroccoli-tagged TERRA and analyze its expression in various yeast strains and growth conditions. For example, we are able to observe highest levels of TERRA expression in *tlc1 npl3* double mutant cells compared to *tlc1* single mutants. The increases also directly correlate with how quickly the cells senesce.

## Investigating the Role of Yeast Npl3 in Regulating the Expression of Telomere Repeat Containing RNA (TERRA)

Brianna Amos, '17

Abigail Sweetman, '18

Faculty Mentor: Julia Y. Lee-Soety

Department of Biology



Supported by the John P. McNulty Scholars Program and the SJU Summer Scholars Program

Telomeres consist of tightly packed DNA sequences found at chromosome ends. They function to cap and protect the DNA, which is essential to maintain genome stability and integrity. With each round of cell division, telomeres shorten in length. This process serves as a time 'clock' for the cell. Cells undergo senescence when telomere shortening occurs to the point that critical DNA sequences near the telomeres start to erode. Yet, telomere shortening is not always the goal of all cells, so there are various proteins and mechanisms to maintain telomere length.

One protein complex is telomerase, which adds bases to the end of the telomeres that would otherwise be lost. In human somatic cells telomerase is usually not expressed, as we want these cells to senesce and die normally. In germline cells, telomerase is expressed to maintain them through the life of the individual, such as bone marrow cells and gametes. In recent years, biologists have discovered telomere repeat containing RNA (TERRA) molecules that are associated with shortened telomeres.

The goal of this summer's work has been to investigate the role that Npl3 has in cell senescence and regulating TERRA in baker's yeast. Npl3 is an RNA processing protein and somehow helps with telomere maintenance. To observe the effects of Npl3, three mutant strains (*tlc1*, *npl3*, and *tlc1 npl3*) and a wild-type strain were used in senescence assays that were performed over 8 to 9 days. To monitor TERRA production, a dBroccoli aptamer was cloned in different regions along the chromosome in three strains. In two strains, the dBroccoli sequences were cloned into the 1L and 6R subtelomeric regions will express dBroccoli-tagged TERRA and be visible when substrate DFHBI-1T interacts with the dBroccoli aptamer. Our positive control strain had the dBroccoli sequence cloned at the end of genes encoding the spindle pole body, so we expect to see similar amounts of dBroccoli expressed regardless of the different mutations. Our negative control contained no dBroccoli sequence. Using florescent microscopy, we observed dBroccoli-tagged transcripts and quantitatively analyzed the dBroccoli florescent foci compared to the DNA DAPI stain representing the cellular nuclei.

Our data suggests that Npl3 does have a role in the regulation of TERRA production. More work is needed to determine specifically of this role. Ongoing experiments in lab are examining whether Npl3 works in transcription initiation to maintain tightly packed heterochromatin, or if Npl3 works in the transcription elongation and termination to promote efficient TERRA transcription.



**Edwin Li**

Department of Biology  
Saint Joseph's University

Ph.D. University of Rhode Island

**Research Interests:** Membrane  
Protein Structure and Assembly;  
Protein-Protein Interaction

My research area focuses on understanding the physical and chemical principles governing the interaction of membrane proteins. The membrane proteins that I study belong to a class that elicits the response to the extracellular signal by forming complexes with other membrane proteins. These complexes are often composed of two proteins interacting with each other, forming a stable new structure. In this context, dimerization, refers to the process in which two monomers (single proteins) come together to form a dimer.

Dimerization of membrane proteins is often one of the initial steps in a series of events that triggers cellular responses such as movement, division, and even cell death. Diseases in living organisms may arise because their cells cannot function properly if dimerization is out of control. The specific disease that may result depends on which membrane protein is affected. For example, unregulated dimerization of a membrane protein may result in unregulated cell growth and division, eventually leading to the formation of tumors. In some other cases, unregulated dimerization of another type of protein may lead to abnormalities during development such as cranial disorders. These are just a few examples highlighting the important physiological roles of these proteins and the medical relevance of studying membrane protein dimerization.

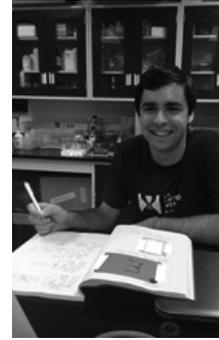
The main focus of my laboratory is to elucidate the physical and chemical principles behind the interaction of membrane proteins. This information will facilitate the design of better therapeutics targeting these proteins.

# **Role of the Transmembrane Domain of Mucin 1 in Nuclear Localization**

Gerald O'Connor, '17

Faculty Mentor: Edwin Li  
Department of Biology

Supported by the SJU Summer Scholars Program



Mucin 1 (MUC1) is a highly glycosylated, single pass transmembrane protein that provides the mucous surfaces of epithelial cells and protects against pathogens. It consists of two parts, MUC1-N, which includes the extracellular domain, and MUC1-C, which includes the cytosolic and transmembrane domains. MUC1 overexpression has been observed in 80 to 90% of human solid tissue cancers. Studies have shown that this overexpression leads to malignant unregulated gene expression when MUC1-C enters the nucleus. The transport of MUC1-C, from the plasma membrane to the nucleus, appears to be the result when two MUC1-C proteins interact with each other, forming a dimer.

Dr. Li's lab focuses on elucidating the role of the transmembrane domain of MUC1-C in both dimerization and nuclear localization. Previous studies in his lab, using a bacterial assay, have shown that several amino acids in the transmembrane domain of MUC1-C play a role in MUC1-C dimerization. For example, mutation of the small amino acid, alanine in position 1180 (A1180), to the larger amino acid leucine (A1180L) decreases the propensity of the transmembrane domain of MUC1-C to dimerize. Therefore, the hypothesis is that this substitution will also decrease the transport of MUC1-C to the nucleus.

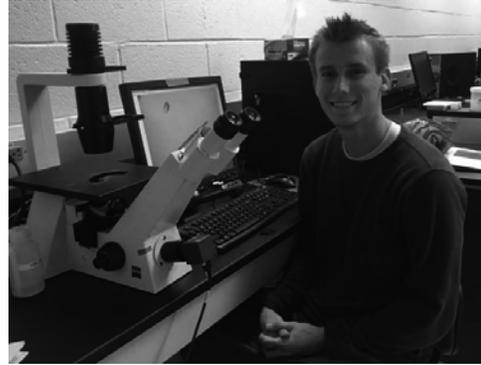
This summer I have learned tissue culture techniques by maintaining human kidney and Chinese hamster ovary cell lines. I have also learned transfection, fractionation and western blot techniques. Transfection is the insertion of foreign DNA into a eukaryotic cell, such as the mammalian cell lines I used. Fractionation and western blots are used to determine the cellular localization of specific proteins. These techniques will be used to determine if the nuclear localization of MUC1-C is decreased when the A1180L mutation is present in the transmembrane domain, providing more information about the mechanism by which MUC1 induces cancer.

# DNA Microinjection to Create Fluorescent Transgenic Worms

Ryan Schuck, '18

Faculty Mentor: Edwin Li  
Department of Biology

Supported by the SJU Summer Scholars  
Program



*Caenorhabditis elegans* is a microscopic worm that is about 1 mm in length and is frequently used as a model organism for biological research. These worms are useful as model organisms because they reproduce quickly, are transparent, and are easy to maintain and handle. Furthermore, their genome is similar (approximately 40%) to that of humans. Thus, studies with *C. elegans* allows us to learn about cellular and physiological pathways, such as those controlling sleep, that may be closely related to humans. In many cases, the creation of a genetically modified fluorescent worm is required to facilitate such studies.

A genetically modified worm, or transgenic worm, is a worm that contains foreign DNA. In order to make transgenic worms, we have to create a DNA construct. This construct includes the gene encoding a fluorescent protein (e.g., green fluorescent protein or GFP) regulated by the DNA promoter sequence of the gene of interest. Fluorescent proteins are used because they allow us to directly observe gene expression in specific regions of the worm due to the worm's transparency. The promoter sequence is used to drive the expression of the fluorescent protein wherever the gene of interest is expressed within the worm. These DNA constructs are then inserted into the worms using a technique called microinjection.

For microinjection an injection arm along with a small needle is attached to the stage of a microscope. This set up is manually controlled via a joystick for movement and also a control pad. The control pad allows us to set the amount of pressure by which the DNA injection mix comes out of the needle and also inject when desired. Ultimately, the worms are then placed on a microscope slide and injected via this injector system attached to the microscope.

My goal over the summer has been to perfect the microinjection technique to create several transgenic strains of *C. elegans*. These transgenic worms will then be used in Dr. Nelson's lab. Although the technique seems very straightforward, the difficult part of the process is ensuring the worms being injected are at the correct stage of their lifecycle and also ensuring that the injection occurs within a specific row of nuclei within the gonad region of the worm. Overall, by mastering the microinjection technique, I can help the lab more efficiently conduct research by creating new strains of worms.



# Measuring cAMP Levels Using the Epac1-Camps Biosensor

Mary Szurgot, '17

Faculty Mentor: Edwin Li  
Department of Biology



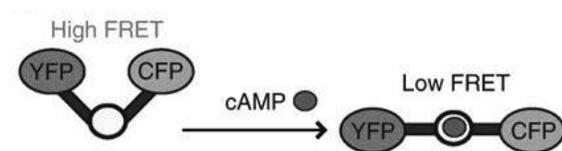
Supported by the John P. McNulty Fellows Program and the SJU Summer Scholars Program

This summer, I worked with a genetically encoded biosensor called Epac1-camps. A biosensor is a tool that can convert a biological phenomenon into a detectable signal. The Epac1-camps biosensor detects cellular cyclic adenosine monophosphate (cAMP) levels which can be visualized through fluorescence. cAMP is an important cellular second messenger molecule which is implicated in many biological processes including metabolism, learning, memory, and sleep.

Epac1-camps utilizes a phenomenon called FRET (Förster resonance energy transfer) to quantify cAMP levels within individual cells. FRET is a phenomenon that involves energy transfer between two fluorescent molecules, described as a donor and an acceptor. In the Epac1-camps biosensor, the donor is cyan fluorescent protein (CFP) and the acceptor is yellow fluorescent protein (YFP). When cAMP binds, a conformational change in the biosensor increases the distance between CFP and YFP, and decreases the incidence of FRET, thereby decreasing the fluorescence of YFP. FRET levels in the Epac1-camps biosensor are therefore inversely proportional to cAMP levels.

My work this summer was to learn how to measure FRET in mammalian cells. Cells were transfected with the DNA sequence encoding the biosensor. Different treatments were used to elevate intracellular levels of cAMP. An enzyme-linked assay and western blots were also used to verify that the treatments were increasing cAMP.

The long-term goal of my project is to use the Epac1-camps biosensor in the microscopic roundworm *Caenorhabditis elegans*, a model system in which this tool has never before been used. High levels of cAMP are associated with wakefulness in *C. elegans* as well as in other animals, including humans, while low levels are associated with sleep-like behavior. I will implement this biosensor in specific subsets of cells in *C. elegans* to observe when and in which cells cAMP levels change in response to periods of wakefulness and sleep. By better understanding the relationship between the cAMP pathway and sleep in worms, more insight will be gained into the molecular basis of sleep conserved among multiple species of animals.



Börner et al. *Nature protocols* 2011.

**Figure 1. Mechanism of Epac1-camps biosensor.** In the biosensor FRET occurs when the emitted energy from CFP excites YFP. Binding of cAMP leads to a conformational change that increases the distance between CFP and YFP, decreasing the amount of energy transfer from CFP to YFP.



**Benjamin H. Liebman**  
Department of Economics

Ph.D. University of Oregon

**Research Interests:** International Trade

My research investigates the impact of trade policies that the United States uses to protect domestic firms threatened by foreign competition. There are various legal avenues that U.S. firms can turn to in order to obtain trade relief, and I'm interested in a number of issues related to these policies. In one study, I investigate which industries are more successful in obtaining protection from U.S. policy makers. My statistical results suggest that firms located in voting districts of influential members of congress were more likely to be granted trade relief.

I have also investigated the degree to which protectionist policies actually aid industries threatened by foreign competition. Results from one paper focusing on the U.S. steel industry suggest that protection has less of an impact than other forces in benefiting U.S. firms, such as a weakening dollar against other currencies, which makes imports into the US more expensive and less competitive.

Another area of my research deals with some of the unintended consequences of trade protection. These include the higher cost that some industries face when trade protection is imposed. For example, when the U.S. steel industry obtains protection from imports, steel prices rise, and U.S. auto companies and appliance makers are suddenly faced with higher costs. Moreover, foreign countries facing U.S. trade barriers sometimes retaliate against the U.S. by imposing their own protectionist policies on U.S. products.

An additional area of research has focused on how trade protection affects investment in new machinery as well as research and development by US manufacturers. In one study, my statistical results suggest that the removal of trade barriers actually caused an increase in investment by US manufacturers despite the fact that it led to increased access to cheaper foreign products. This reason for this outcome seems to have been due to the fact that by lowering import costs, many US firms were able to source cheaper inputs from abroad, which cut their costs and increased their profits, which in turn, led them to invest more.

In general, I find international trade policy to be such a rich area of study with so many issues to explore. My work has been published by scholarly journals that include *Journal of Law and Economics*, *Journal of International Economics*, *Review of World Economics*, *Review of International Economics*, and others

# Analysis of Cuban Agricultural Production: Coop vs. State

John P. McGrath, '18

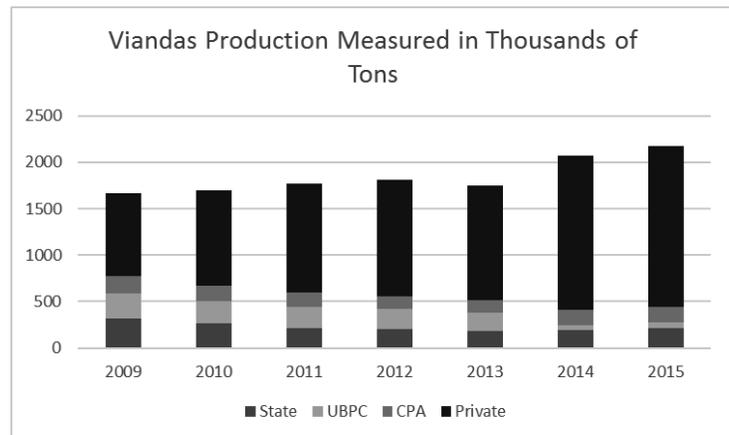
Faculty Mentor: Benjamin H. Liebman  
Department of Economics



Supported by the SJU Summer Scholars Program

At the height of Cuban-Soviet relations, Cuba received subsidies on factors of agricultural production, namely oil, and received preferential prices on sugar sold to the Soviet Union. When the Soviet Union collapsed in 1991 Cuba lost access to these privileges, and its current Sugar based economy was not sustainable. Without Soviet support, the Cuban state lost the ability to effectively run the countries agriculture as it had previously. This period is known as "The Special Period," and during it government was forced to adopt more liberal policies including giving individuals the ability to manage their own farms. This gave rise to the two types of Cuban cooperative farms, the "Basic Unit of Cooperative Production" (UBPC) and the "Cooperativa de Producción Agropecuaria" (CPA). Both of which represented a joint partnership between individuals, where individuals managed agricultural production on government owned land. Both coops still exist today

The purpose of this project is to better understand the efficacy of these coops in today's Cuba. To do so, statistics related to agricultural production were gathered from the Cuban Office of National Statistics. This data was then analyzed year-to-year and broken down into different levels of ownership ranging from state to private. When the process began, I expected the most recent form of coop, the UBPC, to be the dominant non-state producer. However, I had seriously underestimated the significance of Private farmers in Cuba.



According to the data from the Cuban Office of National Statistics, private farmers by far represented the majority of non-state agricultural production. The graph included measures the level of production of Viandas, a general term the Cuban office used to include plantains, potatoes and other tubers. It shows that as early as 2009 private farms dominated production. Moreover, its share of production continues to increase, while that of UBPC's continues to decrease. This trend confirms that Cuban markets are becoming more liberal, but does not tell whether it is happening because of, or despite government policy.

This trend is similar to many other agricultural sectors, with citrus being the only sector where state production was higher. In fact, citrus fruits were the only produce sector where the state constantly out-produced non-state farms. However, all the state production was centralized around the Matanzas region of Cuba. Perhaps this land grows citrus most efficiently, or perhaps it private farms cannot or chose not to produce citrus.



**Aisha D. Lockridge**  
Department of English

Ph.D. Stony Brook University

**Research Interests:** African  
American Literature, Black British  
Literature, Black Popular Culture and  
Pedagogy

Aisha Damali Lockridge received her undergraduate degree in English from City College of New York and her Ph.D. in English from Stony Brook University. Aisha's research focuses on African American Literature, Black British Literature, Black Popular Culture, and Pedagogy. She has written a detailed study – *Tipping on a Tightrope: Divas in African American Literature* – which traces the trajectory of the Diva figure in African American literature. Currently, Aisha is working on a book length project about the transformation of the Magical Negress figure in Black literature and popular culture.

Most recently Aisha has offered courses on the African American Post-Soul Imagination, Black Popular Culture, and Caribbean Literature in English. Her teaching style encourages students to make their own intellectual discoveries by engaging meaningfully with Black texts and interrupting spaces of privilege and power.

**What Lies Beneath the Surface:  
An Examination of ShondaLand,  
Black Feminism and Respectability  
Politics in *Scandal* and  
*How To Get Away With Murder***  
Kayla E. Lane, '17



Faculty Mentor: Aisha D. Lockridge  
Department of English

**Supported by the SJU Summer Scholars Program**

Character construction on primetime television beckons the viewer to parallel how certain tropes work in real life and contributes to the greater discussion of racial politics in popular culture. Shonda Rhimes' domination of primetime TV, more commonly known as Thank God It's Thursday (#TGIT), propels Black female characters to new heights. *Scandal* and *HTGAWM* contribute to the multicultural drama yet can they serve as a mean to an end of overdetermining black narratives?

I chose screenwriter, producer and self-proclaimed Titan, Shonda Rhimes and her production company ShondaLand as my case study for this examination of black womanhood. Rhimes' is the first and only African American woman to maintain a groundbreaking time block on a national network for over 3 years. #TGIT illuminates the vast diversity, creative genius and business savvy within ShondaLand. Both shows garner a combined 25 million viewers and 500,000 tweets per episode. With the success of both shows, I found it imperative to investigate how Rhimes use her platform to disrupt these preconceived notions of femininity, especially for black women.

I've used critical race and feminist theory including but not limited to Patricia Hill Collin's *Black Feminist Thought*, E. Patrick Johnson's *Appropriating Blackness*, and Harvey Young's *Embodying Black Experience*, to examine *Scandal* and *HTGAWM*. Both shows were compared to each other due to similar themes yet different creative approaches. *Scandal*, the brainchild of Rhimes, is in juxtaposition with *HTGAWM* written by Peter Nowalk, a white, male ShondaLand writer.



In regards to Collins' stance on black femininity, both characters visibly represent Black women along with other marginalized groups who work as "political actors" to transcribe the Black feminist message. However, Rhimes and Nowalk's creative feminist writing allows them to posit Black womanhood from experience without decreasing its humanity based on the history. Their characters are rooted in their own experiences, consistently shifting the narrative of respectability through sexuality and rightful ownership of identity. Olivia Pope and Annalise Keating have mastered the war of maneuvers as they shift their own intersectionality in full view of the gaze yet never rely on it for self-definition.

