SJU Saint Joseph's University

Summer Scholars Program

Summer 2015

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Welcome to the 16th Annual Summer Scholars Dinner at Saint Joseph's University. We are very pleased to have the opportunity to bring together so many different people, friends of SJU and representatives of area businesses and corporations, SJU administrators, faculty, staff, and the Summer Scholars students. This book contains brief descriptions of some of the many ongoing projects involving students here at Saint Joseph's. We hope that you will take a few minutes to talk with some of the students and let them tell you something about their work.

This year marks the eleventh in which the Summer Scholars Program has been open to students and faculty in all areas of the university. We are very pleased that students engaged in creative scholarly work and independent research projects with faculty mentors from 23 different academic departments and programs. We especially wish to thank the faculty mentors who have so generously given of their time, talent and abilities to work with these scholars of tomorrow. Their generosity makes this program possible.

Thank you for taking the time to join us as we recognize the work of these young men and women. We would also like to thank the many people, funding agencies, and corporations whose support continues to make student research and creative scholarly activity at SJU a reality.

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	Rosalind Reichard, Ph.D. Professor of Mathematics Interim Provost, Saint Joseph's University

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Paul J. Angiolillo
Department of Physics
Saint Joseph's University

Ph.D. The University of Pennsylvania

Research Interests: Organic Conductors and Semiconductors, Materials Physics

The 21st century, in all probability, will witness a revolution in the electronics industry. Since the end of World War II, doped silicon has been the material, which virtually every electronic device is predicated. The "size" of transistors has shrunk from centimeters in 1948 to approximately 50 nm in 2012. This decreasing trend in the size of the fundamental features of electronic devices based on silicon technology cannot be sustained due to a number of quantum phenomena, which dominate the physics at nanometer length scales. The past 20 years has seen the establishment of a new area of discovery research and promising technology - that of nanoscale molecular electronics that exploit □-conjugated organic materials. Much of this development has been spurred by attempts to mimic or model the highly efficient electron and energy transfer processes typified in green plants and photosynthetic organisms.

This lab has historically used electron paramagnetic resonance (EPR) spectroscopy to probe both charged states (polarons) and neutral excited triplet states in a unique class of organic semiconducting materials. Recently, however, the lab has been utilizing EPR spectroscopy to study radiation-induced radicals in biogenic calcite from several species of extinct cephalopods. These radical systems have been found to be useful in dating the fossilized material. These spin systems may be used to further glean a more fundamental understanding of the dynamics (rotation and vibration) of polyatomic ions in crystal lattice sites.

In past years, the lab has been also looking at the fundamental physics of friction. Despite the common nature of friction, it remains largely unexplained especially the transition from static to kinetic friction and the evolution of stick-slip motion. It appears that the dynamics of systems exhibiting stick-slip frictional motion span many length scales, from the movement of nanometer-scale surfaces to the movement of the Earth's tectonic plates. We have developed a mesoscopic model system employing the commonplace hook-and-loop (Velcro) fastening system. When placed in shear, Velcro exhibits many of the hallmarks of stick-slip motion seen in other systems and, moreover, is accompanied by acoustic bursts that are related to the slip events. Over the past year, we have explored how the Velcro model system behaves with respect to the classical Amontons-Coulomb laws and have discovered stark contrasts with the accepted classical laws.

Probing Internal Reorganization Energies of Doped-Conjugated Porphyrin Arrays

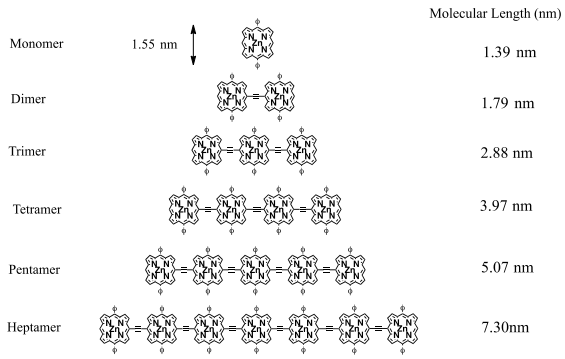
Isabella Goodenough, ‘16

Faculty Mentor: Paul J. Angiolillo
Department of Physics

Supported by the John P. McNulty Scholars Program

Organic π-conjugated semiconductors have attracted much attention as alternatives to traditional silicon-based electronic materials, and have achieved, in some instances, commercial success in photovoltaic, field-effect transistor and light-emitting diode devices. The next generation of organic micro- and nanoelectronics may also exploit the manipulation of the quantum electron spin as well as the electron charge,[1] and this field of study is known as spintronics, or *spin transport electronics*.

Recently, there has been enormous interest in organic molecules as the backbone for spin devices. Unlike in traditional inorganic semiconductors, where electrons and holes reside in bands, in organic π-conjugated semiconductors, charges, although delocalized over rigid sp^2 molecular frameworks, are still subject to charge-lattice (charge-phonon) interactions. This coupling to the nuclear framework (lattice) forms polarons, which are quasiparticles thought of as charges dressed in quantized molecular rearrangements (lattice vibrations or phonons). These polaronic forms are self-localizing if the molecular rearrangements are energetically unfavorable for charge movement. The charge-phonon coupling is related to the internal reorganization energy λ_i following theory originally developed by Marcus to explain redox reactions (charge transfer) in inorganic complexes.



One class of conjugated materials that displays exceptional transport properties as evinced by single molecule break junction conductance measurements is *meso*-to-*meso* ethyne-bridged (porphinato)zinc(II) oligomers (**PZn_n**, **Figure 1**); indeed, variable-temperature solution-phase X-band ESR spectroscopic studies of p-doped **PZn_n** showed that **$[PZn_n]^+$** □ structures define the longest hole polarons yet measured for a conjugated material (~7.5 nm). While this previous finding established exceptional hole-transport capabilities for **PZn_n** and closely related materials, a recent study regarding the anion radical states (electron polarons) of such species has also shown globally delocalized charged starts. In order to accommodate charges over such a large molecular framework, low internal reorganization energies are required and the inverse relationship between the number of π-conjugated atoms over which a polaron is delocalized and the associated λ_i connects polaron dimension directly with thermal barriers to hopping transport.[2]

This project aims to examine the internal reorganization energies of the charged states (electron and hole polarons) in these π-conjugated porphyrin arrays [PZn_1— PZn_7]. Using *Gaussian 09*’s time dependent density functional theory calculations, internal reorganization energies will be computed along with ground state to first excited state transitions, the latter of which can be compared directly to experimental data. Such calculations will be assessed to see if there is a trend of decreasing reorganization energy with molecular dimension. These computations are time consuming and dependent on functional basis sets. Prior to performing these calculations, time has been spent on learning contemporary molecular orbital theory and group theory as it pertains to understanding the molecular spectroscopy of these complex systems.

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[1] Sarma, Sankar Das. "Spintronics." *American Scientist* 89.6 (2001): 516.

[2] Bässler H, Köhler A. Charge Transport in Organic Semiconductors. In: Metzger RM (ed). *Unimolecular and supramolecular Electronics I,* vol. 312. Springer Berlin Heidelberg, 2012, pp 1-65

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.

My laboratory has also worked on designing, optimizing and testing an affordable slow sand filter for people who do not have access to clean water. The project, initiated by the Institute of Catholic Bioethics at SJU, is in its fourth year. My students evaluated the effectiveness of bacterial removal of the filter, finding that it can consistently reduce more than 98% of the bacterial content in contaminated water. We are now investigating the limitations of the filter, so that we can provide the user with clear instructions for its safe use, For example, the user should know how frequently to clean the filter, and when should the filter be replaced.

The Investigation of the Operational Parameters of a Household-scale Slow Sand Filter

Nicholas Abate, ‘16
Alexa Semon, ‘16

Faculty Mentor: Catalina Arango
Department of Biology

Supported by the SJU Summer Scholars Program

Water quality is a major public health concern; clean, drinkable water is not accessible to an estimated 783 million people throughout the world. Slow sand filters have been implemented to combat this problem because they are relatively inexpensive, are easily maintained, do not require chemicals, and are very effective in removing microorganisms from the water source. A slow sand filter functions by utilizing a biological layer, which forms at the top of the bed of sand and effectively aids in the attachment of microorganisms to the sand and ultimately the removal of microorganisms that are present in the water. Over time the biolayer can become overgrown, resulting in an ineffective filter, therefore it must be periodically removed to prevent clogging and bacterial break-through.

The objective of our research is to define the operational parameters of the filter in order to design a user-manual for filter implementation. This is done by determining how much water needs to be filtered in order to develop a biolayer and how much water can be filtered before the biolayer reaches over-maturation. An efficient slow sand filter has a removal efficiency ranging between 80-99%; once the removal efficiency falls below 80% the water is no longer safe to drink. Our filter has consistently achieved a removal efficiency above 85% for 18 months.

Over the course of this summer, we have noticed a decrease in the water filter’s performance (Fig 1). We attribute this to an over-matured biolayer. This data helped to confirm the amount of water that needs to be passed through the filter before the water is no longer safe to drink. Currently we are continuing work with this filter and monitoring other parameters such as effluent turbidity and flow rate. We expect both of these parameters to increase as the biolayer becomes more mature and removal efficiency continues to decrease.

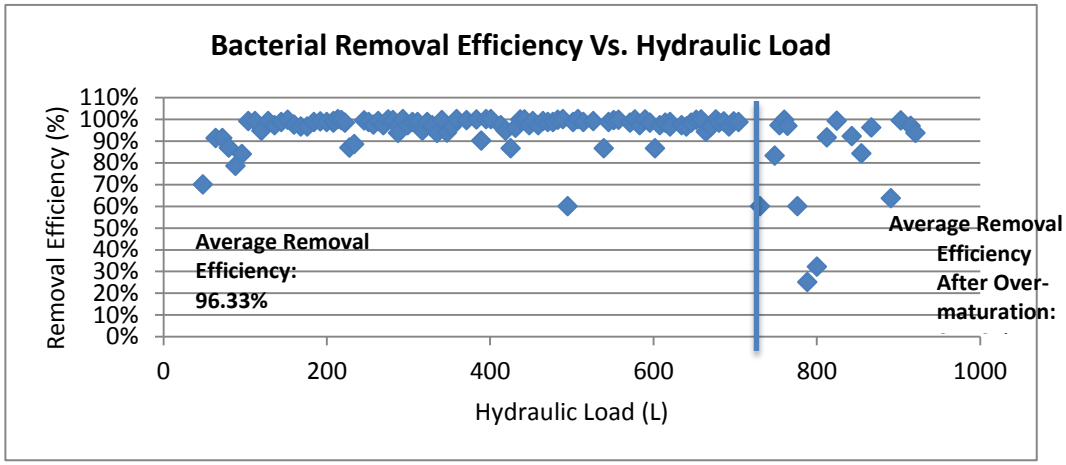


Figure 1: The average removal efficiency was 96.33% for the first 720L of water filtered, after that the average removal efficiency dropped to 87.42%.

Investigating the Role of the AgpT Protein as an Activator of the *melA-agp* Operon in *Sinorhizobium meliloti*

Christina Mirarchi, '16

Faculty Mentor: Catalina Arango
Department of Biology

Supported by the John P. McNulty Fellows Program, the GeoKids LINKS Undergraduate Fellowship and the Dietrich W. Botstiber Foundation

Sinorhizobium meliloti is a gram-negative bacterium that selectively uses different carbon sources and exhibits Succinate-Mediated Catabolite Repression (SMCR). When succinate (primary carbon source) is present in the environment along with raffinose (secondary carbon source), succinate will be transported and metabolized first while the genes needed for the use of raffinose are repressed. Many bacteria, including *E. coli* and *B. subtilis*, exhibit glucose mediated catabolite repression, which is controlled through a global transcriptional regulator and proteins in the phosphotransferase system (PTS). *Sinorhizobium meliloti* has an incomplete PTS that has been shown to be involved in SMCR regulation, but the mechanism is not well understood.

The *melA-agp* operon in *Sinorhizobium meliloti* codes for proteins needed for the use of α-galactosides, such as raffinose, and will be used as a model SMCR-controlled operon. This operon is induced by the presence of raffinose and other α-galactosides, and repressed by the presence of succinate. The protein AgpT is a known local activator of the *melA-agp* operon. However, it is not known where this protein binds on the promoter region or if its inducing activity is affected by SMCR.

The objective of this research project is to confirm that AgpT binds to the promoter region of the *melA-agp* operon and to find the binding sequence. An electrophoretic gel shift assay helps determine whether or not AgpT binds to a DNA sequence. In this assay, protein extracts from the wild type *S. meliloti* and from a mutant strain of *S. meliloti* with a nonfunctional AgpT will be incubated with radioactively-labeled wild type and mutated promoter DNA. The products will be subjected to polyacrylamide gel electrophoresis (PAGE) and electrophoretic gel shift assay (EMSA). If AgpT binds to that sequence of the promoter region, a complex will form with the DNA and AgpT. This complex will move in the gel at a different rate than DNA alone, so a "shift" in the DNA band will be observed. In preparation for this assay, this summer I performed protein extractions on wild type and the mutant strains of *S. meliloti*, as well as on a strain of *E. coli* that overexpresses the AgpT protein. I made continuous and discontinuous polyacrylamide gels, performed Bradford Protein Assays and have learned the necessary techniques to perform the gel shift assay. The gel shift assay will be performed during the school year as part of my senior thesis.

Additionally, to obtain more specific information on the region where AgpT binds, we are using collection of constructs that contain single-nucleotide mutations in the promoter. In this collection, the promoter has been fused to a gene coding for Green Fluorescent Protein (GFP), which allows us to quantitatively measure expression. GFP expression in indicative of *melA-agp*. This summer, I screened the mutant collection for the expression of GFP, and identified several mutants of interest. These mutants will be sequenced and the results will help guide the design of additional gel-shift assays.

Paul F. Aspan
Department of Theology &
Religious Studies
Associate Provost for Academic and
Faculty Support
Saint Joseph's University

Ph. D. Vanderbilt University

Research Interests: New Testament; Religion and Violence; Religion in Literature and Film; Pedagogy

I had just finished teaching a section of my New Testament Introduction when, as I was walking across campus on a beautiful September morning, I encountered a student I had taught the previous spring who asked me if I had heard that a small plane had crashed into one of the World Trade Center towers. I found a television and wheeled it into the Theology Department office. With my colleagues, as well as millions around the world, I watched with horror as the day went on. At that time, we did not offer any formal courses in the study of religious violence, and thus a new research area was born for me.

All of my research interests coalesce around the issues of rhetoric, memory and identity. Just as my early research focused on how the rhetoric of St Paul created particular faith communities, and gave these a particular self-understanding in the ancient world, this "age of sacred terror" in which we currently live thrives on the use and abuse of language in ways that obscures the main streams of religious traditions, but instead creates backwaters that become cesspools of hatred, exclusion, and murder in the name of perverse interpretations of larger truths.

Christopher Diehl's Summer Scholar project grew out of his participation in the class I created, "Religion, Violence and Terrorism." Our class was meeting on April 15, 2013, Patriots' Day, which always sees the running of the Boston Marathon, when students' phones started to hum. Six members of the class had relatives or friends attending the Marathon, including Chris Diehl. As a Boston native, Mr. Diehl was drawn to further investigate this attack on his hometown, and the event that is deeply ingrained in its identity. He is exploring what could make someone who appeared to be, "just another American kid," into a "jihadi" who tragically altered the lives of hundreds, as well as his own, by his attack on the Marathon with his (now deceased) brother. As is always the case in the study of religion, we have found answers, but more questions, because identity is itself in part always a product of mystery, as well of social, historical and psychological factors.

Just an American Kid: From Teenager to Jihadi

Chris Diehl, ‘16

Faculty Mentor: Paul F. Aspan
Department of Theology & Religious Studies

Supported by the SJU Summer Scholars Program

On April 15th, 2013, Dzhokar and Tamerlan Tsarnaev placed two backpacks down at the end of the Boston Marathon. At approximately 2:49 pm, the first bomb went off. Twelve seconds later, the other bomb went off. Four individuals were killed in the explosions and aftermath and hundreds more were left broken, scared, and disabled. In certain ways, April 15th, 2013 forever changed me as an individual and an academic. I found myself disgusted with the actions and heartbroken for the families that suffered, but I never was angry.

Ironically enough, I was leaving my “Religion, Violence and Terrorism” course with Dr. Aspan when the bombs went off. In that course, we talked about how many of the individuals that participate in violent or terrorist acts find that they are completely just in their actions regardless of the suffering or pain they might cause. Taking this and my experience as a Bostonian that has always participated in Patriot’s Day and cheered on many friends and family members that ran the marathon, I wanted to know what kind of logic the two brothers had in attacking the city they had lived in for well over ten years. What it boiled down to was the fact that the two of them had embraced a new identity that stemmed from a form of extreme Islam. This led to the formation of this project.

This project seeks to provide a personal narrative of my experience with the Boston Marathon and the bombings that took place on April 15th. It will also include the experiences of other individuals who have been involved with the marathon in many different ways. The goal of this project is not to attack or defend the Tsarnaevs nor is it’s goal to recant the experiences of those who were present when the bombs were detonated. The goal of this project is to focus on identity and what it means to belong and be a part of something. It will include research and background on the Tsarnaevs and how this new identity became a part of their life. It will include my own personal experience with my identity of a Bostonian and a member of the Boston Marathon. It will include reactions of other’s who felt that their identity was attacked during that day and what being a part of the Marathon means to them. Finally, it will include the role of identity today in this world and how it goes far beyond two young men with backwards hats and pressure cooker bombs.

Elizabeth Ann Becker
Department of Psychology
Saint Joseph's University

Ph.D. University of Wisconsin

Research Interests:
Neural Mechanism of Behavior
Transmission of Parental Care
Epigenetics

My primary interest as a behavioral neuroendocrinologist, is the neural mechanisms underlying the transmission of animal 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 the development of a range of 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.

Summer Research Highlights. This was an extraordinary summer for the Becker Lab. Two graduate students and three undergraduate researchers worked tirelessly on a range of projects in the laboratory. Amanda Leithead, Jamie Palmer and Kieran Slattery were awarded Summer Scholars appointments this year. Amanda is examining the consequences of paternal care on future parenting behavior in offspring. Jamie is testing whether endogenous chemicals, hormones, influence the care offspring receive from parents. Kieran is studying the resultant parental attentiveness following a variable number of territorial intrusions to test the theory that parental care communicates the nature of the environment to offspring. Each of these fantastic students have been engaged with study design, protocol writing and behavioral testing within the lab. In additional to their independent projects, they are working with graduate student researchers on their thesis research. Working with these truly bright and dedicated students was both rewarding and a pleasure.

Transmission of Parental Behavior from Father to Daughter in the California Mouse

Amanda Leithead, '17

Faculty Mentor: Elizabeth A. Becker
Department of Psychology

Supported by the SJU Barbelin Scholars Program

Early development in mammalian species is dependent upon a multitude of environmental conditions which shape the biological, cognitive, and social growth of offspring. One such critical environmental influence is parental care. The degree of parental behavior experienced by offspring can have critical short and long-term consequences on an offspring's neural and behavioral development. The California mouse (Peromyscus californicus) is a model species for testing the effects of parental care on offspring development due to its monogamous and biparental nature. In this particular species, males provide high levels of paternal care through grooming, huddling, and retrieving offspring. Previous research demonstrates that high quantities of paternal care, as evidenced through frequent retrieval behavior, lead to surges in the hormone testosterone and increased paternal behavior in adult male offspring. Similar increases in testosterone have also been observed in female offspring exposed to high levels of paternal care. However, it remains unclear whether female offspring will demonstrate increased maternal behavior if exposed to high degrees of paternal care throughout development.

This summer I have begun work examining the relationship between paternal care and subsequent maternal behavior demonstrated by offspring. In the first phase of testing, I manipulated paternal care such that one group of randomly selected female offspring received high levels of care and the other group received low levels of care. When these female pups reach maturation, they will be paired with a mate and allowed to reproduce. I will then measure the degree of maternal care which they provide their young. Based on previous research, it is my expectation that there will be a positive relationship between paternal care and maternal behavior such that high levels of care experienced throughout development will lead to high levels of care demonstrated by the mature offspring. For future study, I will collect the brains of these mothers to further examine the neural and hormonal mechanisms underlying the transmission of parental care between fathers and daughters.

Effects of Testosterone Levels in Pups on Frequency of Fathers to Retrieve

Jamie Palmer, '17

Faculty Mentor: Elizabeth A. Becker
Department of Psychology

Supported by the SJU Summer Scholars Program

Early-life parent-offspring interactions play an important role in offspring development. In the territorial California mouse, both the mother and father give high levels of care toward their pups. This makes them an excellent model for studying the development of future aggression and parental behavior.

California mice exhibit a range of parental behaviors, but the one that researchers have keyed in on is retrieval. This is when a parent grabs onto the scruff of the pup with its mouth and picks it up off of the ground to return it to the nest. Retrieval behavior, when demonstrated by fathers, has been shown to have an effect on both male and female offspring. Pups that were retrieved at high levels showed high levels of testosterone (T) and aggression, whereas pups retrieved at lower levels had relatively lower levels of both. Since it is known that T and aggression are associated, it is likely that the increase seen in T when male pups are retrieved by their fathers is the source of their increased adulthood aggression.

Although there is strong experimental evidence to support the theory that fathers play a salient role in offspring development, we cannot ignore the possibility that pups, with a unique hormonal signature, may elicit behavior from their fathers.

To address this question, the goal of my study was to examine how experimentally manipulating T levels in pups might influence retrieval behavior by fathers. Briefly, we randomly assigned male and female offspring to one of three conditions: T injection, vehicle control, or handling control. Paternal behavior was observed for 20 minutes, 45 minutes following the manipulation.

I am currently collecting behavioral data and will work on analyses this fall.

The Link Between Aggression and Paternal Care

Kieran Slattery, '17

Faculty Mentor: Elizabeth A. Becker
Department of Psychology

Supported by the SJU Summer Scholars Program

Early social interactions with parents can affect many facets of an individual's development. The level of care provided by parents has important implications on an offspring's development of brain and behavior. Studies illustrating the powerful influence of parental care on offspring behavior focus primarily on mothers given that paternal care is observed in relatively few mammalian species. Similar to maternal care, paternal care is important in the development of species-specific behaviors.

Recently, researchers have suggested that parental care may signal important information to the offspring about the environment in which it is reared. Accordingly, pups reared in a particular environment are more successful on cognitive tasks in a similar than dissimilar environment. Few studies have explored the consequences of the environment on parental behavior and to our knowledge, none have linked the social environment with future parenting behavior.

The California mouse (*Peromyscus californicus)* is a species that exhibits high levels of parental care for its offspring and high levels of territorial aggression. In this species, parental behavior is illustrated best by retrievals, a behavior where the parent grabs its pup by the scruff of the neck and returns it to the nest. Research indicates that retrievals are influential on offspring development of brain and behavior since pups that are retrieved early in development have increased testosterone expression as well as retrieve their own pups at higher rates when they are parents. This suggests a link between testosterone and paternal care. Testosterone also facilitates aggression in the California mouse, and research suggests that paternal retrievals, in this species, facilitate the non-genomic transmission of aggression to offspring. We posit that the retrieval behavior may be a mechanism to communicate relative threat within an environment and prime territorial aggression in offspring. In this study, we examined the consequences of previous territorial contests on paternal care.

To test for a link between aggression and paternal care, male, pair-bonded mice were subjected to either 0, 1 or 3 resident-intruder tests and then later evaluated for paternal care through retrieval manipulations. I expect to see a link between aggression and paternal care such that the fathers who are subjected to three aggressive fights will exhibit the highest levels of paternal care, retrieving their pups at higher rates than animals in the other conditions. We are still in the data collection phase of the study and will continue data collection throughout the fall semester.

Throughout the summer I have had to the opportunity to work with a graduate student, helping her collect data for her thesis. In a similar way to my own project, she is testing how fathers affect the development of aggression in their offspring

Henry V. Bender
Department of Ancient Studies and Classics
Saint Joseph's University

Ph.D. Rutgers University

Research Interests: Latin and Greek Epic, Lyric Poetry; Topography and Archaeology of Ancient Greece and Italy; Classical Mythology; Classical Influence on Renaissance Florence and Rome

My teaching is very student focused and flows from a lifelong commitment to the need for knowledge to inform understanding. While the primary work of a Classicist is the Greek and Latin languages themselves, it is imperative that the relevance of Classical studies be continually reasserted and rediscovered by succeeding ages. In this sense the material culture of the Graeco-Roman world consists of artifacts, structures, sculptures and the "stuff" with which the ancients cultivated, lead and perpetuated their ideas and values. Reading the literature of ancient Greece and Roman invites reflection on profound topics such as the continuity of humankind, the irrepressible need for each person to find meaning in both individuality and in the shared experience of living and struggling with fellow man. The material informs the textual; literature and archaeology are arms on the same torso. My research and publications have been the product of this view.

Classical myths embody the awakening of the human mind to ask and answer—if imperfectly—the deep questions about the origin of life, love, hostility, the defeating sense of life as terminal, the promise of a new day and the life of man as an embryo in the womb of mother earth. Through the gods, goddesses, heroes and warriors of myth and epic, young people today can see emblematic representations of character types, Jungian archetypes, and struggling societal personifications of the antitheses of human nature. Through Greek and Roman art and sculptures we have windows into the values of their worlds; the Roman counterpart is informed by what the Greeks sought abstractly but utilizes decoration for extrinsic purposes. In one sense we see the written and artistic media of the Roman Empire espousing values to inform, direct and cajole more than to edify, dignify and assert the essence of *humanitas.*

My 48 year career of teaching on various secondary and university levels has found me teaching what I have termed the *connective tissue* of being human. The challenge is to awaken my students to think and to express in nonlinear ways the nexus between thinking and feeling. The mysterious dialog between the heart and the mind is always troubling, but it always results in a better understanding of who we are and where we are going. Our values inform our deeds which are the ultimate and undeniable expression of what we value and how we value.

Tradition and Imagination in the Characterization of Helen of Troy

Brendan Phillips, ‘16

Faculty Mentor: Henry V. Bender
Department of Ancient Studies

Supported by the SJU Summer Scholars Program

Women in classical mythology play a vital role in explaining the actions of major heroes. Throughout the Mycenaean Saga, easily the most complex of the Greek Myths, Helen, the wife of Menelaus, king of Sparta, holds a central position. Known as the face that launched a thousand ships, she is the focal point of the Trojan War fought between the Trojans and the Mycenaean Greeks. The conflict surrounding Helen’s accountability results in one of two interpretations: a story of elopement or a story of abduction. This contradiction is inherent in the myth of Helen of Troy and creates controversy regarding the true nature of Helen.

Pottery, relief sculptures, and paintings informed my study of the differentiating and dynamic perspectives of Helen. Connecting how an artist accepted, rejected, or modified the depiction of Helen in the visual arts to the original literature, her story rapidly becomes obscure. The lack of consistency by artists clearly demonstrates how Helen is one of the most ambiguous characters in antiquity. She has been portrayed by different literary sources, and even by the same authors, in opposite extremes. Helen is without a doubt the cause of the war in the *Iliad*, though she does not carry much blame. The most intriguing aspect about Helen is her story, yet she is mostly regarded as a pawn of the gods. The larger story is involved with the people around her, their rise and fall, leaving Helen almost oblivious to the horrors encircling her. Helen herself acts with minimal significant emotion, seemingly unaffected by the outcome of the Trojan War.

Carolyn L. Berenato
Department of Special Education
Saint Joseph's University

Ed.D. Saint Joseph's University

Research Interests: Language-based Learning Disabilities and Dyslexia

The effects of dyslexia, a learning disability, can alter a child's viewpoint on themselves in a variety of ways. It is estimated that twenty percent of students in the United States have some degree of a learning disability equating to 1 in 5 students. Dyslexia is the most common language based learning disability. Dyslexia is a neurologically based, often a familial disorder, which interferes with the acquisition and processing of language. It varies in degrees of severity; shown by difficulties in receptive and expressive language, including phonological processing, in reading, writing, spelling, handwriting, and sometimes in arithmetic. In America, many schools are prepared to aid students with dyslexia. Unfortunately some American schools do not recognize the dyslexia and dismiss this language- based disability resulting in students falling behind in their reading skills. This unrecognized disability often leads to students dropping out of school.

My summer scholar and I are researching how families have handled the diagnosis of having child with dyslexia or a language based learning disability. We are researching where families have found solutions for finding help when the diagnosis of dyslexia has been determined. We are in the process of creating a handbook of resources specifically in the states of Pennsylvania and New Jersey. We were both able to utilize an organization called Decoding Dyslexia. Decoding Dyslexia is a grassroots movement for parents with dyslexic students to receive and give help to other parents in the same situation. In just over three years of it's existence, the Decoding Dyslexia website has spread to all 50 states and 4 Canadian Providences. The Pennsylvania and New Jersey Chapters of Decoding Dyslexia provided the initial contacts for our study. Our study is creating an informed handbook with resources for individuals with dyslexia.

Dyslexia and the Effect on the Student

William W. Marsh, ‘18

Faculty Mentor: Carolyn L. Berenato
Department of Special Education

Supported by the SJU Summer Scholars Program

Dyslexia. A word that brings stress, anger, and weaknesses yet also brings relief, happiness, and strengths to 1 in 5 students in the United States. To help families and educational institutions, Dr. Berenato and I set out to create a resource guide on dyslexia for New Jersey and Pennsylvania as our SJU Summer Scholar project. The guide also includes a directory of national and tangible resources. The guide is unique because it includes an introduction on dyslexia as well as excerpts from interviews with parents. Using the network of Decoding Dyslexia USA, a grassroots movement for parents, we asked the NJ and PA chapters to share our survey on resources for dyslexia that they have used. We also asked parents about the strengths and weaknesses related to their student’s dyslexia. The NJ and PA guides will be available online in fall 2015.

When we released the survey to NJ and PA, we received several requests from other states to participate in the study. Seeing the need for a resource guide for each state, Dr. Berenato and I have decided to go national with the survey. It is our hope to have a guide for each state by spring 2016 following the same model as the NJ and PA guides. We are once again using the Decoding Dyslexia USA network and will be surveying parents beginning in September 2015.

In July 2015, Dr. Berenato and I had the unique opportunity to travel to Washington, D.C. for two days with Decoding Dyslexia USA to discuss and advocate for dyslexia laws at a federal level. I presented to students on my tribulations and triumphs with dyslexia. During this trip, I met Barbara Wilson, the co-founder of Wilson Language Training. Wilson is a system to teach students with dyslexia how to read. SJU’s Masters in Special Education program certifies graduate students on the use of the Wilson Reading System so that they may aid the 1 in 5 students with dyslexia.