ShondaLand represents more than a brand but representation for a demographic that is often marginalized and whitewashed. Rhimes is both artist and powerhouse within ShondaLand as she leads a team dedicated to breaking barriers and inspires a generation of Black female writers to rise above nuanced tropes and construct blackness in the way it is lived: limitlessly.



J. Michael Lyons  
Department of Communication Studies

Ph.D. Indiana University

**Research Interests:** Community Media,  
Communication Activism

Think of the public sphere as a swimming pool with several large floating beach balls filling much of the pool and a whole bunch of tennis balls filling in the gaps. The beach balls are giant media companies, like General Electric (which owns Comcast, NBC and Universal Pictures), Time Warner (CNN, HBO, Hulu etc.) or The New York Times. The tennis balls are small – sometimes very small – community-driven, civic media projects that fill in the gaps. I’m interested in the tennis balls. I study media projects in the past and present that provide communities a platform to discuss what is important to them. These communities could be actual physical places or groups of people joined in pursuit of similar goals.

That work has led me to write on the role of “small media” – specifically, a comic book – in the Civil Rights movement and the use of hand printed newspapers used by Russian dissidents at the turn of the 20<sup>th</sup> Century.

Together with three “juvenile lifers,” men serving sentences of life without parole for crimes they were convicted of as teens, I founded The Redemption Project, a multimedia documentary project focused on the stories of incarcerated men and women. The project provides men and women the opportunity to tell their stories in their own words. Many of these men and women have suffered “civil deaths.” Their incarceration has largely prevented them from participating in the public sphere. They can’t vote. They really have no voice in the political process. Our project is an attempt to help give them a voice on issues like mass incarceration.

I also co-founded West Philly Local, a website that provides news and information for several neighborhoods in West Philadelphia, where I live.

# Creation of an Independently-Run Website for *The Hawk*, Saint Joseph's University's Weekly Student-Run Newspaper

Jessica Cavallaro, '18



Faculty Mentor: J. Michael Lyons  
Department of Communication Studies

## Supported by the SJU Summer Scholars Program

An independently run website using WordPress.org and BlueHost has been something *The Hawk* staff has discussed for many years. For the past three years *The Hawk* has used a full service web development company, SNworks, to host its website. However, the service provides poor customer service at a very expensive price and does not allow for any design customization. The ability for all of the staff to edit any part of the website at any point in time will create a better experience for the entire staff, as well as people visiting the site, because it will always be up-to-date. Also, another great advantage of an independently run website is that the staff will be able to *control* the website, instead of just being able to add content. The capability for the entire staff to change the website whenever needed will provide the ability to produce content specifically for the website—videos, breaking news, featured columns, or blogs, etc.

Over the course of the 2016 spring semester, I created a prototype website from scratch in my Web Design and Development class. The prototype was used this summer to further determine the aesthetics and design of the website and to compare the current site to the prototype to determine what the new WordPress site design should include.

In July I was fortunate enough to attend the ACP/CMA Summer Design/Redesign Workshop in Minneapolis, MN with some of *The Hawk* staff where I learned a lot of valuable resources and tips from professionals in the web design and development field. Seventy-eight different schools attended the workshop from over thirty-six states so I was able to hear what other schools have been doing in terms of their school newspaper website.

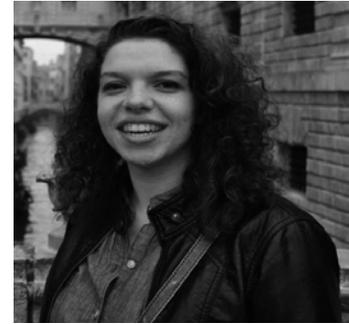


To create the new website, I researched different college newspaper websites including, The CU Independent, The Daily Orange, The Appalachian Online, Montana Journalism Review, and many more. Then, I analyzed different aspects of each site: design, section names, user content, photographs, videos, headlines, social media use, sidebar use and online-only content. We discussed those categories in terms of usage feasibility for *The Hawk* and our target audience. Then, I researched potential themes to use for the new website. During this research process, it was determined that the vast majority of themes are photo-heavy, which is something we need to work on as a staff. We ended up picking The Voice theme due to its high levels of customization and user-friendliness. We also decided to change the domain name from hawhillnews.com to sjuhawknews.com to match all of our social media. The website will be up and running in time for the fall 2016 semester.

# Documenting the Lives of Incarcerated People Serving Juvenile Life Without Parole

Sara Leonetti, '17

Faculty Mentor: J. Mike Lyons  
Department of Communications Studies



Supported by the Redemption Project and the SJU Summer Scholars Program

Juvenile life without parole, just like it sounds, is a prison sentence given to young people under the age of eighteen who have committed a serious crime and because of their actions will spend the rest of their lives in prison. This sentence has been a controversial subject for some time considering the new discoveries in child development and the fact that the US is the only country in the world where it exists. Although most states have already outlawed it, Pennsylvania is one of only 7 states where juvenile life without parole is legal, and of the 2200 juvenile lifers nationwide, 300 of them are in Philadelphia. The reason there are so many is because in the state of Pennsylvania, any person convicted of either first or second degree murder is sentenced to mandatory life without parole.

This mandatory sentence included juveniles until 2012 when the United States Supreme Court cases *Miller v. Alabama* and *Jackson v. Hobbs* declared sentencing a juvenile offender to a mandatory sentence without the possibility of parole was unconstitutional and a violation of the Eighth Amendment. In January 2016, another United States Supreme Court case held that the *Miller v. Alabama* ruling would be applied retroactively. Because of this decision, those already serving juvenile life sentences are being resentenced, some of them are even being released. With so many juvenile lifers reentering their communities outside of prison, a need to educate the public about their lives has come forward.

The objective of The Redemption Project is to document and share the stories of these men and women who have been sentenced to life in prison as teenagers. Over the summer, I worked with Dr. Mike Lyons by contacting incarcerated people in Pennsylvania in order to inform them about The Redemption Project and listen to them share their stories with us. We continue working on how to share those stories with the public. Because juvenile lifers were given a mandatory sentence with no consideration for their remorse or the extent of their involvement in the crime, misunderstandings can easily occur if the public is misinformed. We hope to remove that ignorance through media coverage. While the transition from prison into their communities will be difficult for these juvenile lifers, who have grown up and spent most of their lives in prison, it can be made easier with help from the people around them. However, even with these advancements, the fight is not over. The recent Supreme Court rulings have only prohibited *mandatory* sentences of juvenile life without parole, which means it is still a possible sentence for some. Hopefully through educating the public about juvenile life without parole, we will be able to work together toward rulings which will outlaw juvenile life sentences in all fifty states.



**Scott P. McRobert**  
Department of Biology  
Saint Joseph's University

Ph.D. Temple University

**Research Interests:** The Genetic,  
Ecological and Evolutionary  
Foundations of Animal Behavior

Research in my laboratory involves the examination of animal behavior through studies on rare, exotic and, in many cases, endangered species of fish, reptiles, amphibians, and insects.

Our work with fish involves analysis of shoaling, or grouping behavior. My students and I examine the factors that fish utilize when choosing shoalmates, including coloration, pattern, size, shape and shoal composition. In almost all cases, fish shoal with individuals that have features similar to their own. This may benefit them through the 'Confusion Effect' in which predators have difficulty identifying and attacking an individual within a group of phenotypically similar fish. We have examined shoaling in a number of different species and are now looking at the effect of experience and learning on shoaling behavior.

Our current work with *Drosophila* involves an examination of the invasive species *Drosophila suzukii*. This true fruit fly is a major agricultural pest that had been introduced to the United States. My students and I survey the local *Drosophila* community for the presence of *D. suzukii*, and our laboratory work is aimed at understanding the sexual behavior of this species.

Our work with amphibians and reptiles is focused mainly on conservation. We house many rare and endangered species, and a current research project involves an analysis of the effects of salinity on growth in hatchling diamondback terrapins (turtles).

# Reproductive Behavior of *Drosophila suzukii*

Marissa DiPiero, '17

Faculty Mentor: Scott P. McRobert

Department of Biology

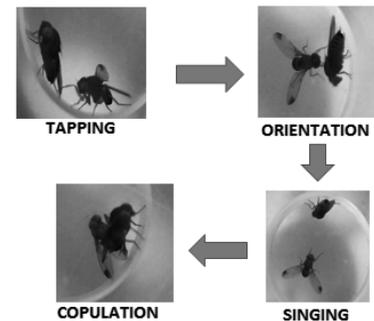
Supported by the SJU Summer Scholars Program



The Spotted Wing Drosophila, *Drosophila suzukii*, also known as the “true fruit fly” is an invasive species of *Drosophila* native to South East Asia. This species has recently become an agricultural pest targeting thin skinned fruits such as blueberries, cherries, raspberries, and grapes. *D. suzukii* is unique in its morphology in that the ovipositor is large and serrated allowing the females to deposit their eggs into ripening fruit that is still attached to the plant. This reproductive behavior differs from that of most other drosophilids, which deposit their eggs into rotting fruit. The behavior of *D. suzukii* causes much crop damage and puts farms at an economic disadvantage as the fruits are now unfit for human consumption.

Much of the research on *D. suzukii* goes into pest management rather than into studying their basic life history. Pest management strategies include setting traps and spraying pesticides. However, studying the life history of these flies will enable us to understand this species and may provide information that could improve existing pest management strategies. This improvement may include, for example: finding better times in the day to apply pesticides and set traps according to when/where mating occurs.

Sexual behavior of *D. suzukii* includes a series of courtship behaviors performed by the male. These behaviors include: tapping, orientation, and singing, which precede copulation (see figure). Within these courtship behaviors, there are visual, auditory and olfactory cues that are present and seemingly necessary for success in copulation. The success of the flies can be tested in a series of experiments where the conditions are changed and their behavior is observed. In our studies, we have shown that light is critical, and thus visual cues must be important aspects of courtship. In other studies we have shown importance of the presence of blueberries during the courtship and copulation behaviors, as well as the fact that males need their wings to be successful in copulation. In ongoing studies, we are examining the remating behavior of *D. suzukii* females. We hope that these studies will lead to the isolation of factors that, when present or missing, cause significant effects on sexual behavior of this important agricultural pest.



Normal courtship pattern for *D. suzukii*.



**Virginia M. Miori**  
Department of Decision and System Sciences  
Saint Joseph's University

Ph.D. Drexel University

## **Research Interests:** Supply Chain Optimization, Health Care Modeling and Decisions, Forecasting and Predictive Analytics

Animal studies are often performed as a precursor to examining human populations. This study is one such case. This research is one such case. The goal was to examine and analyze data on osteoarthritis inflicted dogs compared to healthy dogs in order to evaluate the impact of medication using the activity levels reported through activity monitors. The ultimate goal being to enhance the ability to determine effective levels of medication. This approach can be used to treat humans who cannot effectively communicate their level of discomfort.

Three studies were examined and three types of data, stored in different formats, were provided for this study. Activity data was collected each minute for every dog in the three studies. Each study had three study phases. Demographic data was collected for each dog, and finally pain and activity survey data was collected for each dog. The survey questions and demographics differed by study. Over 5 million records of activity data were cleaned and aggregated by study, study phase and dog reference. Once the activity data was prepared, demographic data and survey data were matched for each study, study phase and dog reference. Further examination of survey data was necessary to match survey questions between studies.

The NIH study had to be eliminated from the analysis. Once all of the data prep was completed, it became clear that the study methodology was faulty and the data could not be examined effectively. The Normal and ACVS studies showed clear correlations between pain and activity levels. The normal dogs presented with significance on each of the survey questions within the basic pain inventory (BPI) and the level of interaction (LOI). Relationships were examined using ANOVA, stepwise regression, correlation and decision trees.

Relationships between pain and activity were determined to be of polynomial order. Models were developed that established statistically significant differences and provided the ability to predict activity level based on pain and interaction.

# **Studying the Correlation Between Activity Level and Discomfort in Canines and the Ability to Communicate Without Verbal Speech**

Annie Hosler, '18

Faculty Mentor: Virginia Miori  
Department of Decision and System Sciences

Supported by the SJU Summer Scholars Program



Within our world today, there are several diseases and circumstances that can severely affect a person's ability to communicate verbally. A person may have had full functioning verbal skills, but tragically suffered from a stroke that either dramatically impacted his skills or completely stripped him of them, leaving him with no way to express or verbalize how he is feeling. A stroke is one of many tragedies that can leave a person speechless. Cerebral palsy, Lyme disease, a head trauma or brain tumor are a few more conditions that can impair one's speech. When a person cannot effectively communicate through verbal language, it makes expressing a need for help in a moment of pain or discomfort incredibly difficult.

The foundation of this project was based using canines at the University Of Pennsylvania School Of Veterinary Medicine where researchers studied canines inflicted with and without Osteoarthritis. Each canine was given an activity monitor that tracked the level of activity for every minute of every day for ten consecutive days in each study phase. The dogs without osteoarthritis were the control group and marked as "normal". These dogs were used as a comparison base for the osteoarthritis inflicted dogs. The aim was to have the normal dogs be a benchmark against anything odd in the variable group.

Each dog owner was subjected to different surveys to give more insight regarding their dog's condition. For example, an owner was asked to rate a dog's pain when jumping down from a step. There were hundreds of questions asked and all collected into a database that served as the survey data center. These numbers were used to later show the relationship between activity level and discomfort for each canine.

It was also of utmost importance to find possible causes for different activity and pain levels that were collected during the survey data. One way to do this was to analyze weather data. I tracked and recorded different weather attributes including temperature, humidity, precipitation and sea-level pressure for each of the days involved in the studies. After doing this I used the data given which included activity levels of the dogs, demographic data, and the survey results to combine with the weather data.

As the project comes to a close, there are still more conclusions to be revealed. The aim in the original collection of data was to determine whether the activity monitors could be used in human patients who, like mentioned above, have suffered from a disease or condition that has inhibited their ability to speak. The goal by the end of my project is to find the relationship between activity level and amount of discomfort so that it one day can be used in the medical field.



**João (John) Neiva de Figueiredo**  
Department of Management  
Saint Joseph's University

Ph.D. Business Economics  
Harvard University

**Research Interests:** Sustainability, Business,  
International Strategy, Organizational  
Efficiency

My research is interdisciplinary in nature, occupying the intersection between international business, strategic management, and sustainability. The two overarching and interrelated objectives in my research are to advance the understanding of organizational sustainability in the global context and to use the models of management science and the tools of strategic management to improve organizational efficiency while contributing to a more sustainable world. My desire is to address specific needs on a case-by-case basis and offer practical contributions to the betterment of individuals and society, in other words, mostly applied research. I believe research not only should contribute to the academic literature and the practitioner community, but also should be a means towards the improvement of our collective lives on the planet.

My research on sustainability focuses on two broad areas. First, the research seeks points of synergy in which actions contribute simultaneously to the three components of the triple bottom line: people (social aspects); planet (environmental aspects); and long-term financial health (economic aspects). Second, when complete synergies among the three components are not present and tradeoffs are necessary, the research seeks to find resolution of these tradeoffs in ways which guarantee preservation of the environment and enhancement of equality and human dignity. Corporate Social Responsibility (CSR) is a major driver towards optimal resolution of such tradeoffs because business is inherently efficient and CSR leads these efficiencies to benefit all stakeholders. Two summer scholar projects examine the impact of CSR actions (or the lack thereof) in unique situations.

One project examines the compatibility between the CSR philosophy and stated intentions of a company with a positive track record, Nestlé, and actions by a subsidiary, Nestlé Waters, related to water usage in Southern California during the state's five-year drought. One of Nestlé Waters' bottling plants in California is located in indigenous lands on the Morongo tribe reservation and has been the focus of recent attention. The research project examines whether Nestlé Waters' actions in drawing and bottling water for the Arrowhead brand at an allegedly increasing rate were indeed consistent with the proactive CSR stance that is suggested by the corporation's policies, by its positive initiatives worldwide, and by the corporation's water usage goals stated in the CSV 2015 report. Further research is leading to additional findings illustrating the difficulties in maintaining a truly proactive CSR stance.

The other project focuses on company responses to the tragic Rana Plaza collapse that in April 2013 claimed the lives of 1,129 apparel industry workers in Bangladesh. Media information suggests American retailers' initial responses differed from European retailers'. Within weeks of the collapse, European companies which included Rana Plaza in their supply chain such as Primark, Benetton, Puma and others, signed the Accord on Fire and Building Safety and established a compensation fund to aid victims of Rana Plaza, whereas American retailers allegedly withheld contributions and declined signing the first legal agreement, agreeing to the Alliance for Worker Safety only months later. This research involves examining CSR actions in contrast to stated intentions and analyzing the interface between employment power relations and consumption power relations within global apparel supply chains.

# **Difficulties in Reconciling Corporate Actions With Stated CSR Intentions: The Case of Nestlé Waters During the Southern California Drought**

Cameron Kenworthy, '18



Faculty Mentor: João (John) Neiva de Figueiredo  
Department of Management

## **Supported by the SJU Summer Scholars Program**

With the increasing realization that business has not only obligations in the social and environmental realms, but also many opportunities to be a force for the greater good, the role of corporate social responsibility (CSR) has expanded. Society increasingly expects businesses to proactively engage with all stakeholders (such as communities, employees, customers, suppliers, besides investors), which can be defined as any group or individual who can affect or is affected by a company's ambitions and achievement of said ambitions (Freeman & Reed). Broadly speaking, corporate responses to social responsibility can be classified among four stances, as a company can react in an obstructionist, defensive, accommodative, or proactive way to social and environmental needs (Carroll, 1979). In a World with increasing sustainability concerns, it usually is in a company's best interest to be socially and environmentally responsible as consumer preferences are also affected by corporate images. Although modern corporations have made concerted efforts to become more socially responsible, the reality is that it is sometimes not easy to reconcile social and environmental responsibility with economic success. It is when tradeoffs between these responsibilities become unavoidable that conflicts emerge. This research examines one such case.

Nestlé S.A. is a transnational company based in Switzerland that has dominated the food and beverage industry since its inception in 1843 (Nestlé, 2016). Nestlé has become a household name as the Nestlé brand is synonymous with quality. In addition, Nestlé's vision clearly includes social responsibility through stated policies and actions. For example, Nestlé has given 300,000 young adults the opportunity to obtain work training in Africa, has provided female livestock workers with veterinary training in Pakistan, has helped improve production and transportation of dairy produced by rural dairy farmers in East Africa, has implemented new technology that enabled a Nestlé dairy plant to use zero groundwater in Mexico, and has committed to building 40 schools in Cote d'Ivoire in efforts to decrease child labor in cocoa plantations (Nestlé). In light of water shortages and concerns in recent years, Nestlé published five objectives in 2015 to improve water sustainability, including decreasing the amount of groundwater used by their factories as well as providing clean water to water-stressed countries (CSV 2015 Report).

With such a positive track record to support the company's stated goals, recent events in which Nestlé Waters was protagonist illustrate the difficulties in reconciling the three aspects of the triple bottom line. One of Nestlé Waters' bottling plants in Southern California is located in indigenous lands on the Morongo tribe reservation and was the focus of attention during the state's recent five-year drought. This research project examines whether Nestlé Waters' actions in drawing and bottling water from a spring alongside Millard Canyon in the Morongo tribe reservation for the Arrowhead brand were indeed consistent with the proactive CSR stance that is suggested by the corporation's policies, that is explicitly stated in the CSV 2015 report, and that is exemplified by the actions described above. The press has reported over the past several years that concerns have been expressed by scientists regarding responsible sourcing, that the water permit had expired in 1988, and that water extraction increased during the drought. Further research is leading to additional findings illustrating the difficulties in maintaining a truly proactive CSR stance.

# Analyzing Company Responses to the Rana Plaza Collapse

Meghan McDonald, '17



Faculty Mentor: Joao (John) Neiva de Figueiredo  
Department of Management

## Supported by the SJU Summer Scholars Program

Corporate Social Responsibility (CSR) is becoming an increasingly important practice for companies worldwide. According to Archie Carroll (1979), there are four response philosophies a company can adopt to address social issues, which can be articulated as obstructionist, defensive, accommodative, and proactive. A company's choice in a response philosophy often derives from their relationship with their stakeholders. An obstructionist approach will avoid engaging stakeholders while the opposite approach; a proactive reaction listens and honestly involves stakeholders. This research project examines the transnational apparel industry, one with an interconnected, cross-border, and complex supply chain with several stages and multiple stakeholders, each one working to maximize value. The supply chain for the apparel industry has three main components, the textile manufacturer, the apparel manufacturer and the retailer.

Numerous Western apparel producers have instituted global supply chains, outsourcing the apparel manufacturing to countries with lower operational costs. Retailers embracing fast-fashion lead to shorter supply cycles, as a result, speed and cost have become the dominating considerations for a supply chain. In the early 1990's, Bangladesh began industrializing from an agricultural economy, capitalizing on the country's vast labor availability. With low-cost labor, Bangladesh quickly became a desirable producer for the Western garment industry, with a growth in garment sector employees from 2 to 4.4 million between 2003 and 2013. After two different accidents killing dozens of apparel workers in 2005 and 2012, Rana Plaza, an eight-story factory complex with over 2,000 employees, which produced millions of clothing items collapsed in April 24<sup>th</sup> 2013: 1,129 employees, mostly women, lost their lives.

According to media reports, the initial response of American retailers differed from European retailers. Within weeks of the collapse, European companies that included Rana Plaza in their supply chain such as Primark, Benetton, Puma and others, signed the Accord on Fire and Building Safety and established a compensation fund to aid victims of Rana Plaza. American retailers withheld contributions and declined signing the first legal agreement, months later signing the Alliance for Worker Safety. Despite their stated intentions of increasing CSR efforts, American retailers such as The Children's Place, Walmart, and J.C. Penny, initially neglected to contribute to the funds due to not producing in the factory at the time of the collapse, despite having previously utilized the factory. After two years, in June of 2015, the compensation fund was fully endowed after hesitation from many American retailers.

This research analyzes the different company reactions to the Rana Plaza collapse over the past three years, classifies them according to the Carroll (1979) criteria, and establishes links between their home country institutional labor context and that of the host country, Bangladesh. This involves examining corporate actions in contrast to stated intentions (such as Mission and Vision statements) from an organizational standpoint and verifying the evolution of the labor regulations in Bangladesh from an institutional standpoint. Additional analysis examines the interface between employment power relations and consumption power relations within global supply chains using the framework of Regimes of Global Labor Governance proposed by Donaghey et al. (2014). The framework proposes four categories of labor governance that can be used to analyze corporate responses and philosophies for CSR.



**Matthew D. Nelson**  
Department of Biology  
Saint Joseph's University

Ph.D. New York University

**Research Interests:** Behavior and  
Genetics

Every animal on earth sleeps or displays quiescent behaviors that resemble sleep. Humans spend greater than a third of their lives asleep but, amazingly, fundamental questions about sleep remain unanswered including: What is its function? And; How is it regulated at a molecular and genetic level? In fact, sleep remains one of nature's greatest biological mysteries.

Simple animals such as fruit flies and nematodes have become key tools in the sleep biology field. These animals are called "model organisms" because many of the same genes and molecules that drive their biology also controls ours. The nematode *Caenorhabditis elegans* is a microscopic, free-living worm that has been widely used in the lab as a model for understanding development and behavior. *C.elegans* displays sleep behaviors at regularly timed intervals during larval development and in response to stressful environmental stimuli. But, why study sleep in a microscopic worm? First, *C.elegans* is a powerful genetic system that we can manipulate with ease. They are transparent and grow from an embryo to an adult in 4 days, thus allowing for fast genetic alteration and experimentation. Because of their simplicity, we know the location of every one of their cells and the connection of every neuron in its simple nervous system (Only 302 neurons!). My lab takes advantage of this amazing animal in hopes to further our understanding of sleep. Specifically, my research focuses on the following: 1) Identification of sleep regulating neurons and how they communicate as neural circuits to control sleep behavior and; 2) Characterize the mechanisms of how signaling molecules called neuropeptides regulate sleep. We use a combination of techniques common in the following disciplines: genetics, molecular biology, neurobiology and behavior.

# Investigating a Neuropeptide That Regulates Rhythmic Behaviors in *Caenorhabditis elegans*

Natalie Barrett, '18

Faculty Mentor: Matthew D. Nelson  
Department of Biology



Supported by the John P. McNulty Scholars Program and the SJU Summer Scholars Program

Sleep is an extremely important rhythmic behavior that occurs in all animals. Notably, little is known about how sleep is regulated and the reasons for its function. Because of the conservation of sleep across the animal kingdom, the nematode *Caenorhabditis elegans* is used as a model of study for further understanding sleep. *C.elegans* is used because of its simplicity, ease of maintenance and available genetic tools.

One of the primary objectives that our lab focuses on is understanding the molecular regulation of one type of sleep behavior called developmentally timed sleep, or DTS. DTS occurs between each larval stage, during a period of time referred to as lethargus, and is immediately followed by ecdysis, a shedding of the animal's exoskeleton. DTS is precisely timed and regulated by the same genes that control the mammalian circadian clock. However, the mechanisms that connect the clock to sleep behavior are poorly understood. Cellular signaling molecules called neuropeptides are involved in this sleep behavior in both humans and *C. elegans*. My project focused on one such neuropeptide, the neuropeptide-like protein NLP-14. Specifically, we are looking at the expression pattern and determining where the NLP-14 protein is being released.

Previous work showed that ectopic over expression of *nlp-14* induces sleep-like behaviors, but we do not know which neurons normally release NLP-14. Based on previous research, we have been able to pinpoint two possible sets of neurons, VD1/DD1 and PHC neurons that are responsible for the release of NLP-14. To test if NLP-14 is released from VD1 and DD1, I am using a strain in which we can activate these neurons with blue light, a technique known as optogenetics. Activation of the VD1 and DD1 neurons induces significant quiescent behavior (AVG: 1.64 body bends, S.E.M=0.39, N=14) compared to the control worms (AVG: 35.28 body bends, S.E.M=2.91, N=14). If NLP-14 is being released from these neurons, and if we remove NLP-14 prior to VD1 and DD1 activation, we predict that quiescence is not induced. RNA interference is currently being implemented to silence the *nlp-14* gene and we will continue to observe and quantify these effects throughout the school year.

# The Relationship of Sleep and Memory in *Caenorhabditis elegans*

Amelia Brown, '18

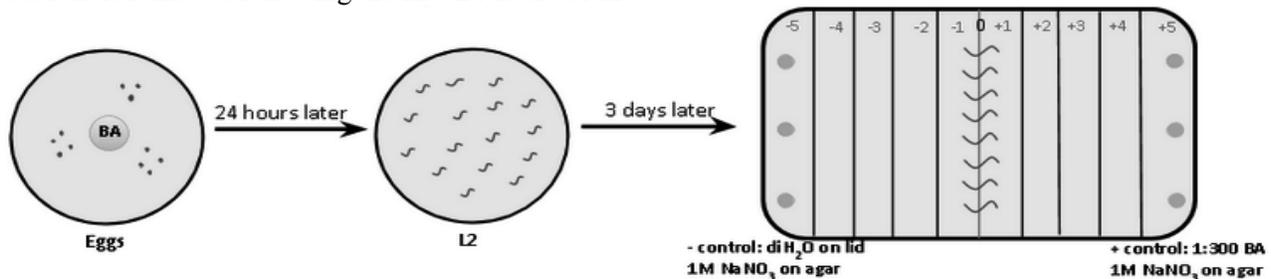
Faculty Mentor: Matthew D. Nelson  
Department of Biology



Supported by the John P. McNulty Scholars Program and the SJU Summer Scholars Program

*Caenorhabditis elegans* is a microscopic round worm that is broadly studied as a model for understanding the cellular and molecular basis of biology. *C. elegans* is the simplest organism, yet to be identified, that exhibits both sleep and memory behaviors. Sleep in *C. elegans* can be noted by a cessation of pharyngeal pumping, the presence of a specific posture, and an increased arousal threshold. *C. elegans* sleep occurs during a period in their life cycle known as lethargus. *C. elegans* has 4 major life stages before they become adults and lethargus occurs between each life stage transition.

*C. elegans* also display evidence of memory. My project focused on a form of long-term memory known as imprinting. Imprinting is a process in which an organism is exposed to a stimulant early in its life and then shows a strong attractive behavior to the same stimulant later in life, thus, remembering it. In the case of *C. elegans* the stimulant is benzaldehyde or isoamyl alcohol, two odorant attractants. *C. elegans* is exposed to the odorant for the first 24 hours of life, which coincides with the worms' first lethargus as shown below. The imprinting assay is performed when the worms are second-day adults, three days after the odorant is removed following the first 24 hours of life.



Worms are measured every fifteen minutes for an hour, and their placement is recorded and averaged at the end of the assay. Because the imprinting is olfactory, many different factors played into the success of the experiment. Everything from deodorant and body spray to the temperature of the lab could have affected the results of the assay and therefore, future work will involve standardizing the experiment as well as creating a more stable environment to collect consistent results.

Because of the simplicity of *C. elegans* they are an ideal organism in which to study how the process of sleep affects memory. In the future we plan on using chemicals (such as the phosphodiesterase inhibitor IBMX) to decrease sleep, or mutant strains with increase sleep ('sleepy' strain) to determine if the amount of sleep affects the ability of the animals to form memories.

## Characterizing the Role of NLP-14 in *Caenorhabditis elegans*

Brendan Gleason, '17

Faculty Mentor: Matthew D. Nelson  
Department of Biology

Supported by the SJU Summer Scholars Program



Neuropeptides often play key roles in the regulation of rhythmic homeostatic behaviors. One such behavior is sleep. *Caenorhabditis elegans* is a nematode commonly studied as a model organism to study larger biological questions. *C. elegans* actively moves and feeds during larval and adult stages, but engages in periodic bouts of sleep characterized by quiescence of locomotion and feeding. This sleep occurs during a life stage called lethargus, which occurs during the transition between each larval stage and before the adult transition. Previous study has shown that when the gene encoding for NLP-14 neuropeptides is over expressed, quiescence is induced in otherwise active adults. This suggests that NLP-14 may regulate sleep during lethargus.

As a first approach to test this hypothesis, my project was aimed at identifying where NLP-14 is expressed in the animal. Previous work in the lab began to address this question by using a transgenic strain that expressed the green fluorescent protein (GFP) fused to the regulatory DNA of the *nlp-14* gene. It was hypothesized that four neurons expressed *nlp-14*: VD1, DD1, PHCL and PHCR, based on their location and morphology. I proved that the two tail neurons were indeed, PHCL and PHCR, by co-localization studies for the gene *ida-1* (fused to mCherry), which is known to be expressed in these cells. I accomplished this by constructing an *ida-1*:mCherry PCR construct and co-injecting this with the *nlp-14*:gfp transcriptional reporter.

To confirm the identity of the VD1 and DD1 neurons I have made another construct: the promoter from the gene *unc-47* promoter was fused to the fluorescent protein DsRED. This construct will be co-injected with *nlp-14*:gfp to confirm the identity of these neurons.

Future work will examine the effects of loss of function of the *nlp-14* gene. It is expected that when *nlp-14* is deleted that sleep will be decreased or possibly eliminated. This work will help to further elucidate the pathways controlling sleep in *C. elegans*.

# The Role of Cyclic Adenosine Monophosphate in *Caenorhabditis elegans* Sleep

Francis Janton, '17

Faculty Mentor: Matthew D. Nelson  
Department of Biology

Supported by the SJU Summer Scholars Program



Sleep is a behavior that occurs in all animals, yet little is known about how sleep is regulated. Cyclic adenosine monophosphate (cAMP) is an important second messenger controlling a wide array of diverse biological processes, ranging from salt and water balance to sleep and memory. It has been shown that cAMP has reduced levels during times of sleep and higher levels during wakefulness. Previous studies used mutants or pharmacological approaches to alter cAMP on a global scale where cAMP levels were raised throughout the entire organism; however, little is known about the specific effects of altering cAMP in single cells or neuronal pathways. We study *Caenorhabditis elegans*, a microscopic nematode, because of their simple nervous system consisting of only 302 neurons where each synapse has been mapped. They serve as a powerful model organism for studying cAMP and the specific neuronal pathways underlying sleep.

*C. elegans* exhibit a sleep-like behavior, or quiescence, characterized by cessation of feeding and locomotion along with homeostasis and a reduced arousal threshold. The major type of quiescence I study is stress-induced quiescence, wherein the nematodes are subjected to a harsh treatment for a limited time and afterwards experience a short bout of activity before falling asleep. My research last summer showed that stress-induced sleep in *C. elegans* is directly regulated by cAMP levels, although the specific neurons responsible remain unidentified. This summer my research focused on determining the neuron or subset of neurons responsible for regulating sleep.

To define where cAMP is functioning during sleep, our lab made use of a near infrared light-activated adenylyl cyclase called IlaC. This enzyme converts ATP to cAMP through its adenylyl cyclic domain when its phytochrome absorbs red light, and is an extremely useful tool for directly controlling cAMP levels through exposure to red light in a cell-specific and temporal fashion. In addition to IlaC, cAMP levels are able to be influenced through genetic manipulations of the gene *kin-2*. *Kin-2* encodes a regulatory subunit of PKA and is also required for stress-induced sleep.

In order to pinpoint what neurons regulate sleep within the nervous system, we constructed a number of *C. elegans* strains which express transgenes composed of tissue-specific promoters. These various promoters drive IlaC expression in certain sets of neurons, such as motor neurons (neurons that regulate locomotion-test group), command interneurons (interneurons that regulate locomotion-test group), and serotonergic neurons (neurons that release serotonin-test group). I will continue my research in the upcoming fall semester and hope to identify the neurons responsible for regulating *C. elegans* sleep.



**Peter Norberg**  
Department of English  
Saint Joseph's University

Ph.D. Rice University

**Research Interests:** Herman Melville's  
Reading

In addition to my other projects, I am Associate General Editor of *Melville's Marginalia Online* (<http://melvillemarginalia.org/front.php>) an electronic archive of Herman Melville's reading that includes critical editions of surviving books from Melville's personal library. The marginalia Melville left in his personal library are essential to the manuscript archive for his fiction and poetry because many of these volumes served as primary source material for his published works. The working manuscripts for most of Melville's major works are either unlocated or destroyed, but one can find valuable clues to his compositional processes in the margins and on the endpapers of the books he had before him while he wrote. In writing such masterworks as *Moby-Dick* and *Billy Budd, Sailor*, Melville drew heavily from other books for factual details, stylistic techniques, and aesthetic form. Using digital photographic enhancement processes, we have also recovered significant new evidence that reveals previously erased marginalia in multiple volumes, including, most recently, Melville's personal copy of *The Poetical Works of John Milton* (Boston: Hilliard, Gray, 1836). This recovery work has uncovered new evidence of Melville's creative processes and his aesthetic, religious, and political concerns. To date, we have published 26 titles, including Melville's 7-volume set of *The Works of William Shakespeare*, his copy of the *New Testament and Psalms*, and his copy of Thomas Beale's *The Natural History of the Sperm Whale*, a significant source for *Moby-Dick*. There are also an additional 21 titles in production, representing one sixth of the 285 extant titles from Melville's library.

***The Descendants* – A Trilogy of Novels  
That Utilizes Fiction to Explore the Idea  
of God, Major World Religions,  
Morality and Moral Conflicts and the  
Challenge of Transitioning From  
Adolescence to Adulthood**

Krista Rossi, '17

Faculty Mentor: Peter C. Norberg  
Department of English



Supported by the SJU Summer Scholars Program

The concept of God has been a major focus of interest throughout the centuries because of perennial questions regarding human experience, and humanity's ceaseless desire to answer them. The answers that the world's various religions offer on many of these questions have diverse effects on an individual's culture, morality, and social relationships, which can be strikingly different when compared to one another. However, I discovered that they can also be strikingly similar, especially when looked at through the creative lens of a fictional world.

*The Descendants* is a well-developed trilogy that is told through the perspective of seventeen-year-old Kylie Ré, who after experiencing the traumatic death of her family, is left grappling with the concept of God, religion, morality, identity, and how to grow up into adulthood in the absence of family. Within the world of the Descendants, Kylie learns that each religion is supported by an elite order of spiritual guardians working to combat the encroaching forces of evil. Book one is centered on the Christian guardians (called the Descendants) who Kylie becomes a part of, and who she learns are internally divided due to a crisis in leadership following the resignation of the leader of the old guard. The first volume ends with Kylie reluctantly agreeing to the laws of the Christian branch, yet still grappling with the concept of the Christian God. Book 2 explores Kylie's discovery that both good and evil can and do coexist, and that the battle between the two will never be finally resolved, but that it is a battle worth continually fighting. As the trilogy will develop in book 3, Kylie and the Descendants will encounter the guardians of the other world's religions who will need to unite in order to prevent the powers of evil from conquering both heaven and earth. In this last volume, Kylie will reach a level of understanding that will enable her to live with the questions she cannot answer. The lack of answers will eventually lead Kylie to the ultimate end of all religions: faith.

With 120,000 words (book 1 and half of book 2) completed, the world of the Descendants continues to show Kylie that God can be interpreted in many ways, the truth can be found in many places, and that strangely enough, evil and good can and do coexist in a constant struggle that is the root cause for so many of the questions she and the world asks, but cannot always answer. When all is said and done, Kylie learns that faith is the only way she can live with the unanswered questions, which is exactly what each religion provides.



## **Aloysius Ochasi**

Institute of Catholic Bioethics and the  
Department of Theology &  
Religious Studies  
Saint Joseph's University

Ph.D. Loyola University Chicago

**Research Interests:** Reusable Medical  
Devices, Community Health and Clinical  
Bioethics

The demands of distributive justice, and the glaring disparities in global health, especially in the treatment of cardiovascular disease (CVD), have necessitated creative means of transforming “medical wastes” from developed countries, into life-saving devices for people in developing countries. With over 80% of yearly CVD deaths occurring in low-and-middle income countries, the reuse of refurbished pacemakers which are treated as “medical wastes” in the U.S, can save the lives of about 2 million people worldwide who die annually, due to lack of a pacemaker. Exploring ways of effectively acquiring and sterilizing the devices (and other allied devices) within legal parameters from funeral homes and hospitals, for reuse in developing countries, is of great interest to me. The outcomes could have tremendous impact on global health.