Left: Will Marsh presenting to students on his journey with dyslexia and how to become a self-advocate

Right: Will Marsh with Barbara Wilson, co-founder of Wilson Language Training

Shantanu Bhatt
Department of Biology
Saint Joseph's University

Ph.D. Emory University

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

Enteropathogenic *Escherichia coli* (EPEC) is a significant cause of morbidity and mortality amongst infants in developing countries. EPEC belongs to the **a**ttaching and **e**ffacing (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 **l**ocus of **e**nterocyte **e**ffacement (LEE). The LEE of EPEC is necessary and sufficient for pedestal formation. Because of its indispensible 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.

Investigating the Roles of Hfq-Dependent sRNAs in Biofilm Formation in Enteropathogenic *Escherichia coli*

Adam Acevedo, '16

Faculty Mentor: Shantanu Bhatt
Department of Biology

Supported by the SJU Summer Scholars Program, the GeoKids LINKS Undergraduate Fellowship and the Dietrich W. Botstiber Foundation

Biofilms are complex communities of bacteria that work together as a single unit to perform various functions. They are known to have the ability to grow in both mild and extreme environmental conditions, and have proven to be extremely dangerous to public health by promoting pathogenicity and antibiotic resistance by drastically increasing the number of persistor cells[3] within a host. One particular pathogen capable of biofilm formation, and main focus of this research, is Enteropathogenic *Escherichia coli* (EPEC). EPEC is a water-borne pathogen and serious health concern in many developing countries. Its toxic effects have had serious implications on infant mortality rates across the world, calling to attention a serious demand in its research in order to develop novel therapies to combat its virulence. One area of study is the effects that Hfq-dependent small regulatory RNAs have in EPEC biofilm formation. Understanding the ways in which Hfq-dependent sRNAs regulate biofilm formation is vital to creating novel therapies necessary to cure hosts of EPEC infection. Throughout this summer, I have dedicated my studies towards investigating the roles that Hfq-dependent sRNAs may have on biofilm formation by EPEC and how this impacts bacterial virulence.

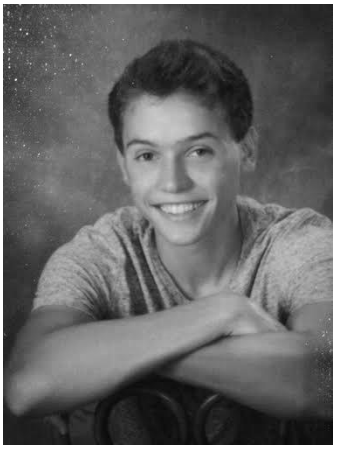
[3] Persistor cells are otherwise known as cells with slow dividing and metabolizing rates

The Role of the Small RNA MgrR in the Regulation of the LEE Pathogenicity Island in Enteropathogenic *E. coli*

Thomas Buerkert, ‘18

Faculty Mentor: Shantanu Bhatt
Department of Biology

Supported by the SJU Summer Scholars Program



Over the course of the summer, I conducted research with Enteropathogenic *E. coli*, or EPEC. EPEC is a pathogenic strain of *E. coli*, the innocuous, rod-shaped bacterium that inhabits our gastrointestinal tract. *E. coli* is a fascinating species and a convenient organism to study, so it is not surprising that it has served as the “lab rat” of bacteriologists and geneticists for decades of research. Experiments with this bacterium have led to detailed understanding of essential processes such as DNA replication and the foundational organization of bacterial genomes. However, the detailed story of *E. coli* in the advancement of genetics and microbiology is accompanied by a more tragic side of its evolutionary history. This account is told through close examination of its pathogenic cousins, one of which is EPEC. With mortality rates as high as 30%, EPEC remains a significant cause of infantile morbidity and a major public health concern. As is the case with many Gram-negative pathogens, EPEC eludes successful treatment by current methods for many reasons: among these is the propagation of multi-drug resistant strains and the heterogeneity of surface-associated membrane proteins, which is why hitherto vaccines have been infeasible as a treatment option. These concerns have necessitated investigations into alterative modes of treatment, so research activity has returned to *E. coli* to understand the genetics of potential molecular targets. MgrR, the molecular target that I have been studying, falls under a class of RNAs called small RNAs, or sRNAs, because they are comparatively shorter in length than other RNAs, such as messenger RNA or ribosomal RNA. sRNAs are key players in post-transcriptional regulation, which is regulation at the level of RNA. The primary mechanism by which they regulate messenger RNA (mRNA) targets is by direct base pairing, an interaction that affects mRNA stability and/or translation efficiency. MgrR has been identified as a post-transcriptional regulator of the Locus of Enterocyte Effacement (LEE) pathogenicity island, a cluster of genes that enables EPEC to infect the human GI tract. Specifically, MgrR targets a transcript encoding two global regulators of the LEE, named GrlA, an activator of LEE-encoded proteins, and GrlR, an anti-activator that targets GrlA. I conducted a series of experiments to lend further support to the hypothesis that MgrR base-pairs to a region on the *grlRA* transcript called the 5’ untranslated region, or 5’ UTR. After this work is completed, I intend to investigate the mechanism of action of MgrR-dependent regulation.

Our previous research has suggests that MgrR is affecting the stability of the *grlRA* mRNA, so investigating the stability of *grlRA* should corroborate this still tentative hypothesis. The next step will be to correlate MgrR-dependent regulation with pathogenesis of EPEC *in vivo*, meaning that we will explore the effect of MgrR on the ability of EPEC to cause disease in an animal infection model.

Investigation of the Role of the sRNA RyhB in Regulating the LEE Pathogenicity Island in Enteropathogenic *Escherichia coli*

Marisa Egan, '18

Faculty Mentor: Shantanu Bhatt
Department of Biology

Supported by the SJU Summer Scholars Program

Enteropathogenic *Escherichia coli,* commonly known as EPEC, is a diarrheal pathogen that infects infants in developing countries. The bacterium belongs to the class of attaching and effacing (A/E) morphotype of pathogenic *E. coli*, since it infects infants by directly binding to their intestinal epithelial cells and destroying cellular microvilli. The virulence of EPEC is attributed to its major pathogenicity island: the locus of enterocyte effacement (LEE). 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. Thus, understanding the regulatory pathways that govern the LEE is critical towards the development of effective measures to combat EPEC infections.

The LEE is responsive to a myriad of environmental cues with the majority of them targeting three LEE-encoded transcription factors, Ler, GrlR, and GrlA. Ler is the master regulator of the LEE, GrlR is the global repressor of the LEE, and GrlA is the global activator of the LEE. Whereas transcriptional regulation of the LEE has been widely characterized, post-transcriptional regulation, including regulation by trans-encoded regulatory small RNAs (sRNAs), remains understudied. Most sRNAs exert their effects by directly base-pairing to their target mRNAs to influence the translation and/or stability of the target. A subset of these sRNAs requires Hfq, a chaperone protein that assists in the finding and base-pairing of sRNAs to their target mRNAs. One such sRNA is RyhB.

The purpose of our research is to identify and understand the post-transcriptional regulation of the LEE by RyhB in EPEC. RyhB is an iron-responsive sRNA, regulated by Fur, or the Ferric Uptake Regulator, and intracellular iron levels, Fe^{2+}. Our results suggest that RyhB and Hfq corepress the *grlRA* mRNA that encodes GrlR and GrlA. To better understand how RyhB exerts its effect on the *grlRA* mRNA we preformed *in silico* analysis. By using a program known as IntaRNA, we predicted a region of complementarity between RyhB and the ribosomal binding site in the 5' untranslated region (UTR) of the upstream gene *grlR* in the *grlRA* mRNa. In order to confirm this prediction of direct base-pairing between RyhB and *grlRA*, we constructed a polynucleotide mutation in the seed region of RyhB. This mutation completely abolished the ability of the mutant RyhB to base pair to and repress the *grlR'-'lacZ* fusion. Thus, collectively, our results suggest that RyhB represses the LEE by directing base-pairing to the 5'UTR of the *grlRA* mRNA and preventing the expression of both GrlR and GrlA.

Currently, we are working to further confirm the mechanism by which RyhB base pairs to the 5'UTR of *grlR*. We have constructed a compensatory polynucleotide mutation in the 5'UTR of *grlR*. This mutation is complementary to the polynucleotide mutation in RyhB base-pairing region and is predicted to restore base pairing between mutant *grlR* and mutant RyhB and, therefore, restore the repression of GrlR.

Role of Base-pairing Small-RNA Spot42 on Virulence in Enteropathogenic *Escherichia coli* Bacteria (EPEC)

Valerie Jenkins, '15

Faculty Mentor: Shantanu Bhatt
Department of Biology

Supported by the SJU Summer Scholars Program

Enteropathogenic *Escherichia coli* bacteria (EPEC) is a member of the attaching and effacing family of pathogens. When these bacteria infect a host, they 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. EPEC causes disease due to the presence of the pathogenicity island locus of enterocyte effacement (LEE).

The *tnaCAB* operon is responsible for the virulence of EPEC and contains the genes *tnaC*, *tnaA*, and *tnaB*. *tnaA* encodes for the enzyme tryptophanase which converts tryptophan to indole, ammonia, and pyruvate. Indole is a bifunctional molecule, which induces 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. Any regulator of the LEE pathogenicity island in EPEC, such as the small RNA Spot42 that indirectly regulates the LEE, is worth further researching. The increase in drug-resistant strains of EPEC make this research very important into understanding the bacterial pathogenicity, with the goal of developing effective therapeutic techniques.

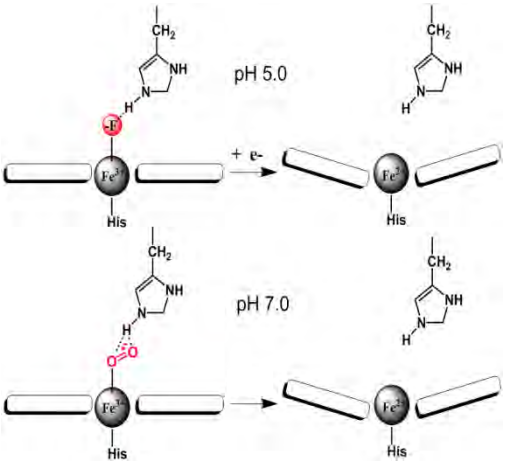
During the Summer Scholar's Program, I investigated the ability of Spot42 to modulate the pathogenicity of EPEC. When Spot42 was overexpressed in EPEC a substantial reduction in indole production was evident in the SIM test. Using the computational program IntaRNA, complementarity was predicted between the *tnaA* mRNA and the Spot42 sRNA. The predicted complementary region *of tnaA* was fused to *lacZ* to generate a *tnaA'-'lacZ* translational fusion. *lacZ* encodes the β -galactosidase enzyme which converts ONPG (a colorless substrate) to ONP (a yellow colored product). Overproduction of Spot42 was found to repress β-galactosidase activity in the *tnaA'-'lacZ* translational fusion suggesting that the region of *tnaA* fused to *lacZ* is sufficient for Spot42-mediated regulation.

In reciprocal experiments, I mutated the *tnaCA* region in the *tnaCA'-'lacZ* fusion, where Spot42 is predicted to base pair. This mutation presumably prevents Spot42 from base-pairing and repressing the fusion, which would be evident as increase in β-galactosidase activity. My future research involves performing a β-galactosidase assay with the mutated *tnaCA* region in the *tnaCA'-'lacZ* fusion and comparing the levels of β-galactosidase with the wild-type strain of EPEC. Using site directed mutagenesis, I also generated a mutant allele of Spot42 that contains a compensatory mutation that endows it the ability to base-pair with the mutant *tnaCA'-'lacZ* fusion and repress β-galactosidase activity. Collectively, the completion of these experiments will genetically confirm the region of direct base pairing between Spot42 and *tnaA*. 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.*

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



My research objective is the study of the electrochemical properties of redox proteins and redox cofactors to understand how proteins utilize redox groups such as hemes, quinones, and flavins to achieve a specific function. Heme *b*, a type of heme cofactor found in myoglobin (Mb), hemoglobin (Hb), and heme peroxidases, can serve in roles such as oxygen storage and transport, electron transfer, oxygenase, catalase, peroxidase, and gas sensing. Although numerous studies have been performed on heme proteins, quantification of a protein-heme interaction is typically difficult because specific heme-protein interactions are hard to isolate within the protein. An approach in understanding protein-cofactor interactions is to use fluoride binding in heme proteins. Research studies performed at other labs have used fluoride ion as a probe of the heme cavity of proteins. In our particular case, we have used fluoride binding in our electrochemical studies. Our past research has shown that the electrochemical property of the heme-bound fluoride in Mb is sensitive to the pH, due to the protonation of the distal histidine. Upon protonation, the distal histidine forms a hydrogen bond with the heme-bound fluoride (see the above figure) which stabilizes the ferric heme (oxidized). Currently, we are utilizing this approach to understand the molecular basis for the oxygen binding properties of Hb. Fluoride binding in Hb, under electrochemical control, is similar to the oxygen dissociation equilibrium in Mb and Hb (see the above figure).

During this summer, my research group investigated the temperature dependence of fluoride binding in Hb, Mb, and horseradish peroxidase. Of these three proteins, Hb is the only one that has quaternary structure and undergoes a conformational change upon oxygen binding. With our measurements, we were able to determine various thermodynamic quantities of the fluoride binding equilibria in the aforementioned proteins. Our preliminary results show that entropy plays a major role for fluoride binding in Hb.

The Use of Fluoride Binding Measurements in Heme Proteins to Understand the Molecular Basis of the Oxygen Binding Properties of Hemoglobin

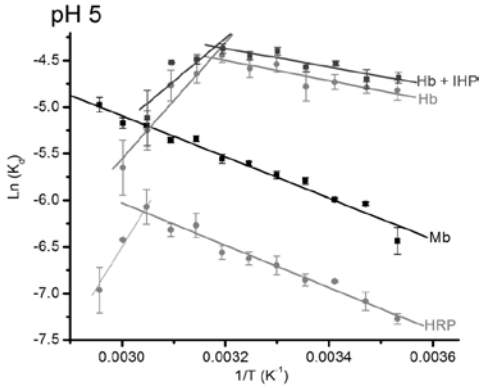
Kimberly Wodzanowski, '17
Thomas Nagle, '17
Julia Leonard, '16
Christopher Moll, '16

Faculty Mentor: Jose F. Cerda
Department of Chemistry

Supported by the SJU Summer Scholars Program

Fluoride has been shown to bind to heme proteins, allowing for the identification of the binding properties of the heme pocket under controlled conditions and using the heme-bound fluoride ligand properties as a probe of the heme pocket structure in proteins. The heme in the hemoglobin (Hb) has porphyrin ring with a distal site that typically contains a histidine amino acid. Upon oxygen binding, this distal histidine forms a hydrogen bond to the heme-bound oxygen, stabilizing the oxy form of the protein. Thus, the oxygen binding properties of Hb is greatly affected by the distal histidine interactions with the iron-oxygen unit of the heme.

Our research utilized fluoride as a probe of the heme pocket in various heme proteins, including myoglobin (Mb), Hb, and horse radish peroxidase (HRP), to demonstrate conformational changes in the heme pocket upon fluoride binding. The dissociation constant, K_d, was calculated by titration with sodium fluoride at various temperatures using UV/Vis spectroscopy. In addition, we also measured the temperature dependence of fluoride binding in Hb with inosital hexaphosphate (IHP), an allosteric effector, to simulate the effects of 2,3-bisphosphoglycerate (BPG) binding to the beta subunits of Hb. Physiologically, BPG regulates oxygen binding, which is an important task at high altitudes because of the diminished amount of atmospheric oxygen.



Our results at pH 5, show that fluoride interacts with ferric Hb and Mb in a similar way that oxygen interacts with ferrous Hb and Mb. Like oxygen, fluoride had a lower binding affinity for Hb and a higher binding affinity for Mb. HRP had the highest affinity for fluoride binding and Hb + IHP had the lowest affinity for fluoride binding. Additionally, the results show that there is loss of the quaternary structure of Hb above 40°C, thus making the protein able to bind fluoride with about the same affinity as Mb. This study shows that fluoride binding at pH 5 can mimic the oxygen binding properties of Hb.

Figure 1. Plot showing the relationship between fluoride dissociation, Ln(K_d), and temperature (1/T) at pH 5.

Melissa Chakars
Department of History
Saint Joseph's University

Ph.D. Indiana University

Research Interests: History of Russia and the Former Soviet Union

Russia is the world's largest country and while it has been a significant force in world history for centuries, little is known about much of its territory. My scholarship contributes by providing new research on Siberia, a region that makes up 70% of the Russian Federation and contains natural resources that account for much of the country's wealth (today, as well as in the past). More specifically, I study the Mongolian Buryats, Siberia's largest indigenous population.

I am a historian and my work is based on archival research in Siberia in the Russian and Buryat languages, but the value of my research provides more than a regional history. It examines topics of gender, culture, literature, media studies, geography, the politics of federalism, national identity, human rights, and urban planning.

My scholarship is especially concerned with massive social and economic change in the modern era. I explore how ordinary Buryats experienced key decisions and episodes such as late-nineteenth-century tsarist policies that ended local autonomy and ushered in a wave of European immigration to Siberia, the implementation of Bolshevik nationalities policies, Stalinism in the 1930s that eliminated indigenous elites and forced nomadic Buryats to settle onto collective farms, the rise in social mobility in the postwar years, the Buryat national movement and the collapse of the Soviet Union, and the economic devastation of the 1990s.

My work has focused on these events by examining significant community and identity-building institutions, particularly media, education, and cultural organizations. The origins of these institutions often came at the direction of central authorities in Moscow who sought to use them to achieve political socialization and cultural homogenization. However, as participants in these fields, Buryats left their own imprint on them and influenced them even if in constricted ways. My scholarship examines their multi-leveled involvement, as well as its wider consequences such as the precipitous decline of the Buryat language in the second half of the twentieth century. In addition, my research demonstrates how top-down governance, typical of authoritarian regimes, still leaves room for local interpretation and implementation that can sometimes differ from the goals of central authorities. Buryat people sometimes challenged the state's authority, but always had to adapt, negotiate, and live through the changes of state political, economic, and cultural policies.

Russia's Doomed Youth: Music and Counterculture in the Soviet Union

Bailey McIntyre, '16

Faculty Mentor: Melissa A. Chakars
Department of History

Supported by the SJU Summer Scholars Program

In the years following World War II, the young people of the Soviet Union began looking westward for inspiration in term of fashion, music, and movies. Young musicians began playing songs like "Chattanooga Choo-Choo" on their saxophones. This evolved into playing the Beatles on their homemade electric guitars. Eventually, young Soviet musicians began expressing their grievances about Soviet society, government, and ideology in their own words, instead of singing about themes of love and partying, which was common in Western rock 'n' roll music. This lead to a rock explosion in the USSR.

More than anything, the Soviet youth were simply searching for identity, and what it meant to be someone who was not inherently Soviet but living in the Soviet system. My project aimed to explore the nature of the Soviet rock movement. Essentially, young people expressed their frustrations and disenchantment with the regime through music. This project explores everything from the phenomenon of the *stilyagi*—Soviet beatniks who were inspired by fashion, music, and dance trends in the West—in the USSR to the importance of the Beatles in Soviet rock culture to discotheques of the 70s to the extreme musical freedom practiced under the Gorbachev reforms.

I started this project by gathering sources in English to gain an understanding of the current historiography of the subject. I read and analyzed conclusions on the Soviet Union's rock music culture. I examined specific arguments from reputable historians, and I analyzed how the historiography has changed over time.

I identified several sources in the Russian language. I analyzed the historiography of the subject in the native language of the country. I gained extensive experience reading, writing, and researching in Russian. Additionally, I used the Library of Congress transliteration system from Russian to English for any Russian terms, words, names, or titles I used. This, especially, was an invaluable tool for my project, and it was especially useful in developing research and language skills.

Finally, this project consisted of gathering sources by searching through bibliographies and databases such as WorldCat, JSTOR, and the Current Digest of the Post-Soviet Press. I analyzed various primary sources by examining the author's purposes in creating the source, the author's argument, assumptions of the author as well as my own in regards to the texts contents, evaluation of the content's truth and trustworthiness, and relating the text/source to similar sources.

Susan Clampet-Lundquist
Department of Sociology
Saint Joseph's University

Ph.D. University of Pennsylvania

Research Interests: Cities, Families, Social Policy

Over the past decade, I have talked to adults and teenagers who live in low-income neighborhoods about neighborhoods, housing, jobs, risk behavior, and school. My ultimate goal in this research is to inform social policy so as to improve the wellbeing of families struggling to make ends meet. Throughout this research, I have heard many stories from teenagers about the violence they witness, and their entanglements with law enforcement – whether or not they are involved in illicit activities. From their narratives I have become more interested in the relationships between youth and the school-to-prison pipeline.

Two important components of the mission of Saint Joseph's University are to prepare students for engaged citizenship and to pursue social justice. Connecting the research resources of universities and the on-the-ground knowledge of community-based agencies is a key part of engaged scholarship. In his call for higher standards at Jesuit universities in 2006, Father Dean Brackley argued that "universities should speak to the wider world." This summer, I worked with a summer scholar whose research sits at this intersection. Michelle Donnelly and I worked with a non-profit organization, Girls Justice League (GJL), which trains teen girls to be advocates on key social issues that affect them. The concern about gendered expectations within the juvenile and adult justice systems is one of the issues that they are currently working on. In other words, do the expectations that law enforcement or school authorities hold about what girls "should" be like influence how girls are punished if they transgress these boundaries? In the spirit of engaged scholarship, Michelle worked with GJL on several aspects of learning more about this issue for girls in Philadelphia. She analyzed data from nearly 150 in-depth interviews of teens in Philadelphia, looking at the relationship among race, gender, and police experiences. She also analyzed data from the School District of Philadelphia to look at racial and gender differences in incidents in the schools. These findings will assist GJL as they move forward to push for policies and programs that are more gender-responsive for teens in Philadelphia.

Girls and Young Women in the Justice Pipeline

Michelle Donnelly, ‘16

Faculty Mentor: Susan E. Clampet-Lundquist
Department of Sociology

Supported by the SJU Summer Scholars Program

This project covers a brief examination of gendered expectations in the school to prison pipeline through community engaged research in partnership with the Girls Justice League of Philadelphia. Community engaged research regarding this topic included a multi-faceted approach including qualitative research, quantitative secondary data research, focus group preparation, and a review of previous literature on the topic of gendered experience and expectations in the criminal justice system.

Much of the qualitative research on nearly 150 African American, Latino/a, and White teens from some of the poorest neighborhoods in Philadelphia found that individuals held a high level of mistrust towards police officers. A gendered difference existed between males and females of all racial categories when discussing the reasons for such mistrust. Overall, when considering public perceptions of the police in Philadelphia, individuals mainly hoped for police officers to perform their job more efficiently and effectively so the neighborhoods themselves had less crime and less of a need to handle the “problems” on their own in a form of vigilante justice. The qualitative analysis focused on what happened in the neighborhoods, and the quantitative analysis explored incidents in Philadelphia’s public schools (2011 – 2012) by race and gender. Black females experienced a consequence for a school incident at rates higher than their Hispanic or White counterparts. For example, Black females experienced a school related arrest at a rate around 3.5 times higher than White females and around 2 times higher than Hispanic females. Thus, the qualitative and quantitative data show that a racial and gendered difference exists in perception and treatment of young individuals in Philadelphia.

Peter A. Clark, S.J.
Departments of Theology & 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 two research projects. The first project deals with Chronic Kidney Disease Non-Traditional (CKDnt) primarily in Nicaragua but also in other parts of the world. One of Nicaragua's largest exports is sugarcane and throughout the country there are numerous sugarcane plantations that not only make the country profitable but also provide jobs to many of the citizens. The problem with the sugarcane plantations is that many of their workers are dying from chronic kidney disease of non-traditional causes (CKDnt). It has been estimated that over 20,000 young men have died in the past two decades from this disease. Currently there is no known cause or cure for the disease and the only treatment is dialysis, which is too expensive for a plantation worker. Some researchers believe that the men contract the disease through dehydration and exhaustion during long hours in the fields. Other researchers believe that the disease comes from exposure to the pesticides that are used on the sugarcane fields. Whatever the source of the disease is, it is causing many health and social problems. The disease can become deadly if untreated with dialysis, which is too expensive for many of the victims. After visiting the sugarcane plantations in Nicaragua and taking soil samples our research team has ascertained three causes for CKDnt. These would be adverse working conditions, climate change and the use of Glyphosate that is used for ripening the sugarcane crop and as a pesticide. Glyphosate toxicity has been grossly underestimated in Nicaragua and may be a major cause of water contamination as well. The research team is in the process of making concrete recommendations to the sugarcane industry and the government of Nicaragua to help decrease the death rate of CKDnt to this vulnerable population.

The second research project is the Mercy Health Promoter Model for Undocumented Hispanics. In May 2014 Fellows in the Institute of Catholic Bioethics were asked if we might be able to expand the Mercy Health Promoter Model for the undocumented African population to the Latino community in the Norristown area. We met with the Administration of Mercy Suburban Hospital and the Director of the Mercy Suburban Residency Program. Both agreed this was a very worthwhile project and committed medical residents to train the Health Promoters and to assist them on one Sunday a month at St. Patrick's Church in Norristown. The Administration agreed to make one Family Practice Physician available one afternoon a week to examine and treat those individuals referred by the Health Promoters. This project began in September 2014. The hope is that this model could serve as a paradigm for other Catholic hospitals nationally in the care for the most vulnerable members of our society—the undocumented. This pilot program has been endorsed by Trinity/Catholic Health East and the Catholic Health Association of the United States and they are very interested in monitoring the implementation, success and evaluation of this model. This past summer we received a $65,000 grant from Trinity Health System and the Mercy Sisters of Merion. Currently, we are in the process of constructing a permanent clinic site in the school building of St. Patrick's Parish. In addition, we will expand the services offered to include dental and eye exams as well as exercise programs and nutrition programs.

Pediatric Brain Cancer:
How to Increase Tissue Donation Levels

Brendan Gleason, ‘17

Faculty Mentor: Peter A. Clark, S.J.
Institute of Catholic Bioethics

Supported by the SJU Summer Scholars Program

Cancer is the leading killer of children, yet there is a paucity of tissue samples with which to conduct research. As a result, survival rates, specifically for brain cancer, have not changed significantly in approximately fifteen years. Tissue donation is a crucial element of cancer research, which moves forward through examination of and experimentation on tumor samples. The goal of this project was to identify the reasons for the lack of donated tissue in pediatric brain cancer, to identify the importance of donated tissue, potential solutions to these problems, and conduct an ethical analysis of our findings. These results have led to the writing of a paper to be submitted for publication in medical journals.

Research this summer has been done in collaboration with the Swifty Foundation, members of the Mercy Health System, as well as doctors centered locally, nationally, and internationally. The Swifty Foundation is an organization with the mission of promoting research in the pediatric brain cancer field. They have already collaborated with prominent organizations such as Kids Vs Cancer and their initiatives show great promise.

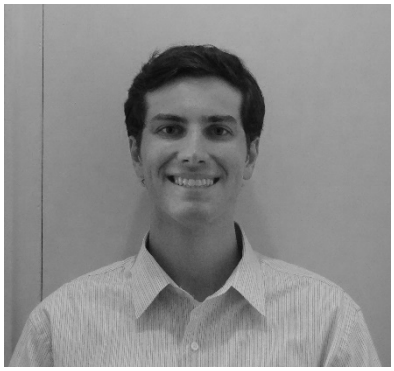
The research conducted this summer included gathering information on this subject through the study and evaluation of medical publications and collaborative investigation with members of the Swifty Foundation Board. Additionally, consistent communication with doctors, other medical professionals in the field, as well as families affected by this condition was maintained throughout the summer. Each of these groups have unique insights into this issue, and communication with individuals with such different experiences helped to provide a wealth of information which will be published for the edification of the scientific community.

This summer's investigation has been vastly productive. Its results include the identification of the importance of tissue donation for cancer research, the major barriers to tissue donation, ethical and practical solutions to those barriers, and a detailed recommended method of discussion for doctors. Additional recommendations have been identified to help ensure the most productive and least stressful experience for all of those involved in the tissue donation process.

The Cause and Spread of Chronic Kidney Disease Non-Traditional Causes in Nicaraguan Sugarcane Workers

Nicholas Radigan, ‘16

Faculty Mentor: Peter A. Clark, S.J.
Institute of Catholic Bioethics



Supported by the SJU Summer Scholars Program

In the past two decades, more than 20,000 Nicaraguan sugarcane workers have died from chronic kidney disease (CKD). The majority of these workers are young men between the ages of 20 and 30 years old. In most first world countries, CKD is not a death sentence. Treatments such as dialysis can prolong life for many years. The problem is that in Nicaragua access to dialysis is very rare due to sterility issues and its cost. In addition to not being able to treat CKD, the cause of it is unknown. Boston University published a report on the topic in 2012, however their results were inconclusive and labeled the causes as "occupational". Our goal for the summer was to improve upon previous research and determine our own reasons for the cause of CKD. We did this by spending two weeks in Nicaragua, researching other papers regarding this topic, and analyzing soil samples taken from the Nicaraguan sugarcane fields. Using this research, we determined that three factors come together in causing CKD. The three factors are: the work conditions, the increasing climate, and the agrichemical glyphosate.

Spending two weeks in Nicaragua allowed us to meet with former workers and their families to learn more about the working conditions. We learned that the workday was 12 hours long. We also saw two sugarcane fields that were fully exposed to the sun. The temperatures in Nicaragua have been rising and during the harvest season temperatures can reach 38°C (100°F). Working for that long in hot temperatures can easily cause dehydration which we learned can severely damage the kidneys. Finally glyphosate is an agrichemical that is used in the popular herbicide, RoundUp. In Nicaragua, it is used as a ripener for the sugarcane. We found a few published papers showing the link between glyphosate and CKD, which lead us to believe that this too is a contributor. We believe that all of the factors: conditions, heat, and glyphosate contribute in damaging the kidneys and causing CKD.