Another area of interest is community health and disease prevention. Despite the expansion of health coverage for millions of Americans through the Affordable Care Act (Obamacare), millions of people, especially the undocumented, still remain uninsured. Lack of access to health care for the uninsured and undocumented, has a significant impact on the overall health of the nation. The utilization of Emergency Room services at the late stages of a preventable or manageable chronic disease is not cost effective. My interest is to understand the healthcare needs of immigrant communities, and how best to meet them in order to keep the communities healthy. An exploration, understanding and adaptation of some health practices in their country of origin, may provide the potential to better manage and promote the health of both the uninsured and undocumented. This would ultimately enhance the patient's quality of life, increase community flourishing, and conserve scarce medical resources.

# **Penile Transplants: To Do or Not To Do: Medical, Legal, Sociocultural and Ethical Analysis of Penile Transplants for Injured Veterans in the United States**

Gabriella Mamo, '17



Faculty Mentor: Aloysius Ochasi  
Department of Theology & Religious Studies and  
the Institute of Catholic Bioethics

Supported by the SJU Summer Scholars Program and the Institute of Catholic Bioethics

Recently, in May of 2016, the very first genitourinary vascular composite allograft (penile) transplant ever performed in the United States was completed at Massachusetts General Hospital. This operation was performed on a 60-year-old man who had a partial penectomy for the treatment of penile cancer. This particular surgery had been previously successful in South Africa in 2014, but failed in China in 2006. Johns Hopkins University School of Medicine in Baltimore has approved and given permission to its physicians and surgeons to perform this experimental operation on 60 potential wounded soldiers. The first patient has already been selected, and has been on the transplant waiting list for several months now. The procedure will be performed on a wounded soldier from the Afghanistan war, who suffered a severe penile injury from an explosion. The success of the surgery will be carefully evaluated and monitored with the hopes that this will eventually become a standard treatment in the United States. The surgery will consist of the careful reconnection of blood vessels, nerves and other vital tissues from a new penis, which will be harvested from a deceased matched donor. Surgeons predict that the sensory and urinary functions of the new organ will begin functioning within several months.

Our project analyzes the medical, legal, sociocultural, and ethical issues as they relate to penile transplants. The history of penile transplants is discussed along with the current planning for penile transplants at major institutions such as Johns Hopkins Hospital. The medical section discusses the surgical technique, risks, potential complications, and the long-term medical management. The legal section explores the various regulatory and legal aspects with a focus on informed consent in organ donation, as they may pertain to the protection of both the donor and recipient. The ethical section discusses the various ethical issues related to penile transplants. Should this procedure be considered lifesaving or life enhancing? The article also addresses the possible sociocultural consequences such as religious rites for different faith traditions, emotional issues for men without penises, implications for the transgender community and the role of cosmetic surgery. Lastly, we offer several different recommendations for the future of penile transplants in the United States, such as how to improve the registration and consent process for organ donation as well as how to raise awareness for potential donors. We plan to submit this article for publication to a peer-reviewed journal.

## **ADHD: Misdiagnosis, Under-Regulation and Over-Prescription**

Jenny Schadt, '17

Faculty Mentor: Aloysius Ochasi  
Department of Theology & Religious Studies and  
the Institute of Catholic Bioethics



### Supported by the SJU Summer Scholars Program

Within the past decade, there has been an approximately 42% increase in the rate of diagnoses of childhood ADHD. A disorder that half a century ago was almost unheard of is now diagnosed in almost 11% of children ages 5-18,(1) and has become the basis of a \$13 billion pharmaceutical industry. While increased awareness of ADHD has benefitted many struggling with the disorder, recent research suggests that there is a great percentage of ADHD children who are misdiagnosed. A nationwide study conducted between 2003 and 2007 found that in states that implemented standards-based evaluations in accordance with the No Child Left Behind Act, there was a significant increase in the percent of children diagnosed with ADHD versus states that already had these standards in place.(2) In addition, there are significant differences in ADHD prevalence and diagnosis rates in different regions of the countries. This variance suggest that there are other factors affecting ADHD diagnosis than meeting the criteria. The diagnosing process for ADHD is itself flawed, with the most recent requirements being that a child must meet six out of approximately 20 criteria, some of which overlap with other disorders such as dyslexia, and most of which are difficult to quantify.(B) Additionally, today ADHD diagnosis typically comes from a pediatrician, and not a psychologist, with the observation time of the child on average around 10 minutes, and the diagnosis is often heavily dependent upon teacher and parent notes. The effects of this were seen in a recent study in which it was found that the youngest child in a classroom has the highest likelihood of being diagnosed with ADHD.

Once a child is diagnosed with ADHD, the CDC recommends evidence-based teacher/parent administered therapy and behavior modifications as first-line treatment for ADHD. They do however, also recommend medication for children as young as 4 years old if therapy does not work. What is often forgetting within the process of forming a treatment decision is that ADHD is a continuum, with only those on the higher end of the spectrum requiring consistent medication. Medication is a "quick fix" for these children, and often teachers and parents push for it because they have been led to believe by manufacturers that medication will make their child well behaved, calm, and a star-student. Medications for ADHD do however, have serious side effects, both short-term and lifelong. In response to this, the FDA directs all manufacturers of ADHD medications to produce Medications Guides that are given to parents when they receive their medications, which should tell the side effects of the drug and recommend precautions to be taken. Doctors, however are not required to review these guidelines with patients and their parents, and there is serious doubt that many doctors who are prescribing ADHD medications have even read the guidelines. While doctors do experience some pressure from drug companies to prescribe ADHD medications, the most significant influence on an individual child being diagnosed with ADHD is the wishes of his or her parents and teachers. Parents and teacher in turn are being led to believe through advertisements and general societal pressure, that children who exhibit excitable behavior and difficulty focusing should be medicated in order to become more "normal". The prevalence of this idea is harmful to today's generation of children, and it is unethical to allow pharmaceutical greed to cause such great interference in the lives of so many children. In order to stop this widespread misdiagnosis and over prescription, pediatricians should not only be encouraged to refer ADHD cases to psychologists, but also receive greater training on AHD. There should also be greater education on ADHD in the school setting for teachers and parents, along with educational reform to allow children with ADHD to thrive in school without needing medication.



**Rommel G. Regis**  
Department of Mathematics  
Saint Joseph's University

Ph.D. Cornell University

**Research Interest:** Optimization

My research is focused on developing algorithms for the optimization (i.e., minimization or maximization) of mathematical functions of several variables possibly subject to constraints on these variables. One application is in aircraft wing design where engineers would like to determine the setting of design variables that minimize the mass of the wing while ensuring that the aerodynamic stresses on critical wing components do not exceed some threshold values. In many applications, the optimization problem is given in the form of a computer program whose inputs are the numerical values of decision variables and whose outputs include the quantity to be optimized, called the objective function, and also measures of how well the constraints are satisfied. When this program is run, a time-consuming simulation is performed that could take a few minutes to many hours before the outputs are obtained. In this case, the problem is referred to as black-box in the sense that the mathematical relationships between the inputs and the outputs are unknown. An optimization algorithm determines the values of the input variables that optimize the value of the objective function while satisfying the constraints. In some cases, multiple objective functions are to be jointly optimized and the goal is to find what is called a Pareto optimal solution that provides a trade-off among conflicting objectives.

Simulation-based black-box optimization problems are important because they are found in many engineering applications, including aerospace, automotive, environmental and medical applications. Because the simulations that yield the objective and constraint values are expensive, only a relatively small number of them can be performed when attempting to find the optimum setting of the input variables. The challenge is to design efficient algorithms that are able to find good solutions given the limited computational budget.

When the objective functions to be optimized and the constraint functions are computationally expensive, a natural approach is to build inexpensive approximation (or surrogate) models for these functions. These approximation or surrogate models are then used to guide the search for optimal solutions. For over a decade, I have been developing optimization algorithms that use Radial Basis Function (RBF) surrogate models, including those that can be mathematically proved to converge to an optimal solution in a deterministic or probabilistic sense.

# Using Algorithms to Optimize Trade-off Solutions

Shelley Donaldson, '18



Faculty Mentor: Rommel G. Regis  
Department of Mathematics

Supported by the John P. McNulty Scholars Program and the SJU Summer Scholars Program

Optimization, the process of maximizing or minimizing a function, is a field of mathematics with many applications. An example of one such application is supply chain optimization, where a company might want to minimize expenses while still acquiring all the materials necessary to meet the demands of their customers. Other such applications can be found in business, engineering, and science, where the goal could be to maximize profit, maximize yield, minimize costs, or minimize risks.

The focus of this project was multi-objective black-box optimization problems. In multi-objective optimization, there are multiple functions that need to be optimized simultaneously, and the goal is to find a set of optimal trade-off solutions. When the functions in question are black-box functions, the optimization becomes even trickier because the algebraic models of the functions are unknown. Black box systems are typically studied through computer simulated outputs given inputs for the system. Challenges often arise in solving black box optimization problems due to excessive computational costs, which limit the number of simulations that can be performed.

The goal of this research was to develop an efficient algorithm that finds optimal trade-off solutions to multi-objective black-box optimization problems. To accomplish this, we modified the Accelerated Random Search algorithm (ARS), which is an algorithm for single-objective optimization, so that it would work for multi-objective optimization. We named this algorithm MARS (Multi-objective Accelerated Random Search). To test the effectiveness of MARS, we performed numerical experiments on 33 benchmark problems. The two algorithms used as basis for comparison were the Multi-objective Pure Random Search (MPRS) algorithm, and NSGA-II, which is a widely used, state-of-the-art multi-objective optimization algorithm. The results of MARS, MPRS, and NSGA-II on the 33 test problems were compared using the widely used hypervolume indicator.

Based on the hypervolume comparisons for these 33 test problems, MARS consistently outperformed MPRS, but failed to outperform NSGA-II in most cases. In an effort to make MARS more competitive with NSGA-II, we incorporated a radial basis function (RBF) surrogate into the algorithm, naming this new algorithm MARS-RBF. We then compared the results obtained from running MPRS, MARS, MARS-RBF, MPRS-RBF, and NSGA-II on the benchmark test problems. When we limited the number of function evaluations to  $50(d+1)$ , where  $d$  is the dimension of the problem, MARS-RBF outperformed NSGA-II on 16 out of 22 low-dimensional problems, and on 8 out of 11 high-dimensional problems. When we allowed  $100(d+1)$  function evaluations, MARS-RBF outperformed NSGA-II on 13 out of 19 problems. These results suggest that MARS-RBF is a promising algorithm for multi-objective black-box optimization.

## **Building Regression Models for Multiple Sclerosis Prevalence**

Nicholas Mandarano, '18

Faculty Mentor: Rommel G. Regis  
Department of Mathematics

Supported by the SJU Summer Scholars Program



Multiple Sclerosis (MS) is an immune-mediated disease in which the body's immune system attacks the central nervous system. The disease causes immune cells to eat away at the myelin sheath, which coats and protects axons. When the myelin is damaged or destroyed, nerve impulses traveling along axons in the central nervous system become distorted and interrupted. The exact cause of MS is currently unknown, but thought to be triggered in a genetically susceptible individual by a combination of one or more environmental factors. Because the cause is unknown, there is currently no cure. MS affects approximately 2.5 million people worldwide.

There is a well-known hypothesis called the Vitamin D hypothesis, which states that people with low vitamin D levels are more susceptible to MS. This hypothesis is often used for disease treatment. We explored and quantified the relationship between a country's MS prevalence and several variables related to vitamin D exposure by building regression models. Since the sun is a large contributor of vitamin D, the first variable we explored was distance to the equator. However, since the data on MS prevalence is only available by country, we needed to find a location in each country that represents its center of population. To do this, we applied the method of Lagrange multipliers to derive a formula for the location of a country's population center. We also explored the relationship between MS prevalence and fish consumption as well as the average angle at which sunlight hits the population center. Finally, we looked at tobacco consumption as smoking is believed to be another factor that could affect the onset of MS.

We found a moderately strong correlation of 0.759 between the MS prevalence of a country and its distance to the equator. The slope of the linear regression model was significant and it suggests that for every 1000 km farther from the equator, MS prevalence increases by 0.000213. The correlation between MS prevalence and the average sun angle variable is also moderately strong at 0.769. The slope of the linear model was also significant and it implies that as the average sun angle increases by one degree, MS prevalence decreases by 0.0000267. Finally, we did not find any association between MS prevalence and the smoking or fish consumption variables.



**Becki S. Scola**

Department of Political Science  
Saint Joseph's University

Ph.D. University of California, Irvine

**Research Interests:** State Politics and Policy,  
American Political Institutions, Gender  
Politics, Inequality, Representation

Who is best represented in the American political system? Whose voices are heard and whose are ignored or overlooked? Who has political power, broadly defined, and who does not? Where, how, and why? These are the primary questions that guide all of my teaching and research projects, and I am especially interested in how politics and policy vary across the fifty U.S. states. For example, some of my research examines the variation in women's state legislative service and explains why we see higher percentage of women in some states versus others. Overall, the effect of institutional arrangement on women's legislative representation has a significant impact on where women are more or less likely to hold public office, especially when we consider the intersection of race/ethnicity and gender.

The idea that gender and race/ethnicity intersect and inform political participation also affects voting behavior. Looking at the relationship between women's descriptive representation in state legislatures and voter turnout across the states, my co-author and I determined that having more women and people of color in state legislatures does indeed impact voter turnout in both Presidential and congressional elections. Gender, race/ethnicity, and their intersections matter and increase the likelihood of voting among constituents with similar identities.

In addition to representation and political behavior, my students and I have been working on a project that assesses anti-hunger advocacy in Philadelphia and across the nation. Families who are food insecure are not well-represented within our political system, and they often lack a voice in the public policymaking process. We are mostly concentrating on the type of policy agendas that anti-hunger non-profits produce and advance, as well as measuring the success of these policy prescriptions. Our goal is to shed light on why the rate of food insecurity within Pennsylvania continues to rise, despite the presence of several advocacy organizations within the state that are committed to alleviating hunger. After our Philadelphia study is completed, we will expand this project to other states and compare how anti-hunger organizations impact social policy within the larger and interrelated realm of local, state, and federal agencies.

# **Tension at the Convention: Racial Based Protests at National Political Party Conventions**

Maxwell Barrile, '18



Faculty Mentor: Becki S. Scola  
Department of Political Science

Supported by the SJU Summer Scholars Program

This paper is concentrated on how citizens have engaged in protest activities that are racially based at national political party conventions. I will be paying attention to four conventions that will serve as my case studies: 1964 Atlantic City Democratic National Convention, 1968 Chicago Democratic National Convention, 2016 Cleveland Republican National Convention, and 2016 Philadelphia Democratic National Convention. In the midst of the Civil Rights Movement Atlantic City 1964 saw the Mississippi Freedom Democratic Party demand to be seated and Fannie Lou Hammer's impassioned speech. Chicago in 1968 was the site of the most violent and famous convention protests in American history yet featured minor racially based protests. Cleveland 2016 was billed to be the next Chicago yet failed to meet expectations with very little actually occurred. Philadelphia 2016 was marked by a week of protests all over the city yet also featured very little protests that had a racial basis.

In this paper I will break down the protests by dissecting those participating in them (groups and individual actors) what is being protested against or for, and the level of that protest. I will be addressing why racial based protests occur, why they are generally smaller in scale compared to other protests, and why they are generally overshadowed by other protests. I will be comparing all four conventions and their protests to discern if there are common themes or common tactics. As each protest represents a different time in American history each protest will thus have surface differences, it is this paper's job to dive deeper and see if there is any continuity.

1964 was the height of the Civil Rights Movement and the convention protests that followed were quite possibly the most significant racially based convention protests in history. In 1964 the Mississippi Freedom Democratic Party protesters utilized the structures in place in order to protest what they saw as a systematic injustice towards African Americans. In this way the MFDP and other civil rights protestors worked within an unfair system in order to alter and fix that system. 1968 was situated at the tail end of the Civil Rights Movement and featured two types of racial based protests both working outside of the "system": those organized by professional organizers that sought to bring attention to specific grievances and those organized by the Black Panther Party that sought to advance their own objectives. 2016 has been quite the turbulent year that has come on the heels of enflamed racial tensions and a spotlight shone on police brutality towards Black Americans. Many expected massive racially based protests in Cleveland and Philadelphia but instead got small scale and largely muted protests that garnered very little media coverage but still sought to address specific grievances like police brutality and systematic racism.

# **A Comparative Analysis of LGBTQ Social Movement Organization: How Does the LGBTQ Community Engage in Political Advocacy?**

Ann Marie Maloney, '18

Faculty Mentor: Becki S. Scola  
Department of Political Science



Supported by the SJU Summer Scholars Program

The lesbian, gay, bisexual, transgender, and queer community has participated in both local and national politics since the 1950s, when upon the founding of the Mattachine Society and the Daughters of Bilitis, LGBTQ activists began a campaign for equal protection under the law that recently culminated in the Supreme Court decision *Obergefell v. Hodges*, making marriage equality the law of the land. I investigated more than ten LGBTQ social movement organizations in the United States to determine if the LGBTQ community remains active in politics and, if so, how these groups continue to engage in political advocacy. By comparing the mission statements, policy proposals, and membership of these LGBTQ organizations, I discovered that the ways in which a group participates in advocacy depends on the size and scale of an organization, the constituency an organization serves, and the level of government at which an organization works.

Most of the LGBTQ groups included in this study were able to be classified as either a national or a grassroots organization, and fundamental differences and similarities exist between these types of advocacy groups. A national organization works either exclusively at the national level of government or works at the national, state, and local levels via the organization's federalized structure of a national headquarters and state chapters. They serve large and broad constituencies, often serving hundreds of thousands, even more than a million members, as well as the LGBTQ community as a whole. Working to influence the single most lobbied institution of American government, the legislative branch, national LGBTQ organizations are forced to build political capital and gain the broadest support possible by pursuing the issues that affect the greatest number of an organizations members and the LGBTQ community.

Grassroots organizations differ widely from national advocacy groups. Concentrated on mobilizing a specific community of a marginalized population, the grassroots groups in this study tended to be smaller organizations with less members and work at lower levels of government than national LGBTQ advocacy groups. Unlike national organizations, the grassroots groups do not face the same degree of competition for political capital that national organizations contend with at the federal level of government. Therefore, they have leeway to aggressively pursue issues ignored by national organizations that affect smaller and more marginalized segments of the LGBTQ community. Because of their size and lower profile, these grassroots groups were also more likely to use disruptive tactics, such as protest, to garner attention from the communities they serve and the levels of government they petition.

Future research will explore how these national and grassroots organizations have each contributed to the advancement of LGBTQ rights and equality in the United States. Furthermore, I will attempt to describe the relationship between national and grassroots organizations as they have each fought for change in the past, as well as what relationship, if any, exists between these groups today.