With this research we want to publish a paper with fellow faculty member, Jean Smolen, Ph.D, and two medical residents, Junad Chowdhury, M.D. and Benjamin Chan, D.O. In the paper, we will focus on the historical, medical, environmental, and ethical aspects of the issue. We want this paper to not only raise awareness about the topic but to initiate an action to support the workers.

Clare 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 counties (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.

Because of the short timeline for Summer Scholars, my students' projects have examined how gender is portrayed in media and how adults judge issues of gender and fairness. Summer Scholars students also assist me in the research with children by interviewing children, transcribing and coding interviews and doing data entry.

Interaction of Reader and Author Gender in Scholarly Article Evaluation

Dani London, ‘16

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

Supported by the SJU Summer Scholars Program

Gender equality in the workplace is an area of research that receives much attention. Of particular interest are pay, hiring opportunities, and expectation biases. Popular studies including a committee rating two identical resumes in which all that is changed is the name of the candidate from male to female. This research shows that time and time again, males and females are judged based upon gender prescriptions. Gender prescriptions are the behavioral standards group members must uphold to avoid redirison from the perceiver (Tyler & McCullough). For example, men are expected to uphold an agentic prescripton, which refers to achievement oriented traits, and women are expected to uphold a communal prescription, which refers to social and service-oriented traits. As such, research shows that female applicants who violate prescriptions are perceived as less likable and competent in comparison to male applicants. Additionally, in identical resumes where only names are changed, male applicants are perceived as having more academic experience and female applicants are perceived as having more extra curriculars (Cole, Field, & Giles).

I found this research to be so interesting and I wanted to if these prescriptions hold true for areas of study. Historically, men are stereotyped as better at science and math subjects and women at social subjects, such as education and social sciences. My research aimed to look at differences in how different scholarly articles are perceived when the author does not fit the gender prescription. For example, would engineering articles be judged differently if the author was a female, rather than the stereotypical male?

I utilized an online survey of college students in order to test my hypotheses. My results showed a significant difference in the way Education articles are perceived compared to STEM (science, technology, engineering, and math). However, I did not find any significant differences in the ratings of the articles based on the change of the author gender. There appeared to be a bit of reverse sexism, in that the female conditions were often rated higher than the male conditions.

Gender in Technology

Dan Shannon, ‘16

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

Supported by the SJU Summer Scholar’s Program

Women make up half of the workforce in the USA, however, only 24% of the STEM (Science, Technology, Engineering & Mathematics) workforce. Furthermore, when looking at the Technology industry, the number of women earning computing degrees has halved in the past three decades[i]. There are very many factors that influence this disparity in STEM fields, and the Technology industry specifically, however, we aimed to investigate how companies were portraying themselves, as perhaps this could shed some light on the fewer number of women in the technology industry. Based on prior research, there is a design preference based on the number of males and females on a given website[ii] as well as other research which has shown that in magazines, there is a higher incidence of males not only in quantity, but also in power, authority and expertise[iii]. It can be suggested that this kind of inequality in the presentation of the companies could result in stereotype threat, which is defined as: “…being at risk of confirming, as a self-characteristic, a negative stereotype of one’s group”[iv]

We examined one of the major mediums in which companies portray themselves, their websites. To ensure a more well-rounded examination, we looked at three core pages of their websites: the home page, about page and careers page. This insured we looked at the general way in which any consumer would see the company, the way in which they present themselves to those wanting to learn more about the company, and the way in which they present themselves to those possibly looking for employment by these companies. The two main questions pertaining to the study was to see how many males and females were in each image, and the perceived importance of said males and females. Multiple individuals answered the questions to ensure reliability and non-bias.

Upon examining 21 of the current top technology companies’ websites, both of the questions implied a significant effect; there is a higher presence of males than females on the websites and males were perceived to be more important than females in those images. Furthermore, this research may play into the idea of stereotype threat, specifically in this case, it may discourage women to perform and even gain interest in STEM fields[v]. Based on this research, it cannot be said definitively that this is the case. However, it is suggested by this preliminary research, for future research, to investigate whether the male dominance in the way companies portray themselves, in this case websites, causes women to fall into stereotype threat, and therefore result in fewer women in the technology industry.

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

Ph.D. 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 in High School: Differences in Gender and Educational Outcomes

Kelsey Lazicki, '16

Faculty Mentor: Laura M. Crispin
Department of Economics

Supported by the SJU Summer Scholars Program

This summer I worked directly with Dr. Crispin on the research question of, "Are there gender differences in time allocation for high school students? If so, are these differences correlated with differences in educational outcomes?" I focused specifically on this topic due to my interest in the allocation of time amongst individuals. Also, I have a strong interest in studying differences between genders, specifically in their decision-making and the future outcomes as a result of those decisions. I predict there is a distinct difference amongst genders and their time allocation due to my past studies and research done through other classes, such as Labor Economics. My goal is to discover whether different allocations of time, whether it be part-time jobs, clubs, sports, leisure, etc., assist high school students in their future educational outcomes.

In my analysis, I explored time allocated to class, homework, and studying, along with work, extracurricular activities, such as clubs, organizations, and sports, and finally leisure activities (meaning sleep, social interaction, outdoor and indoor play). For each individual, I also obtained different outcomes such as whether the student graduated from high school, their high school GPA and their postsecondary plans.

My data is from The Panel Study of Income Dynamics (PSID), which is a longitudinal study that includes demographic information for individuals along with time diaries. This data source includes a multitude of interviews, but I focused my attention on the Child Development Supplement (CDS) and the Transition Into Adulthood Study (TA). The initial interviews, through the CDS, happened in 1997 where they interviewed children from ages zero to twelve. The follow-up interviews happened in 2001-2002 and 2007, when students were in high school. Once the students turned eighteen they were moved into the TA study where I was able to locate their educational outcomes.

Though I am still in the process of analyzing my data while learning a new software (STATA, a sophisticated data analysis and statistical package), preliminary results show that a higher percentage of males take part in education at the high school level, but when females do participate, their time dedication is at a higher percentage than males'.

Benjamin Franklin Cummings
Department of Finance
Saint Joseph's University

Ph.D. Texas Tech University

Research Interests: Use and Value of Financial Advice; Financial Decision Making

I love studying why people do what they do with their money and how to help them make smarter financial decisions. In particular, I investigate the role that financial advice can play in making financial decisions, in addition to exploring who uses professional financial advice. I believe that many individuals can benefit in a variety of ways by relying on the quality advice of a competent financial professional. Often, the benefits of financial advice are qualitative in nature and often difficult to quantify in financial terms. Yet, these benefits have the potential to enhance the quality of life for those who seek the help of a qualified financial professional.

I am also interested in helping students excel in their educational pursuits, including the pursuit of financial planning education. One of my Summer Scholar students embarked on a study to investigate the role of financial planning education and related topics in high school curriculum. The financial marketplace continues to grow in complexity. As such, a growing number of consumers will need educated, competent, and ethical financial planners to help them make wise financial decisions. However, high school and college students are often unaware that financial planning is a growing and fulfilling career option. My student is exploring ways to raise awareness about financial planning through high school educational programs so that we can enhance the next generation of financial planning talent.

The True Cost of Education

Conor DePalma, ‘16

Faculty Mentor: Benjamin F. Cummings
Department of Finance

Supported by the SJU Summer Scholars Program

At roughly seven hours a day, I spent about half of my conscious childhood moving up the grades of the American public education system. I sat through lessons from my teachers, assemblies from various organizations, and end of the year tests that I thought were done for my own self-assessment. How naïve a young mind can be.

As the years went on, I began to question why we took end of the year exams at all, especially as more and more emphasis was placed on practicing exam questions in class. It was not until I learned about the trifecta of historical education laws (Elementary and Secondary Education Act, Improving America’s Schools Act, and No Child Left Behind), that I began to piece together and understand why testing was so prevalent in the American education system. Despite only occurring once at the end of the year, standardized testing has profound effects on the daily instruction provided to students by teachers across the country. Why is this though? Why does one test impact a whole instructional year? It all boils down to the funding, and how public schools are supplied with monetary resources from year to year. This is the direction I decided to take my research in. I looked at how public schools are funded on a federal, state, and local level, and the policies certain individual states have taken upon themselves to enforce. In addition, I looked at how states treat Charters and Virtual Schools, alternative public school options, as their numbers start to increase in areas of statistically low-performing public schools.

I am also a fair believer in understanding all phenomena at a holistic level, thus I took a historical approach in understanding American public education by looking for its origins in the states. What I found was, the least to say, unnerving. Our current education system bares its roots from the reformed Prussian education system, a politically driven system created to emphasize obedience to superiority without question. Of course, this was in a radically different era of time where some felt this was necessary. However, now thought to be outdated by at least a hundred years, many have called for reforms in the American Public education system. So, I studied many of the reforms that have promised to “fix” the antiquated American system, however the system is not broken. It is doing exactly what it was designed two hundred years ago to do in Prussia, the needs of current society have just changed to something greater than the current system can provide. Thus, I took to researching other nations to see how they are focusing on education in their respective countries, in an attempt to see if anything can be adopted at scale in the US.

Ultimately, what I have learned is that there is no need for more reforms to the current education system. What America needs, is a new system altogether.

High School Business Curriculum Study and Restructure

Joseph Dimarco, ‘15

Faculty Mentor: Benjamin F. Cummings
Department of Finance

Supported by the SJU Summer Scholars Program

Throughout my study, my goal was to add value to existing high school programs and/or help establish new ones that will help provide a stronger educational foundation for the students. Many of the schools that I reached out to either had a low participating or a non-existent high school business program to prep students for the college business world. The original focus of the study was to evaluate these programs and use the research to provide feedback to help improve upon the programs and better prepare the participating students for college. However after collaborating with my faculty mentor, we decided to take the study even further. The study evolved into three parts and a follow up event proposal for Saint Joseph’s to help contribute in establishing a stronger educational foundation for the evaluated high schools.

This project incorporated the design of an event to utilize the research found over the summer and back in the fall for the benefit of both the SJU community and participating high schools. The event will act as a cornerstone in aiding these programs towards selecting and implementing more efficient strategies and techniques to their home programs while also allowing the participants to network with each other and the SJU community. It would start with an orientation to the whole benefit of integrating the new technologies and ideas we evaluated into the schools. The day would then follow with a social time amongst the participants and the SJU community so they can be better acquainted with each other and network. The next portion would continue with the option of participating in a number of seminars, each geared towards teaching/providing a new program to the students. In the seminar portion, SJU participants would host different seminars to best equip different levels of high school business programs with a set of guidelines and programs that will help them continue to advance their program further. These interactive events would help serve as a reference point for the high schools so that they can adapt the most efficient and interactive learning models to bring back home.

The actual research began with visiting/emailing various schools from January to March to encourage participation and retrieve the most accurate and efficient information on the programs offered. This evaluation was followed by an interactive stock market competition which studied participants from April 20th to June 20th. The competition was designed as a fun game to help encourage student opinion and passively study the effects of integrative technologies such as investment trading platforms in high schools and how they may lead to further educational development. Lastly, I worked to get IRB approval to interview a few students and faculty from the high schools. These interviews were to retrieve feedback from the people, both faculty and some high school seniors, that I had interacted with throughout my research. The interviews helped tie in my research results with whether or not my suggestions were favorable for participants and to provide another set of views on where each high school community saw itself in regards to being prepared for collegiate level business world.

Renee Dobson
Department of Music, Theatre & Film
Saint Joseph's University

MFA: Ohio University

Research Interests: Musical Theatre, Performance Studies

My work as a teacher and professional director has been concentrated in the area of musical theatre. I began my work as a professional actress in 1988 when I joined Actors Equity Association and performed in New York City and across the country in a wide variety of musical theatre.

In 1994, I was offered my first faculty position at Ohio Northern University as Assistant Professor and Director of Musical Theatre where I was instrumental in creating the BFA program in musical theatre studies. I also served as Director/Choreographer for a range of musicals, both traditional and contemporary.

Currently, I serve as Associate Professor of Theatre in the Department of Music, Theatre & Film at Saint Joseph's University where I direct two university productions each year and spend the summer directing professionally. My most recent professional directing projects have included *Avenue Q* and *I Love a Piano* for Heritage Theatre Festival, a professional Equity company in residence at the University of Virginia.

Most of the students that I advise and mentor are interested in pursuing work as professional performers. In the current market, students must be as versed in a variety of skills in order to compete professionally and to work in several mediums: theatre, film and television. Audition preparation includes preparation of material which is sometimes required to be presented "live" at a traditional audition/interview, and sometimes required to be presented with a reel of material (recorded) in order for the auditor to determine which performers he/she will assess at a live callback audition.

My student, Meghan Cable (Theatre/Film 2016), embarked on a Summer Scholars project which combined her passion for both theatre & film. Her project focused on developing an audition reel, with film clips of her acting, to submit for casting calls for film and television work. In order to prepare for this, Meghan enrolled in a film acting course over the summer in New York City. Using her skills as an actress, she began developing material for the reel. In order to create the actual reel, she relied on her skills as a filmmaker/editor.

Close-ups and Cameras: Auditioning for On-screen Acting

Meghan Cable, ‘16

Faculty Mentor: Renee Dobson
Department of Music, Theatre and Film

Supported by the SJU Summer Scholars Program

As a stage actor, my studies primarily consist of the many techniques and nuances of performing in a theatre to a live audience. In order to expand that horizon into the study of on-screen acting, I decided to focus my project on the comprehensive comparisons between stage and screen acting, specifically how understanding these differences are crucial to the audition process. In addition to the research of the on-screen audition process, I put together an audition reel of my own acting work for film, television, and commercial bookings on a professional level.

The craft of acting as a profession is a balancing act: between art and business, free expression and polished technique, make-believe and reality. In that sense, the task of the actor is to create a believable performance fit for the presentation, in accordance with strong training and an understanding of his or her format, especially in transferring one’s skills from stage to screen.

While drama dates back to the early Greeks, screen acting rose as an attribute of the late 19th and early 20th centuries. Clearly, the type of performance one might have seen in 500 B.C. would certainly differ from a 1920’s Hollywood film. Just as the medium of performance made changes throughout time, the styles of acting needed to adapt to changing times and fit the screen. The large, broad acting performance on a Shakespearean stage would not translate to a Regal Cinema in 2015. This is likely the most important nuance of on-screen acting: understanding intimacy and proximity. The emotions and slight movements on stage are much less noticeable due to the nature of the theatre’s set-up. On the contrary, an actor appearing on a film screen in a movie theater is suddenly “blown-up” in size and proximity, revealing even the slightest change in movement or emotion. Similarly, a screen actor must be aware of the assumed proximity to the other actor to whom he/she is “playing”, so that he/she is not simply playing to the distance of the camera, but rather to their scene partner. These adaptations to one’s performance are of extreme importance in the audition room or on an audition tape, to demonstrate to casting directors the ability to make adjustments for camera work.

Understanding and practicing the techniques of on-screen auditioning allows a training actor to become more marketable in their professional acting careers. Through my research, I have acquired necessary skills to further a career in the film and television industry, in the hopes that this industry can continue to grow and flourish with a new generation of strong actors sharing stories with the world on screen.

Sandra Fillebrown
Department of Mathematics
Saint Joseph's University

Ph.D. Lehigh University

Research Interests: Fractals and Dynamical Systems; Mathematics Education

I am interested in mathematics education, in particular finding problems and projects that encourage students to draw connections and deepen mathematical understanding. I am always looking for new problems that are "low-entry, high-ceiling", that is, problems that students can tackle with little background knowledge and make progress on by being persistent and simultaneously are problems that can be extended in multiple directions leading to rich mathematical explorations. These problems are especially useful when working with pre-service teachers as they can improve mathematical knowledge for teaching.

When the Department of Mathematics gained access to a 3D printer, a natural question was how to use this technology in existing courses and whether it would make sense to create new courses or modify existing courses to incorporate 3D printing. Are there topics that we already teach where 3D printing could help elucidate the mathematics being taught? For example, in calculus we spend time finding volumes of various objects that are constructed by intersecting simple solids. Would having 3D models of the intersections make it easier to understand the integrals involved? Would having students themselves learn how to use the 3D printer to create the 3D models of the intersections make their understanding even deeper? In geometry, we cover cross-sections of various solids. Again, would having 3D printed models help understanding and would learning the mathematics necessary for printing the models be beneficial? Are there topics that could be incorporated into a non-majors mathematics course where 3D printing could be used effectively? Might it be possible to design a math course in the GEP (a math beauty course or a first year seminar) around 3D printing? Will 3D printers become standard equipment in school classrooms, and as a result do our mathematics courses for pre-service teachers need to incorporate instruction on 3D printing? All of these questions are interesting to me and worth investigating.

3D Printing as an Aid to Understanding Mathematical Concepts

Katherine Murphy, ‘16

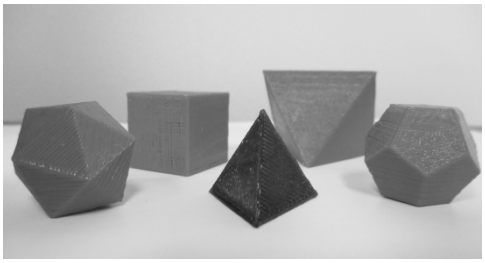
Faculty Mentor: Sandra Fillebrown
Department of Mathematics

Supported by the SJU Summer Scholars Program

3D printing is a fairly new technology. It uses plastic filament, which is fed into an extruder and melted. The melted filament comes out of the extruder and the printer builds an object layer by layer. There are several software programs that can create the files recognized by the 3D printer. One such program is 123D Design; it has a library of predefined objects, which one can alter and combine to create new objects. One of the first objects I created was the intersection of two cylinders, a standard example when studying how to find the volume of solids using calculus. I created this object by taking two cylinders, rotating one of the cylinders 90 degrees, and moving the rotated cylinder into the other cylinder. Then, I was able to select the intersection tool in 123D Design to take the overlapping part of the two cylinders. 123D Design allowed me to get a feel for 3D printing and what I could do with it.

The next program that I learned to use was Maple, which allows for the creation of much more complicated solids. It has several tools for creating and displaying 3D objects and can also export the file format needed by the printer. I used Maple to create some of the Platonic and Archimedean solids, among many other geometric objects. Platonic solids are solids where each face is the same regular polygon (Fig. 1). Archimedean solids are solids where the faces are two or more regular polygons. To create these objects, I had to define each face of the solid as a polygon and to create the polygons I had to find the x, y, z coordinates of all the vertices of the polygon. Next I investigated the relationship between the Platonic solids that are duals of each other and the Archimedean solids. The cube and the octahedron are duals of each other which means that by connecting the centers of the faces of the cube you get an octahedron and vice versa. However, there is a progression through several Archimedean solids from the cube to the octahedron that can be obtained by moving each of the cube’s vertices along the edges and slicing off the resulting triangles. Having 3D models of these solids along with the pieces that are removed aids in understanding the relationship.

3D printing allows one to use a 3D model of a mathematical object instead of a 2D representation of a 3D object. In addition, creating the files to print 3D objects forces one to think about the mathematics behind the object and leads to a deeper understanding of the geometry of the solid. Integrating 3D printing into mathematics courses can thus have a two-fold impact: making it easier to understand properties of solids and also forcing a deeper understanding of underlying mathematics. Having a cool end result - the actual printed object - is a great incentive (Fig. 2).



F Figure 1

FF Figure 2

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 (□) bond and a pi (□) bond as shown in Figures 1a-d. Maximum overlap between the p-orbitals of the □ 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, □, 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^{2,4}.0^{3,8}.0^{5,7}]non-4-ene (**2**) (Figure 1f).

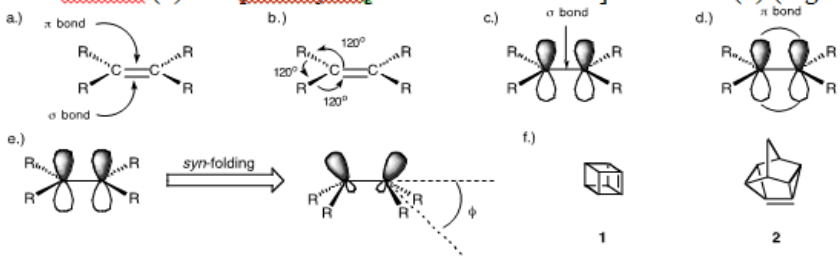
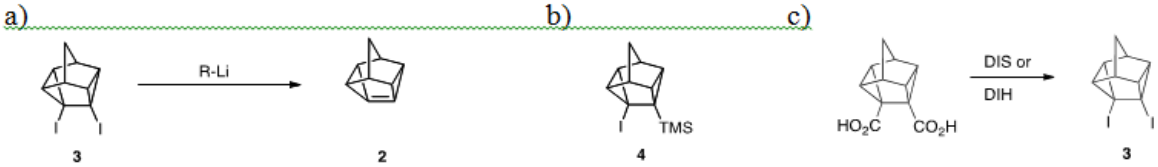


Figure 1

During the summer of 2015, my research group continued the investigation of the synthesis and study of pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene (**2**) and direct synthetic precursors. We have previously shown that alkyllithium induced dehalogenation of 4,5-diiodopentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]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-diiodo-5,5-dimethylhydantoin (DIH).



The Synthesis of Pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene

Renee Kontos, ‘17 and Caroline Stow, ‘17

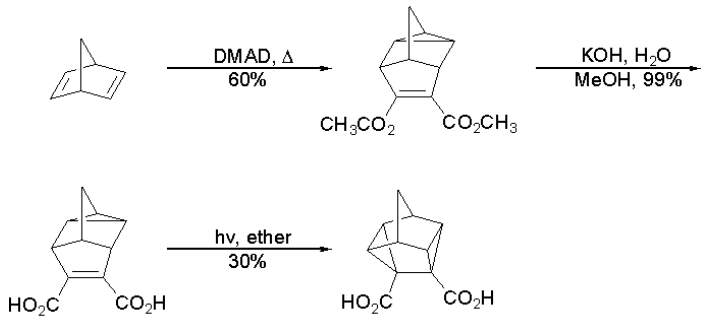
Faculty Mentor: Mark A. Forman
Department of Chemistry

Supported by the SJU Summer Scholars Program

Each summer, the Forman research group continues the study of synthesizing non-natural products. These products have unique properties, including enhanced reactivity due to their molecular geometry. The synthesis focus this summer was the creation of pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene. This compound has a distinctive bond strain on the carbon-carbon double bond, typical in these non-natural products. Ideally, the angle would be 120°, but the strained angle found in pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene implies increased reactivity and high energy.

Pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene experiences syn-folding, a source of the strain in the carbon-carbon double bond. Syn-folding, also known as pyramidalization, is when the substituent groups on the molecule bend towards one another. The result is similar to a tetrahedral geometry instead of the ideal trigonal planar. This causes our molecule to be highly reactive, resulting in a short life span. These contribute to the difficulty in the synthesis of Pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene.

One of our main goals during this summer’s research was to synthesize significant quantities of the precursors to pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene necessary for our research efforts to continue throughout the year. The precursor we focused on was closed diacid. To get this precursor, a Diels-Alder reaction was first performed to synthesize a diester. This diester product was then hydrolyzed in a hydrolysis reaction providing open diacid. The open diacid was then exposed to ultraviolet light in a photochemical reaction, which produced the desired closed diacid. The photochemical reaction causes a photochemical cycloaddition to occur; which is the significant final, yet challenging step in the synthesis of closed diacid as it produces low yields and is very time consuming. Each photochemical reaction needs to be run overnight. Each of the above reactions was repeated numerous times with careful attention to detail so that we could synthesize large amounts of closed diacid.



As we have reached 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 the Forman research group’s efforts to potentially synthesize the target molecule.

The Synthesis of Pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene

Stephanie Schallenhammer, ‘16
Rachel Troxell, ‘16

Faculty Mentor: Mark A. Forman
Department of Chemistry

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

This past summer the Forman research group conducted research on the synthesis and study of the effects on bond angle distortion on the structures and properties of alkenes, specifically pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene .

Alkenes are a class of organic molecules that contain carbon-carbon double bonds. The carbon-carbon double bond of an alkene has an ideal bond angle of 120°. Deviations from this ideal angle result in enhanced reactivity and unique properties of the alkene. Pyramidalization is one of the main types of distortion of alkene bond, which results from a syn-folding of the substituent groups.

We spent this past summer focusing our efforts on modifying the synthetic route we use to get towards our target molecule, pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene, by concentrating our efforts on iododecarboxylation chemistry. Being able to synthesize the diiodide product directly from the diacid product would shorten our synthesis by four reactions (**Figure A**). We reacted our closed diacid product with DIH in chlorobenzene. We experimented with different variables, such as changing the proportions of DIH used, the manner in which reflux was reached, the duration of reflux, and the use of ultraviolet light. Yields varied, and we studied our product via gas chromatography/mass spectroscopy (GCMS).

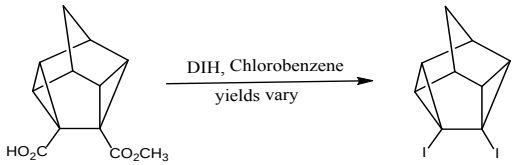


Figure A

Further study will need to be continued throughout the school year to determine if the new reactions we have tried will be more effective for making our diiodide product, or if we will need to continue to use our current synthetic route (**Figure B**).

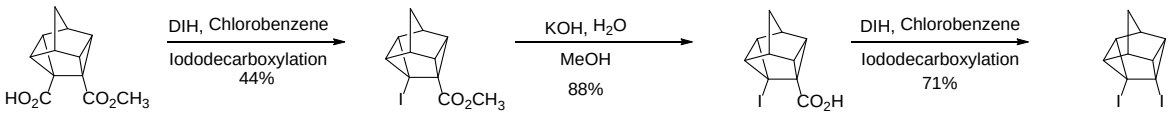
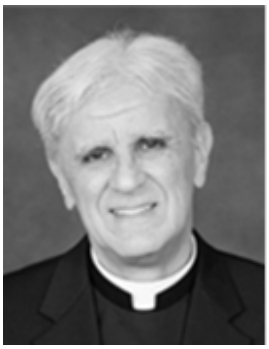


Figure B

The diiodide product is incredibly significant in our synthesis because it is the direct precursor to our target molecule (**Figure C**).

We plan on working to optimize yields of the diiodide product, with the hope of accruing several grams of the diiodide product in the near future, so that we may begin to carry out reactions that will result in pentacyclo[4.3.0.0^{2,4}.0^{3,8}.0^{5,7}]non-4-ene.

Figure C



Vincent J. Genovesi, S.J.
Department of Theology and Religious Studies
Saint Joseph's University

Ph.D. Emory University

Research Interests: Christian Ethics

Vatican II cast a new light on the Catholic Church's perspective regarding the challenges of Christian living. It also provided direction for my writing and teaching, urging that the ethical study of Christian living must reach out in two directions: its spirit and vitality have to be rooted in biblical theology, and its exhortations should highlight the truth that living morally also marks a person's growth in the life of God. Moral growth is also spiritual growth, and is born only in our love that both expresses gratitude for the love offered us by God, and reveals itself in our assisting others to realize their full potential as true human beings.

Because the God who is love walked among us, we learned that to love as he does is to learn to truly live. Authentic Christian living is necessarily committed to establishing social justice by means of an ongoing struggle against the structures of political, economic, racial and sexual oppression, and any attempt to dichotomize the realms of personal and social morality distorts the meaning of Christ's radical commandment of love.

Any moral wrong done, or any moral good omitted, appears as a denial of the responsibilities of true love. This theme has informed my writing and teaching, whether in medical ethics, when dealing with reproductive technology, abortion, or care of the sick and dying; in sexual ethics, when framing the moral issues relating to premarital sex, contraception, same-sex genital relations, or marital love's potential to embody the qualities of God's divine love; in social ethics, when addressing the systemic inequalities that frustrate so many people, and thus remain necessarily devoid of love because they are still so far from the establishment of justice, which reveals love's minimal achievement.

Examining the Medical, Theological and Ethical Implications of Stem Cell Research

Gregory Ferroni, ‘16

Faculty Mentor: Vincent J. Genovesi, S.J.
Department of Theology and Religious Studies

Supported by the SJU Summer Scholars Program

My research this summer focused on the usage of stem cells, both embryonic and somatic, in modern medicine. My work was dedicated to determining if the usage of either group is ethical and whether or not research should continue in this field.

When determining and evaluating the ethical nature of stem cell research, I began with the scientific origins of each group. This determination is crucial for evaluating proper usage. Embryonic stem cells are derived from a 5-7 day old embryo, fertilized through *in vitro* processes. The removal of these cells terminates the life of the embryo. Somatic cells, including induced pluripotent stem cells (iPSCs), are derived from body tissue of the patient. While embryonic stem cells are pluripotent, with a greater ability to differentiate than their somatic counterparts, the possibility of termination of life poses a moral hindrance.

Next, I evaluated the Catholic Church’s opinion on these issues. Primarily using *Donum Vitae*, I not only reviewed stances on stem cell research, but also abortion, artificial insemination, and *in vitro* fertilization, methods used in the embryonic stem cell harvesting pathway. The Church condemns the use of these procedures, thus deeming embryonic stem cell research immoral. She has instead supported the use of somatic stem cells, despite their decreased differentiability.

Overall, my research concluded that because we cannot determine if human life begins in the 5-7 day harvesting period, embryonic stem cell research couldn’t be deemed immoral at this time; however, I propose the increased usage of iPSCs to eliminate the moral ambiguity. Primarily, the usage of iPSCs would eliminate the differentiation hardships of somatic cells while not risking possible life. Essentially, with the use of iPSCs, a determination of the morality of embryonic or somatic stem cell research does not have to be discussed.

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

Ph.D. University of Virginia

Research Interests: CO_2 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 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 useful chemical building blocks.

The Synthesis of New Molybdenum Carbon Dioxide Complexes

Xuyao Duan, ‘16

Faculty Mentor: Peter M. Graham
Department of Chemistry

Supported by a Grant From the American Chemical Society Petroleum Research Fund

In nature’s carbon cycle, carbon dioxide is produced by respiration and is converted into carbohydrates which provide energy to cells. However, the balance of the global carbon cycle has become broken since the industrial revolution because excess carbon has been released into the atmosphere from the overuse of fossil fuels. The development of chemical processes where carbon dioxide is used as a chemical building block will not only decrease the reliance on petroleum, but also consume excess carbon dioxide produced by industry. Carbon dioxide is nonflammable, nontoxic, and easy to obtain, which makes it an ideal starting material. However, the innate stability of carbon dioxide dictates that few chemical processes can make use of it as a starting material. The purpose of our group’s research is to synthesize new carbon dioxide complexes which might enable carbon dioxide to be better utilized by chemical industry and reduce the impact of carbon dioxide emissions.