**Reecha B. Sharma**

Department of Interdisciplinary  
Health Services  
Saint Joseph's University

M.D. Maharashtra University of  
Health Sciences

**Research Interests:** Reproductive  
Medicine, Autism Spectrum Disorders

I am interested in the finding ways to improve communication between health care providers and parents with children of autism spectrum disorders. In a previous study, we identified that there are important gaps in this communication and recommendations suggested creation of an informational questionnaire to be used to gather patient questions and then answer them. My students and I are currently utilizing a survey that we have created to facilitate the process of asking questions and providing necessary information to parents of children and adolescents diagnosed with autism spectrum disorders. In addition, we will be using another survey to assess the benefits and ease of use of the informational survey as well.

Our study once completed can be utilized to develop practice standards for all physician offices catering to parents with children diagnosed with autism spectrum disorders. Physicians can provide detailed information about medication use, providing adequate, timely information to parents, and improving outcomes for children and families. We hope that all physician offices utilize our surveys in future to enhance communication and to reduce informational gaps.

## **Improving Gaps in Communication Between Health Care Providers and Parents of Children with Autism and Autism Spectrum Disorders**

Erin Faller, '17

Faculty Mentor: Reecha B. Sharma  
Department of Interdisciplinary Health Services



Supported by the SJU Summer Scholars Program

The National Institute of Mental Health describes Autism Spectrum Disorders (ASD) as a group of complex disorders of brain development characterized by varying degrees of difficulties in social interaction, verbal and nonverbal communication, and repetitive behaviors with abnormalities in interconnectivity between the different functioning parts of brain regions. Due to the steady increase in prevalence of ASD it is even more critical that parents receive appropriate information and guidance about ASD. Previous studies have showed that parents prefer to obtain information on services, therapies, support groups, and finances by their child's health care professional (HCP) rather than online resources. When there is an information gap between families with an ASD child and HCPs, it can hinder the child's development as well as increase the parent's stress. This can cause parents to have problems engaging with their child.

In a previous study done by our research group, parents were interviewed about their experiences with information received by HCPs. Based on their recommendations, we created an informational needs questionnaire that will provide the necessary, specific, and focused information to health care professionals that matches the unique needs of each parent. Also, it will help us better understand what types of questions parents need answered. This questionnaire will be distributed to parents prior to a consultation with their child's HCP. Then, the HCP will meet with the parents to answer their questions and provide information that they had requested when filling out the questionnaire. If pediatric offices implement this questionnaire, it will allow for more direct and timely communication between both parties. We have created a follow-up survey for parents as to determine the effectiveness of our questionnaire. The results will be comprised in a peer-review journal and a manual or pamphlet, which then may be presented on a website to allow for further, efficient communication.

# **The Effect of BMI on Male Infertility**

Anna Gillin, '17

Faculty Mentor: Reecha B. Sharma

Department of Interdisciplinary Health Services



Supported by the SJU Summer Scholars Program

In the United States, obesity has become a major problem with more than one-third of U.S. adults being characterized as obese. Obesity is defined as an excess amount of body fat, while overweight is considered an excess amount of body weight that may come from muscles, bones, or water weight. Body mass index, or BMI, is used to classify if a person is overweight or obese based on their height and weight. Having a BMI above the normal weight can have severe health effects such as heart disease, cancer, diabetes, and infertility.

Compared to men whose BMI fits in the range of normal weight, overweight and obese males tend to be at greater risk of infertility, due to reduced sperm concentration, volume, motility, and morphology. The explanation for this trend can be analyzed through recent publications and studies regarding the effect of BMI on sperm quality. One possible explanation is that the excess fat cells in overweight males produces the hormone leptin, which may lead to damage of sperm cells, increasing risk of infertility. Also, increased BMIs can be linked with altered levels of hormones such as testosterone and estradiol, leading to poor semen quality and infertility.

While it has been found that obesity can be associated with significant reductions in hormone levels, the association between BMI, semen quality, and overall male fertility has proven to be contradictory, as various studies differ on whether or not there is a correlation between obesity and male fertility. The purpose of this research is to study the effect of obesity on fertility by conducting a systematic review of various studies and understanding the trends seen throughout. The research for this study was conducted by using databases such as MEDLINE/Pubmed, SJU Discover, and Google Scholar to collect published literature that fit the parameters of the study. In order to obtain abstracts, the search terms in the databases included BMI, obesity, male infertility, semen, sperm, and semen parameters. Abstracts were screened for relevance and full copies of studies that met the inclusion criteria were obtained. Such criteria included studies with male participants over the age of 13 and calculations of BMI. The data criteria in the abstracts are either mean +/- the standard deviation or one or more BMI compared at once. The project explores the determination of infertility through semen parameters, including sperm count, motility, volume, and morphology. Other factors that lead to infertility, such as DNA fragmentation, oxidative stress, and hormone levels, are analyzed to see if they are correlated to an increase in BMI. Additionally, the effects of obesity on pregnancy are studied such as the numbers of live births, clinical pregnancies, and the time to pregnancy. Through this analysis, it should be expected that men with higher BMI are at a higher risk of infertility because of decreased semen quality and an altered reproductive hormonal profile.



## **Suniti Sharma**

Department of Teacher Education  
Saint Joseph's University

Ph.D. Purdue University

**Research Interests:** Ending the School-to-Prison Pipeline and Preparing Teachers for Multicultural Classrooms

For the last 10 years, a line of research that interests me deeply is exploring the educational experiences of students who are considered at-risk from graduating high school and are pushed into the school-to-prison pipeline. As a former teacher at a juvenile detention residential school, I experienced a wide gap between the institutional demands of detention, rehabilitation, and education on the one hand, and the educational experiences of students from culturally diverse communities, on the other. Convinced of the need to disrupt the school-to-prison pipeline, I researched historical and contemporary discourses constitutive of detention and its impact on students who experience school suspension, expulsion and academic exclusion. Aimed at disrupting the school-to-prison pipeline, my research offers multicultural teachers, curriculum developers, and policy makers a historical and cultural understanding of diversity in the classroom, and suggests culturally and linguistically responsive strategies for working with at-risk youth and supporting them in the public school. Linked to this line of research is a second strand of collaborative research on preparing multicultural teachers for culturally and linguistically diverse classrooms. Specifically, I conduct research examining how planned experiences such as mentoring and tutoring at-risk youth from diverse communities or cultural immersion through study abroad, deepens preservice teachers' awareness of race, class, gender and other differences in relation to the academic outcomes of diverse students. The two interrelated strands of research on disrupting the school-to-prison pipeline and preparing multicultural teachers through diverse cultural experiences are opportunities for me to participate in the critical process of bringing meaningful social and educational change and influencing policy change by speaking for underrepresented communities and underserved students.

## **Mentoring and Literacy Instruction for Youth in the School-to-Prison Pipeline**

Ciarra Bianculli, '17

John Goldberg, '17

Faculty Mentor: Suniti Sharma  
Department of Teacher Education



Supported by the SJU Summer Scholars Program and Diakon Youth Services

Students in the school-to-prison pipeline are often marginalized and forgotten about, and with the population growing and funds dwindling, this is one of the prominent social justice issues today in the United States. We created this project in order to learn how to properly educate this population of at-risk youth.

Since we are white, middle class, and monolingual individuals, we knew it would be a challenge to connect with this population. Working with our mentor Dr. Suniti Sharma, we developed a ten-week curriculum to increase literacy, comprehension, composition, vocabulary, and fluency. Throughout the ten weeks, we also incorporated aspects of mentoring to increase motivation and teach lessons through our various texts and units.

We both began by meeting twelve students at a center in Norristown, Pennsylvania. Our students, who ranged from ages thirteen to seventeen, had all been previously involved in the school-to-prison pipeline. Some were currently enrolled in an alternative school, while others were on probation and waiting for their final court date. We administered a formal reading pre-test which included curriculum based measures, an informal reading inventory, as well as a reading interest inventory. This pre-test allowed us to roughly gauge at what grade level the students were reading at, as well as to see what their past experiences with reading were and what they were interested in reading. We wanted to be able to design our curriculum around texts that would best fit each individual student's reading abilities and their individual interests.

We separated the students into two groups, each taking six, and began to design our curriculum. We included various subjects into our lessons such as history, science, and civics, and through this, we added the aspect of mentoring. While attempting to increase literacy, we also had the students think about life questions and current events. We shared our views and had open conversations while reading both prose and poetry. While we knew the interests of each student, we also picked texts we knew they had never read before, in order to challenge them.

As the weeks went by, we realized that our fifty-minute sessions provided these students with an opportunity to truly be a student, without being judged for the lives they have lived. We asked them what their classroom experiences have been like before, and tried our best to avoid making the same impression that previous experiences have left. We gave them a voice through different exercises and areas of content, and acknowledged their interests while catering to their needs.

As our end with these students quickly approached, we decided their last challenge would be for them to read a novel. Having already chosen novels during their pre tests, they were excited to see we catered to their interests when receiving their own copy. We challenged them to start the novel with us during our sessions, and our hope became that someday they may finish it on their own, in which we are confident that they can accomplish.



**Amie T. Sheridan**  
Department of Marketing  
Saint Joseph's University

M.S. Ohio University

**Research Interests:** Digital Technologies  
and Their Intersection With Content  
Distribution, Revenue Generation and  
Decision-Making in the Sports Industry

During my career in industry, I was fortunate enough to manage a variety of revenue-generating businesses for sports organizations at the professional league, agency and media levels. I contributed to these businesses during a time of dramatic disruption of systems and processes that had been in place for years. Ecommerce businesses took off at the start of my professional career, followed by the introduction of smart mobile technologies with transactional capabilities. Live streaming services and digital video were close behind offering fans the ability to consume sporting events from any location or platform, and the unprecedented rate of social media adoption speaks for itself.

Each of these new technologies has forever impacted the ways in which sports teams, leagues, agencies and media companies produce content, generate revenue and make strategic decisions, and as industry executives have become more limber in their pursuit of the next big trend, analytics services have been quietly and consistently churning out actionable data.

While the story did not pertain to digital technologies per se, Billy Beane's data-based decision-making in Michael Lewis' *Moneyball* (2003) struck a nerve with sports business executives across the board. Just as they clamored to embrace and monetize each digital trend, professional teams and leagues began to explore the use of player performance data in roster determinations. In 2016, this is no longer a new idea with the majority of team front offices appointing a VP-level analytics executive and perhaps even a team of data analysts, but the art of data-based decision making continues to be massaged and perfected for the benefit of the sports fan experience – on and off the field.

# Analyzing Player Contribution in Major League Soccer

Kevin Shank, '18

Faculty Mentor: Amie T. Sheridan  
Department of Marketing



## Supported by the SJU Summer Scholars Program

With the rise of data analytics in U.S. professional sports, Major League Soccer (MLS) has yet to fully utilize what insights Big Data might offer. The goals of this project were to analyze the 2015 MLS season by constructing an unbiased player ranking system, determining which players are most efficient in terms of salary, and predicting player and team performances. The process of my data entry, forecasting, and transition into using data visualization were posted weekly on my blog, <https://startingxistats.wordpress.com>. My studies found a most cost efficient lineup for the Philadelphia Union based on a mix of offensive, defensive, and passing statistics; however, predicting performances and head-to-head matchups were infeasible due to the undefinable variable of luck.

The WordPress blog I formed included explanations to the purposes and processes of the study, progress updates, and will continue to be updated as I continue studies in this field. Before starting the evaluation and predicting player performances, I needed to collect all of the match data. This required me to form a database of player statistics, with almost 60 stats per player per game. Due to the amount of data, I adjusted the project to focus on the Philadelphia Union. This resulted in a template for future seasons and the 2015 Union's season included over 65,000 data points with the most important ones being creation of goal-scoring opportunities, such as shots and key passes, and defensive contributions, such as clearances, tackles, and interceptions.

With the abundance of data, I turned to the data visualization software Tableau in order to present the data by game, position, and player. Additionally, with Tableau I created an unbiased player ranking system which I then used to evaluate players based on salary efficiency. I produced a formula<sup>1</sup> which yielded the Union's player ranking for the season. By dividing each player's salary by their season rating, I established a cost per positive action for the entire roster, resulting in a way to determine a cost efficient lineup. I further used Tableau to visualize players' salaries with respect to different categories of shooting, passing, defending, goalkeeping, and goal producing which explained why certain players earned a spot in the cost efficient lineup.

Another goal of this project was to predict matches based on recent performances. However, due to the undefinable variable of luck, I was unable to predict player statistics and head-to-head matchups. Instead, I took the angle of predicting MLS standings by using a Credibility Weighted Forecasting<sup>2</sup> (CWF). The CWF was able to predict the game-by-game MLS table correctly within 1 point 65% of the time (3 points for a win, 1 for a draw, and 0 for a loss).

<sup>1</sup> .Player Rating Formula is  $05*Passes + 8*Goals + 6*Assist + 3*Penalty\ Goals + Key\ Passes + .4*(Clearances + Tackles + Interceptions) - Yellow\ Cards - 2*Red\ Cards$ , where each statistic is calculated per 90 minutes

<sup>2</sup> The CWF is  $Z (Trend) + (.5) (1-Z) (Average\ Weighted) + (.5) (1-Z) (Median)$  where  $Z = \text{the square of the correlation coefficient}$  and  $Average\ Weighted = \text{Average of the Linear Weighted and the Exponential Weighted Forecasts}$



**Katherine A. S. Sibley**  
Department of History  
Saint Joseph's University

Ph.D. University of California,  
Santa Barbara

**Research Interests:** US-Soviet Relations in  
the Twentieth Century (Trade, Espionage);  
The Cold War; American First Ladies  
(Especially Florence Harding)

While my research interests over the last two decades, from my 1996 book on Soviet-American trade to my 2016 volume on First Ladies, may seem rather divergent, I have found there are some links; one in particular is the way in which compelling stories are often overlooked in the traditional narratives of modern American history. Thus, what initially got me fascinated about Soviet-American relations in the 1920s was the discovery of little-known trading arrangements between the two nations during a time commonly understood as a hostile period of little contact just after the Bolshevik Revolution. That decade has been overlooked for a number of reasons—sandwiched between two towering presidents, Woodrow Wilson and Franklin Roosevelt, the three Republican administrations and their era are often marginalized. But I soon found that there was much of interest in those years and not only in Soviet-American relations; one of those underrated presidents, the often scorned Warren G. Harding, was married to an activist First Lady, Florence Kling Harding, who made significant contributions to raising the profile of her office, and well before the better known Eleanor Roosevelt.

The Harding administration also witnessed growing trade with the Soviet Union, underlining a Soviet passion for American technology even in the midst of an ideologically polarized period. That technology increasingly became a target of Soviet spies active in America, with atomic research especially prized by the 1940s. The discovery of atomic espionage in the United States created much distrust and fear in the early Cold War, particularly after the Soviet Union used its new knowledge to develop an atomic weapon in 1949.

These Cold War nuclear fears, and the way the U.S. Government tried to manage them, has come under close study in Molly Ledbetter's project with me; her research has explored how the US rhetoric on nuclear war and civil defense during the Truman and Eisenhower Administrations was often a careful balance between managing fear and inspiring confidence in a dangerous era. But these efforts would later be exposed by activists who saw through the government's rhetoric, and helped reframe the Cold War discussion to one that emphasized less brinksmanship and more humanity.

## Saved by The Shell: American Atomic Propaganda from The Cold War

Molly Ledbetter, '17

Faculty Mentor: Katherine A. S. Sibley  
Department of History



Supported by the SJU Summer Scholars Program

In August of 1946, the United States dropped two atomic bombs on the Japanese cities of Hiroshima and Nagasaki, ending the Pacific theatre World War II. To this day they are the only two atomic bomb attacks in the history of the world. This decision also ushered in a terrifying and new age of warfare. For Americans the stark fear of this new reality truly surfaced once the Soviet Union had developed their atomic bomb in 1949 (with the help of spies in the U.S.). With such weapons in the arsenal of both sides in the war, the frightening potential for nuclear devastation as its culminating consequence emerged—should the cold war ever heat up. Accordingly, the political exchange and strategic moves from each party proved analogous to a game of chicken, each player holding his breath until the final moment, pushing their opponent to the brink. In fact, the U.S. Secretary of State under President Dwight D. Eisenhower, John Foster Dulles, started using the term *Brinkmanship* to refer to U.S. strategy.

My research this past summer under the supervision of Dr. Sibley looks at how this term of *Brinkmanship* defined not only the American Government's strategy in the fight abroad, but also domestically. In order to maintain and corral Cold War fears back at home, the American government released a slew of propaganda and civil defense initiatives for Americans. These tactics included the lead-infused "atomic suit," the "duck and cover" videos, the "fall-out shelters" and much more. While still learning the effects of the atomic bomb, the government had little evidence that the cautionary measures provided to the general public would deliver safety in the event of an atomic attack— except maybe assuage panic. In fact, calming American fear was most definitely the main goal. The initial footage released following the bombings in Nagasaki and Hiroshima, as well as the detrimental results of continued hydrogen bomb testing, were entirely incongruous with the hopeful and promising undertones of the civil defense initiatives. The two do not line up: one day the government releases pictures of a mushroom cloud wholly swallowing an entire island and the next a reassuring video of a spritely young cartoon turtle saved by his shell. *It was important to keep the potential for a domestic attack alive in the minds of Americans, so as to maintain and fuel support for containment policies in the fight against communism. It was also important to create a false sense of security, so that citizens did not panic or question the development and testing of nuclear warfare as unduly dangerous.* As I continue my research, I am very interested in this balancing act, and in how Americans received it. As time went on, activists eventually started to resist this approach, dealing a blow to the Cold War political consensus in the early 1960s. I am very interested in tracking this dynamic, historical trajectory.



**George P. Sillup**  
Department of Pharmaceutical &  
Healthcare Marketing  
Pedro Arrupe Center for Business Ethics  
Saint Joseph's University

Ph.D. The Fielding Institute

Prior to joining the full-time faculty at Saint Joseph's University in 2004, Dr. Sillup worked in the diagnostic, pharmaceutical and medical device industry for 28 years and held positions from salesman to COO. He worked in major corporations, such as Johnson & Johnson, as well as in start-up businesses, where he sold products, conducted research and launched several new medical/pharmaceutical businesses into global markets. Dr. Sillup has attained favorable reimbursement coverage and coding for pharmaceuticals, medical devices and drug-device combination products with international regulatory authorities and with the U.S. FDA and CMS (Medicare). He has been a member of several boards of directors, e.g., American Heart Association. In 2016, he has presented research at the Colleagues in Jesuit Business Education (CJBE) Conference research about development and implementation of a service-learning course with his Pharmaceutical & Healthcare Colleague, Dr. Tony DelConte, "Integrating Service Learning into the Business School: Development of an Ethics Intensive, Service-Learning Course in the Pharmaceutical & Healthcare Marketing Program". Additionally he and Dr. Steve Porth have published their 12<sup>th</sup> consecutive audit of the newspaper coverage of ethical issue affecting pharmaceutical industry in *Pharmaceutical Executive* entitled "Pharm Exec's Annual Press Audit 2016". Based research by SJU's Business Reference Librarian, Cynthia Slater, EthicsTrak® Database Administratrix, Claudia Barbiero, and the 2016 Summer Scholars, Caitlin Smith and Olivia Capperella, research and development of 13<sup>th</sup> Annual Press Audit is underway.