During this summer, my project has been to synthesize new molybdenum carbon dioxide complexes featuring new ligands attached to the molybdenum metal center. I start with $TpMo(NO)(CO)_2$, and the compounds which can provide ligands such as an N-heterocyclic carbene (NHC), 3-chloropyridine, or 3,5-dichloropyridine. This reaction requires a high temperature reflux to give ligand substitution and form a new molybdenum carbonyl complex. I then use oxidants like cumene hydroperoxide and *t*-butyl hydroperoxide to oxidize and synthesize a carbon dioxide complex. Next, I use standard spectroscopic techniques to detect the characteristics of the complex. For example, infrared and nuclear magnetic resonance spectroscopy can help determine whether the substitution or oxidation have occurred successfully. One of the carbon dioxide complexes that I have isolated featuring the ligand NHC is depicted in Figure 1.

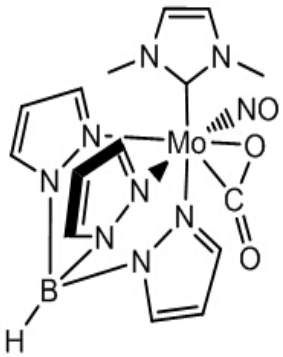


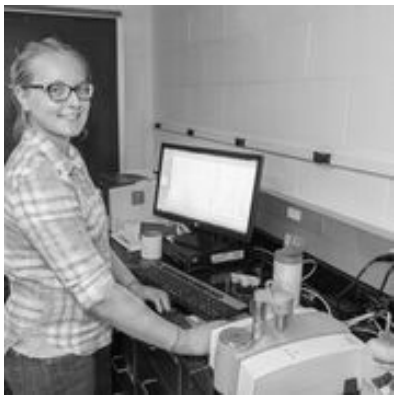
Figure 1. $TpMo(NO)(NHC)(\eta^2\text{-}CO_2)$
(NHC = 1,3-dimethylimidazolidene)

Carbon Dioxide Activation and the Synthesis of Acrylates via Molybdenum Carbon Dioxide Complexes

Madeline Graziani, '17

Faculty Mentor: Peter M. Graham
Department of Chemistry

Supported by the SJU Summer Scholars Program



Carbon-containing fuels, such as natural gas and petroleum, are also used as starting materials for the vast majority of industrial chemical syntheses. Although carbon dioxide is readily abundant and nontoxic, it is rarely used as a carbon source. The problem with carbon dioxide is that it is very 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-carbon dioxide complexes can overcome this obstacle and allow carbon dioxide to react with other substrates to form a product. Such reactions could allow chemical industry to make chemical products, such as acrylates using carbon dioxide as a starting material. These products could sequester carbon for extended lengths of time in an economical way.

My project has mainly involved examining the reactivity of different molybdenum-carbon dioxide complexes, usually with either 3-fluoropyridine or 1-methylamidizole as the supporting ligand. I have done test reactions with a variety of compounds to observe their reactivity with the carbon dioxide complexes. I have also done test reactions to see if the carbon dioxide complex can be reduced to form a carbon monoxide complex. Overall, my research has focused on the activation of carbon dioxide to form acrylates or other products using molybdenum complexes as a promoter.

Reduction of Molybdenum CO_2 Complexes

Gregory Lorzing, ‘16

Faculty Mentor: Peter M. Graham
Department of Chemistry

Supported by SJU Summer Scholars Program

Since the beginning of the industrial revolution, people have used coal and subsequently petroleum as primary energy sources. This reliance on fossil fuels has created an imbalance in the atmosphere due to elevated levels of carbon dioxide. As most people know plants mitigate carbon dioxide in the air through photosynthesis by using the carbon dioxide as a starting material to create carbohydrates. In a similar manner, my research over the summer was to study ways to utilize carbon dioxide as a starting material in chemical synthesis that would both remove it from the environment and reduce the current reliance on fossil fuels. Since carbon dioxide is extremely stable, our research uses a metal center such as molybdenum to activate the carbon dioxide. Upon coordination to the metal center the carbon dioxide becomes bent rather than linear, which causes it to become more reactive.

Over the summer I have worked on the reduction of molybdenum carbon dioxide complexes. The reduction method removes an oxygen from carbon dioxide to create a carbon monoxide complex. This simple reaction shows that the complexes have effectively carbon dioxide by allowing reduction to occur under mild conditions. Additionally I worked to create a new synthetic route to the carbon dioxide complexes of the transition metal, tungsten, through the use photochemical methods. Tungsten complexes are of particular interest since they are capable of activating carbon dioxide more effectively than molybdenum.

Synthesis of Metal-Centered Carbon Dioxide Complexes

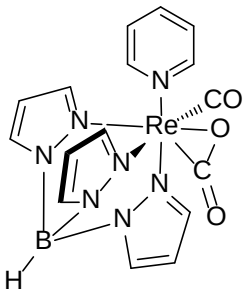
Joe Vasta, ‘16

Faculty Mentor: Peter M. Graham
Department of Chemistry

Supported by the SJU Summer Scholars Program

The problem of excess carbon dioxide in the atmosphere, stemming from the abundance of fossil fuels being burned for energy, can be addressed by using carbon dioxide as a carbon starting material. Utilizing carbon dioxide in large scale chemical reactions has the advantage of sequestering some carbon dioxide by using it to make useful products that would otherwise have been made from petroleum or natural gas sourced starting materials. Since carbon dioxide is extremely stable and does not normally react with other molecules, it must be attached to a metal to increase its reactivity. This activation can allow for various reactions to be performed with carbon dioxide.

Past work in our laboratory has shown that metal complexes using the transition metals molybdenum and tungsten are capable of coordinating a molecule of carbon dioxide very effectively. During this summer I have been working towards the synthesis of an analogous rhenium carbon dioxide complex, the purification of this complex, and the coordination of other ligands. Rhenium complexes are of interest because they may promote photochemical reactions of carbon dioxide. Our preliminary results indicate that carbon dioxide has been successfully coordinated by the rhenium metal center, as shown below. Our future plans are to pursue simple reactions of the new rhenium complex including reduction to carbon monoxide and reactions with other small molecules such as ethylene.



Yu Gu
Department of Physics
Saint Joseph's University

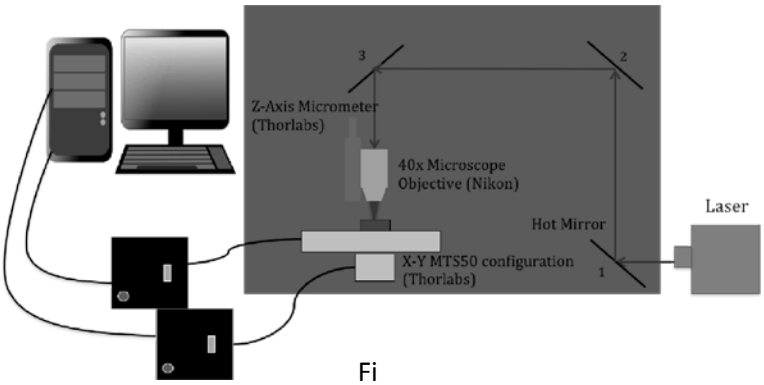
Ph. D. Massachusetts Institute of Technology

Research Interests: Microfluidics and Microfabrication

My students and I are interested the design, fabrication and characterization of Lab-On-Chip devices. Lab-On-Chip is the buzzword for processing liquids in small volumes with compact and portable devices. The volumes we work with range from one-one millionth of a liter to one-one hundred millionth of a liter. Using liquids in small volumes has many advantages, including the ability to process many samples simultaneously and getting immediate results in field applications including environmental monitoring, sensing and biomedical testing. In particular, we are interested in a novel fluid called ferrofluid which is known for its responsiveness to magnetic fields and sealing properties.

This past summer's research had two major thrusts. The first was to redesign and rebuild a laser-based microfabrication system which would enable the "drilling" of microfluidic channels in glass. The second was to study the microfluidic behavior of ferrofluids under periodically changing magnetic fields. Figure 1 (by Karl Morris '16) shows the newly designed microfabrication system, which has upgraded components since last year. Briefly, a short pulsed laser is redirected by three mirrors and focused using a microscope objective onto a glass slide mounted on an computer-controlled X-Y translation stage. The laser causes removal of the glass material resulting in the "drilling" of channel-shaped patterns as controlled by the translation stage. We developed a new Labview software interface for this setup which is robust and intuitive.

In the study of small volume ferrofluids, we used a commercial printed circuit board vendor to produce small two-dimensional solenoids, or microcoils for the production of magnetic fields. We also studied the movement of droplets of ferrofluids inside capillary tubes and microchannels inside a commercial Lab-On-Chip. Droplets of oil-based ferrofluids were suspended in an immiscible fluid (either deionized water of a dilution of alcohol) and inserted into capillary tubes or microchannel of the Lab-On-Chip. An alternating magnetic field was produced using the combination of a permanent magnet and a signal-generator driven electromagnet. Using a high-speed camera (JVC), reflection microscope (Amscope) and MATLAB imaging processing, the position and velocities of the droplets were tracked and calculated.



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Acknowledgements: This research was funded in part by the Cottrell College Science Award from the Research Corporation for Science Advancement.

Investigation of Behavior of Nanoliter Ferrofluids Under Oscillating Magnetic Field

Huiyanangel Chow, ‘16

Faculty Mentor: Yu Gu
Department of Physics

Supported by a Grant From the Research Corporation for Science Advancement

As the usage of ferrofluids in many applications increases, the understanding of basic fluid physics and the magetoviscuous and viscoelastic properties of nanoliter ferrofluids in mutiphase flow need to be characterized, and enhance the optimization in the usage of ferrofluids in microfluidic environments.

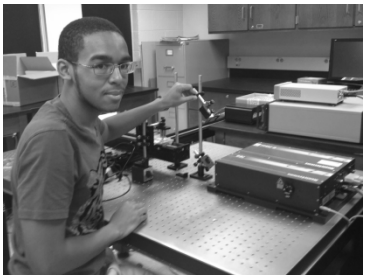
In microfluidic environments, ferrofluids have been used for valving, pumping samples in DNA amplification, and ferrofluids have been used in Lab-On-Chip, a laboratory device that allows miniaturization of chemical and biochemical platforms. Ferrofluids are stable, colloidal suspensions of single-domain magnetic particles of nanometer size suspended in an aqueous or non polar solvent. Ferrofluids can be actuated without the use of moving parts when reacting to external magnetic field. In this research, I studied the behavior of nanoliter ferrofluids under oscillating magnetic field in a wide range of frequency. The movement and megnetoviscuous and viscoelastic behaviors of ferrofluids droplet are expected to depend on strength and frequency of the oscillating magnetic field as well as the density and size of ferrofluids droplet.

During the 10-weeks research, I examined and investigated the magnetoviscuous and viscoelastic behavior of ferrofluids droplet responding to external oscillating magnetic field in a variety range of frequency. At the beginning of the research, the behavior and movement of a variety of ferrofluids were examined and tested. EFH1Ferrofluids were selected and used in the study, they are the educational ferrofluids that have relatively high magnetic performance and response, low viscosity, and they can be purchased at a low-cost for its educational purposes. In the experiment, ferrofluids droplet was periodically actuated by the combination of electromagnet and permanent magnet in a capillary tube, which has a 1.1 millimeter interior diameter. The results showed that the movement of smaller volume of ferrofluids droplet had larger amplitude at the lower frequency, and the movement of larger volume of ferrofluids droplet had smaller amplitude compared to smaller volume of ferrofluids droplet. The magnitude of maximum velocity of larger volume of ferrofluids droplet was smaller than the magnitude of maximum velocity of smaller volume of ferrofluids droplet, and the magnitude of the maximum velocity was independent of the frequency of external oscillating magnetic field.

Microcoils for Ferrofluid Actuation in Lab-on-Chip Application

Karl Morris, '16

Faculty Mentor: Yu Gu
Department of Physics



Supported by the SJU's Summer Scholars Program

In the past, we have worked on an optofluidic switch that makes use of the optical and magnetic properties of ferrofluids. In order to control this switch, we used an electromagnet connected to a signal generator, along with a permanent magnet to provide an offset magnetic field. This setup proved effective but not efficient because the magnets that created the field were large with respect to the size of the chip. The goal is to create an optofluidic switch setup that is as small and portable but just as effective. Therefore, we wanted to design a device that generated a magnetic field but was closer to the chip in size.

A magnetic field can be generated when a current-carrying wire is in the shape of coils and connected to a power supply. Given this information, we decided to design a new setup that makes use of microcoils, shown in Figure 1. The microcoils are copper printed on the face of a circuit board that can be connected to a power source in order to generate a magnetic field. For the switch to work properly, two alternating magnetic fields need to be generated so that the plug can be attracted to each microcoil. The alternating magnetic fields will cause the ferrofluid to move back and forth.

In order to create these structures, I used PCB Artist and sent the board I designed to Advanced Circuits, shown in Figure 2. The board contained multiple wire styles where the wire thickness and the number of turns on the coils were changed. These parameters were changed in order to characterize the magnetic field generated by each microcoil.

Once the board was delivered, I soldered wires to the vias in order to connect the wires to a power supply. Then, I tested each of the microcoils that we created by connecting them to a signal generator and measuring the magnetic field that they generated. The magnetic fields that were generated were not strong enough so we connected the microcoils to a DC power supply. The DC power supply generated a stronger magnetic field; however, the current was caused the microcoils to overheat.

We created a new set of microcoils that were two layers instead of one, hoping that this would increase the magnetic field. Although the magnetic field did increase, it was not significant enough to make the setup complete. In the future, we hope to create microcoils that are able to generate a large enough magnetic field when connected to the signal generator. Last, we hope to have a signal generator that has a higher output voltage.

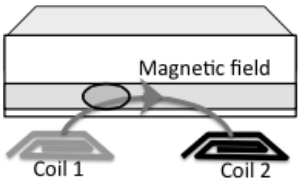


Figure 1

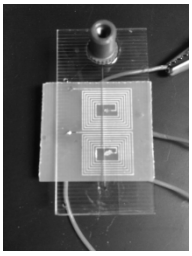
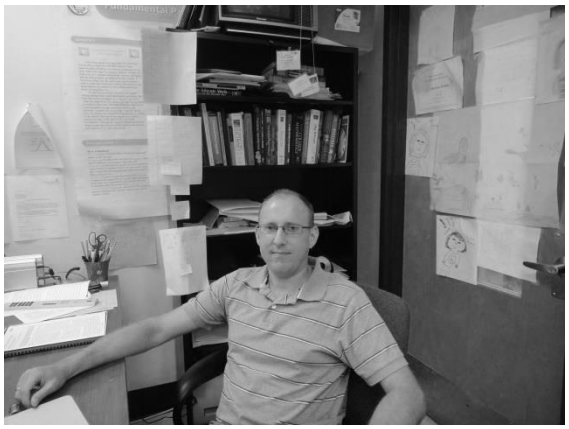


Figure 2



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 2015 three students worked in my laboratory, and two students volunteered for a part of the summer. Zachery Brown'17 and Greogry Hogan'16 studied dynamics of colloidal particles in dense suspensions with various strengths of inter-particle attraction. Ryan Stull'15 and Sebastian Hurtado-Parra'15 worked on extracting properties of complex liquids by tracking motion of magnetic beads suspended in dilute colloidal suspensions.

Colloidal suspensions of spherical particles have been used successfully as a system that models the behavior of a regular glass. Zachery and Gregory made samples with various attractive strengths between colloidal particles, thus making them more sticky, to see how particle dynamics change as the particle stickiness increases. Using confocal microscopy we collected data over several hours and then tracked the centers of the colloidal particles. We were able to study how colloidal particles interact with each other and study their collaborative motion. We are continuing analysis of data to extract more information about cooperative particle motion and how it changes with the concentration of colloidal suspensions and with inter-particle attraction.

Ryan and Sebastian 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.

Funding: NSF RUI-1306990 and Summer Scholars Program.

Investigating States in Dense Colloidal Suspensions

Zachery Brown, ‘17

Faculty Mentor: Piotr Habdas
Department of Physics

Supported by a Grant From the National Science Foundation

It has long been a goal of physicists to understand the nature of glassy materials. Unlike conventional solids whose smallest structural formations are ordered and crystalline, glasses exist in amorphously packed non-equilibrium configurations. One such system, a suspension of spherical colloids, serves as an excellent model for study. As it consists of particles whose sizes are on the order of micrometers, the particles are subject to Brownian motion while in suspension. Systems of only spherical colloids and solution are known as hard-sphere and the particles interact the way billiard balls would, only bouncing off of each other on contact.

Systems of spherical colloids in suspension are not the only system where dynamical arrest can be observed. Adding another species of smaller particle to certain hard sphere glasses produces an interesting result. The smaller particles in the system drive a short ranged attraction between the larger colloidal spheres as a result of a phenomenon known as depletion attraction. This allows a variety of states to be produced by only varying the volume fraction, the volume of colloidal spheres divided by the system volume, and depletent particle concentration. Much of our research over the past few years has been dedicated to understanding how particle dynamics change in each of the different states.

The suspensions in this study consist of spherical colloids suspended in density and index matched liquid. Samples with depletent attraction contain a smaller particle about 10 percent the size of the colloids. Confocal microscopy and particle tracking techniques are employed to identify the trajectories of individual particles within the suspensions. Once trajectories have been determined for thousands of particles, statistical methods are used to learn about the nature of particle motion in various states. Results indicate that within our systems, motion is rarely as simple as a single particle squeezing through a gap in its cage and finding a new position. Instead, correlation functions show that there are instances of cooperative particle rearrangement events in our samples. These rearrangements differ greatly from state to state. Weaker attraction leads to smaller rearrangement events that are more spatially distributed. Highly attractive systems undergo larger rearrangements that are more spatially correlated. We hope that our future research will contain even more clues leading us to a better understanding of dynamical arrest and glassy materials.

Investigating the Free Diffusion of Dilute Colloidal Suspensions

Gregory Hogan, ‘16

Faculty Mentor: Piotr Habdas
Department of Physics

Supported by a Grant From the National Science Foundation

This project deals with an investigation into the nature of glass. Though glass is a commonly used material, its properties are still very poorly understood. It is created when a liquid is cooled rapidly enough so that the molecules do not have time to form crystalline solids. However, it can be rather difficult to study glass itself because of the size of the molecules and their diffusion times. For these reasons, it is difficult to observe it on a microscopic level. But, because glass is similar to a colloidal suspension, researchers can study materials that are analogous to it to help understand its properties. Colloidal suspensions are solid particles that are submerged in a liquid. This project investigates certain properties of colloidal suspensions.

What my project specifically in-tales is studying the free diffusion of dilute colloidal suspensions at varying viscosities. Our colloidal suspensions are PMMA particles, which are dyed in rhodamine. The particles are then density and index matched in a solvent comprised of decalin and cyclohexylbromide. A change in the viscosity will subsequently change the diffusion constant of the colloidal particles, the way in which the viscosity effects the diffusion constant is seen through the Stokes-Einstein relation.

In our lab the particles are first traced on a confocal microscope. Next the through confocal microscopy techniques the particles trajectories are determined and the MSD of the particles is calculated. Finally the diffusion constant of the particles is determined by using the Stokes-Einstein relation. These steps are then repeated in order to find a diffusion constant for a different viscosity.

The main reason we are determining the diffusion constants is because in order to scale our relevant times for our dense samples to Brownian time we need to know the viscosity as well as the diffusion constant. We have observed that as the viscosity increases the diffusion of the particles decreases, and we are planning to observe more samples at varying viscosity.

Investigating Impulse of Impacts on Materials with Varying Stiffness and the Effect of Object Shape on Drag

Nick Johnson, ‘16

Faculty Mentor: Piotr Habdas
Department of Physics

Supported by the SJU Summer Scholars Program

Over the course of this past summer, I have been working on two experiments in conjuncture with both the Department of Physics under my mentor Dr. Habdas as well as with the Department of Biology with the help of Dr. Fingerut. The subject of my research has covered both the effect of stiffness of a material on the impulse (a measure of how long a force acts upon an object) that is recorded from impacts of varying intensity, as well as the effect of the shape of a falling object on the drag that object experiences during uninhibited descent through water.

In the first experiment, it was investigated how impacting materials of varying stiffness affects the impulse being registered by a force sensor. It was discovered that while softer materials registered a lower impulse when the impact was small, the bigger it was, the higher the impulse was. The same can be said of stiffer materials; however the softest material registered an increase in impulse of 39.5% and the stiffest increased by only 18.2%. A trend emerged that the stiffer a material was, the lower the difference of the impulse versus the size of the impact became.

In addition, I found that the shape of an object does indeed impact the drag forces that are felt by that object during an uninhibited descent through water. The experiment performed showed the expected result that the closer to the middle of an object the shoulder (or widest section) is located, the faster it will travel due to the fact that drag is minimized in that type of design. The velocity of the object with the shoulder at the middle was 12% greater than having the shoulder at either of the ends (results from each end were different by only 0.001 m/s).

Emily Hage
Department of Art
Saint Joseph's University

Ph.D. University of Pennsylvania

Research Interests: Twentieth-Century American and European Art; Print Media, Museum Studies, Art and Social Justice

With a background in philosophy, political science, and economics, I am fascinated by the social, political, cultural, and economic context of art, particularly as it relates to national, religious, gender, class, and racial identity and issues of social justice. The relationship between image and text, particularly in collage and artists' magazines, is of particular interest to me. Having worked in museums for years, I also am committed to making cultural institutions accessible and engaging for a broad range of audiences and raising awareness of the importance of display design.

The distinctiveness with which the visual arts can express devotion, critique, and confusion motivates my study of artists' varied responses to their specific historical conditions. Although often overlooked, artists' involvement with print media constitutes some of their most direct and widespread effectiveness. My research on artists' magazines from the early twentieth century has informed my analyses of later works by artists infiltrating mass media and the public sphere. 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.

Street Art and Social Justice: An Arsenal of Aerosol

Molly Ledbetter, '17

Faculty Mentor: Emily K. Hage
Department of Art

Supported by the Summer Scholars Program

Street art provides individuals—particularly those living in urban areas— with an opportunity to speak publicly on social justice issues. In the 1980s there was an explosion of this art medium, especially in New York City. A whole culture formed around it on the streets of New York, where graffiti artists spoke out about issues like the AIDS epidemic and the crack wars, and receptivity varied. Inspired by New York in the 80s, I wanted to further study how street art thrives as a medium for telling stories, expressing public sentiment, and even aesthetically enhancing city streets this day in age. With the help of Philly based artists coupled with scholarly research, I was able to learn more about how this art impacts people, how it influences and adapts to its surroundings, and why certain street artists do what they do.

Street art can be an incredibly personal and expressive form of art. It allows any individual with a can of paint (or otherwise), a dollop of bravery, and an idea to become an artist and for his or her work to exhibit publicly. Because of this work's direct, very raw encounter with the public, it yields a unique interaction between the piece and its audience. This made me question how people receive street art. Do bystanders even notice the vibrant commentary on society clinging to the walls that surround their daily commute? Unlike that housed inside of museums or private collections, viewing this art is free of charge. It's out there in the open, a free gallery for anyone to peruse or ignore. "Street art," can take the form of a mural, a spray painted tag, stickers, posters, a sculpture, performance art, a stencil, flyers. It can take the form of "yarn-bombing," flash-mobs, or even gardening. This umbrella of a term does, however, have a unifying element: a message. Any piece that falls under this category has some sort of message that the artist wants to get across to a viewer. Be it a name, a criticism of government, a commentary on society. I was fascinated in finding out what the messages are that coat the walls of Philadelphia. I wanted to explore what the artists here trying to convey to and how these pieces of art perhaps reveal something about their creator or their setting.

This summer I had the pleasure of working with two street artists from Philadelphia: Jessie Hemmons, otherwise known as 'Ishknits,' and Amber Lynn. These two women opened up my eyes to their respective bodies of work and the messages that that work promotes. 'Ishknits' is a "yarnbomber" from the Philadelphia area who uses yarn as a "mockingly feminine craft." She creates knitted pieces and installs them on buildings, political sculptures, iconic objects, whatever she sees fit or inspiring. One of the most intriguing facets of her work is its temporary existence. Completely exposed and vulnerable to the elements, her work does not last the test of time. Not to mention, it is illegal, and often gets removed almost immediately. Amber Lynn, the other artist I worked with focuses a lot on body image in light of her personal struggles with this topic. She has a series called "CAT CALLS" that includes wheat pastes of women with different catcalls written out, like "Damn girl you thick." The series was part of a larger project called "Project Gastric" that exposes on the emotional and physical effects of gastric bypass surgery. The work is intended to make people feel uncomfortable much like cat calling does. My research inadvertently and subsequently started to focus on the underlying male-dominated sentiment of the street art sub-culture. It led me to question gender and race in relation to street art. I am excited to see where this continued research takes me in the year to come.

From Hottentot to Jezebel:
The Oversexualization of Black Female Bodies in Lionsgate Films

Amiah Taylor, '17

Faculty Mentor: Emily K. Hage

Supported by the SJU Summer Scholars Program

The "Hottentot Venus," was a South African woman named Sarah Baartman, who was toured around Europe for five years in the early 1800's in a freak show exhibit. Baartman was known for her extended labia or "Hottentot apron," and large protruding buttocks. To many she also represented scientific or medical evidence of racial difference. Baartman was seen as the epitome of black femaleness and a missing link between humans and animals, this projection of animalism and emphasis on sexual difference is still alive in well in the portrayals of black women and their sexualities, today. Sarah Baartman and the legacy of the "Hottentot Venus," are still relevant in modern society because black women in films continue to be debased, seen as pornographic commodities and fictionalized as bitches, hoes and jezebels.

To find out information for my project, I read, analyzed and compared movies with black female lead and supporting characters. My research question was: who is the jezebel and how does her constant projection in 21st century film perpetuate the legacy of Sarah Baartman?
The films that I studied for my project include "Temptation: Confessions Of A Marriage Counselor," "Precious," "Addicted," "Frankie and Alice," and "The Inevitable Defeat Of Mister and Pete." Each film contained a jezebel figure or jezebel-hybrid who represented a deviant sexuality. Notable print sources I consulted include academic journals from Duke University Press, University of California Press, University of Illinois Press and Rutgers University Press. The product of my Summer Scholars project was a scholarly article that I hope to submit for publication.

Gerard M. Jacobitz
Department of Theology & Religious Studies
Saint Joseph's University

Ph.D. University of Notre Dame

Research Interests: Phenomenology of Religious Experience

Human beings exercise their faculty of reason in two ways: as participants or as disinterested observers. The first way is personal or existential: the knower gets involved with the object known. The second way is impersonal or factual: the knower stands back from the object and makes intelligent distinctions. Water, for example, can be known in the first way by the swimmer or fire fighter, in the second way by the chemist. Only the factual form of knowledge is expressible in exact formulae, such as "H_2O." The existential by its very nature is harder to pin down—it's not even always conscious. If fish could talk, water would be the last thing they'd talk about.

In the Gifford Lectures of 1900–02, published as *Varieties of Religious Experience*, American philosopher and psychologist William James located religious experience squarely within the domain of the impersonal or factual. Religious phenomena are available to disinterested observers provided they possess the requisite genius to register them. A century later, Canadian philosopher Charles Taylor, in his own Gifford Lectures (1998–99), published as *A Secular Age*, argued quite the opposite. The religious is not something encountered as an extraordinary object alongside ordinary ones; it is an existential reality that accompanies all experiences. And, in the post-industrial secular world of Europe and North America, the sacred is no more absent than it ever was; it has retreated only from the classical religious formulae.

Taylor distinguishes three existential conditions: fullness, emptiness (sometimes referred to as exile), and what he calls the "middle condition." A life lived in fullness is characterized by a superabundance of joy, purpose, and fulfillment beyond measure, which may or may not be punctuated by the intense sort of experiences James was so interested in. But those fortunate enough to persevere in fullness are often, and perhaps paradoxically, also those most prone to experiences of emptiness or exile, what the Christian mystic John of the Cross referred to as the dark night of the soul. In lieu of both these extremes, most people settle for the "middle condition," consisting of, for example, a reasonably satisfying occupation, a family and spouse, or some other means of contributing to the commonweal. Contemporary literature is full of examples.

Perhaps there are spiritual exercises, i.e., disciplines of service, meditation, or prayer, particularly well-suited to our secular age, such as to help people negotiate these basic existential conditions. Andre Dubus seems to suggest this in his short story, "They Now Live In Texas," about a man who achieves what looks like Taylor's sense of fullness with the help of Alcoholics Anonymous and attendance at daily mass. The Jesuit priest and spiritual writer Edward Dowling, though not himself an alcoholic, noticed a significant parallel between the second week of Saint Ignatius' *Spiritual Exercises* and the practice of "humility through humiliations" so important to the spiritual program of AA. There surely isn't an easy equation of the Jesuit *Magis* and Taylor's fullness, but there may be a way, perhaps expressible only in literature, to show how "choosing the greater for the Greater" can stave off emptiness and lead toward fullness.

The Middle Condition

Marty Farrell, ‘17

Faculty Mentor: Gerard M. Jacobitz
Department of Theology

Supported by the SJU Summer Scholars Program

In the spring of 2014 I was introduced to Charles Taylor’s idea of a “Middle Condition” in Professor Jacobitz’s Theology 154 course. This summer I was allowed the opportunity to explore this “Middle Condition” and its relationship to “The Magis” with Professor Jacobitz. Through reading excerpts of Taylor’s *Secular Age* as well as The Spiritual Exercises of Saint Ignatius we were able to gain a deeper understanding of both the Middle Condition and the Magis. After doing so we were able to determine that according to Taylor human beings have the ability to live in a condition of fullness, a condition of emptiness, or a condition that lies somewhere in between. Despite the attraction of fullness, most people, Taylor believes, choose to live in the middle condition. Though it hinders us from absolute fullness, we choose this middle ground because it protects us from emptiness.

We then concluded from the Spiritual Exercises that Ignatius believed that in order to live greater (or achieve fullness) one must give themselves completely to God and accept the worldly humiliation that often accompanies that decision. It was in the Spiritual Exercises, specifically throughout the second week of the exercises, that we were able to see that humility is vital to living for the greater glory of God. From our reading, it seems that the reason most people choose the middle condition is because it is capable of bringing a certain peace without the pain of humiliation. If one wishes to truly live “the Magis” however, he or she must be willing to pass through great humiliation. In the passion and resurrection of Christ we are able to see someone follow that path of humiliation (emptiness) to the glory of a resurrection (fullness) in a most perfect way.