## **Stephen J. Porth**

Associate Dean and Executive Director  
of Graduate Business Education  
Department of Management  
Saint Joseph's University

Ph.D. Temple University

Dr. Stephen Porth is Associate Dean and Professor of Management of the Haub School of Business at Saint Joseph's University, Philadelphia, PA, USA. He is responsible for managing graduate business programs in the Haub School, including nine degree programs and approximately 1100 students. He also serves as the Chair of the Food Marketing Department at SJU.

Dr. Porth is Senior Editor of the *Journal of Jesuit Business Education*. His research and teaching interests are in the areas of strategic management, leadership, management consulting, and business ethics. He has written two books, one which is now in its fourth edition and has been translated into Chinese, and published extensively in management journals. He serves as Treasurer on the Board of Directors of *Nutritional Development Services* and as President on the Board of Trustees of *Country Day School of the Sacred Heart*. He is past president and a current board member of the *Colleagues in Jesuit Business Education*.

He and Dr. George Sillup have published their twelfth consecutive audit of the newspaper coverage of ethical issue affecting pharmaceutical industry in *Pharmaceutical Executive* entitled "Pharm Exec's Annual Press Audit 2016." The research is supported by SJU's Business Reference Librarian, Cynthia Slater, EthicsTrak® Database Administratrix, Claudia Barbiero, and the 2016 Summer Scholars, Caitlin Smith and Olivia Capperella. Research and development of 13<sup>th</sup> Annual Press Audit is underway.

## **Analyzing the Pharmaceutical Industry Through Newspaper Coverage**

Olivia Capperella, '18

Faculty Mentors: Stephen J. Porth and  
George P. Sillup  
Departments of Management and Pharmaceutical  
& Healthcare Marketing



Supported by the SJU Summer Scholars Program

More often than not, we hear about the “greedy” pharmaceutical companies who are raising drug prices to absurd amounts and evading US corporate taxes by moving headquarters overseas. We hear about big pharma pressuring the FDA to pass a new drug. We hear about opioid addiction and fatalities from prescription drugs. So we think to ourselves, what good is the pharmaceutical industry? Why do we need money-hungry pharma companies? Why do we need Johnson & Johnson, GlaxoSmithKline, AstraZeneca, and Sanofi to name a few? For months the newspapers reported on Pfizer’s failed attempt to shake the high US corporate taxes. If the company left, so would the jobs and so would tax money.

For the past 12 years, Drs. George Sillup and Stephan Porth have studied the trends in newspaper coverage of the pharmaceutical and healthcare industry. Over these 12 years, the database that contains the evaluated articles has grown to hold over 16,000 front page and editorials from five different newspaper sources – The Los Angeles Times, The New York Times, The Washington Post, USA Today, and the Wall Street Journal.

Reference librarian Cynthia Slater searches the online database for the five newspapers using specific keywords to find articles relevant to our research. Articles are then sent to Dr. Sillup for formatting and then to the EthicsTrak database administrator, Claudia Barbiero. Claudia divides the articles equally between my partner, Caitlin Smith, and I to analyze. Caitlin and I take many steps to fully analyze and article. We look at the headline and decided whether it is positive, negative and neutral. Once we read the article we then categorize the article as positive, negative, or neutral. We make a note of the pharmaceutical companies and drugs mentioned in the article and what in what connotation they were written in. Additionally, Caitlin and I look at what ethical issues are found in this article. The ethical issues are crucial in understanding the trends of the industry. Finally, all of our findings are recording in an excel sheet to send back to Claudia to be entered into the database.

To me, summer scholars is a continuation of my studies—both are valuable and a priority. You will only get as much out of this as you put into it. From summer scholars I have gained a better understanding of the media’s views on big pharma and why they have the conclusions that they do. On the other side, I have begun to understand how pharma companies may help contribute to a negative light they are sometimes shown in. This research and knowledge I have gained this summer has helped me in my school work as well as internship. Spending time diving into the industry has helped to familiarize me with the issues I will encounter in my future career.

# Portrayal of the Pharmaceutical Industry by Newspaper Coverage

Caitlin Smith, '17

Faculty Mentors: Stephen J. Porth and  
George P. Sillup  
Department of Pharmaceutical &  
Healthcare Marketing



## Sponsored by the SJU Summer Scholars Program

For the third summer in a row, I have enjoyed exploring the how the pharmaceutical industry is portrayed in the media. My partner, Olivia Capperella, and I examine various ethical issues portrayed in newspapers involving the pharmaceutical industry. To do so, we used the five most circulated newspapers in the United States including the *Wall Street Journal*, *USA Today*, *The New York Times*, *The Washington Post*, and *The Los Angeles Times*. Our mentors, Dr. Porth and Dr. Sillup, have been accumulating this research over the past 12 years in the EthicsTrak™ database.

We seek to identify many different trends, including most frequently named companies, whether the industry is mostly portrayed in a negative, neutral, or positive manner, what the most frequent ethical issue discussed is, and whether the headlines are most frequently negative, positive, or neutral. We examine them in chronological order, beginning in October, which is the start of the fiscal year.

Our process is as follows: first, Cynthia Slater, SJU's Business Reference Librarian, searches for articles through two different databases by using keywords that may lead to articles involving pharmaceutical companies. Next, Dr. Sillup organizes the articles identified by Mrs. Slater's searches by month and formats them for our research. Dr. Sillup sends the formatted articles to Claudia Barbiero, who evenly distributes them between Olivia and me in batches of ten articles. Then, Olivia and I read each article and decide if they are relevant or not. If an article is relevant, we enter it into one of two excel spreadsheets depending on whether the focus of the article is 'Pharmaceuticals' or 'Healthcare'. Then we classify them by newspaper, front page or editorial, the ethical issue involved, whether both sides are represented, whether the articles' headlines and the articles themselves are neutral, negative, or positive toward the pharmaceutical industry, and list the companies and drugs mentioned. While Olivia and I are reading the articles, we act as if we are "Big Pharma" in an attempt to see them from their point of view. Once a batch is completed, we send the spreadsheets we have created to Claudia, who compiles them in the EthicsTrak database which holds the research from the past 12 years, and sends us additional articles to review. Following the completion of our research, Dr. Sillup and Dr. Porth use our findings, combined with their insights, to present conclusions in an article which is published annually in the *Pharmaceutical Executive* journal.

This research has helped me to gain valuable insight into the pharmaceutical industry, the industry where I will be working post-graduation as a Pharmaceutical & Healthcare Marketing major. In such a controversial industry, I will face many challenges, including ethical dilemmas, throughout the duration of my career. Reading these articles has given me a preview of what some of those challenges might be. Had I not participated in Summer Scholars for the past three years, I would be as prepared to enter my career next year as I am now.



**Alexander J. Skolnick**  
Department of Psychology  
Saint Joseph's University

Ph.D. University of Georgia

**Research Interests:** Emotion, Disgust,  
Gender and Emotion, Emotions  
Involved in Health, Stress and  
Ways to Buffer it and Olfaction

I am an assistant professor in the psychology department and have been here at Saint Joseph's for 9 years. I began my scientific career as a biopsychologist interested in social relationships in primates. I studied orangutans in zoos, capuchins in group colonies, and rhesus monkeys on an island. Over the years, research twists and turns have led me away from nonhuman primates to focus my research on understanding emotions in humans. My scientific path has led me to the specific study of the emotion of disgust in all its icky glory. This destination was possibly inevitable as there are interesting questions about the biological nature of disgust, in terms of how as an emotion disgust may function to keep people safe from contagious agents. One area I focus on is the extent that gender differences generally seen in disgust (men lower than women) are due to biological differences and social influences. I am also fascinated by the ways that disgust influences people's lives, for example, affecting food choices, occupations, politics, or even moral decisions. Disgust is a particularly interesting emotion because disgust feelings can produce very strong behavioral and facial responses to the physically disgusting (e.g., mucus, slime, blood) as well as to behaviors of others or even moral issues (e.g., cruelty, ambulance chasers, slave labor, abusive relationships).

One direction of my research concerns the ways that gender stereotypes might influence one's emotional landscape. For example, if someone has strong views about how men and women are expected to respond emotionally, do those views influence their own responses. An earlier study from my lab found support for this relationship with the emotion of disgust. In a similar vein, a recent study by a graduate student in my lab found a relationship between the levels of sexism and disgust: the greater one's sexist views the greater their disgust sensitivity. Kristen (Krissy) Lanzilotta's Summer Scholars project with me this year addresses people's views of women when acting disgusted. Krissy hired actresses and created videos of women acting or not acting disgusted in situations that would likely evoke disgust. She is testing whether the views of the women in the videos, such as their attractiveness and femininity, would be influenced by whether they show gender stereotypical disgust levels (e.g., women being more emotional and squeamish) or do not.

# **Women Who Do Not Say “Yuck!” Are Women Evaluated Differently Based on Their Response to a Disgusting Situation?**

Kristen Lanzilotta, '17

Faculty Mentor: Alexander J. Skolnick  
Department of Psychology



Supported by SJU Summer Scholars Program

Gender stereotypes that exist within the U.S. delineate how men and women should behave, and create predetermined expectations about their behaviors. Stereotypes arise from the implementation of gender roles, which are societal constructions that dictate acceptable behaviors for men and women. Women are expected to be more emotional than men due to their gender role of being more communal than men, leading to emotions of weakness or helplessness. Disgust is an emotion with strong withdraw tendencies that shows this type of gender bias and likely stems from existing gender stereotypes. Women tend to show a higher sensitivity to disgust than men because they exhibit more powerless emotions and opposed to powerful ones (e.g., anger).

While the effect of gender stereotypes on men and women's behaviors is evident, it is not entirely clear how acting against these gender stereotypes affects the way individuals are superficially evaluated. Therefore, the objective of this project is to investigate the relationship between women behaving in accordance to the gender-related emotional stereotype of helplessness and their perceived physical attractiveness. We predict that women will be rated as less physically attractive when they do not act disgusted during a disgusting situation (e.g., finding a long black hair in a sandwich) compared to if they do act disgusted, which would fulfill the gender stereotype. We anticipate that women who act less disgusted, contradicting their emotional stereotype, might be viewed negatively in a number of different ways (e.g., perceived femininity, and sexuality). This study is the first to address the effects of such gender stereotypes of disgust.

In order to achieve the above goal, this summer I created three different sets of videos where three different actresses performed one of three disgusting situations: finding a hair in a sandwich while they are eating it, eating cereal with spoiled milk, or using a public restroom stall where there is a visibly open tampon and blood on the toilet seat. I recruited actresses from the Saint Joseph's University theatre group, provided them with a script for their unique disgusting situation, and filmed them acting it out. I had each actress display the following emotions for each situation: disgust, no disgust, and one control situation where no disgusting event occurs.

Once the videos were complete for each scenario, I created an online survey where participants were prompted to view three videos, and each participant was randomly assigned only one condition for each scenario. After viewing each video the participants were asked to answer questions about the actress in that respective video, which were questions about her attractiveness, femininity, expressiveness, emotional strength, the participant's likelihood of wanting to socialize with her, and adventurousness. Data collection is ongoing and will continue into the school year.



**Jury A. Smith**  
Department of Art  
Saint Joseph's University

M.F.A. Tyler School of Art of  
Temple University

**Research Interests:** Ceramics,  
Sculpture

As the poet Mary Oliver writes, “attention is the beginning of devotion.” In working with material and form, my intention is to cultivate space for a type of tending.

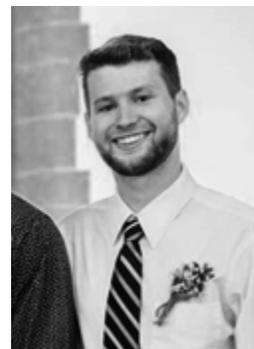
My current studio practice references visual and tactile memories: white structures in hollows; boulders in cool darkness; objects worn smooth by time and use; messages resting in material until surfacing. Through the absence of defining characteristics, with only the most fundamental aspects of a form in place, I hope to give the work a flexible philosophical edge and to engage the poetic eye. My intention is for the work to function by imprinting a visual mark rather than imparting a direct narrative.

In constructing work, I utilize a traditional craft-based approach, employing a repetitive and systematic practice. The work evolves as a conceptual response to a daily practice.

# Running with Japanese Ceramics and Philadelphia Pottery

Jesse Buxton, '17

Faculty Mentor: Jury A. Smith  
Department of Art



## Supported by the SJU Summer Scholars Program

This summer has been truly transformative and was full of unexpected discoveries in my work. During my previous semesters taking ceramics classes at SJU, I spent roughly six to ten hours a week in the studio making work and learning the basics of throwing on a wheel and glazing the pieces I made. This summer, I spent 40 hours a week doing a number of the same things, but building upon my progress under the guidance of my mentor Jury Smith.

Over the course of the summer my Summer Scholars Project in Japanese pottery transformed into a three-pronged study into Studio Pottery and has helped me start to truly find my voice in my art. As part of my summer scholar research, my mentor connected me with two artists in the Philadelphia area with a Studio Pottery focus. The experience of meeting and shadowing these artists has been exciting and eye opening. Through my research, I learned new ways to create forms on a much larger scale and the chemistry behind glazing and firings. At the moment, I am focusing on making good decisions pertaining to the proportions in my work.

The first artist my mentor connected me with was Peter Quinn, an artist based out of Cheltenham. I studied at Peter's studio on a bi-weekly basis and the experience completely changed the way I throw on the wheel. Peter encouraged me to push the limits of the wheel by making large thrown composite pieces. He spoke of his infatuation with traditional Greek pottery and how Greek ceramicists achieved forms that were before extremely challenging, if not impossible, by throwing carefully measured parts that were later assembled into large vessels. I learned not to think of a pottery wheel as a tool that turns one piece of clay into one pot, rather that the possibilities are endless. Making parts of a whole can be thought of as the way a child plays with building blocks.



The second artist my mentor connected me with is a studio potter from West Philadelphia named Ken Beidler. At Ken's studio, I watched him throw and glaze his pots. I also worked on wedging, mixing glazes, and learned about the science behind cone 10 reduction firing in a gas kiln. On one of my visits to Ken's studio I helped him fire his gas kiln, which involved monitoring pyrometers and recording temperature changes ever 30 minutes to maintain the precise firing rate for reduction to achieve his desired results. While shadowing Ken throwing and assembling tea bowls, bowls and ceramic baskets we discussed what it took to be a studio potter. He explained the business side of running a pottery studio, how he rents out space to other artists, how to price his own work, and the importance of good marketing and networking within the clay community.

Finally the largest portion of my time spent this summer was at SJU in Boland Hall creating my own work. I took what I learned and allowed that to direct my own studio work. I made matching tea sets inspired by Japanese forms, large composite vases and jars that were made of three or more precisely measured parts to achieve the forms I intended, and even recreating the proportions of work done by master ceramicists Lucie Rie and Hans Coper. I also spent a lot of time reading some of the necessities when it comes to ceramic literature reading Daniel Rhodes' *Clay and Glazes for the Potter* Bernard Leach's *A Potter's Book*, where Leach often speaks of the influence his study in Japan and working along side Shinji Hamada had on him. During all of this I was always in contact with my mentor who gave me direction throughout the entire summer. My research and work has made me a more confident artist and the helped me prepare for my senior show in the spring of 2017.



Looking towards the future, this summer has reinvigorated my passion for pottery and clay and I look forward to learning more in my final two semesters at Saint Joseph's University while building upon my strides made this summer.



**Jean M. Smolen**  
Department of Chemistry  
Saint Joseph's University

Ph.D. Johns Hopkins University

**Research Interests:** Water Quality  
and Global Access

My current research interests focus on water quality in naturally occurring surface waters and in water distribution systems. I am generally interested in the access and sustainability of water resources.

Access to sufficient quantities of clean water is and will continue to be one of the biggest challenges facing society well into the future. In the United States we are fortunate to have the expertise and the infrastructure to provide water free of chemical and biological impurities that is safe for human consumption. Unfortunately, in developing countries access to such clean water is limited by lack of adequate infrastructure and technology. Women travel long distances to collect water from a reliable source and subsequently spend a majority of their day completing this task. Oftentimes water that appears clean may actually be potentially deadly. In the 1970s, the World Health Organization funded a project that dug deep tube wells in Southeast Asia in search of clean water. At this point in time, most surface waters were contaminated with human sewage and other pollutants. Unfortunately, the deep tube wells accessed a groundwater supply that was contaminated with naturally occurring arsenic. Arsenic is extremely toxic and caused severe illness in the individuals who consumed the contaminated water. Our research efforts are focused on finding solutions to such problems.

## Local Water Quality: Determination of Phosphorus Concentration and pH

Nathalia Benavides, '18

Nicholas Swanson, '17

Faculty Mentor: Jean M. Smolen

Department of Chemistry



### Supported by the SJU Summer Scholars Program

The safety, odor, appearance, and taste of drinking water are important to all communities. Each year, the Philadelphia Water Department (PWD) releases a water quality report that outlines the water filtration process, discloses the results of water testing, and advises residents about how to help preserve water quality. According to the report, Philadelphia water is treated through a series of steps including disinfection with sodium hypochlorite, coagulation with ferric chloride and lime, flocculation, a second round of disinfection, filtration, and final treatment with ammonia, zinc orthophosphate, and fluoride.

Past research has focused on the changes in concentrations of metals and inorganic compounds in Philadelphia water as they travel from river to faucet as well as after being filtered via a Brita® filtration system. Previous students working on this project noted that there were higher levels of phosphorous in their samples, especially after being filtered with the Brita® filtration system. The PWD does not report any data for phosphorus levels before or after the treatment process. The purpose of this study was to determine and compare phosphorus concentrations and pH readings in water from fountains across campus as well as after the water has been filtered using a Brita® filtration system.

Samples were collected from all main academic and recreational buildings across campus using a standard sampling technique. All samples were analyzed for pH and phosphorus concentrations. A standard calibrated pH meter was used. Concentrations of all forms of phosphorus, except organic phosphorus containing compounds, were determined in parts per million (ppm) or mg/L by colorimetric analysis using a UV-Visible Spectrophotometer. The samples specifically collected and used for the Brita® filter tests remained in contact with the filter for 30 minutes and 24 hours before being tested for pH and phosphorus concentrations to determine the effect.

Results have shown that both the pH values and phosphorous concentrations of samples from the SJU main campus water fountains are in the normal range. Once samples have come into contact with the Brita® filtration system, there have been noted changes in the pH levels and phosphorous concentrations. Samples from the SJU main campus water fountains that have not been filtered with the filter have pH levels that fall within safe drinking range. However, pH values dropped below the recommended lower pH limit of drinking water after samples have been filtered with the filter. Unfiltered samples from SJU main campus all have phosphorous concentrations between 0.41 and 0.76 mg/L. After filtration, phosphorous concentrations increased an average of 0.45 mg/L.

## **Arsenic Removal Using Biosand Filters Amended With Iron Nails**

Peter Carney, '18

Anjni Patel, '17

Faculty Mentor: Jean M. Smolen

Department of Chemistry



### **Supported by the SJU Summer Scholars Program**

Arsenic contamination of drinking water is a health crisis affecting numerous populations in both developing nations and in parts of the United States. Arsenic is a naturally and anthropogenically occurring semi-metal that is found in groundwater. The odorless and colorless qualities of arsenic enable individuals to unknowingly consume it through cooking with or drinking contaminated water. Arsenic consumption results in severe symptoms including skin discoloration, limb numbness, and partial paralysis. Long-term consumption of arsenic has been shown to cause various cancers and has been linked to other diseases such as heart disease and diabetes.

In order to provide communities with safer drinking water, large filters and clean drinking water have been shipped to affected areas. These solutions, however, are expensive to implement. To provide a more cost-effective yet efficient solution, small-scale slow-sand water filters have been designed and built. These filters use rusted iron nails placed within the sand layers to remove arsenic from the water supply.

Currently, five of these water filters are being implemented in our lab. There is one control filter in which there are no nails, three filters with a single layer of rusted nails, and one with two layers of rusted nails. One of the three single-layered filters is tested with influent water with an arsenic concentration of 60 parts per billion (ppb) in order to evaluate naturally occurring levels of arsenic. All other filters are tested with water containing 300 ppb of arsenic to determine if the filters are capable of removing arsenic at a higher concentration. These filters have undergone testing twice a day during the summer. Testing is done by adding six liters of water containing the desired concentration of arsenic to the filters and drained. A sample of the effluent water is removed for analysis and its pH measured. After a sufficient number of samples have been obtained, arsenic concentrations are analyzed using Inductively Coupled Plasma (ICP) mass spectrometry that provides arsenic concentrations in units of ppb based on a set of standards.

Thus far, the results have shown that the control filter and the filters containing a single layer of rusted iron nails with influent arsenic concentrations of 300 ppb produce water with arsenic concentrations less than or close to 50 ppb. The filter with a single layer of rusted iron nails and influent water with an arsenic concentration of 60 ppb produces water with an arsenic concentration less than or close to 10 ppb, the maximum arsenic concentration the World Health Organization (WHO) considers permissible for drinking water. Further evaluation needs to be conducted to ensure that the filters consistently meet the WHO guidelines for a reasonable length of time.



**Karen M. Snetselaar**  
Department of Biology  
Saint Joseph's University

Ph.D. University of Georgia

**Research Interests:** Fungi, Fungal Diseases of Plants, Urban Botany

Both of my graduate degrees have "mycology" as a specialty but my MS degree is in botany while the PhD is in plant pathology. This means that I have broad experience with a basic science approach to research but also have experience working in the applied setting where control of plant disease is a goal. For most of my research career I have focused on one particular fungal disease that infects corn plants. The fungus is in a group called smut fungi because the disease the cause ends with production of dusty "smutty" spores. The one I work on is *Ustilago maydis* and although the disease it produces isn't very important economically, it is a very nice model system that has allowed us to learn things about plant diseases that might be applied to some that are more economically important.

My specialty within this field is in characterizing how the fungus and plant interact, often using a range of different types of microscopy. I have collaborated with a number of other researchers to help them characterize mutant strains of the fungus that they have produced. A few years ago I worked with over a hundred other collaborators on a project that resulted in the genome of the fungus being sequenced, annotated and published. More recently I have returned to looking at some basic aspects of the fungal life cycle that have not been characterized very well. Here at SJU we have many great tools for this kind of work, including a greenhouse where we can grow and infect plants, tools needed for growing the fungus, and many different types of microscopes that can be used to carefully study the host-plant interface formed after infection.

Students in the lab have been involved in a range of different projects, from making mutants of the fungus to figuring out how the fungal cells survive in the soil over the winter. Current students are working out techniques to study the plant response to infection, trying to label the endoplasmic reticulum in the fungal hyphae inside the plant and characterizing some mutant strains that are impaired in sexual reproduction and thus unable to infect plants.

# Detecting Reactive Oxygen Species in a Plant-Pathogen Interface Between *Ustilago maydis* and *Zea mays*

Michael DiMuzio, '17



Faculty Mentor: Karen M. Snetselaar  
Department of Biology

Supported by the SJU Summer Scholars Program

*Ustilago maydis* is a biotrophic fungal pathogen that invades *Zea mays* (maize) and causes the plant disease corn smut. This type of pathogen has developed to enter its host and live inside the living plant cells without triggering the defensive host cell death response which occurs in other types of fungal diseases. *Ustilago maydis* grows invading hyphae that penetrate the cell walls of maize in order to infect the plant, and once inside, take up nutrients from the host. From here, *U. maydis* completes its lifecycle within maize, as its hyphae proliferate and differentiate into teliospores, causing large black tumors. These tumors can form in all aerial parts of the plant (leaves, tassels, ears and silks) and with time the spores inside will be released into the environment.

The purpose of my project was to observe the production of reactive oxygen species (ROS), such as hydrogen peroxide, within an infected host plant. ROS have several different roles in maize such as its prevalence in signaling pathways, cell maturation and stress response. Additionally, these compounds can also directly damage the invasive fungal cells and elicit programmed cell death within the host. This deters infection since *U. maydis* can only survive in living cells. So if *U. maydis* is able to circumvent or stop ROS compounds from being formed and released, then the pathogen can suppress the plant's defense system and compromise cell wall integrity in order to invade the host. To observe this, I used a hydrogen peroxide stain, 3,3'-diaminobenzidine (DAB), which is oxidized by hydrogen peroxide resulting in the formation of a dark brown coloration. For imaging, I used light microscopy to determine the accumulation of ROS in inoculated silks at various stages of infection. Looking at the point where the *U. maydis* penetrates the host cells, I was able to not only see where ROS were accumulating, but to infer when they were produced. Preliminary results showed that when the fungus was able to fully penetrate through the epidermal layer of the silks, no ROS were present. Additionally, when infection was unsuccessful, there was a visible presence of ROS. In the future I hope to quantitatively analyze the incidence of these reaction spots at the site of infection and observe the prevalence of ROS when penetration has succeeded or failed. This is very important in understanding some of the underlying mechanics of how *U. maydis* is able to bypass a host's defenses and how other biotrophic pathogens interact within their hosts.

## ***Organization of the Endoplasmic Reticulum in Dikaryotic Filaments of Ustilago maydis***

Lauren Lewis, '17

Faculty Mentor: Karen M. Snetselaar  
Department of Biology

Supported by the SJU Summer Scholars Program



This summer, I had the opportunity to research the pathogenic fungus, *Ustilago maydis*, which is the cause of common corn smut. My project focused on the distribution of endoplasmic reticulum (ER) in the dikaryotic phase of *U. maydis*. The dikaryotic phase is something unique to all fungi, and as a basidiomycete, the dikaryon takes up more than a third of its life cycle. In all other organisms after two cells fuse, karyogamy occurs soon after. But in fungi, this is not the case, and it is a mystery as to why they do it this way. Once two compatible haploid cells mate, a dikaryon is formed. In the dikaryotic stage, there are two separate nuclei within the cell that do not fuse. At this point, the fungus becomes an obligate pathogen that can only live in living tissues of its main host, *Zea mays* (corn). Nuclear fusion occurs much later in the life cycle.

The main question I am researching is whether or not each nucleus within the dikaryon has its own ER. The ER is the organelle involved in the making and modification of proteins. Since there are two separate nuclei in the dikaryon, then perhaps there are two separate networks of ER that would allow for the synthesis of different proteins at different locations within a single infection filament. As a biotrophic pathogen, this might provide the fungus with greater adaptability and compatibility with its plant host. This could explain the mystery of why the fungus maintains a dikaryon instead of having nuclei that fuse right after the cells fuse.

To begin my experiment, I made dikaryotic filaments in lab by mixing equal amounts of two compatible haploid strains on charcoal agar. Twelve hours later, dikaryotic filaments were ready for observation via confocal microscopy. Imaging was done using a GFP-tubulin strain along with ER-Tracker, a vital stain that was taken up by the fungus on the slide. In some images, there do appear to be two separate ER networks, whereas with others, the ER seems to be more interconnected. One problem has been that the fluorescence signal from the two dyes bleeds through from one channel to another. I've now started using a nuclear label instead of GFP-tubulin to help locate nuclei. In addition, now that I have observed the dikaryon in lab, the next step is to observe the dikaryon on its plant host. Although it can be synthesized in vitro, the dikaryon will never develop fully unless within the live plant, where the nuclei mitotically divide. At this point, the process for maintaining its dikaryotic nature becomes more complex. Although it will be technically difficult, I would like to attempt to visualize the organization of the ER in dikaryotic filaments growing within the host plant.



**Jenny Spinner**  
Department of English  
Saint Joseph's University

Ph.D. University of Connecticut

**Research Interests:** Creative Nonfiction,  
History of the Essay, Women Essayists,  
Writing Theory and Pedagogy, Journalism

In my decade-plus that I've been a professor at Saint Joseph's, I've had the privilege of serving on and off as adviser to the Hawk student newspaper, with more years on than off. I've also spent a good number of those years helping to recruit students for the newspaper, making endless pitches in my journalism classes when I recognize potential in students. In the last few years, though, I've had students shrug off the idea of working for the Hawk because they are already involved in Saint Joseph's chapter of HerCampus. Even before I examined HerCampus for myself, I thought of it positively, albeit in the abstract, as healthy competition for the Hawk and yet another opportunity for students to engage in extracurricular writing and editing. (I still feel that way: Competition and experiential learning opportunities are good.) Last November, I was sitting around a table at a hip Mexican restaurant in Salt Lake City, Utah, enjoying a meal with students, who were with me to attend a national writing center conference, when the topic turned to HerCampus. Nicole VanAller was there as well, and whether or not she can trace the beginnings of her Summer Scholars project to this rousing dinner conversation, I pinpoint it as the moment in which I began to seriously consider HerCampus through the eyes of my students who are part of the "global community for college women" that HerCampus purports to serve. The students at the table included some who were HerCampus contributors, some who were ex-contributors, some who found value in it, and some who couldn't stand it (really, not unlike the responses a focus group of Hawk readers might generate). Because HerCampus is a publication written by and for college students who identify as women, though, the students raised important questions about gender identity and audience. Also, because HerCampus bills itself as a publication written by the nation's top college journalists, the students at the table who identified as journalists had much to say about that, too. I sat back and listened to the lively discussion, Nicole's voice strong in its attempt to sort through the responses at the table and frame what would become some of the critical questions of her Summer Scholars project. Months later, working together on her project, Nicole and I were surprised to find so little scholarship—or even just plain thoughtful discussion-- about HerCampus. At some point, I think we both realized that she was charting new territory, engaging in important critical scholarship that had yet to shine its light on a publication that has entrenched itself in more than 300 college campuses around the world, including at Saint Joseph's.

# Defining a “Collegiate Woman:” Responses to Gender Portrayal in Her Campus Magazine

Nicole VanAller, '17

Faculty Mentor: Jennifer Spinner  
Department of English



## Supported by the SJU Summer Scholars Program

Her Campus is an online magazine targeted toward college women. As a gender-non-conforming, radical, and anti-capitalist feminist, that claim of an ability to market to "college women" troubles me immediately. In pursuit of a solution for that troublesome, gut-level feeling, I initially began to look into Her Campus to examine the links between strong gender identity (it's called HER Campus, after all) and a politically-minded feminist attitude.

As an open and mindful person, though, my research exposed me to the fact that, as usual, the seemingly-clear initial prognosis was an oversimplification. Some people, such as myself, take an issue with the website. Others devote their college career to the site. And still others find themselves taking a middle path, disillusioned with what the website promotes but wanting to support the work of fellow women. All of these positions claim to defend the women whom Her Campus desires to reach. Ultimately, I have studied and catalogued the various arguments that surround Her Campus, both in defense of and in opposition towards the platform. As background to my study, I've done research on the history of feminist critiques of women's magazine, such as in the book *Yours in Sisterhood: Ms. Magazine and the Promise of Popular Feminism*, and the book *Backlash* by Susan Faludi. More modern studies, found in online journals, also have contributed to my background knowledge when it comes to female-targeted media today.

To gauge the broader, nationwide conversation around Her Campus, I looked online to see what students at other colleges have said about the magazine. At places like Duke, Holy Cross, Scranton, Harvard (where the initial website was founded), and more, students like myself have taken to their college newspapers or their personal blogs to express discontent regarding the content of Her Campus. At each of these places, responses and arguments to those newspaper pieces were very defensive of the virtues of the magazine. Critics argue that Her Campus articles tend to perpetuate gender roles and stereotypes, while respondents shoot back that those critics should be supportive of other women, instead of insulting their work. It's a vicious circle that only repeats itself in our "post-feminist," individualist era of women's rights, whether the conversation surrounds personal style choices (shaving legs and wearing brassieres) or the wage gap, reproductive rights, and sexual harassment/rape legislation and justice. Almost always, anything accomplished by women is critiqued through a feminist lens; but, at the same time, real change in culture can become closed off, because of a fear of accusing the personal choices made by individual women.

To prove that the pattern exists wherever there are gender-conscious people, I've taken an interest in how these dynamics play out on our own campus. Through interviews with Her Campus writers and ex-writers, I've been able to see the same arguments happen over and over again. At SJU, we're talking about the same things: is Her Campus about "girl power," or is it another vapid fashion magazine that re-creates female degradation through a new media? The fundamental issue behind the controversy surrounding Her Campus is a matter of disconnect. There is a disconnect between the mission of the company, the vision of its college audience and members, and what it is actually accomplishing.

It is very important to continue the conversation about how gender is represented on our campus - on a variety of platforms. I am planning on condensing my research into an article for the Hawk, and on blogging about the issue of gender diversity in media representation. I will also try to bring the topic into my work as part of the Executive Board of the Women's Leadership Initiative at SJU. I am looking forward to the ensuing discussion, as I'm always open to new perspective that may not exactly mirror my own!

More academically, I am excited to submit my project in paper form for presentation at the 2017 Sigma Tau Delta English Honors Society International Annual Conference. The conference will be held in Louisville, KY, at the end of March. Additionally, my research on the media aspect of Her Campus will lead into a sociological study of gender-based movements in college, for my senior year Departmental Honors thesis, and eventually into my graduate school career. I am going to be pursuing a PhD in political sociology after graduation.



**Dr. A. J. Stagliano**  
Department of Accounting  
Saint Joseph's University

Ph.D. University of Illinois

**Research Interests:** Environmental  
Cost Disclosures; Social  
Accountability Reporting;  
Sustainability Accounting

Far from being simply an “in vogue” catch-phrase, *sustainability* has become a major focus for action in the corporate world. Natural resource exhaustion, renewable energy source development, climate change, global warming, workplace threats to health/safety of employees, and accountability, access, and affordability to customers are topics of increasing importance in corporate boardrooms and at annual shareholders’ meetings. There is no longer any doubt that enhancement of lifestyle around the world over the past 50 years has led to the unexpected consequence of a challenge to the continued sustainability of the planet itself. While the fundamental issues involved have been disquieting for decades to social activists, the range of interested parties has broadened recently as a result of legislation and regulation. The deleterious effects of greenhouse gases on the global environment have spilled over into the political and financial areas such that climate change itself has become a regular daily news item.

Environmental threats to our health and attacks on our financial well-being might not seem to be related to disclosures in reports of business firms, but the surprising fact is that they are very much connected. Disclosures made by companies about their firm’s sustainability impact pose a topic worthy of study. This is an area in which empirical investigation will lead to useful outcomes that can inform future public policy decision making.

The Sustainability Accounting Standards Board (SASB), an independent organization supported and governed by a consortium of corporate, non-profit, academic, and former government agency board members, has developed a wide array of measurement methods and reporting guidelines for major sectors in the U.S. economy that cover nearly 100 industries. The SASB’s effort is an attempt to complement regulatory reporting by U.S. and foreign companies as they comply with mandatory filing requirements of the Securities and Exchange Commission. Of interest to both investors and consumers is whether the voluntary disclosure guidelines developed by the SASB are being implemented by large public companies. This is the focus of the current research project that assesses sustainability disclosure postures of firms over the recent ten years.



# Cybercrime Financial Disclosures by SEC Registrants in the U.S. Retail Trade Sector

Christopher McBride, '17

Faculty Mentor: A.J. Stagliano  
Department of Accounting



## Supported by the SJU Summer Scholars Program

In today's world, technology allows for things like instant communication and endless knowledge at our fingertips. Everyone from businesses to consumers are utilizing these technologies. However, these technological advancements, also pave the way for hackers involved in cybercrime.

The first phase of this two-phase project consisted of finding information relating to cybercrime. According to Norton, one of the leading antivirus software companies in the world, cybercrime can take many forms, but can be defined simply as a crime that has some kind of computer or cyber aspect to it. In the past couple years or so, there have been many of these types of incidents that have affected millions of people across the globe. One of the biggest of these recent cybercrimes was the hack of Sony Pictures Entertainment which included personal information of employees, company emails, executive salaries, and even copies of Sony films not yet released. This, along with physical threats, led to Sony pulling their movie "The Interview" from theaters. More recently in 2016, Google and Yahoo were victims of small breaches that, over time, aggregated to a total of over 200 million usernames and passwords. Thankfully for the people who use those services, most of the information was outdated, but the fact that hackers were able to acquire that many records is scary. Many events like these lead to panic from both the companies themselves as well as investors. Because of this, it makes sense to show these crimes as having an impact on the companies' financial statements. Cybercrime is a growing issue in the world and it will not be going away anytime soon. Professional services firm PricewaterhouseCoopers says that cybercrime is the only economic crime to have increased in recent time and also says that only a third of companies have proper response plans to a cyber-attack, even though there are high levels of concern regarding their own security.

The final phase of this project involved looking at the impact of these cybercrimes and why companies want to avoid disclosing these attacks on their financial statements. Below is a graph taken from the Academy of Marketing Studies Journal displaying the percentage change in stock price for companies

Exhibit 5: Effect of Cybercrime News on Stock Price

Company	Date	Percent Change in Company Stock Price				
		-3	-1	Day	+1	+3
Amazon.com Inc	02/10/00	(1.56)	5.33	0.00	(2.30)	(7.22)
ChoicePoint Inc	05/03/05	0.89	0.64	0.00	(1.36)	(1.00)
Citizens Financial Group	11/17/04	0.00	0.00	0.00	0.00	0.00
eBay Inc	02/10/00	4.42	1.00	0.00	(5.54)	(8.55)
First Data Corp	09/12/00	2.51	1.34	0.00	(3.94)	(2.91)
Hibernia Corp	11/17/04	0.72	(0.31)	0.00	(0.52)	(1.13)
JP Morgan Chase Co	06/21/05	0.11	0.03	0.00	0.61	(1.30)
Wachovia Corp	06/01/05	1.11	(1.17)	0.00	(0.19)	(1.36)
Washington Mutual Inc	06/21/05	(1.12)	(0.58)	0.00	(2.43)	(1.80)
Yahoo!	02/10/00	(3.01)	(1.33)	0.00	(6.37)	(9.18)
Avg % Change Stock Price		0.39	0.49	0.00	(2.20)	(3.45)
Avg % Change S&P 500 (match days)		0.21	(0.21)	0.00	(0.44)	(0.82)
Significance (prob.)		0.40	0.14	n.s.	0.01	0.02

*Academy of Marketing Studies Journal, Volume 15, Number 2, 2011*

who experienced a cyber-attack in the early to mid-2000s. All companies listed experienced negative stock price change, with the exception of Citizens Financial Group who, at the time, was a private company. Also, the average percent change in the S&P 500 index when compared to the average percent change in stock price is much different when comparing before and after the cyber-attacks. It is definitely in a company's best interest to avoid displaying this type of information as well as the costs and losses related to cybercrimes in order to continually look good in the eyes of the investing public.