Over this summer, after gaining a better understanding of the Magis and Taylor’s Middle Condition, I was able to create three short stories that follow fictional characters and events inspired by my home in Delaware County and the community at Saint Joseph’s University. My goal was to show how these characters struggle to live greater by choosing or avoiding humility in a world that encourages the avoidance of humiliation at all cost.

James B. Kelley
Department of Marketing
Saint Joseph's University

Ph.D. University of Western Australia

Research Interests: Branding, Brand Communities, Corporate Wellness Branding

My research focuses on global branding, brand communities, and corporate wellness bradnign. In an ever-changing world, it is imperative that organizations track and assess how a consumer perceives their brand, however, how a consumer interacts with the brand plays an equally important role. Consequently, there are three primary research streams that I explore: consumer behavior towards global brands, and global brand communities.

How a consumer behaves toward a global brand has multiple facets that are influenced by country of origin, consumers past experience, education, income, and personality traits. For example, when investigating Eastern cultures attitudes and perceptions towards global brands, Chinese and South Korean consumers are more influenced by their peers and will choose brands based on what others believe are important regardless of their personal preference. Western orientated consumers (U.S.) are more likely to choose brands based on their own personal experience with the brand regardless of what others think. Regardless of cultural orientation, when a consumer is highly materialistic they have stronger attitudes and perceptions towards global brands, and in turn are more likely to consume global brands.

The second stream of literature focuses on online brand community research. Prior research has focused on consumers' general motivations of community engagement, however research related to the power of branding is limited. To explain consumers' general motives for participating in an online brand community, I use various motivation theories to explain why consumers identify, internalize and interact with online brand communities. Through this research we find that an individuals self-concept and motivation to get and give information are found to serve as central mediators between individual differences and brand website interactivity.

Finally, I recently have begun to investigate organizations wellness branding. Organizations spend $6.5 billion dollars a year on corporate wellness program initiatives and motivating employees is a critical part of the process. In this early stage of research I have begun to host a podcast called Brave Endurance Wellness Podcast that can be found on iTunes and Soundcloud. The aim of the podcast is to conduct interviews for a book that I will begin writing in late 2016.

Do Consumers From Different Countries View an International Brand in Different Lights?

Courtney Marzano, '16

Faculty Mentor: James B. Kelley
Department of Marketing

Supported by the SJU Summer Scholars Program

Many international companies attempt to set a universal branding scheme. However, a specific company is not always viewed in that manner depending on the country it is advertised in. I found this to be true while taking my Marketing Communications class and completing a project on the Share a Coke campaign, where the campaign was looked at more favorably in some countries rather than others. This then directed me to question whether this is a common theme amongst other international companies.

The majority of my project was research-based, where I investigated the differences between how countries advertise and perceive international brands. Throughout the course of the summer, I focused on 10 companies, in all different types of industries ranging from food to fashion to cars. In these 10 companies, 5 are American-based that have expanded internationally to other countries (including Spain) and the other 5 are Spanish-based companies that have expanded internationally as well (including the USA). I wanted to make sure to incorporate Spanish speaking countries because I am a Spanish minor and have an interest in how they potentially conduct business differently. Of all of these companies, I made sure they did a heavy amount of marketing and looked at their advertisements in both America and Spain through all different platforms: magazines, Facebook, Youtube, Twitter, Instagram, Pinterest, and more.

When comparing the different types of cultural marketing, I found that the ads that appeared in Spain were different. Since Spain is a low context society, they do not use as many words as many words in their advertising. They are more inclined to either feature a print ad with a picture and company logo or run a commercial with a song playing in the background, no explanation of the product, and finish with the company logo appearing at the end. This differs greatly from advertisements that are promoted in the United States, where companies typically are more verbose with their ads. Ads featured in high context societies, such as America, tend to have commercials where they fit a lot of information in a small time frame by explaining the product, brand, etc.

As a result of this project, I found it is very important to know who your audience is when planning to advertise to them if you are an international company. Therefore, when planning to promote your product internationally, think twice before using the same style of advertising among all platforms.

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 am currently developing studies 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).

A Linguistic Evaluation of Police Interrogations: Question Types and Efficacy

Esteban Valencia, ‘16

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

Supported by the SJU Summer Scholars Program

Research concerning the classification of police interrogation abounds—from the categorization of question typology, to the identification of interrogation phases, to the prescription of ideal interrogation processes (Oxburgh, Myklebust, and Grant, 2010). However, such research is often merely descriptive of the interrogation process, and often rests upon methodologies that are inconsistent across the field (Oxburgh et. al., 2010). One such example is the Griffiths Question Map (GQM; Griffiths & Milne, 2006) which has been used to evaluate the efficacy of police interrogation training programs by tracking and classifying questions deployed by officers over the course of a given interrogation. Though a useful and potentially fundamental tool for law enforcement, the GQM operates upon a system of question classification that is particularly unique and precariously defined—drawing from very little linguistic literature concerning the structure and function of questions (Griffiths & Milne, 2006; Griffiths 2007).

My research concerns a standardization of question classifications that is grounded in linguistic literature, thereby constructing both syntactic and pragmatic definitions of question types. With this foundation, the new standardized question classification system has been applied to a sample police interrogations provided by the LAPD, with the aim of exploring the merits of the GQM as applied in an American law enforcement context. Further, these data have been merged with existing data concerning police interrogation techniques (see Kelly et al., 2013).

Preliminarily, I have been able to reconstruct the graphic representations put forth by Griffiths and Milne (2006), thereby describing the progression of appropriate and inappropriate question types over the course of several LAPD interrogations. In my system of question classification, “appropriate” and “inappropriate” questions are defined in terms of that which contributes to the development of a free narrative—thus appropriate questions allow for longer answers by a given respondent while inappropriate questions elicit shorter, often binary (yes-no) answers from respondents. The data provide insight into how LAPD officers facilitate or inhibit the development of a free narrative through the course of their interrogations. As a tool, these data can be used to evaluate the skill level of police officers in constructing free narrative interrogations—which is helpful in developing training programs for law enforcement.

Additionally, I investigated the possibility of developing a standardized metric for linguistically evaluating police interrogation efficacy. This preliminary investigation examines the merits of evaluative tools constructed from police interrogation research. Should police interrogation research seek to extend beyond the descriptive, tools for evaluating interrogation efficacy will be imperative in creating standardized proscriptive models. As such, my basic research will help to advance that effort.

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

Ph.D. Temple University

Research Interests: Internal Controls Over Financial Reporting and International Financial Reporting Standards

Despite its shortcomings, the United States financial reporting system is one of the most-carefully regulated and transparent systems in the world. Of course it has shortcomings as evidenced by the Enron and WorldCom scandals. The Sarbanes-Oxley Act of 2002 was implemented with the intent of improving and strengthening the internal controls over financial reporting for SEC registrants. The jury is still out on the effectiveness of this legislation.

That being said, we are just one of the players in the global economy. With the emerging prominence of other countries and cultures in the business world, comes an additional set of challenges. As Kelly indicates in her research project, the Islamic banking system and economy have been growing at a rapid pace. The financial reporting process in Islamic countries is much-less regulated in comparison to U.S. or other international standards.

Banking standards and practices in Islamic countries are much different than in other countries. Culture plays a much-greater role in how business is conducted there - as compared to their Western counterparts. This project examines the evolution of Islamic banking in the Middle East. It also contrasts the Islamic system of banking with the Western system and investigates the global economy's response to the evolving Islamic banking system as global business leaders work towards converging financial reporting accounting systems.

A Longitudinal Analysis of Islamic Banking Within the Contexts of a Capitalistic Economy

Kelly Spalding, '18

Faculty Mentor: Joseph M. Larkin
Department of Accounting

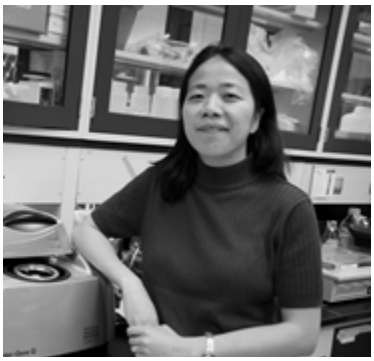
Supported by the SJU Summer Scholars Program

Within the last 20 years, there has been an increase in demand for banks that operate within the boundaries of Shari'a law, the religious regulations that govern what is permitted and prohibited in the actions and daily life of the followers of Islam. According to these laws, the payment and reception of interest, the cornerstone of the Western banking industry, is a sin. In order to comply with their religion, Middle Eastern Muslims have re-established ancient banking strategies to form a modern banking industry that conforms with Shari'a law.

Complex and largely unregulated, Islamic banking is based on religious ethics, rather than the technical rules of the West. Every bank is capable of creating its own policies and procedures for the treatment of daily accounting and banking operations. The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), established in 1990, is determined to create a formal and single set of regulations to govern Islamic banking across the Muslim world. However, due to government controlled economies in many Islamic nations, it has been difficult for the AAOIFI to establish an agreement that suits all nations involved.

The lack of governance and regulation in Islamic banking makes it difficult to value individual banks. A supposed valuation of a bank or any company means nothing if the means of valuation are not consistent across the financial system. A lack of credible systems of valuation can often lead to rampant speculation and unnecessary risk. If the AAOIFI were able to work with Islamic nations to establish a universal set of Islamic banking principles, then it might be possible to reduce the risk and speculation involved in the valuation of these banks, and within the system of Islamic finance as a whole.

In my studies I used the comparison between Islamic banking and Western banking in order to point out the issues within Islamic banking in regards to corporate governance, transparency, and accountability. Specifically, my research focused on stock trading mechanisms, historical evolution, and everyday consumer and investment banking practices. I found beauty in the idealism that Islamic banking is founded on. Indeed, Western finance might learn from Islamic finance that focusing solely on the shareholders of the company, rather than the stakeholders of society may prove to be an unhealthy mindset. Ultimately, Islamic banking will have to address its issues of transparency and corporate governance. Abuse of the Islamic banking system for the purposes of speculation or corporate gain are not only an affront to the founding principles of Islamic banking but also a major challenge to its own survival in a globalized economy. The Islamic banking system must resolve its problems in time in order to improve and grow into a trusted, respected system used worldwide.



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 inappropriate 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.

Multiple mechanisms are involved in telomere maintenance that requires many different types of proteins. My lab is focused on how one particular RNA-processing protein, Npl3, may interact with telomeres and thereby help maintain them. We are using baker's yeast as a model system to study Npl3. Yeast telomerase-null cells with the full *NPL3* gene deleted greatly accelerated the rate of senescence (cell cycle arrest) compared to telomerase-null cells with intact *NPL3*. 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. We hypothesize that Npl3 is either keeping transcription turned off and/or help degrade the transcripts that have been made. This summer, we asked specifically if overexpressing enzymes that degrade RNA is able to substitute for the loss of Npl3. We transformed yeast strains with plasmids that expressed extra ribonuclease RNase H1 and H2 enzymes. In our assays, we found that having these extra enzymes did not rescue for not having Npl3. Moreover, overexpressing RNase H1 made the double mutants missing both Npl3 and telomerase even more sick compared to strains without the overexpression. This result suggests that Npl3 may not be involved in degrading TERRA as a way to suppress its expression. We will design experiments to address whether Npl3 helps to prevent transcription factors from accessing the telomeres.

Bacteriophage Isolation and Treatment Using Host *Pantoea stewartii*

Shawn London, ‘16

Faculty Mentors: Julia Y. Lee-Soety and Karen M. Snetselaar
Department of Biology

Supported by the SJU Summer Scholars Program

Organic agriculture and green friendly farms have become a popular trend in today’s society. One of the difficulties of organic farming is that the plants may be susceptible to many diseases. The disease I am interested in is Stewart’s Wilt of corn which is transmitted by the bacteria *Pantoea stewartii*. This bacterial pest has economic impact but minimal risk for spreading in a controlled environment. *P. stewartii* cannot spread to other corn or crops because it is carried exclusively by the corn flea beetle. My research this summer was to begin a new research project which aims at producing a bio control for *P.stewartii*.

As previously mentioned previously *P. stewartii* is only found in two places. This first is in the infected corn crops, the second is in the gut of the corn flea beetle. To have a local strain of the bacteria the bacteria had to be taken from one of these two sources. The extraction from leaves would be more time sensitive and would also require finding a plant which was significantly infected. No heavily infected plants could be located and for these reasons the beetle was chosen as the source for the bacteria.

The corn flea beetle overwinters in the ground just outside of the cornfields. When spring comes and as the corn begins to sprout, the beetles emerge and begin feeding. I went out to several farms in the area and placed traps to catch these beetles. Twice a week the traps were checked and any likely specimens were brought back to the lab. The beetles were ground up and plated on agar so that any bacteria inside of the gut would be detectable.

After inspection of the agar plates, more tests were performed so that the unknown bacteria could be determined. The bacteria were streaked again so that single colonies could be isolated. Then the bacteria were placed in liquid media. This was necessary as there are several different kinds of bacteria inside of the beetle and not all beetles will carry the *P. stewartii*. I analyzed the shapes and sizes of the bacterium, studied their motility, stained them to see if they were Gram negative or positive, amplified regions of their genome by PCR, and examined whether they were able to infect a corn plant.

One candidate colony that grew up on the agar plate was very promising following these tests. It was found that the candidate was rod shaped Gram-negative stained, and about 2 µm in size; all of these properties fit the published descriptions of Pantoea. For the PCR the bacterial DNA was extracted and specifically amplified. Upon sequencing of the PCR product and subsequent alignment through BLAST the sample had a promising result as being Pantoea or Erwinia. Unfortunately, these families of bacteria are still undergoing rapid changes in naming and categorizations and as a result the bacterium with the promising lead was moved to the infection portion of the experiment.

I also infected Earlivee corn through stem inoculations upward toward the leaf whirl and also through leaf abrasions. After one infection cycle the infected plants showed little sign of infection. While this could be due to many various factors, a major one being sample size. More rounds of infection were started. If the plants show signs of infection, then, despite not knowing the precise classification the bacteria could still be an agricultural pest. Further work would then use this host to find viruses that infect the bacteria and experimenting with various means to deter infection or perhaps cure it depending on the current stage of infection.

Investigating the Mechanism of Yeast Npl3 Protein in Regulating Transcription at the Telomere

Alessandro Sparacio, '17

Faculty Mentor: Julia Y. Lee-Soety
Department of Biology

Supported by the SJU Summer Scholars Program

Nuclei in eukaryotic cells contain genetic information in the form of DNA and proteins, which are assembled into highly organized chromatins. Chromatins compress to form structures known as chromosomes; at the ends of chromosomes are special repetitive sequences of DNA called telomeres (Russell, 2010). The primary function of telomeres is to protect the ends of chromosomes from degradation and fusion to other ends (Siderakis and Tarsounas, 2007). Telomeres in a typical human somatic cell progressively shorten with each cell division (Russell, 2010). Eukaryotic cells may maintain their telomere lengths through the enzyme telomerase, which adds repeated telomeric DNA sequences to prevent shortening (Russell, 2010). Telomeric maintenance is integral, as its malfunction can lead to programmed cell death or replicative senescence. My summer research project observed telomere maintenance in *Saccharomyces cerevisiae*, eukaryotic cells commonly known as budding yeast. The two cellular components of interest in my research are the yeast Npl3 protein and the *TLC1* gene. Yeast Npl3 is an RNA processing protein that has been found to assist in telomere maintenance, while the *TLC1* gene serves as an RNA template within the enzyme telomerase, necessary for telomere elongation.

Healthy yeast cells express the enzyme telomerase, facilitating the lengthening of the telomeres. Conversely, when the *TLC1* gene is deleted thereby rendering telomerase nonfunctional, the yeast cells undergo senescence and resemble typical human somatic cells. Recent studies have found that when the telomeres are eroded to a critical length, active transcription may occur in the telomeric region. This is unusual, as the telomeric region is heterochromatic, or genetically inactive. Interestingly, transcription at the telomere generates a long non-coding RNA, termed TERRA. A past experiment in our lab found that *tlc1 npl3* double mutants accumulate far larger quantities of TERRA than *tlc1* single mutants, suggesting that Npl3 plays a role in suppressing TERRA expression. My summer research investigated whether or not yeast Npl3 degraded or removed TERRA in mutant cells. To test this hypothesis, we overexpressed either yeast *RNH1* and *RNH201* genes, which encode for two RNase H enzymes known to degrade RNA. The haploid yeast strains we used were generated from one diploid yeast cell that was heterozygous for the mutations (*TLC1/tlc1::NPL3/npl3*). The yeast cells also contained plasmids that expressed either *RNH1* or *RNH201*. Data compiled from a senescence assay showed overexpression of RNase H enzymes was not able to rescue the faster senescence of *tlc1 npl3* double mutants; this suggests that overexpressing RNase H enzymes could not substitute for Npl3 function. Furthermore, we concluded that Npl3 might not play a role in degrading or removing TERRA.

Alison Williams Lewin
Department of History
Saint Joseph's University

Ph.D. Cornell University

This year's Summer Scholars Project, working with Matt Sibona, has been an excellent experience in every way. After a slow start in history as an undergraduate, I found myself more and more fascinated with ancient history. The approach to history was also exciting to me, an approach that required students to engage with primary sources, to understand historiographic traditions, to question evidence, and to see that evaluating events in the past could be just as contentious now as they were in their own time. (Ask any two scholars, "Did Rome fall?" and you will get at least three answers!)

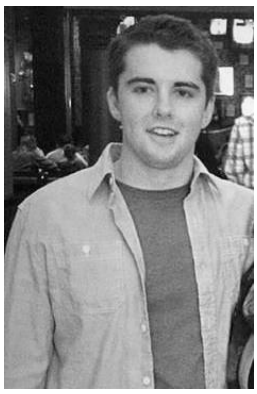
While following a dual track of neurobiology and classics, I kept adding more and more courses in ancient history to my schedule. After a few detours that occupied my twenties in various ways, I found myself wanting to learn more about history and even to think of teaching it someday. Rather than pursue ancient history directly, however, I decided to add another layer, that of the Italian Renaissance. Because the Renaissance was the rebirth of antiquity, I was able to keep my old favorite works and topics, to view them from new perspectives, and to add previously unfamiliar authors and questions to my historical studies. I have, for example, examined the words and actions of Cosimo de' Medici in light of Augustus' *Res Gestae* to evaluate the extent to which Cosimo consciously imitated this first Roman Emperor. Teaching ancient Roman and Greek history at SJU has been enormously enjoyable and enlightening for me as well as for my students.

Mr. Sibona's project requires sophisticated and extensive research in primary and secondary sources, with a view towards evaluating and comparing the reasons Romans gave for the end of the republic and those modern historians put forth for the change to one-man rule.

Success and Failure of the Roman Republic

Matthew Sibona, '17

Faculty Mentor: Alison W. Lewin
Department of History



Supported by the SJU Summer Scholars Program

Over the summer I had the opportunity to research the Roman Republic. My aim was to compare ancient historians to modern ones, as well as compare and contrast different ideas as to why the republic eventually became an empire. In my research I give a quick outline of the republic's history, highlighting different foundational stories of how the republic came to be, the Punic Wars of the third century BCE, and the civil wars of the first century BCE. I chose to focus on the historical accounts of Titus Livius (Livy), who wrote his histories during the rise and reign of Augustus. Augustus was the adoptive son of Julius Caesar, and the First Emperor of Rome.

Livy wrote during an uncertain time. Arguably, Augustus' claim to one man rule could have been seen as an interruption to the republic rather than the beginning of an empire. Livy wrote with several purposes in mind: first, to help legitimize Augustus as emperor; second to create an image of an ideal Roman; and third, to provide a moral guide for his contemporaries. Livy spends a considerable amount of time recounting what he considers the golden years of the Republic (500 BCE to 200 BCE), reflecting the nostalgia of the Roman people. Many Romans, including Livy, considered the past to be better than the present, mainly because they believed men of power acted for the interest of Rome in the past and for their own interest in the present. By retelling stories of Rome's founding, and of its victories, such as the triumph of Rome over Carthage during the Punic wars, Livy creates an image of an ideal Roman for Romans across the entire Mediterranean to model. He made examples of men such as Romulus and Cincinnatus, and women such as Lucretia, all of whom perfectly embodied Roman virtues such as gloria, dignitas, and fides (faith). In short, while Livy at times exaggerated past events or altered history to serve his purpose, he nonetheless uses his history to explain what it meant to be a great Roman.

The second half of my research focused on modern historians' accounts and takes on the republic's demise, as compared to Livy's account. Foremost, modern scholars assert that Roman steadfastness, military prowess, and desire for security and preeminence allowed Rome to become hegemon of the Mediterranean. However, these qualities are also Rome's greatest weakness, which eventually drove the republic to civil war by the first century BCE. Men such as Scipio Africanus allowed soldiers to become more loyal to their generals than to Rome, because generals could promise their soldiers wealth. This element, combined with an ever-weakening senate, further expanding empire, and a redefined meaning of gloria as a recognition of personal triumph, set the republic on a course towards one-man rule. Thus the glory days of men like Cincinnatus, a general who only had to hold command for fifteen days before returning to life as a civilian farmer, became an ideal rather than a reality. By the late republic most Roman soldiers had to bring back more loot and conquer more land than previous generations to prove their military prowess and leadership capabilities. Ancient Romans ultimately come down to us as human; because despite their high opinions of themselves, their habit of self-glorification, and all-consuming ambition, Romans could be inconsistent and flawed as all humans are.

Edwin Li
Department of Biology
Saint Joseph's University

Ph.D. University of Rhode Island

Research Interests: Membrane Protein Structure and Assembly

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 responds 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.

Determining the Structural Consequences of CQC-mediated Dimerization of MUC1

Emily Bilyk, '16

Faculty Mentor: Edwin Li
Department of Biology

Supported by the SJU Summer Scholars Program

I study a protein called mucin 1 (MUC1), which is a highly glycosylated, single-pass membrane protein. In normal cells, this protein acts as a selective barrier against pathogens, and has roles in cellular growth and differentiation. However, sometimes too much of this protein is produced. The overexpression of mucins has been linked to 80-90% of all human solid tissue cancers. The direct physical result of the increased amount of MUC1 in the membrane is that the protein begins to stick to others of its kind in a process called homodimerization. This activity leads to the formation of complexes with growth factor receptors, and targets the nucleus, where MUC1 interacts with effector proteins regulating gene expression. This damages the cell's normal control systems, causing unregulated growth and replication.

Recent studies have shown that MUC1 has a CQC amino acid sequence inside the cell, near the membrane (juxtamembrane), which promotes dimerization under oxidizing conditions. Because most studies have only focused on the role of this CQC sequence, it was important to look at whether the transmembrane domain of the protein was also dimerizing. Preliminary studies in Dr. Li's lab have shown that MUC1 transmembrane domains (TMDs), lacking the CQC motif, form weak dimers, confirming the importance of the CQC motif for dimerization. Because weak dimerization still occurs, this indicates that there may also be TMD interaction. My research question has been to discover which parts of the TMD are interacting, in order to gain more insight into the structure of the dimer.

For my project, I have been studying the small amino acid alanine (A), and the effect of replacing this residue with a larger amino acid, leucine (L). By replacing different alanines in the TMD sequence with leucines, I am able to determine which parts of the TMDs are interacting when dimerization occurs. The data I have collected so far shows reduced dimerization with A-to-L substitutions at the 1162, 1180, and 1182 sites and possibly increased dimerization with substitution at the 1172 site. From these results, we can conclude that the 1162, 1180, and 1182 sites may indicate the position of the dimerizing interface. By obtaining new structural information about the MUC1 protein, we hope to contribute useful insights for the development of novel therapeutic strategies for cancer.

TMD_{CQC} : ^{1161}IALLVLVCVLVALAIVYLIALAV**CQC**R

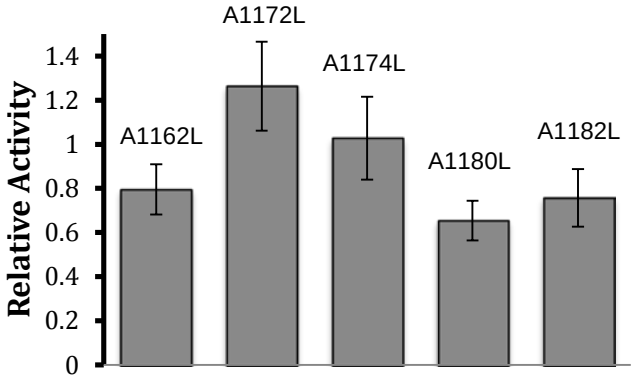


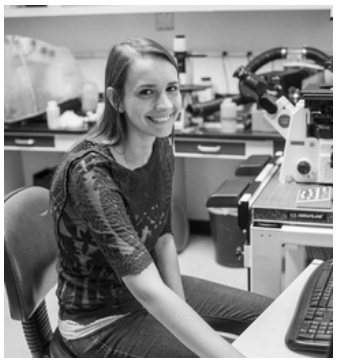
Figure 1. Data on TMD dimerization was collected using the ToxR assay. Dimerization activity is shown relative to wild-type CQC-sequence shown above data.

Implementing a cAMP FRET Biosensor for Use in *Caenorhabditis elegans*

Mary Szurgot, '17

Faculty Mentors: Edwin Li & Matthew D. Nelson
Department of Biology

Supported by the John P. McNulty Scholars Program



Although all animals demonstrate some kind of sleep-like quiescence, the reason for this behavior is still unknown. In pursuit of a better understanding of this behavior, previous research has pinpointed certain genetic pathways that are associated with sleep and wakefulness. One such pathway which regulates sleep in model organisms such as mice, fruit flies, and worms is the cAMP pathway. cAMP (cyclic adenosine monophosphate) is a secondary messenger molecule which can amplify various signals received by a cell and bring about several different effects within the cell that regulate physiological responses. Increased levels of cAMP are associated with wakefulness, while decreased levels are associated with sleep-like behavior. The exact cells in which cAMP levels are associated with sleep are yet unknown. Epac1-camps is a biosensor that utilizes a phenomenon called FRET (Förster resonance energy transfer) to quantify cAMP levels and can be targeted for expression in specific subsets of cells. This tool has been used in human cell lines and in the model system *Drosophila melanogaster* in order to gain an understanding of how cAMP levels are related to sleep. In the Nelson lab, we study quiescence in the model system Caenorhabditis elegans, a microscopic round worm, and a system where Epac1-camps has not yet been used.

FRET is a phenomenon in which one fluorescent molecule, known as a "donor," gets excited by a specific wavelength of light and emits energy in the form of light which can excite a nearby fluorescent molecule, known as a FRET "acceptor." When FRET is occurring, excitation of the donor molecule causes observable fluorescence of the acceptor. The Epac1-camps biosensor consists of a cAMP binding protein tagged with two FRET-compatible fluorescent molecules, cyan fluorescent protein (donor) and yellow fluorescent protein (acceptor). When cAMP is not bound to Epac1, the two fluorescent proteins are located close enough to each other for FRET to occur and thus, yellow fluorescence is higher. When cAMP binds, conformational changes in the biosensor increase the distance between the two fluorescent molecules and decrease the incidence of FRET. FRET levels in the Epac1-camps biosensor are therefore inversely proportional to cAMP levels.

The first part of my project was to visualize Epac1-camps in fixed mammalian cells that had been transfected with plasmid DNA encoding the Epac1-camps biosensor, using confocal microscopy. FRET levels were calculated in these cells as well as in control cells which were transfected to express cyan or yellow fluorescent protein alone. Consistent levels of FRET were observed and statistical significance was established between the Epac1-camps plasmid and the controls. To express Epac1-camps in *C. elegans*, a worm-specific promoter (from the gene *myo-2* pharyngeal expression) and 3' UTR were cloned into the Epac1-camps plasmid. This new DNA construct was injected directly into the gonads of fertile adult worms to generate a line of transgenic worms in which only the pharynx, the muscular tube with which the worm feeds, expresses the biosensor. The confocal microscope was then used to observe the Epac1-camps biosensor in vivo.

Kim A. Logio
Department Sociology
Saint Joseph's University

Ph.D. University of Delaware

Research Interests: Race, Class, & Gender; Women and Health; Social Deviance

Sociology studies the social structures and institutions that influence everyday life. The interactions that take place within these institutions are formed, changed, and influenced by the status of individuals. Racial-ethnic identity, social class, and gender are overlapping, simultaneously occurring identities that are central to understanding how individuals are affected by institutions and vice versa. My research interests are broad in that I enjoy studying many different types of institutions, education and health care, with race, class, and gender integral to understanding these systems of social relations.

Public perception of race and race-relations is one general area of research that highlights the importance of social structures and individual identities. Sarah Ferguson's project looks at how young adults from both America and South Africa interpret race, race-relations, and the media framing of racial conflict. By interviewing South African students, Sarah is able to get a comparative view of how race is framed by another country, particularly one with a history of difficult racial relations. She will continue her research and compare attitudes about race between South African students and American students.

Sarah's project is methodologically sophisticated, theoretically grounded, and sociologically relevant.

How Race is Discussed in South Africa Post the Ferguson Protests

Sarah Ferguson, '16

Faculty Mentor: Kim A. Logio
Department of Sociology

Supported by the SJU Summer Scholars Program

I studied the way college students in Cape Town discuss the concept of race in the post-Ferguson era of racial protests through a collection of interviews. The interviews cover topics such as personal beliefs about race, habits regarding media and news coverage of racially-tense protests, and opinions on racial theories. Asking people's opinions about protests that result after tragedies like Ferguson, MO and Baltimore, MD provides empirical evidence of what is happening in American society and how it is viewed in a country that underwent drastic racial turmoil two decades ago.

Research shows that sociologists such as W.E.B. Du Bois and C.W. Mills define race as socially constructed[4], and therefore real, not in the natural sense, but as a result of society. For this project, I ask people what race they identify as, and if they believe races are socially constructed. The sample population in the project was 3 female, Coloured[5] students attending the University of the Western Cape, near Cape Town, South Africa, ages 18-25. I found that the subjects' main source of exposure to American current events was through social media, not newspapers or magazines. In addition, the subjects agree that inequalities between races still exist, and that the media should bring attention to the inequalities. However, subjects agree that the media is too quick to "play the race card" when tragedy occurs. For example, when asked if the media should talk about occurrences like the shootings in Ferguson and Baltimore, one subject responded "no," because racializing the event draws away from the fact that it was a loss of a human life.

Challenges to my research primarily involved the distance of my subjects. I used recording equipment in the library, which has hours that do not correspond well with the 6 hour difference between myself and the subjects. Furthermore, while Cape Town is a very modern and westernized city, its residents do not always have personal computers and reliable, fast household Wi-Fi. In the end, I conducted only one oral interview via Skype and two written interviews, much like open-ended surveys. The project will continue throughout the fall semester and will be supplemented with more interviews, both written and oral. While the project cannot explain how or why college students and the media hold the opinions they do regarding race, I hope to provide a descriptive example of some of these opinions, in the hopes of sparking greater discussion on what I believe is an important issue.

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[4] Du Bois, W.E.B. (1897). 'The conservation of races' in 'The conservation of races' and 'The Negro' by W.E.B. Du Bois: A Penn State Electronic Classics Series Publication (2007). 5-20. & Mills, C.W. (1998) '"But what are you really?" The metaphysics of race', in Blackness Visible: Essays on Philosophy and Race. New York: Cornell University Press. pp.41-50.

[5] This term has a unique meaning and spelling in South Africa, describing a separate race both in culture and on the census, and may include those of mixed-race, Cape Malay, Asian, or tribal descent.

J. Michael Lyons
Department of Communication Studies
Saint Joseph's University

PhD. Indiana University

Research Interests: Civic Media

I am interested in the way marginalized groups use media and communication technologies for civic engagement. My research and creative projects range from the study of a comic book about the Montgomery Bus Boycott and its deployment in the Civil Rights movement to a multimedia documentary project that tells the stories of four "juvenile lifers," men and women who are serving sentences of life without parole for crimes they committed as juveniles.

My goal in the juvenile lifers project – called *The Redemption Project* – is to disrupt the narrative about incarcerated youth. A media narrative gained traction in the late 1980s that influenced public policy on criminal justice, particularly the adjudication of young people. Devised by academics and politicians, this "superpredator" narrative, which was later discredited, led to "tough on crime" legislation that resulted in more juveniles being tried as adults. Pennsylvania now incarcerates about 500 "juvenile lifers," the most by far of any state in the country. The United States incarcerates about 2,500 juvenile lifers. Every other country in the world combined incarcerates zero.

SJU student Kaitlin Neinstedt and I spent the summer designing an online digital media presence that includes oral history interviews with juvenile lifers, their families and attorneys and policy experts. We hope the site will broaden the context within which the public considers juvenile lifers.

The Redemption Project

Kaitlin Neinstedt, ‘17

Faculty Mentor: J. Michael Lyons
Department of Communications Studies

Supported by the SJU Summer Scholars Program

The term “juvenile lifers” refers to people who have been incarcerated and sentenced to life in prison while they were under the age of 18. The United States is the only developed country in the world that sentences children to die in prison, and Pennsylvania is home to more juvenile lifers than any other state in the US. Thus, Pennsylvania holds more juvenile lifers than anywhere else in the world.

On June 25, 2012, the Supreme Court case Miller v. Alabama found mandatory life-without-parole sentences for children unconstitutional. Many factors contributed to this decision, but essentially, what it came down to is that children are different in terms of culpability and underdeveloped decision-making skills. It has always been widely accepted that children are impulsive, but recent developments in biological and chemical research now support this idea as fact. Now, the question is whether this ruling will be applied retroactively for Juvenile Lifers who are already serving life sentences. Since 2012, 12 states have declared this ruling retroactive, and 7 (including Pennsylvania) have not.

Through multimedia presentations and our website (www.theredemptionproject.org), the Redemption Project unearths and shares the stories of Juvenile Lifers who have grown up behind bars. The lifers that we have been in contact with for the past 2 years have defied the odds to become thoughtful, compassionate individuals – despite spending the last few years of their childhood in one of the most fearful places imaginable. We present these individuals to you in hopes that you may see the people that they have fought to become throughout their incarceration, instead of just the number on their jumpsuit.

Randall M. Miller
Department of History
Saint Joseph's University

Ph.D. Ohio State University

Research Interests: American Social, Political and Regional History, With Special Interests in the Eighteenth and Nineteenth Centuries

My work has largely concerned issues of forging identity and community, the ways people organize and respond to social change (e.g., civil rights), people at war, urban culture and society, politics, religion, and media images and interests. Such work has led to books on such varied subjects as slavery and freedom in the Old South, the Civil War and Reconstruction, religion and society, ethnic and racial images in American film and television, immigration and forming ethnic communities, interactions among different religious, racial, and ethnic groups, urban development (especially in the South and the Sunbelt), and American politics, among others. Of special interest is discovering how people express their own selves in word and material culture. Probably my best-known work in that regard remains my book, *"Dear Master": Letters of a Slave Family* (Cornell University Press; rev. and enlarged pbk. ed., University of Georgia Press), which related the story of an African-American family, as revealed in their letters that spanned over two generations in bondage (in Virginia and Alabama) and, for some, in freedom (in Liberia). In my teaching, I have emphasized similar interest in finding and interpreting new materials, most particularly in crafting writing assignments that ask students to discover and engage primary sources such as diaries, letters, and autobiographies of "ordinary" people (e.g., people heading west on the overland trails, soldiers and civilians in wartime, workers in factories and fields), as well as using the built environment and material culture to "find" people's values, interests, and identities by what they made and used. Most recently, I have been exploring several topics related to home fronts in wartime, politics and religion, and political leadership and writing a short history of Philadelphia.

John Pietruszka's work discovering and describing the intellectual, social, cultural, and personal connections between turn-of-the-nineteenth-century Austria and the United States, with a special focus on Gustav Mahler, Sigmund Freud, and "Austrian Secession" artists, is an original and important inquiry into the directions and dynamics of intellectual and cultural exchanges. It speaks to my own interests in such processes, as it also has taught me much about the ways America provided an environment, and even an invitation, for Austrians to try out their ideas. This summer, Mr. Pietruszka looked especially at the Austrian cultural matrix and at Mahler's time in America and the symbiosis between the conductor/composer and his American audience. He considered factors of physical space—e.g., the concert hall—and cultural need on the American side and of monetary support and a place to experiment on the Austrian side, among several factors that made the American "connection" so productive for both sides. This is the first step to a larger comparative study of the Austrian connections that did much to shape American and European conceptions of and practices in music, art, and psychology, and more.

Austria and America: How Austrian *Fin-De-Siècle* Ideas Influenced the United States

John Pietruszka, '16

Faculty Mentor: Randall M. Miller
Department of History

Supported by the SJU Summer Scholars Program

My project entailed an analysis of the elusive notion of "influence" between two countries, Austria-Hungary and the United States, during the years 1890 - 1914. I chose to focus my research specifically on two leading Viennese intellectual figures that had an extensive and lasting impact on America; the medical doctor Sigmund Freud and the conductor/composer Gustav Mahler. Each of these men through their travels to the United States disseminated ideas that changed institutions, and ways of thinking both within their fields, and within the wider context of American society. Furthermore, both men had varying perceptions of the United States and were themselves changed by their travels and experiences across the Atlantic.

Freud's early impact on America can be traced back to his invitation to lecture at the decennial of the opening of Clark University in Worcester, Massachusetts in 1909. There he gave five lectures in German, later revised by Freud, translated, and published, that discussed his theories about the role of the unconscious, the sexual etiology of neurosis, and the "talking cure" that could be used to treat neurosis. This was the first step, a watershed moment, in a longer process of dissemination and scholarly discourse of psychology in the United States. His ideas helped support Stanley Hall's theories regarding childhood development. Hall coined the term "adolescence" and his work in child psychology was tremendously influential in changing attitudes toward industrial childhood labor in the United States. Outside of psychology, Freudian thought was influential to other fields such as literature, cinema, and such figures of the feminist movement such as Emma Goldman. He was also profoundly changed by his American experiences. His feelings toward America were mixed, sometimes even very negative. Despite this, he felt as though his time at Clark was a significant moment in the worldwide psychoanalytic movement. He also praised Americans for their receptiveness and touted his honorary degree conferred to him to any naysayers who challenged his theories.

Mahler's influence on America took a different, but no less important, form than Freud. In 1907 through an arrangement with the Austrian-American director Heinrich Conried, Mahler was invited to conduct at the Metropolitan Opera. He was enticed by a larger salary and smaller workload, but found more opportunities here than he probably ever imagined. Traveling to New York in the late summer of 1908, he conducted for two seasons at the Met, premiering such works as Wagner's *Tristan und Isolde* and Mozart's *Don Giovanni* to critical acclaim. It was through these works that Americans for the first time experienced the full aesthetic potential of the Wagnerian notion of a *Gesamtkunstwerk* or "total work of art". After two seasons with the Met, he was given a commission to restructure and rework the New York Philharmonic into a professional, world-class orchestra under the auspices of the affluent patron Mary Seney Sheldon. Mahler through his efforts left a legacy of excellence that would continue well into the 20th century. Moreover, this ensemble premiered many of his own compositions for the first time in the United States, most notably his 1st symphony of epic proportions entitled "Titan". Mahler had ambivalent attitudes toward America, harboring prejudices and feeling homesick, but more than Freud he understood the potential of Americans to cultivate the arts.

My conclusion from examining these two important figure is that the notion of "influence" is not a one-way street, but inevitably a cross pollination that affected both the figures themselves and the American cultural and intellectual landscape. Both Mahler and Freud's experiences added a necessary vitality to American institutions and ways of thinking that remained present in the 20th century. Concurrently their travels furthered their own ends. For Freud, this was the dissemination of psychoanalysis, for Mahler it was composing and conducting. Both parties sought to benefit from this symbiotic relationship—and did so--in more ways than previously considered.

Matthew 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.

A Role for the Antimicrobial Peptide NLP-29 During Stress-Induced Sleep in *Caenorhabditis elegans*

Jacqueline Boran, '17

Faculty Mentor: Matthew D. Nelson
Department of Biology

Supported by the SJU Summer Scholars Program

NLP-29 is a neuropeptide like protein that plays a role in the innate immunity of *Caenorhabditis elegans*, but how it does this is unknown. NLP-29 transcription is upregulated when a worm is exposed to stressors such as injury, infection, or osmotic shock. Based on these observations, Jonathan Ewbanks lab proposed that it was an antimicrobial peptide. Additional data supporting this idea is that worms that overexpress NLP-29 live longer after exposure to an infection in comparison to a wild type worm. More recently, the Avery lab proposed that NLP-29 may be related to human opioids based on its similar protein sequence. My summer project was focused on determining how this peptide functions in an immunological response and if it plays a role during stress-induced sleep in *C.elegans*.

I first wanted to determine the effects of *nlp-29* over expression. To do this, we used a transgenic worm to induce n*lp-29* over expression (+) in wild type animals. I observed a significant difference in feeding rates in comparison to wild type worms. Nearly all of the *nlp-29* (+) transgenic animals exhibited feeding quiescence or inhibition whereas the wild type worms or controls continued to feed. This observation suggests that NLP-29 is sufficient to induce feeding quiescence and may be involved with a behavioral response that occurs following stress, much like opioid peptides.

Next, I studied how the absence of *nlp-29* affected feeding quiescence following stress. When *C.elegans* is exposed to high amounts of heat, they will initially attempt to escape this stress, and then will fall asleep, presumably to allow time for recovery. This sleep consists of both feeding and locomotory quiescence. Based on the observation that *nlp-29* over-expression inhibits feeding, I hypothesized that the worms would continue to feed following stress with the absence of *nlp-29*. Surprisingly, I observed increased feeding quiescence in *nlp-29* (-) mutants, which led us to wonder if maybe their behavior during stress exposure is altered and not necessarily their sleep response. My future research includes observing *nlp-29* (-) mutants to observe if and when feeding quiescence occurs during the heat stress to hopefully better understand the reasoning behind the protective behavioral response.

Finally, I wanted to confirm that heat induces *nlp-29* expression. Using a transgenic worm strain in which the *nlp-29* promoter was fused with gfp or green fluorescent protein, I was able to compare the amount of nlp-29 expression in heat shocked worms to wild type worms by comparing their green fluorescence after a stressor had been applied. My preliminary data showed that worms that were exposed to heat exhibited more fluorescence than those that were not exposed to heat, confirming that heat up regulates nlp-29 expression.

Identification of Where cAMP Signaling Regulates Stress-Induced Sleep in *Caenorhabditis elegans*

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 is 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 known is 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 studied this summer was stressed-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. We hypothesized that this stress-induced quiescence was regulated by cAMP.

Protein Kinase A (PKA) is a cAMP-dependent protein that functions to phosphorylate all the enzymes involved in the cAMP pathway, and its activity is directly regulated by cAMP levels within the cell. This cAMP regulation of PKA is a result of KIN-2, a regulatory subunit of PKA in *C. elegans*. *C. elegans* mutants lacking *kin-2* have constitutive activation of PKA and thus, mimic a situation where cAMP levels are continuously high. I found that *kin-2* mutants are severely defective in their quiescent response to stress. These experiments are the first to elucidate a direct relation between cAMP messaging and stress-induced sleep-like behavior. Next, I wanted to determine exactly where KIN-2 is functioning in the nervous system. To do this, we made transgenic animals where *kin-2* was restored solely in the motor neurons. Performing multiple experiments with differing stressors, both heat and UV radiation, it was determined that restoring *kin-2* in the motor neurons only partially restores wild type quiescent behavior. More strains in which *kin-2* is restored in other neuronal subgroups will be part of future research for me in order to narrow down the specific neurons and cells that regulate sleep in *C. elegans.* Discovering the mechanisms of the cAMP pathways and its role in *C elegan* quiescent behavior is an important step in learning more about how cAMP acts on a local, cellular level, and can lead to further insight about the role and function of cAMP in sleep.

Using a Light-Induced Adenylyl Cyclase to Determine the Mechanisms of Stress-Induced Sleep in the Nematode *C. elegans*

Ryan Vance, '16

Faculty Mentor: Matthew D. Nelson
Department of Biology

Supported by the GeoKids LINKS Undergraduate Fellowship and the Dietrich W. Botstiber Foundation

Cyclic AMP (aka cAMP) is a regulator of animal physiology at all levels and has been implicated in the mechanisms of behavior and memory. Previous research in mice and fruit flies has shown that cAMP levels are high when animals are in an active state and low during sleep. The animal that we study is the nematode (or worm) *Caenorhabditis elegans*. This animal is useful because it has a short life cycle, its genome is easily manipulated, and its whole neural circuit has been mapped. Prior research has shown that, among other complex behaviors, this worm goes through various waves of sleep-like states, one of which is triggered by stress. So, the big question driving my research was: does cAMP play a role in regulating stress-induced sleep in *C. elegans?* This was tested using worms that expressed an optogenetic tool called IlaC in their nervous system. IlaC is short for "infrared light-activated adenylyl cyclase"; it is an enzyme that generates cAMP when struck by near-infrared light. With this tool, we can potentially manipulate *C. elegans* behavior in a cAMP-dependent manner by exposing them to alternating wavelengths of light. But why is this useful? Since cAMP controls behavior in higher animals, if IlaC proves to be useful in disrupting sleep in a simple model like *C. elegans*, then it could potentially be used to control sleep in mice and even humans.

Throughout the summer, I have monitored the behavior of *C. elegans* expressing IlaC in their nervous system with two objectives in mind: 1) does this tool increase levels of cAMP *in vivo*, thus reducing sleep, in response to red light and 2) does cAMP primarily act in the nervous system and, if so, where in the neural circuitry. To tackle these objectives, I had to grow strains of worms expressing IlaC in different parts of the nervous system. I personally constructed the strain that expressed Ilac in all of the 302 neurons of the organism. Thus, I could answer the broad question of whether cAMP acts in the nervous system to control sleep. The two other strains developed express Ilac in motor neurons, which connect to muscle, and interneurons, which relay signals connecting various sections of the nervous system. I grew all strains of worms in the dark to minimize Ilac activation and selected them for behavioral experiments under green light only. The reason for green light use is the fact that it has been shown to have no effect on worm behavior and does not activated IlaC. The specific behavior of *C. elegans* that I study is stress-induced sleep. So, after being placed in a heat bath at 37 degrees Celsius or struck with UV light, the worms will enter a period of reduced movement and feeding that we recognize as sleep. Subsequent to the stress, I track the behavior of the worms for periods of two or four hours using an image acquisition system to determine average values of sleep (picked up as inactivity by the worm) for each of my strains of interest.

To test whether my worms expressing Ilac showed reduced sleep upon IlaC activation, animals were monitored in the presence of either constant green or red light. The graph below confirms that activation of Ilac in all of the neurons of the worm reduces stress-induced sleep (Fig. I). This is depicted by the group of worms under red light being asleep for less time than worms under green light. In theory, worms under green light should show wild type levels of sleep, since Ilac is not activated. Worms under red light should show reduced levels of sleep, similar to our sleep-defective positive control, due to Ilac activation. From here, I will narrow down the site of cAMP action to smaller and smaller subsets of neurons. Another goal of mine is to use biochemical techniques to define the temporal dynamics of Ilac activation.

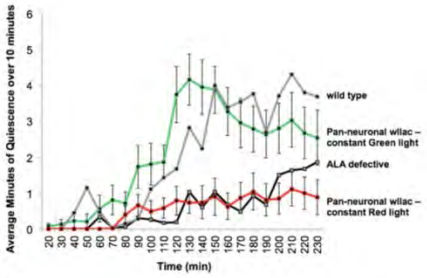


Figure I: Worms expressing Ilac in all neurons tracked under four hours of either green light (green line) or red light (red line). Wild type worms and positive control (stress-induced sleep inhibited) tracked as well for comparison.

Peter C. Norberg
English Department
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://melvillesmarginalia.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.

Love and Hate in Warmer Waters: American Capitalists Exploiting Western Australia and the Impact on the Early Development of the Swan River Colony (1836-1859)

Evan McKernon, ‘16

Faculty Mentor: Peter C. Norberg
Department of English

Supported by the SJU Summer Scholars Program

The United States whaling industry, some may call an empire, was the most lucrative and active whaling industry for the years it was active in history that employed over 700 ships annually at its height in the 1850s; while there were +900 whaling ships active in the world at the time. Whale oil was needed to not only light the lanterns that illuminated the major cities up and down the coasts of the nation but to lubricate the megalithic factories of the American Industrial Age. Whale bone was used for a variety of purposes such as female clothing braces and tooth maintenance. Americans undercut international competition through their capitalistic drives which not only led to the demise of British competitors-who led the industry on a smaller scale before the Anglo-American War of 1812-but also French and colonial whaling operations. From 1815, when the war ended, to the late 1850s, the United States whaling barons, mainly from New England, ventured to new fishing grounds that aided not only in exploration of areas but added to the prestige of the industry.

From the onset of the Swan River Colony in 1829 whaling was seen as a possible industry however due to the high costs of establishing these whaling stations, it was not until the 1840s that consistent colonial shore-whaling stations were established. The colonials had mixed reviews of the American whaling presence on their coast as they were not financially able to take part in what became one of the most successful regions of the American whaling industry’s history while benefitting from the trade between the crews and settlers. However, stations sprung up on the coast through concerted colonial efforts and some became large towns such as Albany, Busselton, Bunbury, and Perth- all aided by the American deep sea whalers via trade and salvaged shipwrecks of whaling ships. American mariners were also sought out due to their skilled seamanship, tenacity, and versatility and there are reports of Americans remaining in Western Australia in the employ of the budding Western Australian whaling industry.

After a summer of research including a trip to New Bedford’s Whaling Museum in southern Massachusetts, utilizing online sources from the local colonial newspapers, and having materials sent via e-mail from historical societies in Western Australia, I have been able to prove that American whalers had a direct contribution to the development of Western Australia’s economy and foundation as a colony.

An Analysis of *Melville's Marginalia Online*

Sarah Sutherland, '16

Faculty Mentor: Peter C. Norberg
Department of English

Supported by the SJU Summer Scholars Program

With the ever-growing presence of technology in academia, it can at first seem difficult, if not impossible, to continue to include research of literature in our studies while still staying up-to-date with the new expectations set by these advancements. However, the emerging arena of Digital Humanities, or the synthesis of technology and humanities, has proved to do just this. By combining these two previously separate worlds, the Digital Humanities have paved the way to keeping literature present and prominent in the studies of today's college students especially those, such as myself, with a great interest in both technology and literature.

This summer, I was able to contribute to the ongoing development of *Melville's Marginalia Online*, a digital archive containing virtual representations of the personal library previously owned by Herman Melville (1819-1891), an American author most famous for his novel *Moby-Dick* (1851). While *Moby-Dick* is Melville's more widely recognized work, his writings cover an endless variety of topics, as does his knowledge and research. In order to understand how, exactly, masterpieces such as *Moby-Dick* came to be, one must first delve into the works of literature that gave Melville his inspiration.

Although I was able to examine several volumes owned by Herman Melville, I worked most closely with Melville's two-volume set of John Milton's *Paradise Lost*, published by Hilliard, Gray, and Company in 1836. For this set, I worked on not only the material seen by the site's visitors, but also the unseen coding that makes *Melville's Marginalia Online* so unique. After editing the set's apparatus and ensuring that all of the material was easily readable, I researched the significance of Melville's inscriptions within the set, noting allusions made by Melville in a commentary section viewable by the public. This commentary allows the site's visitors to not only read the annotations made by Melville, but also to understand them without even needing to leave the site.

Additionally, I was given the responsibility of making all of the marked pages within the set searchable. This involved acquiring the optical character recognition (OCR) of each page and editing the provided coding using Extensible Markup Language (XML). This editing involved clearly indicating which types of markings were made by Melville, providing alternate spellings to words that the site's visitors might search, and proofreading all of the OCR. Once all of this work is put into the website, any visitor will be able to search any one term from a marked page and find exactly what he or she is looking for instantly. With the addition of this search feature, *Melville's Marginalia Online* will become more accessible to its visitors, providing them with the information they want within seconds.

Stacy I. Olitsky
Department of Teacher Education
Saint Joseph's University

Ph.D. University of Pennsylvania

Research Interests: Science and Math Education, Urban Education, Identity

I am interested in the relationship between teacher and student identities, classroom social interaction, and school structures. Some of my projects have included studying the role of race and class as they play out in the process of science learning and identity development, how social and organizational structures within schools and classrooms reproduce inequalities, how individuals exercise agency within these structures, and how social solidarity, sense of community, and science learning and achievement emerge from ongoing social interaction. I have also explored the conditions that promote mutual learning, the development of collective identities, and instructional change for participants in STEM education partnerships between universities and K-12 schools.

One of my more recent projects is a qualitative study that examines the factors that contribute to STEM teacher commitment in high-need schools. The retention of effective science and math teachers is essential to reducing inequalities in education, yet teacher turnover is a persistent problem for STEM education in underserved urban areas. In this study, we investigate how STEM teacher identities develop within different school settings, and how these identities may support retention.

Since teachers need to negotiate institutions, reform initiatives, and relationships with students and colleagues, identity development for new STEM teachers in high-need schools can be a complex process. In this work, we draw on a view of identity as continually constructed through ongoing social interaction in order to support participation within communities of practice. We also integrate perspectives from identity theory (Stryker, 1968), interaction ritual theory (Collins, 2004), and the role of the internal conversation in mediating between structure and agency (Archer, 2003). Using data sources that include interviews, surveys, journals, observations, and reconstructed internal conversations, the study aims to develop a better understanding of the relationship between teacher self-talk, identity development, and retention.

I Am a Teacher: Retaining STEM Teachers by Building Strong Identities

Amy Perfetti, ‘16

Faculty Mentor: Stacy I. Olitsky
Department of Teacher Education

Supported by the SJU Summer Scholars Program

A great struggle currently occurring in the field of education is that the need for teachers is constantly greater than the available supply of teachers, especially highly qualified ones. This is particularly true in high-need schools: 12.2% of teachers in schools where 75% or more of the students qualify for free lunches leave the profession each year. Based on these statistics, high-need schools will have more than a 50% teacher turnover ever five years. Math and science departments, which make up two of the three areas with the lowest average teacher retention nationally, frequently find themselves facing this problem. Therefore, a question emerged: what can be done to increase the retention of math and science teachers, especially in high-need schools?

The study utilized Sheldon Stryker’s Identity Theory. Identity theory acknowledges that a person’s character is multifaceted, and claim that which identity (a specific piece of their character) is manifested in a given situation has to do with identity salience. Identity salience is the probability that a particular identity will be called upon in across a variety of situations. A highly salient identity is one that is drawn upon frequently, while a less salient identity is more likely to remain dormant. According to Identity Theory, behaviors aligned with the meanings and expectations of a particular identity occur when the salience of that identity is reinforced. Identity salience is reinforced when behaviors result in the confirmation of that particular identity. This study suggests that identity confirmation generally results as an alignment between beliefs and practices, expectations and outcomes, or self-view and perception by others.

The study analyzed the identities and future teaching intentions of five different teachers in high-need schools. They have diverse plans for the next five years: one intends to remain in the same school, two intend to remain in high-need schools, one is moving to a suburban school, and one is unsure if she will continue teaching in any setting. Based upon journal entries and surveys, it was determined that relationships (with the students, colleagues, and administration) have the largest impact upon identity confirmation, followed by impact upon students (seen as success, growth, or engagement). The good relationships most frequently contribute to the alignment between self-view and perception by others, while success, growth, or engagement among students is representative of the fulfillment of the teacher’s expectation to make a difference for his or her students. These alignments lead to more identity confirmation and ultimately a higher identity salience. The teachers who are not committed to remaining in high-need schools seemed to have less salient identities than those who are, evidenced by fewer mentions of good relationships or impacting their students. Since identity salience is linked to commitment to the profession and retention of teachers, the creation of new teacher cohorts, led by a few experienced teachers, was suggested as a support. This would allow for good relationships among colleagues and would allow the new teachers to gain advice on how to impact their students. Through these cohorts, the teachers would be able to build stronger identities thanks to a positive impact upon identity building factors and would hopefully remain in high-need schools more frequently.

Paul J. Patterson
Department of English
Saint Joseph's University

Ph.D. University of Notre Dame

Research Interests: Medieval English Religious Writing; Bible Translation; Transition from Manuscript to Print Culture

My research focuses on the early fifteenth-century in England when vernacular religious books were in high demand amongst an elite segment of the lay population. Shortly after his ascension to the throne in 1413, Henry V began a series of reforms to address the ongoing controversies brought about by the heretical movement. The administrative consolidation of power included establishing an effective episcopate; promoting the ascetic and interior life; and placing an emphasis on the veneration of the Eucharist, the saints, and the Passion of Christ. Due to these reforms, the English church during Henry's reign saw the religious controversies diminish and the demand by laity for access to devotional texts increase. Each of these religious and cultural factors influenced the ongoing shift in English religious textual practice, but none had the impact on English translation debates as the founding of the Birgittine Syon Abbey and the Carthusian monastery on the royal manor of Sheen by Henry V in 1415. The two houses were founded near each other on the royal manor of Sheen in an effort to invigorate English spiritual life while concomitantly securing Lancastrian power. Both Syon and Sheen were royally sanctioned institutions in close proximity to London, which made them a spiritual and intellectual hub for the emerging debates on authority and translation. Books were, after all, the centerpieces of the spiritual lives of those residing at the two houses. Carthusians were famous for their commitment to the written word and the sisters of Syon were held to a Rule that encouraged non-liturgical reading. My work centers on these two religious houses and the influence they had on the creation and distribution of religious texts to other religious houses and to lay readers. I am currently completing an edition of a key text, which was produced at the Carthusian Sheen monastery for a sister at the Bridgettine Syon Abbey. The *Mirror to Devout People*, a life of Christ that is organized into thirty-three chapters for each of the years Christ spent on earth, is forthcoming from Oxford University Press in November 2015.

Women in Fiction: Subjects of History

Jessica Marinucci, ‘17

Faculty Mentor: Paul J. Patterson
Department of English

Supported by the SJU Summer Scholars Program

This project began with an intent to dive into the world of Geoffrey Chaucer. With female characterization as the focal point, my research quickly expanded into a variety of authors and time periods. Having myriad cultures and relative social expectations to grapple with, my writing became more and more invested in the development of characters, the elements which factor into characterization, and the trends that transgress generations of literature.

The ability for any character or figure of history to remain present in literature and society through centuries of reform and development is a miraculous gift. In the case of women, so frequently objectified in cultures throughout the world, I find it incredible how characters take shape in a given culture and become icons of reverence in literary work across centuries. In studying literature extensively during my time here at Saint Joseph’s, I have come to develop a great appreciation for the motives behind authors’ work and different elements that may influence their writing. Primarily through studying historical contexts of literature, I have made many personal discoveries pertaining to how different literary icons are received by their readership. Moving into fiction provided insight into the authors’ writing process.

In contemplating literary worlds and revealing the interconnectedness of societies and cultures throughout time, I began to draw a viewpoint on literature that proves what an impact a single character can have on an eternal readership. It begins in the mind of the author, studying criticism and the history of different time periods; then I moved into fiction. I was able to acquire a deeper understanding of the formation of characters and what may have influenced authors in the process of writing. Being able to think this way about the writing process of fiction had a didactic effect. Of course, I learned from characters and began to see the paths on which they took their first steps. Additionally, my studies--more particularly my studies on Virginia Woolf--created an opportunity for me to reflect on my own writing. The process of which lends itself to discovery in greater truth. This project allowed me to experiment in the process of writing characters and storylines that strive to represent some greater truth, a truth that aligns with the society in which I live. Drawing on the work of Julian of Norwich, Margery Kempe, Virginia Woolf, Ernest Hemingway, and Chimamanda Ngozi Adichie I saw how truth was discovered and conveyed through fiction. Inspired by the mode of communication that reproduced this kind of social truth indelibly, my perspective of fiction has been revitalized.

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

Ph.D. Cornell University

Research Interest: Optimization

My main research goal is to develop of algorithms for the optimization (i.e., minimization or maximization) of mathematical functions of several variables possibly subject to constraints on these variables. One typical problem setting is given in the form of a computer program whose inputs are the numerical values of decision variables and whose outputs include a measure of cost or system performance, called the objective function, and some measure of how well the constraints are satisfied or violated. 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. The goal of an optimization algorithm is to determine the values of the input variables that optimize the value of the objective function while satisfying the constraints. In some cases, multiple objective functions need 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. In many practical applications, this computer program is a black-box in the sense that the mathematical relationships between the inputs and the outputs are unknown. These optimization problems are important because they are found in many engineering applications, including aerospace, automotive, environmental and medical applications. Many standard optimization techniques and commercial optimization software at present are ineffective for these computationally expensive black-box problems. Because the simulations 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 black-box function to be optimized and the constraint functions are computationally expensive, a natural approach is to build inexpensive surrogate models for the expensive functions and learn the mathematical relationship between the inputs and the outputs. The surrogate models provide an approximation of this relationship and it is used to guide the search for an optimal solution. Examples of surrogate models include multivariate polynomials, radial basis function (RBF) models, and kriging models. For more than a decade, I have been developing various optimization algorithms that use RBF models, including those that can be mathematically proved to converge to an optimal solution either deterministically or in a probabilistic sense.