In today's always-connect and fast-paced world, transparency is a necessity for businesses. People require that companies are operating effectively, efficiently, and ethically. The Securities and Exchange Commission should push for an increase in regulation when it comes to disclosing issues of cybercrimes. Forced compliance in regards to disclosure could lead to stricter security standards among companies. These higher standards mean that companies will be more secure, your information will be safer, and, hopefully, companies can reduce the amount and the effect of these cybercrimes.

**Examining the Promulgation of Sustainability Accounting of Registrants in the SEC Pharmaceutical Industry and the Impact of SEC Guidance Regarding Cybercrime on Financial Disclosures of SEC Registrants in the Retail Trade Sector**  
Margaret McGuire, '18



Faculty Mentor: A.J. Stagliano  
Department of Accounting

Supported by the SJU Summer Scholars Program

Today, there is no relationship more vital in the business world than that between the corporation and its stockholders. Because of financialization, corporations are precise and often cautious in their calculations of whether or not business ventures will be profitable for shareholders.

Exactly how clear are corporations in their reports to their shareholders, especially when it comes to issues such as cybercrime and environmental sustainability?

Our first task was rooted in the pharmaceutical industry, specifically those corporations that adhere to the Sustainability Accounting Standards Board's disclosure standards, formally established in 2011. These standards promote transparency between the corporation and the stockholder on non-financial issues of the corporation that would have an effect on the environment, society, or economic performance. We narrowed down the sample corporations by high sales and Form 10-K and 20-F availability, then searched each SEC report and all available Corporate Social Responsibility or Sustainability reports for the mention of the SASB. Four out of ninety-five corporations in our sample mentioned the SASB. These four corporations had total assets amounting to approximately 14.31, 40.3, 64.3, and 133.4 billion U.S. dollars respectively, indicating strong economic performance that even if hindered by mention of sustainability measures, would not be gravely affected. One could theoretically conclude that despite participation in sustainability accounting, corporations rarely disclose this to their stockholders or potential investors. This may be because many investors seek immediate profit which sustainability measures often do not provide.

Financialization is a process that is hindered just as much as it is aided by new technology. Practices are more efficient, profits increase, yet an entire sector of corporations has been left vulnerable: information security. Data, sales, consumer sensitive information, are improperly protected against thieves of today, resulting in billions of dollars in losses. In 2011, the SEC promulgated encouragement to corporations to disclose such data on cybersecurity and breaches in annual reports to increase financial transparency. However, whether this encouragement has appropriately effected institutions' reports at all is what we wish to answer.



**C. Ken Weidner**  
Department of Management  
Saint Joseph's University

Ph.D. University of Illinois at Chicago

**Research Interests:** Social Justice in Organizations; Ethics in Academe, Business and the Professions; Change and Change Agents; Learning and Teaching and the Subjects My Students Are Interested in Exploring for Themselves

The character of a society can be inferred by how its most vulnerable members are treated. This perspective has guided both my teaching and scholarship and service; supervising on this project has reinforced my worldview.

Enya Maher's research addresses the overlapping, reinforcing structures that maintain – or increase – differences between the most privileged and the most vulnerable among us. The “American dream” of a happy and prosperous retirement celebrated and advertised through mass media is at odds with the reality many middle- and low-income “baby boomers” are encountering as they reach retirement age with diminished (if any) savings, and expectations of working much later in life than they imagined.

The economic ground lost by middle income households has been well documented. While middle income Americans have lost real purchasing power over the past several decades, the gaps between the privileged and the disadvantaged have widened even further. But the economically disadvantaged in American society started “behind” the middle class, had less to fall back on (and less to lose), and have disproportionately been affected by economic dislocations.

What this means for the elderly of today and the near future is that lifelong patterns of discrimination on the basis of race, class, and gender are further intensified during one's retirement years. These structural disadvantages are intensified as one advances in years, as elderly Americans from disadvantaged backgrounds are vulnerable to more even greater levels discrimination in employment, housing, and healthcare than during their working years.

Enya's research examines the vulnerability of the elderly and the pressures they face, which are compounded by diminishing resources and a cloak of invisibility in our society that hides age, the aging process, and the elderly themselves. In today's culture that celebrates youth and vibrancy, we do too little to affirm, celebrate, and revere our elderly. In a society facing multiple forms of social injustice, we do too little to perpetuate inequality. To improve the quality of life for the later years of coming generations, we can no longer continue to do too little.

## Exploring Elder Economics

Enya Maher, '18

Faculty Mentor: C. Ken Weidner

Department of Management

Supported by the SJU Summer Scholars Program



Getting older isn't easy for anyone; everyone faces some difficulties as they approach the age of retirement. Age in America often isn't seen as a victory, as it is in other cultures, but rather a burden. Unfortunately, elder life is a cultural and structural afterthought to many in our society, a society that celebrates youth and actively marginalizes advancing age. However, because of preexisting structural and systematic issues some people have to overcome more – and greater – challenges than others as they advance in age. These challenges are not unidimensional, but instead are *intersectional*, that is, gender, race, class, and other factors can combine to complicate the already challenging process of aging. Given this intersectionality, it is very difficult to isolate the effects of any one of these factors on elder life.

The variables of intersectionality begin at birth as unearned privilege, and continue into old age. Privilege can be thought of as having different starting points in the race of life. If people born into circumstances of privilege have a head start in the race, others are met by cultural and structural inequities that form a cumulative disadvantage – making it much less likely that people who begin life without privilege to catch up. As people get older, gaps between the privileged and the disadvantaged widen rather than narrow. These issues have existed for generations and continue to exist today. Disparities during working years appear to be magnified during retirement years. Differences that disadvantage the most vulnerable during early life can create even greater discrimination against elders in employment, housing, and healthcare, among others.

The baby boomer generation (roughly, born 1946-1964) is the largest in American history to reach retirement; the size of the boomers' generation creates different issues on systems to support the elder life. The shared historical events and developments unique to baby boomers mean that they will likely approach the challenges of aging differently than previous generations. Baby boomers grew up in a time of great social change and also of increasing economic inequality. Baby boomers have proven to be a socially more inclusive generation, which could perhaps make them more accepting of help.

The four main themes of social justice I focused on regarding baby boomers getting older are physical health, mental health, financial resources, and maintaining a social network. These issues can't be looked through one simple lens, but rather through the eyes of intersectional issues that affect their accesses to resources that can help deal with these problems.

Baby boomers have proven to be a very resilient generation, and some are already facing issues with the vulnerability that comes with getting old. Part of how these issues are dealt with will rely on boomers' proactivity in looking and advocating for help, and part will also come from the younger generation in being active still in the social network of these older people, but also active in the political realm, advocating for the older generation.



**William I. Wolff**  
Department of Communication Studies  
Saint Joseph's University

Ph.D. University of Texas at Austin

**Research Interests:** Social Media  
Communications and Research Methods,  
Fandom, Digital Pedagogy

I have developed a scholarly agenda that attempts to answer the questions: How are new media technologies changing what it means to communicate? What are the implications of those changes for communications-related fields? And how can we better prepare our students to be writers for a future with a constantly changing understanding of what it means to communicate? The value of the questions that guide my work is that they provide me with the opportunity to build on my findings, observations, and suggestions over time and as new media technologies continue to evolve.

Most recently my work has centered on Twitter, and in particular how fans are using Twitter to communicate. My interest in how fans are composing emerges from Kathleen Blake Yancey's (2004) call to better understand how and why people are writing outside of the classroom—especially in the age of Web 2.0. As Yancey writes, “no one is making anyone do any of this writing.” No one is making anyone tweet, yet millions are tweeting every day. During the course of the study, I have employed netnographic participant observation, archived over 2.5 million Springsteen-related tweets, ran an online survey of Springsteen fans, and conducted grounded theory analyses of concert-related tweets. I discuss the results of two grounded theory analyses in articles appearing in 2015 in *Kairos: A Journal of Rhetoric, Technology, and Pedagogy* and *Transformative Works and Cultures*. The data reveal a complex system of texts, technologies, and human actions organized in response to media events. Rather than discussing a corpus as a whole, the results make clear the importance of considering and discussing each tweet individually. Each individual tweet—each individual composition—reifies one or more fan community practice or discourse. New media writing technologies in the hands of fans afford the transformation of a single concert into a collaboratively composed transmedia story situated within individual fan and Springsteen concert histories.

The next stage of my research will focus on two areas. First, I am interested in exploring in more detail the ethics of archiving social media. Second, I'd like to see how communities dedicated to social change are using social media to enact that change. Then, I'd like to translate my findings into practical suggestions that non-profits and other communities can use to enhance their social media communications.

# Social Justice and Social Media: The Use of the Hashtag #climatechange on Twitter

Elizabeth Krotulis, '17



Faculty Mentor: William I. Wolff  
Department of Communication Studies

## Supported by the SJU Summer Scholars Program

Communities surrounding social justice issues are using hashtags on Twitter to advocate for causes, spread the word about injustice, and organize as well as mobilize particular missions. Such has happened recently with the #blacklivesmatter hashtag, which has evolved from a response to anti-black racism to a social object solidifying an organized interventionist movement.

The focus of this project was to learn about why and how the social justice hashtag #climatechange is used on Twitter. Theories explaining such were drawn from the collected data. Data collection began with research on environmentalist movements online, particularly via social media, and active engagement with the community of users including #climatechange in their tweets. Following everyday people, major advocates, and environmental organizations provided the chance to observe common patterns in tweets about #climatechange as well as interact with such users by tweeting the hashtag in a similar fashion. Liking, retweeting, and replying to their tweets about climate change was done often to participate with the community.

An archive was then created to capture all tweets including #climatechange. From the archive, a sample of 250 tweets were taken for open coding, an analysis conducted by broad categories of definitions to categorize what a tweet includes, from media other than text to hashtags other than #climatechange. From these 250 tweets, 152 were retweets. Such a significant number of retweets (over 60%) led to defining them more specifically through axial coding. Of the 152 retweets, 100 were coded further to understand the purposes of the retweets.

Theories on how and why the community uses #climatechange were grounded in the data and emerged themselves. Through retweets, the community using the #climatechange hashtag strengthen outreach efforts among those involved and not involved in climate change efforts to make change by creating awareness, civically engaging, and empowering and giving voice to those users while branding the climate change cause in an attractive manner. The hashtag is also used to achieve specific policy goals in the climate change movement by advocating, collectively acting, and politically mobilizing on social media. Finally, the use of #climatechange aims to influence or change media practices in favor of the movement by democratizing media and communicating. However, communicating, while consisting of mentioning other Twitter users in the context of climate change, rarely includes basic back-and-forth replying that creates direct conversation between users.

It cannot be judged from the data whether or not offline action is spurred by the activity within the use of #climatechange on Twitter. Climate change advocacy through the hashtag on Twitter also lacks narrating and telling of stories about offline activity in support of action on climate change, typically a persuasive method of attracting people to join a social justice cause. However, the frequency of retweets to engage others and influence change over media on an everyday basis shows community members using #climatechange to support a cause they are interested in, whether to liberate themselves or others.



**Natalie Wood**  
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Ph.D. Auburn University

**Research Interests:** Social Media,  
Consumer Behavior, Advertising, Politics

Digital media plays a pivotal omnipresent role in our daily lives: it influences how we learn, how we work, how we live and who we are. In the pre-internet era, it was the marketer who held the majority of the power dictating what we did and how we did it. Companies decided what to produce, when and where to release it, how consumers would purchase and the appropriate way to consume. With the explosive growth of technology, the balance of power slowly shifted. Today the consumer sits in the driver's seat dictating what they want, how, when and where they want it. They wield this power through a small, powerful device that sits nicely in the palm of their hand. When they have a question, a complaint or a compliment, they turn to this device and share it potential millions of other consumers on social media. If a company cannot give them what they want, they discount them with a swipe of their finger or the click of a button.

My research examines how consumers use social media in everyday life to research products and services, to make purchase decisions, to socialize, to communicate and to craft their identity. It also examines how organizations can use social media and other forms of new media to reach their target market. As many organizations now realize the tried and true methods of marketing communications of yesteryear, don't work quite as well today. Consumers are replacing television with YouTube, the newspaper with Twitter, and the opinions of the knowledgeable sales associate with Facebook friends and online communities. Even the company web page is quickly being replaced with mobile apps, LinkedIn profiles, and blogs. For a company to succeed today, they need to embrace the power of social media, to make it part of who they are and what they do.

# Marketing Strategies for University Writing Centers

Theresa Bender, '17



Faculty Mentor: Natalie Wood  
Department of Marketing

Supported by the SJU Summer Scholars Program

In the spring of 2015, Saint Joseph's University's writing center formed a marketing team designed to further both student and faculty awareness of the center. We aimed to increase familiarity through targeted marketing initiatives and implemented strategies to that end. We discussed these initial efforts in a panel presentation in Salt Lake City at the 2015 National Conference on Peer Tutoring in Writing. The dialogue we took part in at this panel inspired further thought on how marketing fits into university writing centers. Despite our initial work, it was clear there was still room to improve the writing center's marketing to students. Consequently, researching marketing in writing centers became necessary in order to expand marketing capabilities to continue to best target the Saint Joseph's community.

In this research project, I strove to answer the two main questions that arose from the initial study conducted by the marketing team: what is involved in creating an effective marketing campaign for a university writing center and how can Saint Joseph's writing center more successfully market itself. I compiled information on the marketing techniques used by writing centers across the country and prepared a report that outlines findings and makes recommendations customized to our writing center's needs.

My research began with a study of articles written on marketing writing centers and an analysis of numerous writing centers' websites. I used the results of this investigation to craft a survey that inquired about marketing techniques such as writing workshops, partnerships with on-campus and community groups, and promotional activities geared towards attracting students to the center and sent this survey to the directors of 98 writing center. 21 schools completed the survey and 9 participated in a follow-up phone call to discuss their answers in greater depth. The results of this research indicate that our marketing team has excelled in certain areas such as maintaining an active Twitter presence and offering informational presentations about the writing center's offerings in classes and at university events such as orientation; however, marketing in the writing center still has room to grow. Initiatives that we can improve are strengthening relationships with faculty by producing writing workshops that can be offered in-class by teacher request, forming a writing center blog, restructuring the marketing team, and incorporating additional social media platforms like YouTube or Snapchat.

I will share the final results of this research with all research participants and my findings will be implemented in the writing center during the 2016 fall semester. Additionally, I will present this research in Tacoma, Washington at the 2016 National Conference on Peer Tutoring in Writing.



**Brian J. Yates**  
Department of History  
Saint Joseph's University

Ph.D. University of Illinois

**Research Interests:** Modern Ethiopian History, Black Identities, State Construction

Identity is life. It shapes how we understand reality, how we experience the world and how it understands us. It can be utilized to correct social evils or to create them. In my life and research, I have



*Emperor Menilek II and Empress T'aytu  
in early 20th century*

always been interested in the ways in which identities are constructed by society. Specifically, I am interested in the formations of identities among groups of African descent. Having Black American and Cape Verdean (Cape Verde - a nation of 10 islands off the coast of Senegal) descent, I learned that people who look similar and are classified in the same group can be very different. I am interested in the ways in which, diet, religion, historical legacy and circumstance, class, migration, language, profession, affiliations, family and age affect the fluid process of identity construction. In my research, I investigate the historical significance of cultural practices that either integrate some segments of society or separate others.

My research in Ethiopia centers on the Oromo populations in the central provinces of Wällo and Shäwa. However, they have not been a subject of scholarly focus as essential actors in the making of Christian Amharic speaking modern Ethiopia. This is due to their Oromo descent and formerly Islamic or Oromo traditional religious practices. My work focuses on two elements of this phenomenon. One, the changes in these Northern Oromo groups when they entered the Ethiopian community, and, two, the shifts in the identity of the Ethiopian state when these groups became a part of it.

In addition to Ethiopia, black identities in America have also been vastly under studied. This topic is especially timely due to recent developments. African immigration to the United States of America has doubled since 1990 to over one million, the various identity debates that occurred during the campaign of Barack Obama and the growing acknowledgement of the diversity of black communities in America. The conception of white ethnic identities has been at the forefront of much of the discourse on white identity, urbanization and immigration; however, the same cannot be said of black ethnic identities, which continues to be presented by scholars and laypeople alike as homogenous, racial and non-ethnic



*John Hope, the first black  
president of Morehouse  
College*

# **How “Blackness” is Lived: An Exploration of Cultural and Economic Experiences Between African Immigrants, African Americans, and Black Americans**

Eric Adjei-Danquah, ‘17



**Faculty Mentor:** Brian J. Yates  
Department of History

## **Supported by the SJU Summer Scholars Program**

Black-American cultures are exceptionally unique, comprised of a combination of traditions and values from different eras in the history of Africa and the United States—from 17<sup>th</sup> century slavery to today’s modern times. It is a dynamic culture hallmarked by intersectionality with African ideals, and it exists as an entity tangibly separate from the larger, Anglo Euro-centric “American” culture. During the advent of the later 20<sup>th</sup> century, an influx of African immigration created a steadily increasing population of Africans in the United States which viewed their culture as one entirely different from that of Black-Americans who had slave ancestors, were born and raised in the United States, and had very little or no connection to Africa. Moreover, the descendants of African immigrants arriving before the great 20<sup>th</sup> century influx have differing opinions on what they identify as their culture due to varying levels of connections with the continent of Africa and recent immigrant arrivals. Despite sharing a continent of origin and multiple aspects of culture, there exists a cultural dissonance amongst these groups. In this paradigm, an African is not Black American, an African American may or may not be Black or African, and Black Americans are only Black Americans due to differing perceptions of culture and individual lived experiences. To some that do not have black skin, they are all Black. Amongst themselves, subtleties exist which influence everyday life.

Recent data from the Pew Research Center, United States Census Bureau, and American Community Service indicate that foreign born blacks have significantly higher median incomes than U.S. born blacks. Trends show that Black South Americans have the highest median incomes, with Caribbean and African immigrants tied for second. Data also shows that African immigrants have the highest poverty rate in the country, second by a small margin only to Black Americans. Interestingly, Data from the same sources show that African immigrants hold degrees at higher rates than the majority of other immigrant groups eand the country and also have the highest rates of advanced education among any black immigrant sub-group and U.S. born blacks. African immigrants also have the highest rates of English proficiency than any other immigrant group. Although African immigrants have the highest English proficiency rates and attain degrees at higher rates than the vast majority of other immigrant groups, their outcomes in life do not reflect this. The goal and purpose of this project is to explore the idea of socially perceived philosophical or value system differences within black communities based on country of origin and self-identity through first-hand interviews and diaspora literature to account for the vast differences in socio-economic success. Ultimately, I am seeking to determine if the socio-economic outcomes and trends of people considered Black or African immigrants reflect their individual and ethnic cultures, identities, philosophies, and values.