Multiple Sclerosis: A Statistical Analysis

Nicholas Mandarano, ‘18
Elizabeth Bloom, ‘16

Faculty Mentor: Rommel G. Regis
Department of Mathematics

Supported by the SJU Summer Scholars Program

Multiple Sclerosis (MS) is a neurological disease in which the flow of information within the brain is slowed. The body’s immune system thinks the body is sick when it is not, and it deteriorates the myelin of the brain and sometimes spinal cord. It is still unknown what causes MS and, while uncertain treatments are available, there is currently no cure.

Biostatistics is a field of study that applies statistical techniques to Biology and the Health sciences. Medical studies frequently, if not always, require statistical support. Diseases that are not yet well understood, like multiple sclerosis, have supple opportunities for an application of biostatistics. Through these studies, much can potentially be uncovered about a mysterious disease.

We began by gathering some basic facts and background about Multiple Sclerosis and by summarizing the results of some statistical studies about this disease. Many statistical analyses were then performed on the basis of different hypothesis. The foundation of our work is based on the hypothesis that Multiple Sclerosis becomes more prevalent as distance grows from the equator. We used an optimization technique from Calculus called the Method of Lagrange Multipliers to derive a formula for calculating a weighted population center for a given country based on the populations and coordinates (longitude/latitude) of its major cities. After using this optimization technique to calculate the weighted population centers for several countries, we created a scatterplot of the distance of those locations from the equator against each country’s disease prevalence and ran a regression model. We found a moderately strong positive linear relationship between distance to the equator and MS prevalence and this is consistent with the well-known vitamin D hypothesis. We then performed similar procedures for other MS-related hypotheses involving variables like smoking and diet, particularly seafood and milk consumption per capita in a given country.

Through this project, we learned how to use the SPSS software to perform statistical analysis. Furthermore, we deepened our knowledge and understanding of both statistics and multiple sclerosis. We hope this project will help improve awareness of multiple sclerosis in society as well.

Optimization of Black Box Functions With Inequality Constraints

Luigi Nuñez, ‘17
Kayla Varela, ‘17

Faculty Mentor: Rommel G. Regis
Department of Mathematics

Supported by the SJU Summer Scholars Program

Simply put, optimization is finding the largest or the smallest value of a mathematical function of one or more input variables. Optimization problems may be subject to constraints, restricting the feasible solutions to certain regions of the domain of the function. Optimization methods are widely used in many engineering and scientific applications. For example, manufacturing companies use optimization methods to make efficient use of their resources and to determine the correct measurements that make certain parts of a machine run properly. In many of these applications, the function to optimize is a black-box, which means its mathematical form is not explicitly available and its values are obtained by means of a time consuming computer simulation whose inner workings may be unknown.

There are many optimization methods. Classical methods use the gradient of the objective function to optimize. The gradient of a multivariable function, which is a concept learned in Calculus, is the vector of first order partial derivatives of the function and it always points in the direction of steepest ascent on the surface of the function. However, classical methods are not suitable for optimizing black-box functions since the gradient is not available. Hence, most optimization algorithms for black-box functions do so iteratively, attempting to find an improving solution in every iteration. Since black-box functions may have a large number of variables or be time consuming to evaluate, to use resources efficiently, engineers aim to optimize using as few function evaluations as possible.

Using Octave, a high-language programming language intended for mathematical computations, and by reading scholarly journals, we began the summer by learning how the Pure Random Search (PRS) and Accelerated Random Search (ARS) algorithms worked and modified them to handle problems with inequality constraints. After running thirty trials of the modified PRS and ARS algorithms on twenty inequality constrained test problems, we compared our results with those of two algorithms that are well-established in the optimization community: SRES and SDPEN. The comparisons confirmed our hypothesis that ARS outperforms PRS on inequality constrained problems. Moreover, the constrained version of ARS is competitive with SRES and SDPEN. We then further modified the ARS algorithm by fitting Radial Basis Function (RBF) models that approximate the objective and constraint functions to guide the selection of sample points. This modification is essential to working with expensive black-box functions; we are not given the mathematical form of the function, so approximating it directs the algorithm in an effective manner. Further experiments revealed that ARS with RBF surrogate models results in better solutions than those obtained by SRES and SDPEN on most of the test problems.

With the guidance of Dr. Regis, we familiarized ourselves with software applications such as Octave and LaTeX, both of which are widely used in the mathematical sciences. We also got first-hand experience with the research process, which typically includes a mixture of setbacks and successes. Overall, our project accomplished its goals and was a great deal of success.

Brendan T. Sammon
Department of Theology and
Religious Studies
St. Joseph's University

Ph.D. Catholic University of America

Research Interests: Theology of Beauty, Theological Aesthetics, Theology of Disability

One of my primary areas of research concerns the theology of beauty or what is more commonly known as theological aesthetics. This is, in its simplest expression, a way of approaching God through the event and experience of beauty. Historically, this approach to God derives most fundamentally from the tradition of the divine names—a tradition found in all three major monotheistic faiths (Judaism, Christianity, and Islam). In Christianity, one of these names for God was beauty, identifying the way in which our natural experiences of beauty open us to something beyond nature, something divine. From the earliest origins of philosophical inquiry up to contemporary aesthetic discourse, beauty has always proven itself to be something that resists conventional modes of human thought while simultaneously uplifting that thought into something beyond, something that nourishes, fulfills, and augments it. Beauty, it might be said, calls us to new ways of thinking and being.

For this reason, beauty proves itself to be not only helpful but indelible for enriching both human experience and the reflection upon that experience found in the variety of discourses that constitutes human thought. Beauty is the first event of attraction to any experience or thought and so is there at the origins and activity of human consciousness. Beauty also expands that consciousness by instilling a desire for more of itself, pushing the inquiring intellect into ever new frontiers of exploration. Beauty is unique in that it both provokes and excites human desire while simultaneously bringing that desire to rest without causing desire to stagnate. Classical accounts of beauty saw it as a mode of being whereby the unity of existence itself appeared and attracted through the diversity of beings that exist. In this way, beauty balances in glorious harmony a unity in plurality and a plurality in unity.

The theological study of beauty, then, is the study not only of how God attracts or calls human beings to his own divine beauty, but also, as Hans Urs Von Balthasar—the father of contemporary theological aesthetics asserts—a new way of seeing. This capacity to see enriches every facet of human existence, whether social, political, economical, educational, and even mathematical and scientific. When beauty opens new ways of seeing it also impacts the variety of practices that constitute human activity.

One area of particular, though long term, interest to me concerns the phenomenon of human disability. It is my contention that a theology of beauty holds important riches for seeing the beauty of persons who are considered 'disabled' or 'differently abled.' The many strategies for approaching disabled persons today have proven fruitful. However, many of these strategies, informed as they are by trends in modern and postmodern thinking, tend to function as values extrinsically imposed upon social consciousness. It is my belief that a theology of beauty offers a more organic or internal way of embedding these values, thus fortifying them for posterity. Beyond attempts either to integrate disabled persons into a supposedly neuro-typical world, or to elevate them beyond the world into some holier-than-us status, a theology of beauty enables the beauty of human disability to contribute in its own unique way to the overall beauty of a creation brought forth from the Divine Source of all beauty.

A Theology of Beauty in Augustine's Thought: A Beauty that Brings Desire to Rest

Molly Verghese, '17

Faculty Mentor: Brendan T. Sammon
Department of Theology

Supported by the SJU Barbelin Scholars

This summer study explored the theology of beauty and desire in the works of fourth century theologian and one of the most important figures in the Western intellectual tradition, Saint Augustine. Although Augustine may be best known for his political theology, his Trinitarian theology, or his theology on grace, his theology of beauty and desire are essential to his overall theological synthesis. The study of beauty is one that studies how people perceive and comprehend beauty most especially as a form of the presence of the divine. In other words, it intends to figure out what exactly people mean when they say something is "beautiful." In a time where spiritual hunger remains a consistent need in peoples' lives, studying Augustine's theology of beauty and desire provides relevant and intentional direction for this spiritual search.

For this study, the focus was on discerning how Augustine understood beauty based in his writings in Confessions, City of God, and a few of his other minor works. What came out of these readings was an assertion that Augustine understood beauty to be that which brings desire to rest. Augustine's life was saturated with unquenchable desires of all types but most especially with a desire for God. In fact, his path in search for satiety led him to conclude that the only thing capable of satisfying human desire is God himself. One of Augustine's most famous lines is found in his Confessions (410), "You have made us for yourself, Oh Lord, and our hearts are restless until they rest in you." But the questions remain: what does it mean to say that God satisfies human desire especially when God is not seen as a distinct entity among other entities found in the world? And what does it mean to truly be at rest in God for Augustine?

These questions gave shape to the direction of this study. The paper breaks apart Augustine's understanding of the three components of the thesis - beauty, desire, and rest - in order to more fully understand the undeniable exchange between the three within Augustine's writings. We found that Augustine's theology of beauty derives from a number of sources. The most significant of these influences include the Biblical, Neo-Platonic, and Stoic traditions. He drew from these sources an understanding of beauty as an encounter with that which is desired for its own sake. Augustine's image of God as it shifts throughout his life remains consistent with his understanding of beauty as that which stills desire. All along his understanding of God was one that satisfied his deepest desires. Although he knew this, he did not always act accordingly. However, after his conversion, he comes to speak of a beauty which calls desire to itself and in so doing brings it to rest by reorienting it to its divine origins. Thus, to bring desire to rest is not to put an end to the desire. Rather, it is to redirect the desire to its origin in order to give the actions that follow more intention and direction. Augustine's theology of beauty and desire culminate in any experience that invites a person to say, "That is beautiful."

Carolin Schellhorn
Department of Finance
Saint Joseph's University

Ph.D. University of Texas – Austin

Research Interests: Financial Markets and Sustainability

The financial crisis of 2007-2009 has illustrated the vulnerability of asset values to the mispricing of risks and the concomitant threats to the stability of our financial system. At the time, widespread asset devaluations resulted from excessive risk taking that was particularly concentrated in the housing and mortgage markets. Similar fragilities exist today due to the markets' negligence in pricing climate-related risks. The corporate model of shareholder wealth maximization, which has continued to support a worldwide reliance on fossil fuels, shares responsibility for anthropogenic climate change and the threats this poses to our society and civilization. Governments, businesses, consumers and investors are beginning to wake up to the need to identify and quantify the sources of these threats and to chart the transition of our economy to a more sustainable developmental path.

Assets associated with fossil fuels are increasingly at risk of becoming stranded as heightened public awareness of climate change risks raises the possibility of regulation, taxation, the development of stigma and divestment. The magnitude of the risks and the size of this asset class require immediate, multi-pronged analysis and action in all economic sectors by all market participants. For the purpose of asset valuation, identification and quantification of risk factors associated with individual energy sources is critical. Climate bonds offer borrowers a way to protect themselves from being saddled with unusable assets by providing the funds needed for the transition to a low-carbon infrastructure and economy. For investors, climate bonds offer a unique opportunity to hedge the risks of stranded assets in their portfolios. Disclosure and certification standards for these new securities are in the process of being developed. My research addresses some of the many issues associated with this important emerging area of finance.

Stranded Assets

Morgan Bui, ‘17

Faculty Mentor: Carolin D. Schellhorn
Department of Finance

Supported by the SJU Barbelin Scholars Program

Every company today uses financial statements to record its financial activities and report its financial condition. The balance sheet, in particular, lists the economic resources a company owns, also known as assets, and the debt it owes to others, known as liabilities. This summer scholar’s project focuses on the possibility that assets associated with the fossil fuel industry may be at risk of becoming “stranded,” which means that they may experience large losses of market value before the end of their expected economic lives. The stranded assets problem arises from two main sources: the consequences of anthropogenic climate change, and blind spots in the area of corporate governance.

In 2010, all governments operationalized the objective of the United Nations Framework Convention on Climate Change (UNFCCC) to target the keeping of the global temperature to below 2°C. Such a limit implied that a tough global greenhouse gas emissions (GHG) budget would need to be created in order for the world to meet its goal. Of GHG emissions, carbon dioxide accounts for the largest source at about 76%. Carbon dioxide comes from the burning of fossil fuels (coal, natural gas and oil), solid waste, trees and wood products, and results from certain chemical reactions. For the purposes of this project, the main focus falls upon carbon emission from the burning of systemically important fossil fuels. According to an analysis conducted by Carbon Tracker Initiative, the Grantham Research Institute for Climate Change and the Environment at the London School of Economics and Political Science, the carbon budget from 2013 – 2050 is about 900 GtCO2. This carbon budget means that the coal, natural gas, and oil sectors will not be able to use all of their reserves as currently listed. Therefore, current financial statements are likely overstating the values of some of these assets.

The markets' reluctance to recognize and price the risks associated with climate change when valuing assets is consistent with, and supported by, a widespread focus on shareholder wealth maximization and a definition of value as purely financial. This mindset, which developed in the 1970s and is now taught in business classrooms around the world, has replaced companies' original concern for the public interest and society's welfare. Management’s endless pursuit of profit has been strengthened by the short-termism that resulted from the pressure to provide quarterly financial reports, a general disregard of signs of local and global economic imbalances, and a failure to be held responsible for corporate wrong-doing and excessive risk-taking. These issues all relate to the problem of stranded assets, because they have created a business and regulatory environment in which companies have been able to avoid responding to the risks associated with climate change. Managers and investors in the fossil fuel industries continue to price corporate assets consistent with a "business as usual" scenario, and are ignoring regulations and market consequences that will likely occur in response to the global carbon budget and the threats to our health, communities, physical assets and ecosystems from climate change.

In order to avoid a financial crisis similar to the one seen in 2007, the finance sector must become more responsible and act immediately. Corporate governance must shift to a focus on the long term, and embrace a more holistic concept of shareholder value that includes environmental and social dimensions in addition to the financial component. This can begin with a willingness to interpret climate change reports so that the finance sector can identify and price all risks in the fossil fuel industries. Acknowledging, identifying and pricing climate-related risks are the first key steps towards tackling the emerging problem of stranded assets and protecting the stability of our financial system, our economy and society.

Elaine M. Shenk
Department of Modern & Classical Languages
Saint Joseph's University

Ph.D. University of Iowa

Research Interests: Linguistics

I am interested in the linguistic phenomena that occur in contexts of language contact, such as specific phonetic, morphological, syntactic, or pragmatic features, as well as in the social phenomena that are relevant to that contact, such as symbolic values of different ways of speaking, language ideologies, or language policy and planning. In both Puerto Rico and the United States, language contact provides a rich source of data for this kind of analysis. On the Island, Spanish and English have coexisted officially for over one hundred years, and although Spanish is the clear language of choice for most islanders, English can also be present to varying degrees in oral and visual language practices in the public sphere. In the United States, the two languages come into frequent contact in heritage language populations who are part of a bilingual continuum as well as in immigrant communities as we observe rapidly changing demographics beyond the traditionally studied contact settings such as Miami, New York, Chicago, and the Southwest.

My overall research focuses on the ideologies articulated by speakers about language officialization as well as speakers' daily decisions about language use and practices. To explore these areas, I collect data through personal interviews, participant observation, public speeches, legislative debates, and metaphors or other analysis in the media. I examine the data within the framework of Critical Discourse Analysis, which prioritizes the mapping of various analytical forms onto one another, asking how spoken and written texts (e.g., the texts of a radio campaign about language) are produced and distributed; analyzing the discourse about those texts (e.g., interviewees' ideologies about the content of those texts); and situating these realities within a sociopolitical framework (e.g., Puerto Rico's historically colonial relationship to Spain and its current commonwealth status in relationship to the United States are crucial elements to understanding the context of language contact). Critical Discourse Analysis thus moves the researcher between a micro- and macro-analysis of text and context.

Language contact varieties readily demonstrate features such as codeswitching and/or loanwords from one language to the other. Thus, ideologies sometimes point to the ordinary character of these features and sometimes decry them as less 'pure' varieties of language. This determination is based more on socially- or politically-determined values than on linguistic ones. Thus, these language contact settings provide sources of data that compel scholars to incorporate not only linguistic, but also historical, political, and social realities into our research objectives and analysis.

Language Ideologies of Puerto Ricans in Philadelphia

Rebecca McIntyre, '17

Faculty Mentor: Elaine M. Shenk
Department of Modern and Classical Languages

Supported by the SJU Summer Scholars Program

Due to the historical relationship between the United States and Puerto Rico, the Puerto Rican dialect of the Spanish language holds great significance both socially and politically within both countries. The contact between Spanish and English within this context has allowed for loanwords to be exchanged between both languages and for code switching, or using both languages within one discourse, to occur. In addition, the relationship between Puerto Rican Spanish and other dialects of Spanish at times features a tension regarding "correct" and "incorrect" Spanish of the spoken variety. For these reasons, strong beliefs, ideologies, and stigmatization have emerged both among some speakers of Spanish towards some Puerto Ricans and among some Puerto Ricans in the United States and some of those residing on the island, in relation to the use of Puerto Rican Spanish in daily speech as well as the specific features, structure, and vocabulary particular to it. The field of Linguistics includes the study of ideologies and perceptions that surround language, including the relationship between the philosophies that certain people hold in comparison to their practical use of language in daily life. I studied the linguistic features specific to this dialect, such as omitting or aspirating the "s" at the end of syllables, various perceptions of code switching, the art of being bilingual, views on the essence of Puerto Rican identity, the politicization of the Spanish language, and works sponsored by the Puerto Rican Academy of the Spanish Language, an organization committed to promoting correct usage of, conservation of, and the study of Spanish within the history and culture of the island, among other topics.

Our methodology consisted of interviewing Puerto Ricans in the Philadelphia area, with the focus of the interviews stemming from two Puerto Rican radio program campaigns called "*¡Atrévete y dilo!*" and "*El español nuestro de cada día"/'Our Daily Spanish'* sponsored by the Puerto Rican Academy of the Spanish Language. The first campaign focuses on encouraging the use of traditional Puerto Rican vocabulary words as a form of cultural identity through thirty-second long programs concentrating on one word each. The second seeks to promote the usage of particular linguistic features in Puerto Rican Spanish in daily interactions, following the same format as the former with the intent of correcting "incorrect" Puerto Rican dialectal features of Spanish. The following is a transcribed example of one of the radio episodes from the ENCD campaign:

Tarjeta

"Compañeros atención. Esta persona que ven en la foto es la tarjeta de la investigación. Tarjeta es un anglicismo innecesario adaptado del inglés «target». Se recomienda decir «objetivo» o «blanco». Esta persona que ven en la foto es el objetivo de la investigación "El Español Nuestro de Cada Día" Dilo bien. Dilo mejor. Academia Puertorriqueña de la Lengua Española. Fundación Puertorriqueña de las Humanidades y esta emisora."

The literal translation of the Spanish word "tarjeta" is "card" in English, whereas "objetivo" and "blanco" translate more closely to "object" or "target," respectively. The influence of English has transformed the meaning of "tarjeta" In Spanish from "card" into "target," due to the similarity in the words in both languages. In addition, aspiration is a specific feature of Puerto Rican Spanish that involves pronouncing an "h" sound in place of the "s" at the end of a syllable. In this episode, the first time the speaker offers the sentence with the use of the anglicism "tarjeta," she also aspirates her "s" in "e(h)ta" and "inve(h)tigación," but clearly pronounces the "s" in the second "corrected" sentence in both words, not only promoting correct usage of vocabulary but also insinuating the use of a less regionalized pronunciation. This is just one example of the twenty-five radio segments, broken into the categories of pronunciation, morphology (or language structure, such as the plural form of a noun or irregular verb conjugations), vocabulary, and grammar. Taking a sociolinguistic approach, we first recorded and transcribed each participant's thoughts about Puerto Rican Spanish from in-depth interviews conducted in either English or Spanish, and then analyzed how the participants both legitimized and delegitimized their own ideologies within their own speech. Studying the features of the Puerto Rican Spanish dialect aided immensely in listening to the interviews in order to transcribe them, as well as in helping to analyze the various manners of speaking present in each interview and the views held by each participant on various features and forms of speaking.

George P. Sillup
Department of Pharmaceutical &
Healthcare Marketing
Pedro Arrupe Center for Business Ethics

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 2015, he has presented research at the Alzheimer's Association International Conference research with College of Arts & Sciences colleague, Dr. Eileen Sullivan, and Haub School of Business professor, Dr. Ronald Klimberg, "Reduction of Agitation and Anxiety Observed in a Clinical Study of Nursing Home Residents with Dementia Using Timeslips™, a Creative Expression Program".

Additionally he and Steve Porth have published their 11th consecutive audit of the newspaper coverage of ethical issue affecting pharmaceutical industry in *Pharmaceutical Executive* entitled "Pharma in the News: The Eleventh Annual Press Audit and are working on the 12th with the Reference Librarian for the Haub School of Business, Cynthia Slater, EthicsTrak® Database Administratrix, Lauren Lang, and the 2015 Summer Scholars, Dante Gleason and Caitlin Smith.

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.

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. Dr. Porth is also a management consultant, specializing in leadership development and strategic management programs. He has written two books, one which is now in its fourth edition and has been translated into Chinese, and he has published extensively in management journals, including the *Journal of Operations Management, Journal of Management Education, Management Decision, Journal of Organizational Change Management, International Journal of Production Research,* and *International Journal of Operations and Production Management*.

Dr. Porth 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.*

Portrayal of the Pharmaceutical Industry by Newspaper Coverage

Dante Gleason, ‘16

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

Sponsored by the SJU Summer Scholars Program

This summer, continuing an analysis of trends for over eleven years, my partner and I researched how articles in major newspapers portrayed pharmaceutical companies and/or their products. We read newspaper articles from some of the most read newspapers in the country, including the following: *The New York Times, The Los Angeles Times, USA Today, Wall Street Journal,* and *Washington Post*. Over these eleven years, just under two thousand articles entered into the EthicsTrak® database.

Reference librarian Cynthia Slater would search our online database using specific keyword searches to find articles relevant to our research spanning Quarter 4 of 2014 until Quarter 3 of 2015. These articles were then sent to Dr. Sillup to send to Lauren Lang, ’16, who is leading the EthicsTrak database, who then divides the articles into two batches, one for my partner and one for me, to analyze.

I read these articles searching for certain issues commonly reported in the media. After I’m done reading each article, I analyze them to see if the content of the article presents a positive or negative image for “Big Pharma,” or the large pharmaceutical companies across the country (Johnson & Johnson, Sanofi, and Merck for example). I input this data into an Excel spreadsheet, and send it back to Lauren for the data to be input in the EthicsTrak database.

For the past three years, drug safety is always a big concern. There is always a nice batch of articles that are written about drug overdoses when it comes to prescription painkillers like Vicodin or OxyContin. However, there is always a new trend in the media concerning some of the biggest worldwide issues in healthcare. For example, as we have all heard, the Ebola virus took the world by storm, and that is reflected in a high number of articles calling for extensive testing and production of something that would help the many afflicted people of Africa. Every year, I am surprised by the number of positive articles that are written about the pharmaceutical industry. Most people (at least ones whom I know) have a fairly negative outlook on the pharmaceutical industry, but according to the research that I’ve done for the past three years, the media would beg to differ.

Through my past three years as a Summer Scholar, I’ve learned a lot about what is happening in the pharmaceutical world that I did not know about before. This program is the reason I know that I am in the correct major because I love reading these articles every day. But most importantly, I’ve gained a lot of necessary skills through this program that I know will help me in my professional career once I graduate from Saint Joseph’s University in May.

Portrayal of the Pharmaceutical Industry by Newspaper Coverage

Caitlin Smith, '17

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

Sponsored by the SJU Summer Scholars Program

For the second summer in a row, I have enjoyed exploring the pharmaceutical industry as it is portrayed in the media. My partner, Dante Gleason, 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 11 years, evaluating just under 2,000 articles prior to this year.

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. This year, I have found that vaccination is one of the most common controversies. Ebola vaccines are popping up, and many parents are still concerned about vaccinating their children with injections such as the MMR vaccine due to the accusations about its link to autism.

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 them by month and formats these articles to make them easily readable. Once they are formatted correctly and organized, Dr. Sillup sends the articles to Lauren Lang who evenly distributes them between me and Dante in batches of ten articles. Then, Dante and I read each article and decide if they are relevant. If they are, we enter them into one of two excel spreadsheets depending on what is focused on the most, Pharma 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 Dante 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 Lauren who compiles them together and send us additional material to review. Following the completion of our research, Dr. Sillup and Dr. Porth use our findings, combined with their insight, to make conclusions in an article which is published annually in the *Pharmaceutical Executive.*

This research has helped me to gain valuable insight into the pharmaceutical industry which is the field I will be working in post-graduation as a Pharmaceutical and Healthcare Marketing major. In such a controversial industry, I will face many challenges throughout the duration of my career; reading these articles has given me a preview of what some of those challenges might be.

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 focuses on water quality in naturally occurring surface waters and in water distribution systems. I also work with many student fellows from the Catholic Bioethics Institute in designing and testing slow sand water filters that can be employed to remediate polluted water in developing countries.

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 Bangladesh 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 quite toxic and caused severe illness in the individuals who consumed the contaminated water.

We have developed a slow sand water filter that can be constructed easily with supplies found in country. Experiments on this slow sand filter have demonstrated that it is effective in removing bacteria by students working in Dr. Arango's research lab (Biology). This same filter design, with the modification of added iron metal construction nails, is effective at removing enough arsenic from water to result in safe ingestible levels.

Determination of Inorganic Compounds and Pharmaceuticals in the Philadelphia Water Supply

Heidi Kurn, ‘16

Faculty Mentor: Jean M. Smolen
Department of Chemistry

Supported by the SJU Summer Scholars Program

The Belmont water supply is the water provider for the West Philadelphia area, including parts of the Saint Joseph’s University Campus. With the intent of determining the water quality of the Belmont water supply, water samples from Saint Joseph’s campus, Science Center, and surrounding creeks, Indian Creek and the creek in the Merion Botanical Gardens, were collected. This allowed for a comparison between the compounds in treated and untreated water. These samples were then tested for inorganic and pharmaceutical compounds.

All of the water samples were tested for two inorganic constituents, phosphorus and calcium carbonate as well as three pharmaceuticals: ibuprofen, acetaminophen, and carbamazapine (an anti-seizure medication). These compounds were selected based on their prevalence in the home and the Philadelphia Water Department's Annual Quality Report. The concentration of the inorganic compounds was determined using Standard Methods and the pharmaceuticals were extracted from the water samples by solid phase extraction using an Oasis Hydrophilic-lipophilic-balanced 20 cc cartridge. The method used for this extraction was developed by the EPA (1694) in 2007.

After analysis, it was determined that the calcium carbonate concentration of the creeks was much higher than that of the Science Center tap water. On the other hand, the phosphorus concentration of the Science Center tap water was almost ten times higher than the concentration in the creeks. In this study, the phosphorus concentration of water was tested and then the water was run through a Brita pitcher and tested again for phosphorus. A Brita pitcher is a household water filtering system that uses an activated carbon and ion-exchange resin disposable filter. The phosphorus concentration was greater in the water after it had passed through the Brita pitcher. This is a common problem with many activated carbon filters in aquariums. One possibility for the increase in phosphorus is zinc orthophsophate which the city adds to its water supply in order to prevent the corrosion of pipes. This compound may dissociate and the zinc would be absorbed by the Brita pitcher which would make the phosphate more detectable in the water.

I hope to expand this research over the next year. I plan on collecting a larger variety of samples from more buildings on campus and other local creeks. My plan is to continue the Brita pitcher study and see if I can determine what causes the phosphorus concentration to increase. I also hope to continue examining the pharmaceuticals in the water by analyzing the extracted samples using liquid chromatography mass spectroscopy in order to determine the concentration of the pharmaceuticals in the water.

Arsenic Removal Through Biosand Filters and Iron Nails

David Temme, ‘16 and Anjni Patel, ‘17

Faculty Mentor: Jean M. Smolen
Department of Chemistry

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

Arsenic contamination of drinking water is a health crisis affecting numerous populations, both in developing nations and in parts of the United States. Arsenic is a naturally occurring semi-metal that is found in groundwater. Arsenic is odorless and colorless, allowing 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 effective 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. The iron rust acts as an effective absorbent for the arsenic present in the drinking water.

Seven of these water filters have been constructed in our lab. There is one control filter in which there are no nails, five filters with a single layer of rusted nails and one with two layers of rusted nails. One of the five 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, their arsenic concentrations are tested using Inductively Coupled Plasma (ICP) mass spectrometry after filtration though a 33-millimeter filter.

Thus far, the results have shown that the filters containing a single layer of rusted iron nails and 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.

Karen Snetselaar
Department of Biology
Saint Joseph's University

Ph.D. University of Georgia

Research Interests: Plants and Fungi, Especially Fungal Diseases

For many years the major focus of my lab has been a system involving corn (maize) and the plant pathogenic fungus Ustilago maydis. The disease caused by this fungus is known as corn smut, and it's generally known to people who grow corn all over the world. It has been fairly easy to breed smut-resistant corn plants, so our reasons for working on this fungus aren't so much about trying to stop this particular disease. Rather, we study corn smut because it is a very useful model system. Corn plants that are just a week old can be reliably inoculated with fungal cells that are easily grown in culture. We can study the progress of disease in many ways, using a variety of different kinds of microscopy. In addition, because the entire genome of Ustilago maydis has been sequenced, we have access to well-characterized mutants and other tools that can help us link form with function.

Recently one area of research has involved experiments to determine what the fungus senses on plant cells that provide the signal for infection to begin. Students have used living leaves and leaf replicas to try to answer this question, documenting what they see with various types of microscopy, including confocal microscopy. A second focus in the lab has been to study how the fungus overwinters in the soil, between times when the host plant is available. Students have carried out experiments to look at the survival of fungal cells in different types of soils, also varying temperature and moisture conditions.

As a broadly-trained botanist, I also have some more general interests in the distribution of plants and fungi. My students and I have recently been doing work on the SJU experimental green roof. We are documenting the distribution of plants that make up the roof community and how it has changed since the roof was planted. The next step is to determine which factors are most important in determining the success of the various kinds of plants on the roof. Factors such as moisture, temperature extremes, sunlight and wind are being considered, as well competition and other biotic factors. Most recently, summer scholars began examining soil pH, nutrient levels, and microbial soil communities across the roof.

Effects of Anthocyanin Production in Developing *Zea mays* on Virulence of *Ustilago maydis*

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.

In inoculated, older plant leaves where infection has failed, a visible degree of anthocyanin is present. The role of anthocyanin production is not clear. In maize, anthocyanin is a water-soluble vacuole pigment which produces a red, purple color. The observed leaves vary as to where and how much anthocyanin is present. With this, it cannot be assumed that the pigment's production is a systemic response to *U. maydis,* yet these findings are significant in that anthocyanin and lignin share a precursor, phenylalanine, in their biosynthetic pathways. This means that the compound phenylalanine can be redirected into the biosynthesis of either lignin or anthocyanin depending on the plant's needs at the time. Lignin is a strong, stable compound and it has been proposed that it could be a defense response in *U. maydis* (Tanaka et al, 2014). Based on a study of an effector protein, these authors proposed that the fungus might induce the plant to produce anthocyanin at the expense of lignin production, thus preventing a host response to infection. My research during the year looked at the interplay between these two compounds within inoculated leaves in order to understanding the *U. maydis* interaction with maize.

In all, I developed various techniques in order to extract and quantify anthocyanin production within freshly inoculated corn plants. The method that I found most reliable was the pH differential method. This method consists of isolating infected plant tissue samples and placing them into different pH buffer solutions, both at a pH of 1 and a pH of 4.5. At the different pH levels, anthocyanin undergoes a structural change and becomes colorless in the more basic solution. Measuring the difference between how much light is absorbed at each pH is indicative of how much anthocyanin is present within the sample. I used this method to see when anthocyanin was being produced in relation to when the fungus was inoculated into the plant. It was seen that synthesis of the pigments could only be detected at later stages of infection, five to six days after the introduction of the pathogen. At this stage, if infection is successful, the fungus is already within its host and is starting to proliferate, forming tumors. With this, it is apparent that there is a correlation between *U. maydis* infection and anthocyanin production in the host plant. However, it is still not clear if the pigments production effects the fungus's ability to infect maize.

To continue this research, I plan to look at lignin production within maize and when and where the compound is being produced. This could be done by staining and profiling both inoculated and non-inoculated plants for lignin after the pathogen has been introduced. From here, the plants can be compared to show if biosynthesis of the compound is occurring as a response to *U. maydis*. Similarly, production of the lignin precursor phenylalanine can be observed and followed before and after inoculation using different stains. This can be related to the resulting amount of anthocyanin present to see if the precursors are naturally being made for other reasons besides lignin production. Precursor production after inoculation would indicate a host response.

Ustilago maydis and its Capability to Infect Young *Zea mays* Leaves Through a Soil Medium

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. The tumor-like galls that form on the tissues of *Zea mays* are a clear indicator of the disease. These tumors contain diploid teliospores, which function as the propagative structure of the fungus. The plant's young leaves and kernels are most often affected, but all meristematic host tissue is susceptible to tumor growth. In the lab, we are able to grow haploid cells that will cause infection when injected into growing corn plants. However, over the past couple months, I sought to understand *U. maydis*'s infection pathway as it occurs in nature.

To understand how *U. maydis* infects its plant host, comprehension of its lifecycle is essential. Its lifecycle consists of three stages. There is a nonpathogenic haploid form that reproduces by budding in a yeast-like manner. As a result of meiosis, there are multiple haploid forms that can only mate when they have unlike alleles at two loci, which regulate mating and pathogenicity. When two compatible haploid cells mate, they form the infectious dikaryon stage that must enter the host. The fungus then produces tumors, from which teliospores arise, and when germinated, they restart the cycle at the haploid stage.

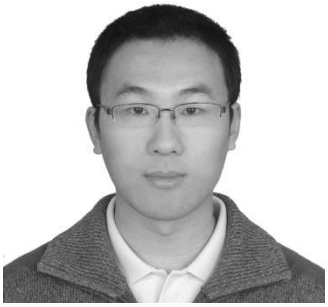
In nature, the spores overwinter in soil and can remain viable for several years in a dormant state. Wind or rain is thought to cause the spores to splash up upon the plant leaves. Once two compatible sporidia meet, they fuse and make a hypha in order to enter and thereby infect the host's growing tissues. It is the assumption that the teliospores are carried up to the aerial parts of the plant, and then germinate to cause infection. However, there is no data to back this up, and this is what I have been researching. Previous students in Dr. Snetselaar's lab have been able to isolate both haploid cells and teliospores from the soil. From here, my research focused on whether or not the haploid cells of *U. maydis* were able to lie dormant on plant leaf surface.

To answer this question, a teliospore solution from an old tumor was poured into freshly planted pots of maize. Once the seedlings have sprouted up, the liquid in the middle leaf whirl is swabbed and plated on Rose Bengal Agar. This liquid in the whirl is a product of root pressure, which is a force that pushes water from the roots up the stem. If *U. maydis* has grown up on the plates, we now have to determine whether those cells on the leaf surface were haploids or teliospores through a charcoal assay. A charcoal assay is a way to see if two different kinds of cells are compatible. A white and fuzzy appearance on the charcoal agar indicates that successful mating has occurred. By cross-testing unknown *U. maydis* cells with possible haploid forms, we can tell whether or not they were haploids or teliospores as well as their mating type. My results suggest that teliospores are germinating somewhere else, possibly in the soil, and that the haploids are getting up onto the leaf surface.

Identification of the Function of Auxin for the Infection of *Ustilago maydis* on *Zea mays*

Wenlan Yu, '16

Faculty Mentor: Karen M. Snetselaar
Department of Biology



Supported by the SJU Summer Scholars Program

Ustilago maydis is a fungal pathogen that causes corn smut, which can be easily identified by tumor-like galls that form on actively growing host tissues and contain masses of dark, sooty teliospores (Pataky & Snetselaar, 2006). However, very little about the possible role of plant hormones in the infectious processes of *Ustilago maydis* is completely understood. Some evidence has shown that *Ustilago maydis* has the ability to produce auxin, a group of plant hormone control the growth of plant, during the infection process. Thus, it is interesting as to why the fungus produces auxin if the hormone is only beneficial to plants. My research during the summer looked at the function of auxin during the infection of *Ustilago maydis* in *Zea mays*.

Some previous research in Dr.Snetselaar's lab has shown that the appressorium, which is the specialized swollen infection structure that penetrates the cell wall of the corn cells, mainly form and infect seedlings in the elongating region of the corn leaves. We know that auxin causes the elongation of plant cells by loosening the cell walls to allow expansion. It has been shown that *Ustilago* also produces auxin in early infection stages (Marti et al, 1997).We hypothesize that auxin produced by either the plant or fungus will weaken the cell wall, giving the appressorium a better chance to infect. If this model is correct, the treatment of auxin in corn will increase the susceptibility of the plant to *U. maydis*. Thus, some older seedlings that normally show resistance to *U. maydis*, compared to younger plants, will be able to be infected after the treatment of auxin. My experiments in this summer were designed to test this model. Pieces of leaves were cut off and drops of fungus culture were put on the top of each leaf. Leaf pieces were treated with different concentrations of auxin solution 12 hours after the beginning of the experiment. The leaves were cleared according to an established protocol 24 hours after the beginning of the experiment. With the help of a confocal microscope, some signs of infection were observed in the auxin treatment group. However, the evidence is not strong enough to support the hypothesis because overall infection rates were low.

In the future, I will try to design a technique to measure the level of infection under microscopic observation, so that the difference between the auxin group and the control group will be easily compared.

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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

Some of my favorite parts about being a college professor are the unexpected journeys I take with my students to places I never expected to be. I took one of those journeys with Darby Rourick this past summer, straight into the "manosphere," an unwelcome and dangerous place for women, by design. As a rhetorician and a writer, I'm interested in spaces like the ones Darby investigated in her research, spaces that attempt to use words to silence perceived threats, in this case, the threat of women in general and feminists in particular. My own narrative blog, *Twinprints,* is an online version of a memoir I am writing about the adoption of my twin sister and me as infants and our subsequent reunion with our birth family several years ago. One of the key differences for me between writing online and writing in more traditional venues is the instantaneous feedback I receive the moment I publish a blog entry. While adoption is complex, as are people's responses to it, my story is not the kind that inspires the level of hatred you find in the manosphere. Still, I have my own pet troll, a man who appears every six months or so and unleashes a slew of insults. The first time he left a comment several years ago, he did little to hide who he was, but he's gotten savvier in the last year or so, creating different personae (most recently he posed as a woman from Australia) and fake IP addresses. I find him more fascinating than bothersome, but I do think about his compulsion to tear me down in my space, albeit a public space, behind the coward's veil of anonymity. Because it's my blog, I retain the power to approve comments, and despite my general embrace of free speech, I don't allow my troll to exercise his on my blog. I also rarely respond. Paying him no mind doesn't make him disappear, but it does remove much of his bite. One of Darby's dilemmas in taking on this project was her need to dive into the manosphere—that is, to feed it with attention—in order to critically respond to it. What she pulled from that dark mess was, ultimately, a call to action regarding harassment of women in online spaces. Her critical analysis of the manosphere, a pushing back against it, reminds me of the women essayists I've been studying for more than a decade, especially those in earlier centuries who had to enter the historically male space of the essayist in order to re-define it, and make it their own, and even prosper within it. There was no online space in the 18th and 19th centuries, but there was a periodical press dominated by men who derided, and even threatened, women writers who dared enter the territory they thought they owned. But they didn't own it, any more than the men in the manosphere own the internet. I'm so grateful to Darby for her courage to take on this project, and for leading me along a path of unexpected discoveries in a place that was designed to do the opposite of what it ultimately did: encourage us both to speak up.

Silencing Women Online in the Manosphere

Darby Rourick, ‘16

Faculty Mentor: Jenny Spinner
Department of English

Supported by the SJU Summer Scholars Program

The internet is the most important meeting place of the modern world. However, despite the growing reach of the internet there is a surprising lack of oversight online. Due to this, the internet is sometimes called the 'Wild West' because online, anything goes. There is no rule, or even expectation, to be polite and respectful. Numerous people have been harassed and stalked online. Sadly, the abuse they have suffered online is trivialized because it's happening online; however, the internet has become such a part of our lives that the online world affects our offline life. Women are disproportionately affected by online stalking and harassment. These acts are directed at specific women, but there is another whole corner of the internet that demeans and harasses all women indiscriminately. This corner of the internet is the manosphere. The main objective of the manosphere is to fight against feminism. Blogs, message boards, sites and podcasts in the manosphere publish articles that demean and harm all women.

My project went deeper into the manosphere. I spent numerous hours reading blogs and sites, and listening to podcasts to better understand the manosphere. I utilized this research in an article and a paper that examined the manosphere. I defined the manosphere in my paper and then I argued that the manosphere is detrimental to women. The abuse and harassment from the manosphere is not acceptable. Online abuse of this nature is sexual harassment and should be treated as such.

This harassment is especially harmful because it is gendered. The manosphere usually writes articles and posts about women in general; therefore, all women are targeted by the articles and comments. This is a problem for all women. Cyber stalking and harassment of specific women is terrible, and it can ruin lives, but the manosphere can be just as harmful. Even though the site may not directly attack one person, the words matter. These words hurt all women and try to scare them away from the internet. Women are demeaned in the manosphere. Rules in the manosphere limit how much a woman is allowed to talk, so women are silenced. One such rule requires women keep quiet unless they are willing to show their naked bodies. Full participation for women is impossible with rules like this. Even partial participation requires an acknowledgement of inferiority from women.

The manosphere threatens to undo years of work by feminists. Anyone with internet access can read about why females should not have self-esteem, how to beat a girl without leaving bruises, or how to manipulate a women in the bedroom. Articles like this matter because they affect the real world and they harm real people. My project brings attention to the manosphere because I do not want women to be silenced. It may seem that this harassment is only words, but for women it is reality.

Clint J. Springer
Department of Biology
Saint Joseph's University

Ph.D. West Virginia University

Research Interests: Biological Effects of Global Climate Change on Plants; Urban Agriculture; Science Education

Research in the Global Change Plant Ecophysiology Lab at Saint Joseph's University focuses on the physiological, developmental, and growth responses of natural and agricultural plant species to human-induced climate change. The work of my students and I seeks to understand how physiological processes of plants will change in the near future as humans continue to negatively impact our environment. While working to meet this goal, we are also asking important questions about the basic biology of both natural and agricultural plant species. Our research uses techniques in plant physiology, quantitative genetics, genomics, and plant ecology. Past studies carried out by our lab have investigated the effects of altered precipitation patterns on the biofuel plant species, *Panicum virgatum* or switchgrass; the interaction of elevated atmospheric carbon dioxide (CO_2) and a severe pathogen of oak trees, *Xylella fastidiosa*; the interaction of the soybean cyst nematode and elevated atmospheric CO_2 in soybeans; and the use of water resources by *Pinus rigata* or Pitch Pine growing in the pinelands of southern New Jersey.

Studying Differences in Flowering Time and Physiology of Multiple Ecotypes of *Arabidopsis thaliana* Grown in Altering Levels of Carbon Dioxide

John Julian, ‘17

Faculty Mentor: Clint J. Springer
Department of Biology

Supported by the SJU Summer Scholars Program

For decades, the average amount of carbon dioxide found in the atmosphere has been increasing and it has been affecting the mechanisms involved in the flowering time of plants. Studies have shown that plants undergo increases in growth and changes in physiological functions as a result of increased atmospheric CO_2 compared to plants grown under normal levels of CO_2. The increased growth leads to loss of water and elevated levels of photosynthesis, which lead to higher production of and higher concentrations of sugars. According to studies, high concentrations of sugars affect carbohydrates' role as signals in physiological pathways, which can act similarly to hormone signals that are involved in developmental processes related to the flowering time of plants.

My project examined the differences in flowering time and physiology, including leaf variance and plant weight, of *Arabidopsis thaliana* grown at ambient and elevated levels of atmospheric CO_2. To carry out the project, I grew twenty different ecotypes of *A. thaliana* in ambient and elevated levels of CO_2 over the span of one month and harvested the plants once they started flowering. Once they flowered, they were removed from the soil, their respective number of adult and juvenile leaves were recorded, and they were placed in an oven to dry for later weighing. The results were compared and conclusions are currently underway.

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

Ph.D. University of Illinois

Research Interests: Disclosures About Environmental and Cybercrime Costs, Social Accounting and Accountability, Sustainability Accounting

Threats to our physical health and financial well-being might not seem to be closely related to disclosures in reports of business firms, but the surprising fact is that they are very much associated. The quantity and quality of disclosure made by companies with respect to the financial impacts of both climate change and cybercrime poses a significant problem worthy of study. This is an area in which empirical investigation can lead to interesting outcomes.

Data theft, or cybercrime, is a real threat to our financial health. Like risks to physical well-being, there is a chance for major harm from this illicit activity. Financial market participants have a keen interest in knowing if firms have had breaches of sensitive data. They also need to know what the economic cost to the company is expected to be. An essential element in any public firm's annual financial reporting relates to risks of loss from having been victimized by cyber criminals. The ultimate research question here, which I have been studying for five years, is whether full and fair disclosure has been made to stakeholders. Transparent reporting concerning all the effects of operations are needed if there is to be a serious assessment of corporate accountability.

Climate change—usually discussed in the context of "global warming"—is created largely by human activity. More than an inconvenience, this phenomenon will have as significant a financial impact on the *next* generation as the extraordinary run-up in costs for energy and healthcare has had on the current one. This, together with corporate social responsibility and environmental disclosure issues, has been a focus for much of my empirical research over the past 30 years. Holders of scarce financial resources want to be informed—*as decision makers*—regarding the actual and expected outcomes of their investment choices. If climate change risk creates significant negative economic consequences, investors and creditors should be fully informed about the impact that enterprise managers expect. Consumers, too, want to know more about products than just the price and availability; they want to know the lasting effects of choosing to buy and consume.

Cybercrime Financial Disclosures by SEC Registrants in the U.S. Retail Trade Sector and Sustainability Reporting by Companies that Participate in the European Union Emissions Trading System

Annie Hosler, ’18 and Dennies Chung, ‘17

Faculty Mentor: A.J. Stagliano
Department of Accounting

Supported by SJU Summer Scholars Program

With the rise in technology, there comes a fascinating arrival of integrity and information on many companies' behalves. However, with this rise in technology, we are seeing unprecedented levels of cybercrime and emissions within our business and global environment.

Our first project consisted of doing research on cybercrime. According to dictionary.com, cybercrime is defined as criminal activity that involves the internet, a computer system, or computer technology. In recent news, Jeep, Ram and Chrysler products were recalled after products were proven that their systems could be compromised by computer hackers, leaving a driver completely helpless on the street. In other 2015 cybercrime news, we saw big corporations and companies such as Sony, Home Depot and Ashley Madison have their systems and information compromised by an unwanted third-party; having customer and client intel stolen right from under their noses which could and would surely have an impact on many companies' financial statements. Cybercrime and cyberattacks are unfortunate situations; however, the American global information technology company, Hewlett-Packard, predicts that there will be an earthquake of cybercrime activity by the year 2020 that will devastate different companies and different industries accordingly.

Our second project dealt with sustainability reporting by companies that participate in the European Union which includes companies that are in the Pharmaceutical, Retail, Industrial, and Entertainment industries, all of which we have gathered data for. The globe is seeing a huge trend in rising levels of Greenhouse Gas and Carbon Emissions, and we as a globe are starting to see effects of such behavior: Climate Change. It is so important that we not only work towards reducing emissions, but also inform the consumers and investors of these trends so that they can push for change. As with Cybercrime, the SEC does not require disclosure of sustainability reporting.

With these projects in hand, we have conducted research on data availability using search terms and a criteria for evaluation for a list of sample companies. With this information, we were able to analyze the gathered data and make minor and theorized conclusions. Many of the companies that worked directly in hand with energy and made obvious contributions to Greenhouse Gas Emissions such as International Paper and ConocoPhillips were the companies that were the most transparent and have made the furthest push for change by recording and disclosing capital expenditures particularly for climate change and having carbon allowances as well as pushing for the Cap-and-Trade program.

Transparency is a required component of business in the modern age. It is required to perform ethical, effective, and efficient business, and the SEC must enact stern policies. In many circumstances, if these policies were to take place, these security breaches and abnormal climate changes can become an expectation for companies, leading to normal market conditions, thus leading to very little changes in share price.

Financial Reporting of EU Companies Participating in the Emissions Trading System

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Returns to Investors in Small Banking Enterprises

Evan Megill, ‘16

Faculty Mentor: A. J. Stagliano
Department of Accounting

Supported by the SJU Summer Scholars Program

The issue of climate change, and the liabilities that accompany it, has become a very relevant problem for countries worldwide. Consequently, it comes as no surprise that the risks and opportunities surrounding climate change pose a legitimate concern for investors and corporations alike. The leading regulator of climate change reporting is the SEC, a government agency that strives to ensure the protection of investors through increased transparency of corporate reporting. Since February 2010, enhanced guidance provided by the SEC has led to positive results with respect to disclosures regarding climate change. The goal of our research project is to bridge this financial reporting regime to the European Union to see how and if companies are disclosing financial risks related to climate change. All disclosures found, or even the lack thereof, will create questions and issues concerning the clearness of climate change risks as they apply to particular businesses.

My role in this project was to extend a previously developed database of annual financial reporting information into year 2014 filings. A methodology that includes collecting 10-K documentation, extracting relevant text disclosures and building an organizational framework was utilized. This work will allow content analysis to be performed by principal researchers. This research will give us a better understanding of how SEC climate change disclosure guidance is impacting firms around the world.

The second research initiative revisited a study on equity investment returns of small banking institutions over two decades since its original publication. The process included combing the profusion of new data sources to see if any coincided with the already established methodology. The next step is to develop a database displaying the small bank mergers and acquisitions for a specific time period–a fundamental process that allows us to determine the actual returns earned, ex post, from start-up to the date of corporate enterprise change. Moving forward with this research contributes to the area of financial analysis in a very practical way.

Ilene Warner-Maron
Department of Health Services
Saint Joseph's University

Ph.D. University of the Sciences

Research Interests: Aging, Long-term Care Administration, Nursing, HIV and Aging, End of Life Care

Joe Paparo has tackled and important aspect of life—the discussion of death. It is an area often avoided by physicians, families and the individual him/herself. Although the majority of older adults voice their desire to have a natural death in their own bed at home, surrounded by loved ones, the reality is that most will die in a hospital, nursing home or other institution. Why is there such a disconnect about end of life care and the choices we face?

In most long-term care facilities in this country, the task of discussing advance directives falls the social worker, often the least clinically knowledgeable member of the interdisciplinary team. Physicians often fail to discuss these issues when a person is admitted for care, even if the individual's trajectory is obviously short. Nursing staff may also be reluctant to discuss these issues with the older adult as well as family members who may be facing difficult challenges in acclimating to a nursing home environment.

The Affordable Care Act (ACA) originally contained provisions for payment to physicians for reviewing advance directives with their patients, however a firestorm erupted and the legislation was labeled "death panels" by some politicians. Do health providers only discuss these issues if there is associated reimbursement?

In his study, Joe Paparo has developed a handout that discusses end of life care, care planning and opens the conversation about "the talk." He was able to access a large number of social workers from area long-term care facilities and engage them in finding ways to begin this discussion.

Joe's initial data suggests that a wider dissemination of information would be valuable for older adults, their families and the facilities which provide care in their last weeks, months and years. Engaging in this discussion is vital in order to ensure quality of life, quality of care and the equitable distribution of scarce resources for health care.

In the future, Joe Paparo may wish to expand his research to targeted older adults in the community, particularly senior centers, church groups, senior housing and other forums in which "the talk" can be initiated.

Having "The Talk:" Helping Medical Professionals, Social Workers and Families Address End of Life Treatments With the Dying

Joseph Paparo, '16

Faculty Mentor: Ilene B. Warner-Maron
Department of Interdisciplinary Health Services

Supported by the SJU Summer Scholars Program

Through a course at Saint Joseph's, I was able to become a hospice volunteer in my sophomore year with a few different programs in the Philadelphia area. As a hospice volunteer I was able to gain experience treating patients holistically, while getting to connect with some amazing individuals. One day I was sitting with a patient I had been visiting for well over six months, and I asked him what was in his living will. He told me he didn't know. When we pulled his documentation, we both were surprised to learn the wishes marked on his living will were completely different than the wishes he had at the time, and that was when I realized nobody had asked him about his end of life plans possibly since his admittance to the nursing facility. He had been dying of lung cancer for several months, and at the time we looked into it, his documentation called for interventions he wouldn't have wanted if he had stopped breathing. This was the first time I understood exactly how crucial having conversations about living wills actually is.

At the end of life, the lack of communication between patients and their caregivers often result in a low quality of life for all of those involved, and the use of medically futile treatment. In order to encourage more conversations, medical professionals must persuade their patients to create a plan of care for end of life situations with their families, such as an advanced directive. The goal of the study I conducted was to identify some of the reasons behind the lack of advanced directives at the end of life. We interviewed a total of 14 social workers from 8 nursing homes surrounding St. Joseph's University. The results showed some of the primary reasons patients do not develop advanced directives are general misconceptions surrounding the documents in addition to general discomfort to talk about dying. In order to combat these problems, doctors must be more willing to discuss death with their patients and take the time to properly explain all aspects of an advanced directive, while dispelling any misconceptions and concerns the patient may have. Finally, using the information provided from interviews, we developed a pamphlet to get the conversations started in nursing homes about advanced directives. It includes a section separating fact and fiction about procedures surrounding the documents, a section on what goes into one, and why and how the patient should fill out a living will. The brochure is currently beginning two month trial periods in nursing homes around the Philadelphia area.

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

I currently teach courses in business ethics, leadership, change, and consulting; I also teach a first year seminar, "Serious Comedy and Social Justice," and a media-based upper-division elective, "Breaking News in Business Ethics." This summer I had the privilege of working with two Summer Scholars exploring very interesting – and very disparate – topics using different methods.

Liz Sohmer's Summer Scholar Project is an example of why teaching at Saint Joseph's is so rewarding, both professionally and personally. Presidential candidate Sen. Bernie Sanders said: **"I don't think that's a radical idea to say that if you work 40 hours a week in America you should not be living in poverty."** (reported by Leah Jessen via dailysignal.com, July 2, 2015) Liz's research is grounded in the real world: How many institutions of higher education take so seriously the matter of its employees that they are concerned that each and every employee and contractor be paid on which they can live? The answer, unfortunately, is very few. Liz's research – and what she hopes to do with it – aspires to change that.

None of the institutions that have adopted living wage policies have gone out of business. By all accounts the small number of institutions with living wage policies appear to be at least as successful as they were before adopting such policies. The difference is that those institutions with such policies are *socially sustainable – in addition to* being financially sustainable.

People around the country, in business, in government, and in higher education, recognize that a federal minimum hourly wage of $7.25 has resulting in workers paid those wages falling behind the rising cost of living. Even though nominal minimum wages have increased, real wages have fallen as inflation has risen at a faster rate. While governments are moving to raise the minimum wage at the state, county, and municipal levels companies are raising starting wages, and, in some cases, adopting living wage policies. It appears that institutions of higher education are finally beginning to realize their responsibility to the most vulnerable members of their own community.

Rachel DeLuco's research is a reminder that history is being made each day. Her research explored our forebears' history to see who could have acted to change the course of history for millions of people sold into bondage and oppressed for generations. This summer (2015), we bore witness to moving pictures – history being made across the South as our society inches toward greater inclusion and understanding of others' points of view. Those defending maintaining a place of honor for a symbol that capstones several centuries of racial oppression, while those who demanded its removal collectively asked, "why does this still exist?"

I've been struck by the power of ***moving pictures*** – art, images, video, television, film, news –that move us as we see it. That interest led me to create a first year seminar, Serious Comedy and Social Justice, in which students examine social justice with regard to class, gender, sexuality and race. It is a challenging course experience that includes viewing a number of moving pictures, comedic and non-comedic, that strive to express the desire for the full realization of every person's potential. Rachel's Summer Scholar project was designed in this spirit, and I would be hard pressed to think of a more relevant topic to the ongoing national conversation of race in America. The very definition and, more importantly, the meaning of race, defined who was free and who was a slave, who had rights and who longed for them, who could make their own decisions as moral beings and those who could not.

Rachel's research also asks something of each us: In a culture of consumerism, in a world of constant selfies, what history are each of us making, today? What can we do, right now, so that people in the future won't be looking back and regretting our inaction regarding the injustices of today?

Shortcuts to Emancipation

Rachel DeLuco, ‘18

Faculty Mentor: C. Ken Weidner
Department of Management

Supported by the SJU Summer Scholars Program

It is a well-known fact that during the Constitutional Convention, most delegates opposed slavery. And yet, they chose to let this institution continue for 80 years. This historical fact always bothered me. It bothered me because thousands of soldiers had just lost their lives for a 7-year war for human freedom. It bothered me because of the way we glorify these founding fathers, putting them on countless monuments and even our currency. It bothered me because their reluctance to solve this dilemma only exacerbated the problem, leading to the bloodiest war in American history.

I realized that there was only one way to rectify this wrong; to create a hypothetical situation in which the institution of slavery was ended much earlier than 1863. I am not alone in creating these hypothetical ‘What-if’ situations. In fact, there is a whole genre entitled ‘alternate history’. After exploring various works in the genre, I decided to create my own version.

There are countless points in our history that would have enabled us to prevent or end slavery. What if slaves were never introduced to the Jamestown colony in 1619? What if the first draft of the Declaration of Independence was kept, in which Jefferson condemns slavery? What if the members of the Constitutional Convention of 1787, who were morally against slavery, stayed true to their values and fought to end it?

There is one important point that I would like to highlight from my project. As long as slavery persisted, no further moral or social development could take place. Without fundamental human rights for African-Americans, there could be no voting rights for women, nor land rights for the Native Americans. Because of this, the effects of slavery remain significant today. Whether it is a Confederate flag flying above South Carolina or a gender wage gap, human progress in the United States has been stalled by the founders’ reluctance to end slavery. Therefore, we have a long way to go before we can attain the type of egalitarian society the founders envisioned.

Living Wage Policies in American Higher Education

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Supported by SJU Summer Scholars Program

As a student involved in campus advocacy for justice, I am interested at looking at universities as employers and how they pay their workers. My Summer Scholars research involves living wage policies and their implementation in higher education within the United States. The idea of a living wage originated in the 1990s when legislation began passing local ordinances to raise the wage floor. While no states have passed *living* wage ordinances, there are a growing number of cities that are enacting higher *minimum* wages in recent years. Cities such as Seattle and Los Angeles passed ordinances to raise the minimum wage to $15 per hour, due to the high cost of living. Businesses within these cities must comply with the wage raise, yet some companies and universities have implemented higher wages as well even beyond these cities’ limits. A number of private sector companies have higher wages for their employees for example; Costco, Trader Joe’s, and Ben and Jerry’s. Relatively few universities have policies that ensure a higher minimum wage or a living wage for their workers on campus, but I learned that a number of institutions are working towards such policies.

While the movement for living wage and higher minimum wage progresses, universities as influential leaders start to adopt policies as well. Few universities have adopted living wage policies’ among the few that have are Georgetown University, Loyola University New Orleans, Stanford University, and the University of Wisconsin. All of these policies I found had been enacted in 2000 or later. At Georgetown – an institution that shares our Jesuit commitment to social justice – a model living wage policy was created to aid other universities in developing their own policies. Within my research, I evaluated universities with living wage policies using Georgetown’s effective model, to see what is included in each individual policy. This includes aspects such as covered workers, employment principles, and oversight and implementation. This detailed model policy ensures a sustainable approach to implementing a living wage at universities across the U.S.

While researching schools, their minimum and living wage policies, and how those policies came to be, I learned that the data on this issue is very fragmented. Many people are talking about living wage policies on their campuses, yet there is no “go to” source reporting on which schools have – and have not – enacted living wage policies. Thus, my project has led to finding a way to compile and integrate all the information about policies across campuses in the U.S. into a more accessible location for others.